PRE-SERVICE TEACHERS' PERCEPTIONS OF GENERATIVE AI: DEPENDENCY, EFFECT, AND ETHICS

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Abstract

This study investigates pre-service teachers' dependency on Generative Artificial Intelligence (GenAI), their perceptions of its effects, and their awareness of academic ethics. Employing a descriptive quantitative research design, data were collected through an online questionnaire adapted from Chan & Hu (2023) and the Indonesian Ministry of Education's Guidebook on GenAI Usage (2024). The study involved 100 pre-service teachers from the English Education Study Program, with 46 valid responses. The results indicate that while most participants are uncertain about their dependency on GenAI, many acknowledge its benefits in saving time, providing unique insights, and offering personalized feedback. However, concerns remain regarding its impact on digital competence, social interaction, teamwork, critical thinking, and leadership skills. Additionally, perceptions of GenAI's effect on problem-solving skills are evenly divided. In terms of academic ethics, more than half of the respondents are unsure whether using GenAI undermines ethical values. Nonetheless, most pre-service teachers report that they rewrite AI-generated content in their style and provide references. Given the high level of uncertainty in responses, this study highlights the need for universities and lecturers to provide clearer and more intensive guidance on responsible GenAI usage. Future research should explore its impact on academic skill development and employ alternative research designs for deeper insights.

Keywords: *academic ethics, dependency, Generative Artificial Intelligence (GenAI), perceptions, pre-service teachers.*

Introduction

The integration of Generative Artificial Intelligence (GenAI) into education is reshaping how students learn, write, and conduct research. As AI-powered tools become increasingly sophisticated, they offer personalized learning experiences, streamline assessments, and enhance academic productivity. However, this growing reliance on GenAI raises concerns about student dependency, academic integrity, and ethical considerations. At its

core, GenAI employs computational techniques to generate meaningful content—such as text, images, and audio—based on extensive training data (Feuerriegel et al., 2024). Similarly, Satya (2024) defines GenAI as a machine-learning system capable of producing human-like outputs, including text, images, and code. By leveraging large datasets, these systems generate content that closely resembles human work, making GenAI a powerful tool for automation, creativity, and efficiency across various domains.

In higher education, GenAI offers numerous benefits, particularly in learning, writing, and research. One of its key advantages is its ability to provide personalized and immediate learning support, functioning as a virtual tutor that delivers instant feedback and customized recommendations (Chan & Hu, 2023). For instance, an engineering student described AI as "a top student" in their class, emphasizing its value when human assistance was unavailable. Additionally, GenAI facilitates writing and brainstorming by generating ideas and refining writing skills. A participant in the study noted that "it's convenient to ask ChatGPT general questions and even get inspired by it" (Chan & Hu, 2023). Beyond writing, GenAI assists in research by streamlining literature searches, summarizing readings, and generating hypotheses. Another student highlighted its role in data collection and preliminary analysis, emphasizing its efficiency in saving time and resources. Furthermore, GenAI enhances multimedia production, enabling students to create AI-generated artworks and improve content creation. It also simplifies administrative tasks, as one participant pointed out: "Tedious administrative work will be handled by AI efficiently" (Chan & Hu, 2023).

Similarly, Francis et al. (2024) assert that GenAI has significantly transformed education by facilitating personalized learning and innovative assessment methods. AI-driven tools provide students with tailored feedback, enabling them to refine their skills more effectively. For example, AI-powered writing assistants such as ChatGPT, Gemini, and Grammarly analyze student essays, suggest improvements, and explain grammar and style corrections. Additionally, GenAI enhances assessment by automating grading and offering instructors valuable insights into students' performance

trends. AI-generated quizzes and simulations foster dynamic learning experiences that emphasize critical thinking rather than rote memorization. As a result, GenAI is reshaping education by making learning more adaptive, interactive, and efficient.

Expanding on these benefits, Almassaad et al. (2024) identify six key advantages of using GenAI in education. First, it provides personalized and immediate learning support, ensuring that students receive timely assistance. Second, it enhances learning efficiency through automated feedback and tailored guidance. Third, it grants access to diverse information sources while fostering critical thinking skills. Additionally, GenAI functions as a research tool, facilitating idea generation, data analysis, and multimedia creation. It also plays a crucial role in programming education by reducing learning obstacles, increasing productivity, and automating repetitive coding tasks. Lastly, GenAI supports teaching and assessment by streamlining content creation and evaluation, ultimately improving instructional practices. These advantages highlight GenAI's transformative role in higher education, benefiting both students and educators alike.

Despite these advantages, integrating GenAI into education presents challenges, particularly regarding student dependency and academic integrity. Razmerita (2024) highlights student-AI collaboration concerns, particularly with ChatGPT and other GenAI tools. Key issues include plagiarism, inaccuracies, flawed referencing, outdated knowledge, and dependency on prior information. Additional concerns involve reliability, ethical considerations, potential loss of learning, and reduced creativity. Papyshev (2024) examines the dependency of research postgraduate students on GenAI tools in research, teaching, and learning. While GenAI aids in idea generation, plagiarism detection, coding, reference generation, and literature reviews, the study highlights concern about over-reliance. Dependency issues arise particularly in academic writing, where AI helps refine language for non-English speakers but may hinder critical thinking and writing skills. In coding, AI improves workflow but shows biases toward specific languages. The study calls for adaptive policies to regulate GenAI use, ensuring it

supports rather than replaces essential academic skills.

Morales-García et al. (2024) define dependence as a compulsive necessity affecting decision-making and self-perception, with AI reliance potentially altering cognitive processes and reducing learning autonomy. Scott-Herring (2024) found that while students value GenAI for efficiency, they express concerns about inaccuracies, superficiality, and risks to academic integrity. Likewise, Virlan and Tomak (2024) reported that Turkish EFL learners acknowledge AI writing tools' benefits but recognize drawbacks such as diminished originality and plagiarism risks. As universities increasingly adopt GenAI, implementing adaptive policies is essential to balance its advantages while minimizing dependency risks.

A study by Chan & Hu (2023) on Hong Kong University students revealed that while AI was perceived as beneficial, concerns persisted regarding its long-term impact on learning autonomy and critical thinking. These findings underscore the need to explore how pre-service teachers perceive the role of GenAI in their academic journey, particularly in balancing AI dependence with independent learning and ethical responsibility. Chan & Hu (2023) further identify six major concerns regarding GenAI adoption. First, accuracy and transparency issues arise, as AI-generated content is not always reliable, and its decision-making process remains a "black box," making verification difficult (Chan & Hu, 2023). Second, privacy and ethical concerns emerge, with students worrying about data security and potential misuse. Additionally, the increased difficulty in detecting plagiarism presents an academic challenge. Third, reliance on GenAI may weaken holistic competencies, such as critical thinking and creativity, as students depend on AI-generated responses rather than developing original ideas. Fourth, GenAI raises career-related concerns, as automation may replace certain jobs, requiring students to meet higher recruitment standards in an AI-driven job market. Fifth, ethical dilemmas arise regarding AI alignment with human values and social equity, particularly for students who lack access to advanced AI tools. Lastly, uncertainties surrounding AI policies highlight the need for clear

implementation strategies to prevent misuse and ensure responsible AI integration in education (Chan & Hu, 2023).

Recognizing these challenges, the Indonesian Ministry of Education, Culture, Research, and Technology issued the Guidelines for the Use of Generative Artificial Intelligence (GenAI) in Higher Education Learning in October 2024 (Direktorat Pembelajaran dan Kemahasiswaan, 2024). These guidelines serve as a framework for lecturers, students, and academic institutions, emphasizing responsible AI use while safeguarding academic integrity, data privacy, and transparency. While they acknowledge GenAI's potential to enhance teaching and learning effectiveness—such as by supporting students' critical thinking and creativity—they also highlight risks, including plagiarism, overdependence on AI, and diminished problem-solving abilities if misused. Therefore, the guidelines advocate for a balanced approach, ensuring that AI integration complements rather than replaces independent learning and ethical awareness.

Despite these regulatory efforts, the growing presence of GenAI in academic settings raises critical questions about its impact on pre-service teachers' skills and ethical awareness. One major concern is whether pre-service teachers recognize and manage their reliance on GenAI when completing academic assignments. While AI tools offer convenience and efficiency, there is an ongoing debate about whether they genuinely enhance learning or foster dependency that undermines independent skill development. Examining pre-service teachers' perspectives on the advantages and drawbacks of GenAI is crucial to understanding its role in shaping their academic and professional growth. Additionally, ethical considerations—particularly regarding plagiarism and academic integrity—remain pressing issues that need further exploration. This study seeks to address these concerns by investigating pre-service teachers' dependency on GenAI, their perceptions of its usage, and their awareness of academic ethics.

The introduction of the Guidelines for the Use of Generative Artificial Intelligence (GenAI) in Higher Education Learning reflects the government's proactive stance in mitigating AI's potential negative effects in academia

(Direktorat Pembelajaran dan Kemahasiswaan, 2024). While GenAI provides significant educational benefits, such as personalized learning support and research assistance, unresolved concerns about overdependence and ethical dilemmas persist. These concerns are particularly relevant for pre-service teachers, who are expected to develop critical thinking skills, uphold ethical responsibility, and serve as role models for academic integrity in their future classrooms (Kasneci et al., 2023). Given the rapid adoption of AI-driven tools in education, understanding how pre-service teachers interact with GenAI—and the extent of their reliance on it—is crucial.

Research by Cavojský et al. (2023) underscores the dual nature of GenAI, highlighting its benefits as a learning aid while also warning against cognitive offloading, where students may become overly dependent on AI-generated content rather than developing their own analytical skills. This issue is particularly relevant in teacher education programs, where pre-service teachers must learn to balance AI-assisted learning with independent reasoning and ethical decision-making. However, studies examining the perspectives of pre-service teachers in Indonesia regarding GenAI's impact on their academic development and ethical awareness remain limited.

As GenAI continues to shape modern education, its ethical implications must be carefully considered. Jianzheng and Xuwei (2023) argue that AI should complement rather than replace human educators, as teachers possess irreplaceable qualities such as creativity, emotional intelligence, and pedagogical expertise. Nevertheless, the growing use of GenAI presents ethical challenges that may hinder the development of essential academic skills (Bjelobaba et al., 2024). Additionally, a lack of clear understanding regarding academic integrity policies has contributed to unintentional plagiarism among students (Sysoyev, 2024). Since pre-service teachers are expected to model ethical academic practices, investigating their perceptions of GenAI is essential for promoting responsible AI literacy within teacher education programs. This research is particularly significant in the Indonesian context, where an AI guidebook has already been published, and the implementation of AI policies in higher education is still evolving.

Methods

This study employed a descriptive quantitative research design, which aims to describe the level, characteristics, or distribution of a phenomenon or variable (Sahir, 2022 in Barella et al., 2024). A questionnaire was used as the primary data collection instrument and was administered online via Google Forms and comprised 16 Likert-scale items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). These items measured students' perceptions of generative AI usage, covering aspects such as dependency (3 items), its effects on their skills (10 items), and awareness of academic ethics (3 items). As defined by Ranganathan & Caduff (2023) describes it as a tool consisting of a series of questions designed to gather information on respondents' knowledge, opinions, attitudes, beliefs, and behavior. The questionnaire in this study was adapted from Chan & Hu (2023) and the Guide Book of Generative Artificial Intelligence (GenAI) Usage in Higher Education 2024, published by the Ministry of Education, Culture, Research, and Technology of Indonesia. It included questions on "Willingness to Use Generative AI Technologies" and "Concerns About Generative AI Technologies" adapted from Chan & Hu (2023), while academic ethics questions were modified from the Ethics Checklist in the guidebook.

The original questionnaire by Chan & Hu (2023) was initially developed for undergraduate and postgraduate students in Hong Kong, focusing on the perceptions, benefits, and challenges of using generative AI in academic settings. Meanwhile, the respondents in this study were 100 pre-service teachers from the English Education Study Program, Faculty of Teacher Training and Education, Islamic University of Kadiri. Of these, 46 students from semesters 3, 5, and 7 returned valid responses. The selection of pre-service teachers was based on the assumption that they need to develop a responsible approach to generative AI use to enhance their learning without becoming overly dependent on AI tools. As future educators, they must balance technology use with skill development. The sample size was determined based on practical constraints and aligned with Creswell & Creswell (2018), who emphasize that sample size selection in survey research

balances accuracy and feasibility. Although a larger sample might provide more precise inferences, factors such as time constraints and response rates influenced the final number of participants. Creswell & Creswell (2018) further note that survey research often selects sample sizes based on past studies or as a representative fraction of the population, making the selection of 46 valid responses methodologically justifiable.

To ensure the validity and reliability of the questionnaire, data analysis was conducted using Microsoft Excel. The validity test compared each question item with an r-table value of 0.2403, and all items were found to be valid as they had an r-count value greater than the r-table. Specifically, question item numbers 1 to 16 had R-values ranging from 0.43 to 0.76, indicating no need for item deletion or revision. Consequently, the questionnaire was deemed suitable for research with a high level of confidence. Additionally, the reliability test using Cronbach's Alpha method yielded a value of 0.8878, placing it within the high-reliability category (0.80–0.90). This suggests that the questionnaire demonstrated strong internal consistency and could produce stable and reliable data if used repeatedly in similar research contexts. Therefore, the instrument used in this study was both valid and reliable, ensuring its effectiveness as a measurement tool.

Findings and Discussions

Before presenting the results of the data analysis, this section provides an overview of the respondents' demographics and preliminary information. It includes details on gender, semester, experience with GenAI, frequency of GenAI usage, and the types of GenAI tools they have used. This background information offers essential context for understanding the findings and interpreting the participants' perspectives on GenAI in education.

Table 1 Demographic Information

Characteristic	N	%
Gender		
Male	10	21.7
Female	36	78.3
Semester		

3	13	28.3
5	21	45.7
7	12	26.0
Have you ever used Generative Artificial Intelligence (AI) to complete assignments?		
Yes	46	100
No	0	0
In your opinion, how often do you use Generative Artificial Intelligence (AI) to complete assignments?	0	0
Never	3	6.5
Rarely	15	32.6
Sometimes	25	54.4
Often	3	6.5
Always		
Select the types of Generative Artificial Intelligence (AI) you have used. You may check more than one.		
Gemini	36	78.3
ChatGPT	46	100
Github Copilot	1	2.2
Storylab.Ai	1	2.2
Writefull Title Generator	1	2.2
Microsoft Copilot	4	8.7
Google text-to speech	7	15.2
Soundful	0	0
Stable Diffusion	0	0
Flair	0	0
Synthesia	0	0
Tome.App	3	6.5
Magic Slides	2	4.3
AIPPT	2	4.3
Others:		
You.ai	2	4.3
Consensus	1	2.2
Perplexity	4	8.7
Scispace	2	4.3

Table 1 presents the demographic characteristics of the respondents, including gender, semester level, experience with Generative Artificial Intelligence (GenAI), frequency of GenAI usage, and the types of GenAI tools they have used. The majority of respondents are female (78.3%), while males account for 21.7% of the total participants. In terms of semester level, most respondents are in their fifth semester (45.7%), followed by third-semester students (28.3%) and seventh-semester students (26.0%). All 46

respondents (100%) reported having used GenAI for completing assignments. Regarding the frequency of usage, 54.4% stated that they "often" use GenAI, 32.6% use it "sometimes," 6.5% use it "rarely," and another 6.5% reported "always" using it, with none selecting "never." As for the types of GenAI tools used, ChatGPT is the most widely utilized (100%), followed by Gemini (78.3%). Other tools, such as Microsoft Copilot (15.2%) and Writefull Title Generator (8.7%), were used by a smaller percentage of respondents. Additionally, a few participants reported using AI tools like Perplexity, Consensus, and AIPPT, while some, including Soundful, Stable Diffusion, and Flair, were not used at all. These findings highlight students' familiarity with and reliance on GenAI tools, providing a foundation for further analysis of their perceptions and ethical considerations regarding its usage.

Given that the purpose of this study is to explore these concerns by examining pre-service teachers' dependency on using GenAI, their perceptions of its effects on skill development, and their awareness of academic ethics, the data will be presented in the following three sections.

1. Pre-Service Teachers' Dependency on Using GenAI

The increasing integration of Generative AI (GenAI) technologies in educational settings has raised concerns about students' reliance on these tools. Pre-service teachers, as future educators, are expected to develop critical thinking and problem-solving skills while navigating the benefits and challenges of AI-assisted learning. Understanding their dependency on GenAI is essential to evaluate whether its usage supports or hinders their academic growth. Table 2 presents respondents' perceptions of their dependency on Generative AI technologies, measured through three key statements on a five-point Likert scale.

Table 2 Generative AI Dependency

Statement	Answer									
	Strongly Disagree 1 point		Disagree 2 points		Neutral 3 points		Agree 4 points		Strongly Agree 5 points	
	n	%	n	%	n	%	n	%	n	%
I can become over-reliant on generative AI technologies.	3	6.5	8	17.4	24	52.2	8	17.4	3	6.5

I am fine with my any dependency level of generative AI technologies usage.	6	13	12	26.1	20	43.5	7	15.2	1	2.2
I want to decrease my generative AI technologies dependency.	2	4.3	4	8.7	15	32.6	13	2.2	12	26.1

Table 2 presents respondents' perceptions of their dependency on Generative AI technologies, measured across three statements using a five-point Likert scale. The first statement, “I can become over-reliant on generative AI technologies,” shows that more than half of the respondents (52.2%) remain neutral, while 17.4% agree and another 6.5% strongly agree, suggesting that a significant portion of students recognize the potential for over-reliance. However, 23.9% (combining disagree and strongly disagree) do not perceive themselves as overly dependent.

The findings indicate that most students are uncertain about whether they are dependent on Generative AI. This situation presents an opportunity for institutions to intensively educate students on both the benefits and challenges of Generative AI usage to prevent its misuse. Since dependency on AI may lead to challenges, students might experience changes in their critical thinking skills. These concerns align with the findings of Chan & Hu (2023), who argue that while AI enhances learning efficiency, excessive reliance may hinder students' ability to develop critical thinking skills.

For the second statement, “I am fine with my dependency level on generative AI technologies,” the responses are more varied. While 43.5% remain neutral, a considerable 39.1% (disagree and strongly disagree combined) indicate concern over their dependency, whereas 17.4% (agree and strongly agree) express comfort with their current level of reliance. This suggests a general uncertainty or mixed feelings regarding their AI usage habits. The uncertainty in students' responses aligns with Papyshev (2024), who highlights that AI tools, such as ChatGPT and Gemini, offer both convenience and accessibility, making them integral to students' workflows.

However, their role as both facilitators and potential crutches for learning requires careful examination to ensure AI complements rather than replaces cognitive engagement and critical thinking. It is also similar with Jianzheng and Xuwei (2023), who emphasize that AI should complement rather than replace human educators, as teachers possess irreplaceable attributes such as creativity, emotional intelligence, and pedagogical expertise.

The third statement, "I want to decrease my generative AI technology dependency," reveals that 26.1% of respondents strongly agree and 2.2% agree, meaning nearly one-third of participants wish to reduce their AI usage. Meanwhile, 32.6% remain neutral, and a smaller proportion (13%) disagree and strongly disagree, indicating that while some students recognize their reliance, only a portion actively seeks to reduce it. This finding suggests that pre-service students who have grown comfortable and reliant on GenAI may be less inclined to reduce their dependency. This aligns with Papyshev (2024), who found that dependency issues are particularly evident in academic writing, where AI can assist non-English speakers in refining their language skills but may simultaneously hinder the development of critical thinking and writing abilities. On the other hand, those who remain neutral could benefit from educational initiatives that encourage more mindful and responsible use of GenAI.

Overall, the results highlight a complex relationship between students and Generative AI tools. While many acknowledge the possibility of over-reliance, their perspectives on whether this reliance is problematic remain divided. The fact that more than half of the respondents remain neutral suggests ongoing uncertainty regarding AI's role in their learning process. Nevertheless, a notable proportion expresses a willingness to reduce their dependence, indicating growing awareness of the need for balance in AI-assisted learning. The mixed responses emphasize the necessity of clear guidelines that promote responsible AI use, ensuring that pre-service teachers cultivate essential skills such as analytical thinking, critical reasoning, and ethical decision-making alongside technological proficiency, as suggested by Cavojský et al. (2023).

2. Pre-Service Teachers' Perceptions on the Effects of GenAI Usage

The adoption of Generative AI (GenAI) technologies in education has sparked discussions on their impact on students' skill development. While these tools enhance digital competence, provide quick insights, and streamline assignments, they may also pose challenges, including reduced critical thinking, problem-solving, and teamwork skills. For pre-service teachers, balancing the advantages and drawbacks of GenAI is crucial as they prepare for their future roles in education. Table 3 presents respondents' perceptions of how GenAI influences various aspects of their skill development.

Table 3 The Effects of Generative AI Usage

Statement	Answer									
	Strongly Disagree 1 point		Disagree 2 points		Neutral 3 points		Agree 4 points		Strongly Agree 5 points	
	n	%	n	%	n	%	n	%	n	%
I believe generative AI technologies can improve my digital competence.	0	0	6	13.0	25	54.3	10	21.7	5	10.9
I believe generative AI technologies can help me save time.	0	0	5	10.9	11	23.9	21	45.7	9	19.6
I believe AI technologies can provide me with unique insights and perspectives that I may not have thought of myself.	2	4.3	3	6.5	12	26.1	21	45.7	8	17.4
I think AI technologies can provide me with personalized and immediate feedback and suggestions for my assignments.	2	4.3	4	8.7	18	39.1	14	30.4	8	17.4
Generative AI make me convert my assignments form effortlessly, such as converting text assignments into videos, images or sound.	0	0	9	19.6	19	41.3	9	19.6	9	19.6
Using generative AI technologies limit my opportunities to interact with others when completing coursework.	4	8.7	16	34.8	17	37.0	5	10.9	4	8.7

Generative AI technologies hinder my teamwork skills development.	4	8.7	17	37.0	18	39.1	4	8.7	3	6.5
I feel that using generative AI technologies make my problem-solving skills lost.	3	6.5	12	26.1	16	34.8	10	21.7	5	10.9
My critical thinking is weaker when I use Generative AI technologies.	3	6.5	15	32.6	14	30.4	9	19.6	5	10.9
When I use Generative AI technologies, it seems that my leadership skills are weakening.	7	5.2	16	34.8	15	32.6	4	8.7	4	8.7

Table 3 presents respondents' perceptions of the positive and negative effects of Generative AI technologies on their skills. A majority (54.3%) believe that Generative AI enhances their digital competence, with 21.7% agreeing and 10.9% strongly agreeing, reflecting a predominantly positive perception. This aligns with Chan & Hu (2023), who highlight that AI tools improve digital literacy by exposing students to advanced technological applications, making them more proficient in digital environments.

Similarly, 45.7% agree and 19.6% strongly agree that AI helps save time, while only 10.9% disagree, demonstrating its perceived efficiency benefits. Chan & Hu (2023) also emphasize that AI streamlines literature reviews, data collection, and preliminary analysis, improving efficiency. It can be said that it streamlines academic tasks, allowing students to focus on refining their work rather than spending excessive time on routine activities, thereby reinforcing their learning experience.

Additionally, 45.7% agree and 17.4% strongly agree that AI provides unique insights and perspectives, reinforcing its role in supporting learning. It is also supported by Almassaad et al. (2024) who found that GenAI grants access to diverse information sources while delivering clear explanations that foster critical thinking skills. It captures that AI can expand students' knowledge by offering diverse viewpoints and enabling access to vast amounts of information, enhancing their analytical abilities.

Regarding AI's ability to provide personalized and immediate feedback, responses vary. While 30.4% agree and 17.4% strongly agree, a significant portion (39.1%) remains neutral. Similarly, for AI's capability in converting assignments into different formats, 41.3% of respondents are neutral, while 19.6% agree and 19.6% strongly agree. This suggests that while the feature is beneficial, it is not universally valued. These findings align with Francis et al. (2024), who argue that AI personalizes learning experiences. Similarly, Chan and Hu (2023) highlight that one of GenAI's primary advantages is its ability to provide personalized and immediate learning support, functioning as a virtual tutor that delivers instant feedback and customized recommendations. However, the high percentage of neutral responses suggests that many students may not fully understand how to utilize GenAI to enhance their learning. Therefore, it can be concluded that the effectiveness of GenAI depends on students' engagement with and interpretation of AI-generated feedback. This finding highlights the need for further research in this area.

On the potential drawbacks, 37% of respondents remain neutral on whether AI limits opportunities for interaction, while 34.8% disagree, suggesting that many students do not see AI as a barrier to social engagement. A similar trend appears regarding teamwork skills development, where 39.1% are neutral, and 37% disagree, indicating limited concern about AI hindering collaboration. However, concerns arise regarding AI's impact on cognitive skills. While 34.8% are neutral, 26.1% disagree, and 32.6% agree or strongly agree that AI weakens problem-solving skills. A similar pattern appears with critical thinking, where 30.4% are neutral, but 32.6% disagree, and 30.5% agree, showing divided opinions. Additionally, leadership skills seem to be a concern, with 34.8% disagreeing and 15.2% strongly disagreeing that AI weakens leadership, while only 8.7% strongly agree.

The overall findings indicate that while pre-service teachers recognize the efficiency and learning benefits of GenAI, concerns remain regarding its influence on higher-order cognitive skills, such as critical thinking, problem-solving, and leadership. Many respondents remain neutral on these

drawbacks, suggesting a level of uncertainty about AI's long-term impact on their skills. These findings align with Chan & Wu (2023), who highlight that a major concern regarding AI's impact on individuals and personal development is excessive dependence on the technology, which could hinder personal growth, skill acquisition, and intellectual progress over time. However, a significant number of respondents remained neutral rather than clearly expressing their perception of GenAI's impact on their essential skill development. Therefore, structured AI-driven learning approaches, where students actively engage with AI outputs rather than passively accepting them, are crucial to mitigating these concerns and ensuring AI serves as a tool for skill enhancement rather than a replacement for cognitive effort.

The findings of this study highlight the dual nature of GenAI in educational settings. While pre-service teachers acknowledge its benefits in enhancing digital competence, improving efficiency, and providing valuable insights, concerns regarding its potential impact on cognitive skills and leadership abilities persist. The neutral stance of many respondents suggests the need for greater awareness and structured implementation of AI in learning environments. To maximize its benefits while addressing its drawbacks, educators should encourage critical engagement with AI tools, fostering a balance between technological assistance and independent cognitive development.

3. Pre-Service Teachers' Awareness of Academic Ethics

As Generative AI (GenAI) technologies become more prevalent in academic settings, concerns regarding their ethical use have emerged. Pre-service teachers, as future educators, must develop a strong awareness of academic integrity, including proper citation practices, avoiding plagiarism, and maintaining originality in their work. Their perceptions of ethical considerations when using GenAI provide insight into how well they understand and uphold academic standards. Table 4 presents respondents' awareness of academic ethics about their use of GenAI technologies.

Table 4 Awareness of Academic Ethics

Statement	Answer									
	Strongly Disagree 1 point		**Disagree 2 points**		**Neutral 3 points**		**Agree 4 points**		**Strongly Agree 5 points**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
I feel that the way I use generative AI technologies to complete my assignments undermines the value of academic ethics such as plagiarism.	5	10.9	11	23.9	25	54.4	2	4.3	3	6.5
After I read and understand the answer provided by any generative AI technologies, I rewrite the answer based on my writing style.	1	2.2	2	4.3	17	37	11	23.9	15	32.6
I make sure that I give sources or references from the data, information, or answer given by generative AI technologies in my academic assignments.	2	4.3	1	2.2	19	41.3	12	26.1	12	26.1

Table 4 illustrates respondents' awareness of academic ethics when using Generative AI technologies for assignments. The first statement, “I feel that the way I use generative AI technologies to complete my assignments undermines the value of academic ethics such as plagiarism,” reveals that more than half of the respondents (54.4%) remain neutral. Meanwhile, 23.9% disagree, while a smaller portion (10.9%) strongly disagree, indicating that many students do not perceive their AI usage as a major ethical concern. However, 10.8% (agree and strongly agree combined) recognize ethical concerns, indicating that a minority perceives potential risks in their AI usage.

Regarding the second statement, “After I read and understand the answer provided by any generative AI technologies, I rewrite the answer based on my writing style,” a significant 56.5% (agree and strongly agree combined) report that they actively paraphrase AI-generated content to fit their writing style. Meanwhile, 37% remain neutral, which may indicate uncertainty about their paraphrasing habits, and only 6.5% disagree,

suggesting that most students at least attempt to modify AI-generated content.

For the third statement, "I make sure that I give sources or references from the data, information, or answer given by generative AI technologies in my academic assignments," 52.2% (agree and strongly agree combined) affirm their commitment to citing AI-generated information. However, 41.3% remain neutral, which may indicate hesitation or a lack of clarity regarding proper referencing practices, and only 6.5% (disagree and strongly disagree combined) openly admit to not attributing sources.

The findings on academic ethics suggest that most students strive to use AI in accordance with ethical academic practices, such as paraphrasing AI-generated content and citing sources. However, the high proportion of neutral responses indicates that many students may be uncertain about the appropriate use of AI in academic settings. This aligns with Sysoyev (2024), who found that a lack of clear understanding of academic integrity policies has contributed to unintentional plagiarism among students. Similarly, this uncertainty reflects broader discussions on AI ethics in education, where institutional guidelines and policies continue to evolve to promote responsible AI use (Chan & Hu, 2023).

Conclusion

The findings reveal a complex relationship between pre-service teachers and Generative AI (GenAI), with mixed perceptions regarding dependency, effects, and ethical considerations. First, most pre-service teacher are not sure whether they can become over-reliant on GenAI technology (52.2%), are concerned to be neutral about their dependency level (43.3%), and have a willingness to decrease their dependency (32.6%). Second, pre-service teachers have a positive perspective toward GenAI usage which can help them save time (65.3%, combined), give them unique insight and perspective (63.1%, combined), give them personal and immediate feedback (47.8%, combined). However, they are not sure that GenAI usage can improve their digital competence (54.3%) and convert their assignment form effortlessly (41.3%). Besides, they have negative perception if GenAI

usage can limit their social interaction (43.5%, combined), hinder their teamwork skills (45.7%, combined), weaken their critical thinking (39.1%, combined), and leadership skills (40%, combined). Meanwhile, the effect of GenAI on problem-solving skills is viewed as a dilemma, as both positive and negative perceptions are equally divided (32.6%). Third, pre-service teachers are not certain whether they undermine the value of academic ethics when they use GenAI to complete their assignments (54.4%). Nonetheless, most of them make sure that they read, understand, and rewrite GenAI answers based on their writing style (56.5%, combined) and give sources or references from the answers given by GenAI (52.2%).

Given that many pre-service teachers still have uncertainties (as indicated by the high percentage of "neutral" responses) regarding the impact of GenAI usage and academic ethics, researchers suggest that universities and lecturers ensure students receive clear and intensive education on key aspects to consider. This includes guidelines for completing assignments and essential aspects to review before submission. Strengthening awareness and understanding of these guidelines is crucial for fostering responsible and ethical AI use among both pre-service teachers and educators. Moreover, the Ministry of Education, Culture, Research, and Technology has published the Guidelines for the Use of Generative Artificial Intelligence (GenAI) in Higher Education Learning in 2024.

Regarding the findings, researchers suggest that future studies explore the effects of GenAI usage on pre-service teachers' academic skill development, particularly problem-solving skills, which yielded an equal distribution of responses. Additionally, alternative research designs can be employed to obtain deeper and more detailed data.

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