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The Use of AI by Elementary Teacher Education Students: Between Innovation and Dependency

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Abstract

This study aims to analyze the use of Artificial Intelligence (AI) by fourth-semester students of the Primary School Teacher Education (PGSD) program in completing academic assignments. Specifically, the study explores (1) the impact of AI use on students' critical thinking skills, (2) students' perceptions of AI's role in academic tasks, (3) the extent to which AI influences the quality of academic assignments, and (4) the ethical implications of AI use in the training of future teachers. Employing a quantitative survey approach and qualitative thematic analysis from 77 respondents, it was found that AI has become a prevalent and highly valued tool due to its ability to enhance efficiency and save time in various academic tasks (e.g., essay writing, summarizing, presentations). However, findings also indicate an increased dependence on AI, raising concerns about a potential decline in critical thinking skills and intellectual laziness. While AI is perceived to improve assignment professionalism and facilitate achieving higher grades, students consistently emphasize the need for extensive revision of AI output to ensure accuracy, originality, and adherence to academic standards. Furthermore, significant ethical implications related to plagiarism, academic dishonesty, and the potential for superficial learning are major concerns among students, who actively advise using AI as a tool that requires critical verification, rather than a substitute for independent thought. This study concludes that the integration of AI in future teacher education must be done wisely and responsibly, emphasizing the importance of academic integrity, continuous critical thinking development, and intellectual autonomy to prepare competent and ethical future educators. This study recommends that AI integration in teacher education emphasize academic integrity, foster continuous critical thinking, and ensure intellectual autonomy

Keywords : AI, Challenges, Innovation

INTRODUCTION

The growing presence of Artificial Intelligence (AI) in higher education is significantly reshaping learning environments, offering both promising opportunities and pressing concerns. Generative AI tools such as ChatGPT have enabled more interactive, personalized, and efficient learning, marking a shift toward Education 4.0, where teaching becomes more adaptive and student-centered (Peláez-Sánchez et al., 2024). These tools can support students by simplifying complex content, improving engagement, and enhancing productivity. However, this convenience also raises concerns, particularly regarding

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student overreliance on AI, which may hinder the development of critical thinking and independent learning skills (Ibrahim et al., 2024).

One major concern is the potential erosion of academic integrity and creativity(Hieu & Thao, 2024). When students increasingly depend on AI to complete assignments, there is a risk that learning becomes superficial and passive, reducing their active engagement in the learning process (Koka, 2023)(Zulfikasari et al., 2024)., 2024). Educators are therefore encouraged to adopt balanced strategies that integrate AI in meaningful ways without compromising learners' intellectual growth (Roy et al., 2021). Maintaining this balance is crucial to avoid devaluing educational responsibilities and to preserve the human aspects of creativity and critical reasoning (Shafei & Ahmed, 2025).

Equally important is the ethical dimension of AI in education. As AI tools gain popularity, there is growing concern about data privacy, algorithmic bias, and the responsible use of student-generated data. Scholars emphasize the need for transparent, ethical frameworks that guide the use of AI in academic settings (Bettayeb et al., 2024)(Widayanti & Mariyanti, 2023). These frameworks should ensure that students' rights are protected while promoting the ethical and equitable use of AI technologies.

integration of Artificial Intelligence (AI) into educational environments necessitates a thoughtful reevaluation of how assessments are designed and implemented (Fakhrutdinova, 2024). Traditional assessment methods, which often emphasize standardized testing and summative evaluations, may not fully capture the dynamic learning experiences facilitated by AI. Generative AI tools offer the potential to support more personalized, formative assessments that are tailored to individual learning needs, preferences, and progress (Vineethan, 2025). These tools can provide real-time feedback, adaptive questioning, and diverse modes of expression, which collectively contribute to a more inclusive and learner-centered evaluation process (Fauziddin et al., 2025). However, relying solely on AI for assessment could compromise the validity and authenticity of student work, especially if human oversight is absent.

Rather than replacing conventional practices, AI-powered assessments should be designed to complement them. By integrating AI tools with established evaluation techniques, educators can achieve a more comprehensive understanding of students' abilities (Anastasia, 2024). This hybrid approach ensures that learning remains both measurable and meaningful, preserving the pedagogical intent behind each assignment or activity. For instance, while AI can help automate grading or suggest performance trends, educators are still needed to interpret nuanced responses, foster reflective learning, and ensure alignment with learning objectives. As noted by Fauziddin et al. (2025), maintaining this balance is key to upholding the integrity of assessment systems in the digital age.

To implement such integration effectively, the readiness of educators plays a critical role. Institutions must invest in professional development programs that equip teachers with the necessary digital literacy, pedagogical strategies, and ethical understanding to use AI meaningfully in the classroom (Abisoye et al., 2022). Without sufficient training, educators may face difficulties in aligning AI tools with curriculum goals, which can lead to inconsistent or ineffective implementation (Lee et al., 2024). Inadequate preparation may also cause educators to either overly depend on AI or avoid its use entirely, both of which hinder its full potential. As Shafei (2025) emphasizes, sustainable educational progress

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hinges on empowering educators to confidently manage AI-assisted learning environments and to guide students in navigating these tools responsibly.

While generative AI holds great potential to personalize education and reduce teaching workloads (Matsumoto, 2023), it also presents a paradox. The same features that make AI convenient may encourage dependency, particularly among students who lack the maturity or guidance to use such tools wisely. Hence, fostering digital literacy and AI awareness becomes essential—not only to help students use AI effectively, but also to ensure they remain critical, creative, and ethical learners.

The integration of AI in higher education presents both opportunities and challenges. It has the potential to transform learning and teaching, yet it must be approached with caution and responsibility (Bennett & Abusalem, 2024). Educators, institutions, and policymakers must work together to strike a balance between innovation and integrity. By doing so, they can ensure that AI enhances rather than undermines the educational process, supporting students not only in gaining knowledge but also in developing as thoughtful, independent, and ethical individuals (Rohmah, 2024).

One of the most pressing issues surrounding the integration of Artificial Intelligence (AI) in higher education is its potential to foster student dependency, particularly among pre-service elementary school teachers (PGSD students). While AI tools such as ChatGPT offer convenience and enhanced productivity, their misuse can undermine fundamental educational goals. In the context of teacher education, the overreliance on AI raises critical concerns regarding the development of essential academic and professional competencies (Vargas-Murillo et al., 2023). Specifically, five major challenges emerge: the decline of critical and analytical thinking skills; the disruption of pedagogical internalization and scientific values; increased risks of plagiarism and diminished originality in academic work; the erosion of core instructional abilities such as lesson planning, reflective writing, and independent material design; and the neglect of academic ethics and professionalism.

These concerns prompt the need for a more structured investigation into the implications of AI usage in PGSD programs. Several key research questions emerge from this context. First, what is the impact of AI on PGSD students' critical thinking skills? Second, how do students perceive the role of AI in completing their academic tasks? Third, to what extent does AI use influence the quality of assignments submitted by pre-service teachers? Fourth, what ethical implications arise from the integration of AI into the training of future elementary educators? And finally, how can a responsible and balanced use of AI be embedded into PGSD coursework without compromising the integrity of teacher education?

Addressing these questions is not only timely but also crucial in ensuring that the integration of AI enhances rather than diminishes the quality of teacher preparation. Investigating these dimensions can help shape policies and instructional strategies that promote healthy, ethical, and pedagogically sound AI practices. Moreover, the findings may provide insights for educators and policymakers on how to scaffold the use of AI in a way that supports student learning while preserving originality, professionalism, and essential pedagogical skills.

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METHOD

This study employed a quantitative descriptive-exploratory approach to describe and analyze the use of Artificial Intelligence (AI) by students of the Primary School Teacher Education (PGSD) study program in completing academic assignments. This approach was chosen to gain a deeper understanding of students' perceptions, usage habits, and the impact of AI on essential aspects of teacher competence development, including critical thinking, academic ethics, and the quality of submitted tasks.

Data were collected through an online questionnaire distributed via Google Form, consisting of 20 closed-ended questions using a Likert scale and 3 open-ended questions. The instrument was developed based on indicators aligned with the four core research focuses: (1) the impact of AI use on students' critical thinking skills, (2) students' perceptions of the role of AI in completing academic tasks, (3) the extent to which AI influences the quality of academic assignments, and (4) the ethical implications of AI use in the training of future teachers.

The respondents in this study were active PGSD students selected through purposive sampling, with a total of 77 participants. The collected data were analyzed using descriptive statistics for the closed-ended questions, and content analysis for the open-ended responses. The results of the analysis were then used to answer the research questions and draw conclusions regarding AI practices and ethical considerations in teacher education contexts. The questionnaire used in this study underwent a validation process by three experts specializing in education, educational technology, and educational measurement and evaluation. The validation assessed three key aspects for each item: (1) content relevance, (2) language clarity, and (3) alignment with the intended research indicators.

Based on the validation results, all questionnaire items scored above 3 (on a 4-point scale) for each aspect, indicating that the items were considered relevant, clearly worded, and appropriate for the study's objectives. No items were deemed unsuitable for inclusion. Minor revisions were made to improve the wording of a few statements, without altering their intended meaning.

Therefore, it can be concluded that all items in the questionnaire were deemed content-valid and suitable for use in this study. The instrument is expected to effectively capture the perceptions, experiences, and attitudes of PGSD students regarding the use of Artificial Intelligence (AI) in academic contexts.

Table 1. Instrument Validation Results and I-CVI Scores

No	Item	Avg. Relevance	Avg. Clarity	Avg. Content Fit	I-CVI Relevance	I-CVI Clarity	I-CVI Content Fit
1	Item 1	4.00	3.67	4.00	1.00	1.00	1.00
2	Item 2	3.67	3.67	3.33	1.00	1.00	1.00
3	Item 3	3.67	3.67	4.00	1.00	1.00	1.00
4	Item 4	3.67	4.00	4.00	1.00	1.00	1.00
5	Item 5	3.67	3.33	3.67	1.00	1.00	1.00

Note: An I-CVI score ≥ 0.78 indicates acceptable content validity. All items above exceed this threshold and are therefore considered valid for use in the study.

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FINDINGS

The first research question investigated in this study pertains to the impact of AI use on students' critical thinking skills among Primary School Teacher Education (PGSD) students. To address this, both quantitative and qualitative data were analyzed. Quantitatively, the study utilized responses from 51 students of 77 to three closed-ended Likert scale questions directly related to critical thinking and intellectual autonomy. The findings indicate a mixed but notable impact. For instance, 49% of students reported becoming more dependent on AI than on thinking for themselves, suggesting a significant shift in their approach to problem-solving. Conversely, a large majority (67%) stated that they do not rarely read books or primary sources since using AI, indicating that for most, AI has not entirely replaced traditional research methods.

Regarding the enthusiasm for critical thinking, 53% of students denied that AI made them lose such enthusiasm, yet a substantial combined percentage of 47% (16% "Yes" and 31% "Uncertain") either agreed or were unsure about AI's dampening effect on their critical thinking drive. Qualitatively, analysis of open-ended responses strongly reinforced these concerns, with students frequently expressing fears of dependence and decrease in critical thinking ability, highlighting worries about intellectual laziness and the erosion of independent thought due to AI over-reliance. Concerns about the accuracy and validity of AI-generated content also emerged, implicitly underlining the need for critical evaluation that might be undermined by over-dependence. In summary, while AI offers perceived benefits in efficiency, the quantitative and qualitative evidence collectively suggest that its use, if not managed judiciously, poses a tangible risk to the development of critical thinking skills by fostering dependency and potentially reducing students' intrinsic motivation for independent intellectual engagement. Here is the unified table for the quantitative data:

Table 2. Students' Perception of the Impact of AI use on Students' Critical Thinking Skills

Statement	Response	Number of Respondents	Percentage (%)
I become more dependent on AI than thinking for myself.	Yes	25	49%
	No	18	35%
	Uncertain	8	16%
Since using AI, I rarely read books or primary sources.	No	34	67%
	Uncertain	10	20%
	Yes	7	14%
AI makes me lose enthusiasm for critical thinking.	No	27	53%
	Uncertain	16	31%
	Yes	8	16%

Qualitatively, the primary concerns of PGSD students regarding the use of AI are the potential for declining critical thinking skills and increasing dependence on AI. Students

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expressed fears that AI could encourage laziness in thinking, inhibit the development of original ideas, and reduce motivation to seek and verify information independently. Although AI is recognized as a tool, there is a strong awareness that its unwise use can erode an important foundation of a prospective teacher's competence, namely critical and analytical thinking skills.

The second research question aimed to explore students' perceptions of the role of AI in completing academic tasks among Primary School Teacher Education (PGSD) students. The findings reveal a predominantly positive and highly utilitarian view of AI's function. Students largely perceive AI as a powerful tool for enhancing efficiency, saving time, and facilitating access to information and learning resources.

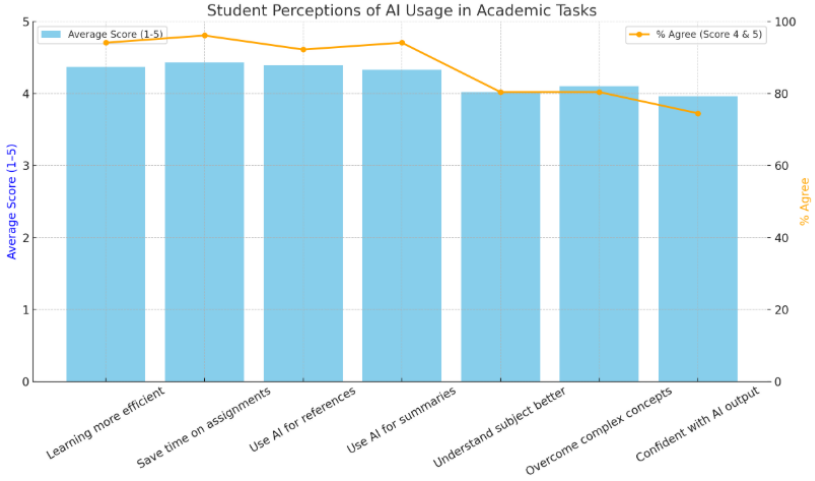

Figure 1: Percentage of students' responses

Quantitatively, this perception is robustly supported by high levels of agreement across several key indicators: over 90% of students agree that AI significantly boosts learning efficiency (94.1%) and helps them save valuable time (96.1%). Furthermore, a vast majority utilize AI for crucial academic activities such as finding references (92.2%) and creating presentations or material summaries (94.1%). A substantial 80.4% also believe that AI aids their understanding of subject matter and helps in overcoming complex concepts, while 74.5% express increased confidence in the quality of their AI-assisted assignments.

These quantitative insights are further enriched by qualitative data, where students consistently highlight AI's benefits in terms of efficiency, rapid information access, support for comprehension, assistance in task drafting and improvement, and as a valuable source of ideas. Although challenges like accuracy concerns and potential over-dependence are acknowledged, the overriding perception is that AI plays an indispensable and beneficial role in streamlining their academic workflow, supporting their learning processes, and ultimately, boosting their productivity across a range of academic assignments.
Here is the table summarizing the quantitative data on students' perceptions:

Table 3. Students' perceptions of the role of AI in completing academic tasks

Statement (Student Perception)	Average Score (1-5 scale)	% Agree (Score 4 & 5)
AI makes the learning process more efficient.	4.37	94.10%

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AI helps me save time in completing assignments.	4.43	96.10%
I use AI to search for references or information sources.	4.39	92.20%
I use AI to create presentations or material summaries.	4.33	94.10%
AI helps me understand subject matter better.	4.02	80.40%
AI helps me overcome difficulties in understanding complex concepts.	4.1	80.40%
I feel confident with the quality of assignments I produce with AI assistance.	3.96	74.50%

The third research question explored the extent to which AI influences the quality of academic assignments among Primary School Teacher Education (PGSD) students. The findings indicate that AI has a largely positive impact on the perceived quality of assignments, particularly concerning presentation and perceived academic success, but crucially, it necessitates significant critical engagement and revision from the students. Quantitatively, a high percentage of students feel confident (74.5%) in the quality of their AI-assisted tasks, and an even greater majority (78.4%) believe AI makes their assignments look more professional. Furthermore, a substantial 76.5% find it easier to achieve high grades on assignments utilizing AI, suggesting a direct link between AI use and perceived academic achievement. However, a critical insight from the quantitative data is that 64.7% of students frequently need to edit or revise AI output to meet academic standards, indicating that AI-generated content is often not ready for submission without substantial human refinement. Qualitatively, students acknowledge AI's benefits in improving language, structure, and initial accuracy, but they also consistently highlight challenges such as concerns about the accuracy and validity of AI-generated information, the potential for plagiarism if not properly processed, and the explicit necessity for extensive editing and revision. These qualitative responses underscore that while AI provides a powerful initial draft or support, the ultimate academic quality, originality, and adherence to rigorous standards are heavily dependent on the student's critical review, verification, and active revision processes. Here is the table summarizing the quantitative data on AI's influence on assignment quality:

Table 4. Students' Perceptions of AI Influence the Quality of Academic Assignments

Statement (Student Perception)	Average Score (1-5 scale)	% Agree (Score 4 & 5)	% Disagree (Score 1 & 2)	% Uncertain (Score 3)
I feel confident with the quality of assignments I produce with AI assistance.	3.96	74.50%	2.00%	23.50%
Using AI makes my assignments look more professional.	4.04	78.40%	2.00%	19.60%
I often have to edit or revise AI output to meet academic standards.	3.75	64.70%	9.80%	25.50%
I find it easier to achieve high grades on assignments that use AI.	4	76.50%	2.00%	21.60%

The fourth research question delves into the ethical implications of AI use in the training of future teachers. To address this, a qualitative approach was primarily employed

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to capture the nuanced perspectives and concerns articulated by students in open-ended responses, subsequently supported by relevant quantitative data to indicate the prevalence of these issues. The analysis reveals a multifaceted set of ethical considerations, predominantly revolving around academic integrity, intellectual autonomy, and the responsible development of professional competencies.

Students explicitly voice significant ethical concerns, including the risk of plagiarism and academic dishonesty, fearing that AI could lead to unoriginal work and a lack of genuine intellectual contribution. A prominent worry is the erosion of intellectual autonomy, where over-reliance on AI may foster dependence and diminish critical thinking skills—a crucial competency for future educators. Concerns about the authenticity and originality of academic work also emerge, as does the potential for superficial learning if AI bypasses true understanding. Furthermore, issues regarding the accuracy and validity of AI-generated information are raised, underscoring the ethical responsibility to verify content.

In response to these concerns, students' advice for ethical AI use consistently emphasizes treating AI as a "tool" or "reference" rather than a "substitute" for independent thought. They highlight the paramount importance of critical verification and extensive revision of AI output to ensure accuracy, originality, and adherence to academic standards. Encouraging the cultivation of independent thinking and promoting judicious, limited use of AI are also frequently suggested, alongside calls for guidance from lecturers on responsible AI integration. Quantitatively, the fact that 49% of students admit to becoming more dependent on AI and 64.7% frequently revise AI output provides a strong empirical backdrop, underscoring the widespread nature of these qualitative ethical dilemmas. Ultimately, the findings advocate for a highly cautious, critically engaged, and ethically conscious approach to AI integration in teacher training, ensuring that future educators develop both technological literacy and unwavering intellectual and ethical foundations.

DISCUSSION

This Discussion section aims to interpret the key findings from the research on AI use by PGSD students, connect them with relevant literature, and address practical implications and suggestions for future research. The findings indicate that while students acknowledge AI can enhance task efficiency and professionalism, a significant portion (49%) report becoming more dependent on it, raising serious concerns about a decline in critical thinking skills and intellectual laziness.

This aligns with research highlighting the dilemma between technological efficiency and the development of deep cognitive abilities. The predominantly positive perception of AI as a time-saving and efficient tool for information retrieval and task compilation is strong; however, ironically, 64.7% of students regularly need to edit and revise AI output to meet academic standards. This suggests that AI provides a strong foundation and facilitates the process, but the substantial quality, accuracy, and originality of the final assignment heavily depend on critical human intervention and in-depth analysis by the students themselves. The ethical implications of AI use are also a major focus, with students explicitly voicing concerns about potential plagiarism, academic dishonesty, originality, and superficial learning processes. Interestingly, students themselves offer ethical solutions, emphasizing the use of AI as a tool (not a replacement), the importance of information

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verification, independent thinking, and limited, judicious use. These findings underscore the necessity for clear guidelines and AI ethics education within the teacher education curriculum to ensure future educators are not only technologically literate but also uphold intellectual integrity.

Practically, educational institutions and PGSD lecturers need to develop teaching strategies that encourage critical and responsible AI use, focusing on skills in verification, synthesis, and original thought, rather than mere copying. This study has limitations, such as a relatively small sample size and reliance on self-reported data from a single study program, which may limit generalizability. Therefore, future research is recommended to employ longitudinal designs, involve larger samples from various institutions, and explore lecturers' perspectives and the long-term impact of AI use on pre-service teachers' teaching competencies.

The present study's findings share several similarities with previous research on AI integration in higher education. Consistent with Peláez-Sánchez et al. (2024) and Bettayeb et al. (2024), PGSD students in this study perceive AI as a highly efficient tool for saving time, enhancing productivity, and improving the professional appearance of assignments. Similar to Hieu and Thao (2024), students acknowledged AI's role in simplifying complex concepts and supporting comprehension, indicating its strong utility as a learning aid. Moreover, the necessity of revising AI output to meet academic standards aligns with Lee et al. (2024) and Anastasia (2024), who emphasized that AI-generated content often requires substantial human intervention to ensure accuracy, originality, and alignment with learning objectives.

At the same time, the results corroborate concerns raised by Shafei and Ahmed (2025) and Vargas-Murillo et al. (2023) regarding the potential decline in critical thinking skills and increased dependency when students over-rely on AI. The finding that nearly half of respondents admitted to greater dependence on AI echoes Ibrahim et al. (2024), who noted similar patterns in other academic contexts. Ethical concerns—such as plagiarism, academic dishonesty, and superficial learning—also mirror those highlighted by Widayanti and Mariyanti (2023) and Koka (2023), underscoring the importance of promoting responsible AI use. However, some contrasts emerge. While Bennett and Abusalem (2024) warned that AI adoption could significantly undermine learner autonomy if not carefully managed, this study found that many PGSD students remain actively engaged in revising, editing, and critically assessing AI outputs—suggesting that, in this context, AI use has not fully displaced independent intellectual effort. Furthermore, unlike the predominantly cautious stance reported by Rohmah (2024), the students in this study demonstrated a more balanced view, recognizing both the benefits and risks of AI, and proposing practical ethical strategies for its use. These differences may stem from contextual factors such as the nature of teacher education programs, the maturity of learners, and the level of institutional guidance on AI ethics.

CONCLUSION

This study aimed to analyze the use of Artificial Intelligence (AI) by Primary School Teacher Education (PGSD) students in completing academic assignments, examining its impact on critical thinking skills, their perceptions of AI's role, its influence on academic

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assignment quality, and the ethical implications that arise. The research findings indicate that AI has become a common and highly valued tool among PGSD students due to its ability to enhance efficiency and save time in completing academic tasks such as writing papers, summaries, and presentations.

It was found that AI use tends to increase student dependence, with nearly half of the respondents admitting to a decline in independent thinking and concerns about losing enthusiasm for critical thinking. Regarding assignment quality, while AI is perceived to make assignments look more professional and facilitate achieving higher grades, the majority of students still need to extensively revise AI output to ensure accuracy, originality, and adherence to academic standards.

Furthermore, the ethical implications of AI use are prominent. Students are aware of the risks of plagiarism, academic dishonesty, and the potential for superficial learning due to excessive reliance. This awareness is reflected in their suggestions for ethical and responsible AI use, which emphasize treating AI as a supporting tool that requires critical verification, rather than a substitute for independent thought and effort. This study concludes that AI is a transformative tool in higher education, offering significant advantages in academic productivity.

However, its integration into the training of future teachers must be done wisely and responsibly, emphasizing the importance of academic integrity, continuous critical thinking development, and intellectual autonomy. To ensure that future teachers are not only technologically literate but also educators with integrity and critical thinking abilities, clear guidelines, comprehensive AI ethics education, and pedagogical strategies that encourage the use of AI as a complement, not a substitute, for authentic learning and thinking processes are essential. This is crucial for preparing them as agents of change in an ever-evolving digital landscape.

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