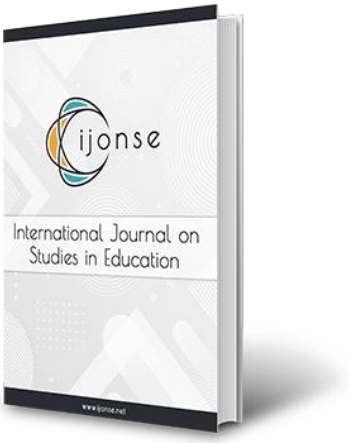

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To cite this article:

Espino, C. (2025). Pre-service teachers' perspectives on generative AI: Insights, applications, and challenges in the classroom. *International Journal on Studies in Education (IJonSE), 7*(3), 732-747. https://doi.org/10.46328/ijonse.1930

International Journal on Studies in Education

2025, Vol. 7, No. 3, 732-747 https://doi.org/10.46328/ijonse.1930

Pre-Service Teachers' Perspectives on Generative AI: Insights, Applications, and Challenges in the Classroom

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Article Info

Article History

Received:
6 January 2025
Accepted:
13 June 2025

Keywords

Generative AI
Pre-service teachers
AI in education
SDG 4 quality education

Abstract

Generative artificial intelligence (AI) tools such as ChatGPT are rapidly transforming educational practices, offering new possibilities for teaching and learning. This study investigates the perspectives of 229 pre-service teachers from a state university in the Philippines on the use of generative AI in education. Employing a convergent parallel mixed-methods design, both quantitative survey data and qualitative responses were analyzed to examine participants' knowledge, willingness, perceived benefits, and concerns. Findings indicate that pre-service teachers are generally knowledgeable about generative AI and express a willingness to incorporate it into future teaching practices. Reported advantages include timesaving in lesson planning, grammar and writing assistance, idea generation, and enhanced creativity. However, concerns were raised regarding over-reliance on AI, the accuracy of generated content, academic integrity, and unequal access due to the digital divide. These findings emphasize the compelling need to equip teacher education graduates with the critical skills and ethical frameworks for responsible use of AI. This study contributes to the growing discussion on the use of AI in education.

Introduction

The rise of generative artificial intelligence (AI) is changing the educational landscape at a faster rate. This provides both opportunities and challenges for educators and learners. Generative AI tools—such as ChatGPT and other large language models—can generate text, images, and various types of content in response to user input (Ogunleye et al., 2024). According to Zawacki-Richter et al. (2019) these generative AI tools have shown considerable potential in enhancing teaching practices by supporting lesson planning, developing instructional materials, and providing instant feedback to students. However, alongside these benefits are emerging issues and concerns regarding the ethical implications, reliability of AI-generated content, and risk of overdependence on technology in the learning process (Taşçı & Tunaz, 2024; Floridi & Chiriatti, 2020).

Pre-service teachers, those who are now pursuing teacher education and training, play a significant role in shaping the future of education. Digital natives are more likely to incorporate emerging technologies into their practice (Al-Shidhani et al., 2024). Preliminary research indicates that many pre-service teachers perceive generative AI to be a powerful tool for enhancing student learning and streamlining instructional tasks. However, there are still

pressing concerns about the accuracy, reliability, and impact of such technologies on critical thinking, creativity, and classroom engagement of students (Chan & Tsi, 2024; Holmes et al., 2019). Despite the increasing integration of artificial intelligence into education, few studies have explored how pre-service teachers perceive the practical implications of AI in classroom settings.

This study investigated the perspectives of pre-service teachers on the use of generative AI in education. This study examined the perceived insights, applications, and challenges on instructional practices. By examining their experiences and insights, this study contributes to the ongoing discourse on AI in education and offers meaningful recommendations for teacher education programs seeking to make future educators ready for technology-integrated classrooms.

Literature Review

Generative AI

Generative AI is a transformative field within machine learning that enables machines to generate complex, realistic data across various domains (Sengar et al., 2024). It encompasses a range of model architectures such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and flow-based models, which have enabled applications from image and video synthesis to drug discovery and code generation. With the rise of large-scale models such as OpenAI's ChatGPT and DALL·E 2, generative AI has gained significant attention for its ability to generate coherent text, images, and other content from simple prompts (Gozalo-Brizuela & Garrido-Merchan, 2023). These tools can perform tasks such as writing essays, translating languages, composing music, and simulating conversations, which reshape various sectors including education, business, healthcare, and entertainment.

Feuerriegel et al. (2024) frame generative AI as a socio-technical system that not only automates tasks but also influences how people communicate and collaborate. Despite their potential, generative AI poses challenges related to data privacy, algorithmic bias, misinformation, and intellectual property. These concerns necessitate ethical guidelines, transparency, and AI development. Effective evaluation frameworks, incorporating both algorithmic metrics and human judgment, are crucial for ensuring the safety and utility of the generative outputs (Sengar et al., 2024).

Generative AI in Education

Generative AI is increasingly being integrated into educational settings, where it reshape teaching practices, learning processes, and assessment strategies. Its adoption has introduced both unprecedented advantages and notable concerns. Recent literature suggests that generative AI tools, such as ChatGPT, are widely used by students and educators to enhance productivity, support content creation, and personalize learning experiences (Zhang & Hou, 2024; Shard et al., 2024). These technologies assist in designing lesson plans, generating quizzes, simulating dialogues for language learning, and offering instant feedback, thereby reducing the administrative burden on teachers and facilitating differentiated instruction (Ahmed et al., 2024)

For learners, generative AI acts as a readily available tutor, capable of explaining concepts, correcting grammar, and supporting academic writing. This empowers students to explore ideas creatively and receive on-demand assistance outside the traditional classroom (Shard et al., 2024). Moreover, its interactive nature promotes learner engagement and autonomy, aligning with student-centered pedagogical models.

However, the increasing use of generative AI in education has raised several concerns. Studies have highlighted issues related to academic integrity, such as plagiarism and superficial learning due to over-reliance on AI-generated content (Lund et al., 2025). There are fears that students may bypass critical thinking, collaboration, and problem-solving in favor of quick AI solutions. Educators also express concerns about the reliability and accuracy of AI outputs, the potential for hallucinated content, and the ethical implications of AI in formative assessments (Zhang & Hou, 2024).

Another emerging issue is digital divide. Access to generative AI tools often requires stable internet and digital literacy, which may not be equally available to all learners, especially in low-resource settings. This disparity threatens to widen existing educational inequalities unless appropriate infrastructure and training are provided.Despite these challenges, scholars argue that the integration of generative AI into education should not be viewed merely as a technical upgrade but as an opportunity to reimagine teaching and learning (Feuerriegel et al., 2024). As Ahmed et al. (2024) emphasize, preparing future educators—particularly pre-service teachers, to engage critically with these technologies is essential for building an adaptive and ethical educational system in the age of AI.

Method

Research Design

This study utilized a mixed-methods research design which integrates both quantitative and qualitative approaches (Creswell & Plano Clark, 2017). The purpose is to gain a comprehensive understanding of pre-service teachers' perspectives on the use of generative artificial intelligence (AI) in education. This approach was preferred because the study has an exploratory nature which aimed to capture both measurable patterns and nuanced personal insights.

This study utilized a convergent parallel mixed-methods design. Both quantitative and qualitative data were collected concurrently, analyzed independently, and then merged during the interpretation process. This allowed the researchers to triangulate the findings, thereby enhancing the validity and richness of the results.The quantitative component involved a descriptive survey that systematically examined participants' knowledge, willingness, and concerns related to generative AI. Descriptive research was appropriate for identifying trends and summarizing the general attitudes of a large group of participants. The qualitative component consisted of open-ended survey responses that provided in-depth insights into participants' perceived benefits and challenges of using generative AI tools in educational settings.This mixed-methods framework enabled this study to go beyond surface-level statistics, offering a holistic view of how future educators perceive, engage with, and evaluate generative AI technologies. It also ensures that both statistical trends and individual voices are considered

in the formation of conclusions and recommendations.

Research Locale and Participants

The study's locale is a state university in the Philippines, specifically targeting pre-service teachers enrolled in academic year 2024-2025 from various teacher education programs. The university was selected because of its diverse academic offerings and strategic efforts to integrate digital technologies into pedagogy, making it a suitable setting for examining perspectives on generative AI in education.A total of 229 pre-service teachers participated in the study. They represent a wide range of academic specializations. Participants were selected using a convenience sampling technique, wherein individuals who were available during the data collection and willing to participate were included. While this non-probability sampling method may limit the generalizability of the results, it was deemed appropriate because of time and resource constraints.

Participation in this study was strictly voluntary. Prior to data collection, the participants were properly informed of the objectives of the study, the procedures to be followed, as well as the guidelines to maintain ethical standards. They were informed that they have the right to withdraw at any stage without consequences. To maintain confidentiality and protect their identities, no personally identifiable information was collected, and all responses were anonymized and used solely for academic purposes.

Research Instrument

This study adopted a survey questionnaire originally developed by Chan & Hu (2023). The survey questionnaire consisted of a combination of Likert-scale items to collect quantitative data and open-ended questions to dig deep into the essence of qualitative data. The instrument was designed to comprehensively investigate pre-service teachers' perspectives on the utilization of generative AI in education. The questionnaire was organized into three parts: Part 1 (Demographic Information) collected the background data of the participants such as age, sex, and frequency of generative AI tool usage. Part 2 (Knowlegde, Willingness, and Concerns) on the other hand, included a series of statements rated on a 5-point Likert scale which was designed to assess the participants' level of agreement regarding their knowledge, willingness to use, and concerns about generative AI technologies. Part 3 (Perceived Benefits and Challenges) contained open-ended questions aimed at eliciting participants' insights and reflections on the advantages and challenges associated with using generative AI in education.

To ensure the validity of the instrument in this study, content validation was performed by subject matter experts in the field of AI in education. Additionally, a language expert reviewed the questionnaire to ensure clarity, coherence, and linguistic suitability for the target participants. Feedback from both expert groups was incorporated into the final revision of the instrument for it to be appropriate for use in the study.

Data Collection

For ease and convenience, data were collected through the use of an online survey administered using Google

Forms. The online survey link was disseminated to potential participants via institutional emails and other social media platforms. Prior to participating in this study, the participants were provided with a comprehensive overview of the study's purpose, including assurances regarding the voluntary nature of their involvement and their responses' confidentiality. Informed consent was obtained electronically before the completion of the questionnaire. The participants were allotted a two-week window to respond to the survey and provide them with ample time to reflect on the questions and submit their responses at their convenience.

Data Analysis

The data that has been collected were analyzed using both quantitative and qualitative methods, adhering to the convergent parallel mixed-methods design of the study. The quantitative data from the Likert-scale items were exported to Microsoft Excel and analyzed using descriptive statistics including frequencies, percentages, mean scores, and standard deviations. These statistical methods were used to provide a summary of the pre-service teachers' perceptions of generative AI which eventually provided a broad view of the trends and patterns in the quantitative data. Qualitative data from open-ended questions were analyzed using thematic analysis, following Braun and Clarke (2006) a six-step framework to identify recurring themes and patterns in the participants' responses. This process involved (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Participants' responses were systematically coded and organized into initial categories, which were subsequently reviewed and clustered into broader themes based on recurring patterns and shared meanings. The emerging themes were independently reviewed by a second researcher to enhance the reliability of the qualitative analysis. Any discrepancies in coding or theme identification were resolved through collaborative discussion.

Finally, to ensure validity and depth, data triangulation was conducted during the interpretation phase by integrating the quantitative and qualitative findings. This analytical strategy provided a more nuanced and comprehensive understanding of pre-service teachers' perspectives on the use of generative AI in educational contexts.

Ethical Considerations

The study strictly adhered to established ethical research standards, ensuring confidentiality and anonymity of the participants. Prior to data collection, the participants were presented with a detailed information sheet outlining the purpose of the study, procedures, and their rights as research participants. Informed consent was obtained electronically before they proceeded with the survey, ensuring they understood that their participation was voluntary and that they could withdraw at any time without consequences.

To ensure anonymity, participants were assigned unique identifiers, and no personally identifiable information (PII) was collected at any point in the study. Confidentiality was maintained by reporting data in aggregate form, ensuring that no individual responses could be linked back to specific participants in any publication or presentation. Data were used exclusively for research purposes and handled in compliance with institutional and

national ethical guidelines for human research.

Results

This part presents both the quantitative and qualitative results of pre-service teachers' perspectives on the use of artificial intelligence (AI) in education.

Demographic Information

A total of 229 pre-service teachers participated in the study. Most participants were between 19 and 24 years old, with 21 years being the most common age among respondents. In terms of the sex assigned at birth, 157 participants (approximately 69%) were female, and 72 participants (approximately 31%) were male.

Figure 1 shows the participants' varying levels of experience with generative AI tools such as ChatGPT. The majority indicated that they use these tools "sometimes" (n = 139), followed by those who use them "often" (n = 56) and "rarely" (n = 24). A small number of participants reported using generative AI tools "always" (n = 10), while only five participants stated that they "never" use them. These results suggest that generative AI technologies are relatively familiar to most pre-service teachers, although the overall frequency of use remains moderate.

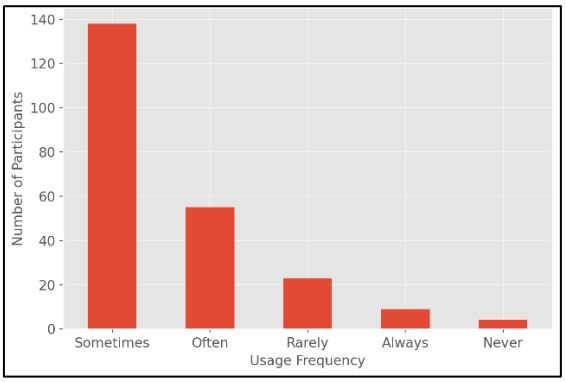

Figure 1. Frequency of Generative AI Usage

Quantitative Findings

This study explored the perception of pre-service teachers in Generative AI in terms of knowledge, willingness, and concerns about generative AI technologies. Table 1 discusses pre-service teachers' knowledge of generative AI technologies. Generally, the participants had a good understanding of Generative AI technologies, with mean scores ranging from 3.82 - 4.46. Specifically, the participants had the highest mean score for the statement "I understand that Generative AI technologies, such as ChatGPT, have limitations in handling complex tasks" (mean = 4.46; SD = 0.84) and the lowest mean score for the statement "I am aware that generative AI technologies, such as ChatGPT, can exhibit biases and unfairness in their outputs" (mean = 3.82; SD = 0.96), indicating that while they are generally aware of Generative AI technologies, they may not be fully aware of the biases and unfairness

in their produced outputs.

Table 1. Knowledge of Generative AI Technologies

Statements	Mean	SD
I understand that generative AI technologies, such as ChatGPT, have limitations in handling complex tasks.	4.46	0.84
I am aware that generative AI technologies, such as ChatGPT, can generate factually inaccurate information.	3.89	0.96
I understand that generative AI technologies, such as ChatGPT, may produce content that is out of context or inappropriate.	3.94	0.98
I am aware that generative AI technologies, such as ChatGPT, can exhibit biases and unfairness in their outputs.	3.82	0.96
I understand that generative AI technologies, such as ChatGPT, rely heavily on statistical models, which may limit their applicability in certain situations.	3.96	0.95
I understand that generative AI technologies, such as ChatGPT, lack emotional intelligence and empathy, which may lead to insensitive or inappropriate responses.	4.00	1.06

The data from Table 2 highlights an overall positive perception of generative AI technologies, such as ChatGPT, among participants, particularly in their potential application in teaching and learning practices. The highest-rated statement, with a mean of 3.93 (SD = 0.99), indicates a strong agreement that generative AI can help educators save time when preparing lesson plans or other teaching materials, underscoring its efficiency and practical value. Similarly, respondents recognized the accessibility of such technologies, as evidenced by the high mean score of 3.87 (SD = 0.98), which reflects the convenience of 24/7 availability.

Table 2. Willingness to Use Generative AI Technologies

Statements	Mean	SD
I am open to integrating generative AI technologies, such as ChatGPT, into my teaching and learning practices.	3.46	0.89
I believe students should learn how to effectively use generative AI technologies to prepare for their careers.	3.82	0.97
I believe generative AI technologies, such as ChatGPT, can enhance my digital competence as a future educator.	3.68	0.94
I think generative AI technologies, such as ChatGPT, can help me save time when preparing lesson plans or other teaching materials.	3.93	0.99
I believe generative AI technologies, such as ChatGPT, can provide unique insights and perspectives that I may not have considered.	3.58	1.12
I think generative AI technologies, such as ChatGPT, can offer personalized and immediate feedback for assignments or classroom activities.	3.58	0.97
I find generative AI technologies, such as ChatGPT, valuable because they are accessible 24/7.	3.87	0.98
I believe generative AI technologies, such as ChatGPT, can enhance student support services by providing anonymity in interactions.	3.54	0.88

Additionally, participants expressed a firm belief in the importance of teaching students how to effectively use generative AI for career preparation, with a mean of 3.82 (SD = 0.97), emphasizing its relevance to future professional success. The integration of generative AI into teaching practices was also seen as beneficial for enhancing digital competence among future educators (mean = 3.68; SD = 0.94) and offering unique insights and perspectives (mean = 3.58; SD = 0.97).

While respondents acknowledge the personalized and immediate feedback capabilities of generative AI (mean = 3.58; SD = 0.97) and its ability to enhance student support services by providing anonymity (mean = 3.54; SD = 0.88), these scores suggest room for further exploration and improvement in these areas. Lastly, the mean score of 3.46 (SD = 0.89) for openness to integrating generative AI into teaching reflects a generally positive attitude but hints at some variability in acceptance, likely influenced by individual familiarity, perceived challenges, or contextual factors.

The survey data on Table 3 reveal a moderate level of concern regarding the potential drawbacks of using generative AI technologies such as ChatGPT in educational contexts. The highest-rated concern, with a mean of 3.35 (SD = 1.10), reflected apprehension about becoming overly dependent on such technologies for completing tasks, suggesting that respondents were mindful of the potential for overreliance. Similarly, a mean score of 3.28 (SD = 1.00) indicates a notable worry that the use of generative AI to complete assignments could diminish the perceived value of university education, highlighting concerns about maintaining academic integrity and traditional standards of learning.

Table 3. Concerns About Generative AI Technologies

Statements	Mean	SD
I am concerned that using generative AI technologies, such as ChatGPT, to complete assignments may impact the perceived value of university education.	3.28	1.00
I am concerned that relying on generative AI technologies, such as ChatGPT, may limit opportunities to interact and collaborate with peers.	3.22	1.16
I worry that I might become overly dependent on generative AI technologies, such as ChatGPT, for completing tasks.	3.35	1.10
I believe generative AI technologies, such as ChatGPT, may hinder the development of essential skills, such as teamwork, problem-solving, and leadership.	2.99	1.11

Concerns about the social implications of generative AI are also evident, as indicated by the mean score of 3.22 (SD = 1.16) for the belief that reliance on such technologies may limit opportunities for interaction and collaboration with peers. This suggests that while respondents recognize the efficiency of generative AI, they are also cautious about its potential impact on interpersonal connections and group learning dynamics.

The lowest-rated statement, with a mean of 2.99 (SD = 1.11), points to a more mixed perception of whether generative AI may hinder the development of essential skills, such as teamwork, problem-solving, and leadership. While some respondents may see generative AI as a supplementary tool rather than a replacement for skill-

building opportunities, a lower mean indicates less agreement with this specific concern compared to others.

Qualitative Findings

This study explored the perception of pre-service teachers in Generative AI in terms of knowledge, willingness, and concerns about generative AI technologies.

Table 4. Benefits Using Generative AI

Theme	Codes	Sample Responses
Timesaving	speeds up research and assignments	"It speeds up research and assignments."
	complete tasks more quickly	"I can complete tasks more quickly and focus on other things."
Idea Generation	gives new ideas	"Gives me new ideas when I'm stuck."
	gives ideas that one lacks	"It gives us many ideas that we lack and helps make our efforts more informative."
Convenience	can be used anytime and anywhere	"I can use it anytime, anywhere."
	available all the time	"It's like having a tutor available all the time."
Grammar and Writing Assistance	correct grammar errors	"It helps correct grammar errors and organize my thoughts."
	fix grammatical errors; improve structure	"It can fix grammatical errors in an essay and improve the structure of an answer."
Enhancing Creativity	gives creative solutions	"It gives creative solutions to problems."
	improves creativity	"It can guide students in improving their creativity."
Teaching and Learning Support	helps create engaging activities	"It helps my teachers create engaging activities."
	can be used in preparing lessons	"Teachers can use AI to prepare and evaluate lessons more efficiently."

Timesaving

One of the advantages of using Generative AI is its ability to speed up academic tasks. As a result, learning is made more efficient. A pre-service teacher participant mentioned that Generative AI "speeds up research and assignments". This is congruent with what has been mentioned by other participants. They view AI as a useful and powerful tool in completing their research papers and assignments quickly. Another participant emphasized that tasks can be completed faster because of the integration of AI. Most of the participants have reported that using AI reduces their workload thus allowing them to focus and spend more time on other responsibilities. This suggests that AI aids the students balance multiple academic commitments. Therefore, the convenience of AI enables students to better manage their time, leading to increased productivity.

Idea Generation

Another theme that emerged is that Generative AI serves as an intellectual tool that aids students in brainstorming and overcoming issues in creativity. One participant stated that Generative AI is always on the rescue because it generates new ideas. As stated, “it gives me new ideas when I am stuck’, which suggests that AI can be a resource that provokes thought. Likewise, it aids in expanding and refining variety of academic work. As stated by one participant, “It gives us many ideas that we lack and help make our efforts more informative”. This emphasizes the role of AI in stimulating users’ thinking capabilities.

Convenience

Regarding convenience, several participants appreciate AI for its accessibility because it provides instant assistance anytime, anywhere. One participant expressed “I can use it anytime, anywhere”. While another stated, “It’s like having a tutor available all the time.” This clearly explains that AI is a useful educational confidante even outside the four walls of the classroom.

Grammar Assistant

Most students see AI as a tool that aids in writing content with correct grammar. As one pre-service teacher mentioned, “It helps correct grammar errors and organize my thoughts.” In addition, the open-ended survey responses revealed that AI helps in enhancing writing skills particularly in correcting grammatical errors and improving sentence structure. As one participant stated, “It can fix grammatical errors in an essay and improve the structure of an answer.” This emphasizes the usefulness of AI in refining students’ academic writing especially those who are struggling with the mechanics in language.

Enhancing Creativity

AI is perceived as a tool that fosters creativity by providing diverse solutions. A student shared, "It gives creative solutions to problems," demonstrating AI’s ability to offer fresh perspectives. Another participant remarked, "It can guide students in improving their creativity," suggesting that AI can serve as an inspiration for artistic and intellectual expression. Many students believe that AI helps them think outside the box, thus enhancing their ability to develop unique perspectives and innovative approaches to academic tasks.

Teaching and Learning Support

AI is not only beneficial for students but also for educators as student noted "It helps my teachers create engaging activities.” Another stated, "Teachers can use AI to prepare and evaluate lessons more efficiently.” Many teachers use AI to assist in lesson planning, create engaging activities, and evaluate student work. This suggests that AI reshapes instructional methods, making teaching more efficient.

Table 5. Challenges in Using Generative AI

Theme	Codes	Sample Responses
Over-Reliance on AI	too much reliance on AI	"Students might rely solely on generative AI rather than improving their 21st-century skills."
	overuse of AI results to laziness and over-reliance	"Unfortunately, overuse of AI can lead to laziness and overreliance by students on digital answers."
Issues on Accuracy and Reliability	AI gives wrong and outdated information	"It can give wrong and outdated information."
	resources are not reliable	"Sometimes the resources that it gives are not reliable."
Academic Integrity	questionable integrity of outputs	"Teachers may find it hard to believe the integrity of the learners' output due to generative AI."
	Students do a copy and paste	"They heavily rely on AI to the point that whatever ChatGPT generates, they will automatically copy and paste it to their work."
Digital Divide	Not accessible to everyone	"Not everyone has the capacity to access it."
	lack of internet connection	"Accessibility and Context/Content Relevance. Not all can access this kind of generative AI as most students don't have an internet connection."

Over-Reliance on AI

One of the primary challenges raised by the participants regarding the use of Generative AI is that excessive reliance on AI may hinder students' ability to develop critical thinking and problem-solving skills which are considered 21st-century skills. As stated by one of the participants, "Students might rely solely on generative AI rather than improving their 21st-century skills." Another responded, "Unfortunately, overuse of AI can lead to laziness and overreliance by students on digital answers." Although many students use AI for convenience, its overuse can lead to a decline in independent learning which reduces motivation and effort in academic tasks.

Issues on Accuracy and Reliability

Another major challenge is the accuracy and reliability of the contents generated by AI. As one student put forward, "It can give wrong and outdated information." While AI can generate vast amounts of information, it is not always factual or up to date. Moreover, students relying on AI without cross-referencing sources have increased risk of using misleading or incorrect information, which can negatively impact their learning as one participant experienced "Sometimes the resources that it gives are not reliable."

Academic Integrity

The ease of accessing AI-generated content raises concerns regarding plagiarism and academic dishonesty. As some participants noted, "Teachers may find it hard to believe the integrity of the learners' output due to generative AI." In addition, many students may be tempted to copy and paste AI-generated responses instead of engaging with the learning material since "They heavily rely on AI to the point that whatever ChatGPT generates, they will automatically copy and paste it to their work." This challenges teachers' ability to assess genuine student learning and raises ethical concerns about originality.

Digital Divide

Problems with access to Generative AI stem from disparities in internet access and digital resources among students. Most of the participants mentioned that "Not everyone has the capacity to access it" because "most students don't have an internet connection" Those in underprivileged communities or rural areas may lack the connectivity or devices needed to use AI tools, leading to unequal learning opportunities.

Discussion

This study investigated pre-service teachers' viewpoints on the use of generative artificial intelligence (AI) technology in education by combining quantitative and qualitative findings. The use of a convergent parallel mixed-methods design resulted in a more nuanced understanding of how future educators see the potential and constraints connected with AI technologies, such as ChatGPT (Creswell & Plano Clark, 2017).

Awareness and Understanding of Generative AI

The quantitative findings revealed that most participants have a thorough understanding of Generative AI technology. The high mean ratings suggested that most pre-service teachers were aware of the limitations of these tools, specifically their inability to manage complicated tasks and emotional intelligence. These findings are congruent with the insights provided during the qualitative phase, in which participants acknowledged that, while AI is beneficial, it must be used with caution. However, a lack of awareness of AI-generated biases shows a gap in comprehending AI's ethical dimensions, reflecting the concerns voiced (Chan & Tsi, 2024) and the hidden risks of algorithmic decision-making (Feuerriegel et al., 2024). Similar gaps in AI literacy have been identified in recent large-scale reviews (Chan & Tsi, 2024; Maphosa & Maphosa, 2023), emphasizing the importance of ethics-focused training.

Willingness and Potential for Integration

The participants had a largely optimistic outlook on incorporating AI into their future classes. These findings strongly support the premise that generative AI might assist in expediting tasks such as lesson planning, providing 24-hour support, and improving digital competency (Al-Shidhani et al., 2024; Ahmed et al., 2024). These

viewpoints were echoed in the qualitative responses, with participants citing time savings, convenience, and idea development as significant benefits. These findings are consistent with earlier research indicating that AI can be a useful support tool for both teaching and learning (Maphosa & Maphosa, 2023; Shard et al., 2024).

Furthermore, Almasri (2024) highlighted similar findings in their investigation of AI applications in science education, emphasizing potential of AI to promote engagement and creative thinking. However, the comparatively low score on openness to fully integrating AI into teaching methods indicates some hesitancy, likely due to concerns about reliability, accuracy, and ethical use (Taşçı & Tunaz, 2024). This mixed opinion highlights the importance of targeted training, as advocated by Shard et al. (2024) and supported by global scoping reviews (Shard et al., 2024; Alenezi, 2024).

Concerns and Challenges

The findings also raise some serious issues. The participants were particularly concerned about being overly reliant on AI, with the highest concern score indicating the possibility of dependence. This was substantiated by qualitative data, where respondents noted that the excessive use of AI could lead to decreased motivation and weakened critical thinking skills. These insights align with those of studies by Lund et al. (2025) and Yang et al. (2025), who warn that unregulated AI use may negatively impact academic integrity and cognitive development.

Additionally, concerns about misinformation, plagiarism, and access disparities were evident in both the quantitative and qualitative data. The participants discussed hallucinated content and copy-paste behaviors. These issues resonate with recent literature on academic integrity challenges in AI-integrated classrooms (Alenezi, 2024); Ravšelj et al., 2025). Moreover, the digital divide remains a major issue, as noted by Zawacki-Richter et al. (2019) and reaffirmed by global studies Zhang & Hou (2024), that which emphasize the need for equitable access to AI technologies.

Implications for Teacher Education

The findings highlight the crucial significance of teacher education programs in preparing pre-service teachers not only to use AI tools effectively but also to develop ethical and pedagogically sound approaches to their implementation. Educators must be equipped to critically assess AI outputs, promote academic honesty, and ensure that AI enhances rather than replaces student participation and creativity. Systematic reviews also recommend embedding AI education in teacher training to foster long-term adaptability and resilience (Chan & Tsi, 2024; Maphosa & Maphosa, 2023).

Conclusion and Recommendations

This study explored pre-service teachers' perspectives on generative AI technologies, shedding light on their insights, applications, and concerns regarding their utilization in the classroom. The findings of the study revealed that pre-service teachers are generally knowledgeable about generative AI technologies and express a strong

willingness to use them in the classroom. They recognize the transformative potential of AI, particularly in areas such as timesaving, idea generation, convenience, grammar and writing assistance, creativity enhancement, and teaching and learning support. These benefits highlight the potential of AI as a tool for streamlining tasks, fostering innovation, and improving educational outcomes.

However, the study also emphasized significant challenges that need to be addressed to ensure the responsible and equitable use of AI in education. Several concerns include over-reliance on AI, issues of accuracy and reliability, threats to academic integrity, and the growing digital divide. Such concerns are necessary for careful implementation and ongoing critical evaluation of these technologies. These challenges call for robust frameworks, policies, and training programs to equip educators with the skills and knowledge required to navigate the complexities of AI integration.

This study contributes to the growing discourse on AI in education by providing valuable insights into the perspectives of future educators. This highlights the dual nature of AI as both a powerful tool and a potential source of ethical and practical dilemmas. By addressing these challenges and leveraging the benefits, generative AI has the potential to significantly improve education, fostering a more efficient, creative, and inclusive learning environment. Future research should focus on developing strategies to mitigate the identified challenges and explore the long-term impact of AI on teaching and learning practices.Ultimately, this study calls for a balanced approach to AI adoption in education—one that embraces innovation while remaining vigilant about its implications. As pre-service teachers prepare to enter the classroom, their perspectives and experiences play a crucial role in shaping the future of education in the age of AI.

References

Ahmed, Z., Shanto, S. S., Rime, Most. H. K., Morol, Md. K., Fahad, N., Hossen, Md. J., & Abdullah-Al-Jubair, Md. (2024). The Generative AI Landscape in Education: Mapping the Terrain of Opportunities, Challenges, and Student Perception. *IEEE Access*, *12*, 147023–147050. https://doi.org/10.1109/ACCESS.2024.3461874

Alenezi, A. (2024). Obstacles to the Use of AI Applications in Blackboard for Faculty Members at Northern Border University, Saudi Arabia. *MIER Journal of Educational Studies Trends and Practices*, 248–268. https://doi.org/10.52634/mier/2024/v14/i2/2581

Almasri, F. (2024). Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science: A Systematic Review of Empirical Research. *Research in Science Education*, *54*(5), 977–997. https://doi.org/10.1007/s11165-024-10176-3

Al-Shidhani, Z., Al Abri, M., & AlRamadhani, S. (2024). *PRE-SERVICE TEACHERS' ATTITUDES TOWARDS AI INTEGRATION IN TEACHING AND LEARNING*. 3133–3138. https://doi.org/10.21125/edulearn.2024.0824

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: perceptions, benefits, and challenges in

higher education. *International Journal of Educational Technology in Higher Education*, *20*(1), 43. https://doi.org/10.1186/s41239-023-00411-8

Chan, C. K. Y., & Tsi, L. H. Y. (2024). Will generative AI replace teachers in higher education? A study of teacher and student perceptions. *Studies in Educational Evaluation*, *83*, 101395. https://doi.org/10.1016/j.stueduc.2024.101395

Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

Feuerriegel, S., Hartmann, J., Janiesch, C., & Zschech, P. (2024). Generative AI. *Business & Information Systems Engineering*, *66*(1), 111–126. https://doi.org/10.1007/s12599-023-00834-7

Floridi, L., & Chiriatti, M. (2020). GPT-3: Its Nature, Scope, Limits, and Consequences. *Minds and Machines*, *30*(4), 681–694. https://doi.org/10.1007/s11023-020-09548-1

Gozalo-Brizuela, R., & Garrido-Merchan, E. C. (2023). *ChatGPT is not all you need. A State of the Art Review of large Generative AI models*.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education Promises and Implications for Teaching and Learning*. Center for Curriculum Redesign.

Lund, B. D., Lee, T. H., Mannuru, N. R., & Arutla, N. (2025). AI and Academic Integrity: Exploring Student Perceptions and Implications for Higher Education. *Journal of Academic Ethics*. https://doi.org/10.1007/s10805-025-09613-3

Maphosa, V., & Maphosa, M. (2023). Artificial intelligence in higher education: a bibliometric analysis and topic modeling approach. *Applied Artificial Intelligence*, *37*(1). https://doi.org/10.1080/08839514.2023.2261730

Ogunleye, B., Zakariyyah, K. I., Ajao, O., Olayinka, O., & Sharma, H. (2024). A Systematic Review of Generative AI for Teaching and Learning Practice. *Education Sciences*, *14*(6), 636. https://doi.org/10.3390/educsci14060636

Ravšelj, D., Keržič, D., Tomaževič, N., Umek, L., Brezovar, N., A. Iahad, N., Abdulla, A. A., Akopyan, A., Aldana Segura, M. W., AlHumaid, J., Allam, M. F., Alló, M., Andoh, R. P. K., Andronic, O., Arthur, Y. D., Aydın, F., Badran, A., Balbontín-Alvarado, R., Ben Saad, H., … Aristovnik, A. (2025). Higher education students' perceptions of ChatGPT: A global study of early reactions. *PLOS ONE*, *20*(2), e0315011. https://doi.org/10.1371/journal.pone.0315011

Sengar, S. S., Hasan, A. Bin, Kumar, S., & Carroll, F. (2024). Generative artificial intelligence: a systematic review and applications. *Multimedia Tools and Applications*. https://doi.org/10.1007/s11042-024-20016-1

Shard, Vaidya, P., Koul, S., Arora, A., Sonia, & Jain, P. (2024). Exploring Student Perspectives on ChatGPT in Higher Education. *2024 3rd Edition of IEEE Delhi Section Flagship Conference (DELCON)*, 1–6. https://doi.org/10.1109/DELCON64804.2024.10866660

Taşçı, S., & Tunaz, M. (2024). OPPORTUNITIES AND CHALLENGES IN AI-ASSISTED LANGUAGE TEACHING: PERCEPTIONS OF PRE-SERVICE EFL TEACHERS. *Araştırma ve Deneyim Dergisi*, *9*(2), 74–83. https://doi.org/10.47214/adeder.1575897

Yang, Y., Zhang, Y., Sun, D., He, W., & Wei, Y. (2025). Navigating the landscape of AI literacy education: insights from a decade of research (2014–2024). *Humanities and Social Sciences Communications*,

12(1), 374. https://doi.org/10.1057/s41599-025-04583-8

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1), 39. https://doi.org/10.1186/s41239-019-0171-0

Zhang, W., & Hou, Z. (2024). College Teachers' Behavioral Intention to Adopt Artificial Intelligence-Assisted Teaching Systems. *IEEE Access*, *12*, 152812–152824. https://doi.org/10.1109/ACCESS.2024.3445909

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