

Evaluating the Academic and Societal Value of AI-Powered Tools: Moving Beyond Traditional Educational Metrics

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Abstract

Modern educational landscapes increasingly rely on Artificial Intelligence (AI). These technologies supply pre-service educators with sophisticated applications designed to facilitate instruction and enrich technology-driven scholarly pursuits. With the rapid proliferation of such digital resources, evaluating their impact demands a dual focus. Researchers must look past immediate scholastic success and student drive to understand how these platforms cultivate skills with wider societal implications. To achieve this, the current study utilized an explanatory sequential mixed-methods approach. The participant pool consisted of 148 first-year pre-service teachers enrolled at North Eastern Mindanao State University–Cantilan Campus. In the initial quantitative phase, researchers gathered data from the entire cohort via a validated survey, measuring variables that included the frequency and diversity of AI application usage, alongside users' perceptions regarding the platforms' utility and user-friendliness. Subsequently, a purposive subset of 24 individuals from the original group participated in the qualitative stage. By answering a pair of open-ended questions, these subjects provided detailed perspectives that underwent thematic analysis, serving to contextualize and deepen the numerical data. Statistical results revealed a strong correlation between the deployment of AI resources and students' self-assessed scholastic success, notably reflecting higher grades on tests and superior coursework execution. When analyzing user motivation, the range of different AI platforms employed correlated strongly with both perceived utility and operational simplicity; interestingly, the mere frequency of interaction with these tools did not demonstrate a meaningful link to student motivation. Thematic exploration further confirmed these insights, showing that AI-integrated education fosters scholastic efficiency, technological agility, and digital preparedness. Furthermore, it encourages ethical interaction with new tech and builds practical life skills that translate into active community involvement. Ultimately, this research concludes that artificial intelligence platforms do more than just elevate educational trajectories; they actively develop the foundational aptitudes required for individuals to thrive in heavily digitized academic and societal environments...

Keywords : Artificial Intelligence; AI-integrated applications; pre-service teachers; scholastic achievement; digital preparedness; societal impact; technology acceptance.

Introduction

Artificial intelligence (AI) is fundamentally restructuring the higher education landscape, equipping learners with generative platforms, automated writing aides, and intelligent tutoring systems that deliver personalized, data-driven support while streamlining academic workflows (Salido, 2023). For pre-service teachers, these digital resources do more than expedite repetitive tasks and reduce cognitive load; they act as working models of the technological ecosystems these future educators will eventually manage in their own classrooms (Chen et al., 2022). By integrating AI into their daily routines—from conceptualizing lesson plans to editing coursework—teaching candidates simultaneously elevate their scholastic efficiency and build foundational technological confidence.

Despite the widespread integration of these platforms, their ultimate impact on scholastic achievement remains a subject of debate. Certain investigations indicate that AI adoption elevates academic outcomes by organizing knowledge efficiently, enhancing writing precision, and providing instant feedback (Sahiner & Sahiner, 2021). Conversely, other scholars warn that a heavy reliance on automation risks deteriorating critical problem-solving faculties and breeding superficial comprehension (Koehler et al., 2023). Furthermore, the proliferation of AI introduces complex ethical dilemmas, including reduced academic originality, data privacy vulnerabilities, and the risk of students bypassing authentic learning processes (Dwivedi et al., 2023). Consequently, researchers emphasize the critical necessity of cultivating responsible AI engagement and safeguarding academic integrity within higher education (Mundo et al., 2024).

The continued acceptance and integration of these platforms are best understood through the Technology Acceptance Model (TAM), which posits that a user's drive to adopt an innovation hinges on its Perceived Ease of Use and Perceived Usefulness (Davis, 1989). When university students find AI applications intuitive and advantageous for task completion, their academic engagement and motivation surge (Mark & Nguyen, 2024). Among future educators, this motivation translates into an eagerness to incorporate a diverse array of digital tools into their study habits, seeking instant feedback and academic support (Ponce & Paglinawan, 2023). While active interaction with instructional technologies is strongly linked to heightened learning engagement (Legarde et al., 2025), a critical need remains to investigate how the specific frequency of AI utilization and the variety of tools deployed interact with these motivational factors.

Crucially, the utility of AI extends far beyond traditional classroom metrics, functioning as a catalyst for generating broader social value (Chisom & Chloe, 2025). Sustained engagement with these technologies nurtures competencies that transcend immediate educational requirements, fostering personal maturation and community development (Diamante et al., 2025). As individuals continuously interact with digital platforms, they acquire essential life skills—such as information verification, ethical digital communication, and technological adaptability (Nur, 2021). Ultimately, these proficiencies prepare learners to responsibly navigate, collaborate, and contribute within highly digitized, contemporary societies (Mariyono & Nur, 2025).

Current scholarship predominantly fixates on the immediate academic and efficiency gains of general student populations, leaving a noticeable gap regarding how AI shapes the broader societal capabilities of pre-service teachers. To bridge this divide, the present study explores the dual impact of AI-powered tools on both educational outcomes and wider social significance. By investigating how tool variety and usage frequency relate to learner motivation (perceived ease of use and perceived usefulness) and academic performance, this research offers a comprehensive evaluation of how AI fosters not only classroom success but also the digital readiness and responsible engagement necessary for long-term societal participation.

Methods

Research Design

This investigation utilized an explanatory sequential mixed-methods design. The research initiated with a quantitative phase relying on a descriptive-correlational framework to establish the statistical relationships between the pre-service teachers' AI tool utilization, their academic performance, and their motivation. Following the numeric data collection, a qualitative phase was conducted to capture subjective experiences, serving to deepen and contextualize the preliminary statistical findings. The descriptive portion of the analysis mapped the current state of the variables, while the correlational procedures tested their mathematical linkages. Ultimately, synthesizing the qualitative narratives with the quantitative data allowed for a robust, highly nuanced understanding of how AI applications influence both learner drive and educational outcomes.

Participants

For the quantitative portion of the study, the sample comprised exactly 148 first-year pre-service teachers attending North Eastern Mindanao State University–Cantilan Campus. These respondents were enrolled within the Department of General Teachers Training during the 2025–2026 academic year, spanning six distinct degree tracks: Bachelor of Secondary Education (with specializations in English, Filipino, Science, and Mathematics), Bachelor of Technical Vocational and Livelihood Education, and Bachelor of Science in Technology Education. Following the administration of the survey to the entire cohort of 148 individuals, researchers purposively selected a subset of 24 participants for the qualitative stage. This targeted group answered two open-ended questions, generating the rich narrative data required for subsequent thematic analysis to substantiate the quantitative trends.

Research Instrument

Primary quantitative data were gathered using a pre-existing survey instrument originally developed by Veronica Salido, titled *Impact of AI-Powered Learning Tools on Student Understanding and Academic Performance and Motivation*. This questionnaire is specifically designed to extract detailed insights regarding students' perspectives

on educational AI integration. Prior to deployment, formal authorization to adapt and utilize this tool was secured from the original author via email correspondence.

To facilitate the qualitative dimension of the research, the instrument was augmented with two specific open-ended inquiries. These questions were formulated to elicit reflective responses regarding how AI shapes the students' scholastic trajectories, technological habits, and future professional capabilities. The qualitative prompts were: a. How do AI-powered tools influence your learning activities, technology use practices, and engagement within academic and digital environments? b. In what ways do AI-powered tools influence your academic performance, quality of work, and ability to contribute meaningfully to learning and professional development?

Data Collection and Analysis

Prior to initiating data gathering, the researcher obtained formal administrative clearance from the Department Chair of the College of General Teachers Training, coordinated through the respective program heads. The researcher then administered the survey instruments in person. All distributed questionnaires were retrieved immediately upon completion, yielding a 100% response rate.

For the quantitative analysis, the data from the 148 respondents were summarized using Weighted Means and Standard Deviations to illustrate AI usage patterns, motivation levels, and perceived academic performance. To evaluate the inferential relationships among these variables, a Pearson Product-Moment Correlation Coefficient was applied, utilizing a 0.05 level of significance.

Concurrently, the qualitative responses derived from the 24 purposively selected participants were subjected to descriptive thematic analysis. This involved a rigorous process: the researcher continuously reviewed the dataset for familiarization, extracted significant statements, generated preliminary codes, grouped these into broader categories, and ultimately formulated overarching themes reflecting the collective participant experience. Representative excerpts were selected to empirically support each theme. In the final analytical step, these qualitative themes were integrated with the statistical outcomes, fulfilling the requirements of the explanatory sequential mixed-methods design by providing a comprehensively grounded interpretation of the results.

Results and Findings

Table 1: Students' Use of AI-Powered Tools

Statement / Construct	Weighted Mean	Verbal Description
Usage Frequency		
1. I regularly use AI tools to support my academic work.	3.14	Agree
2. I use an AI-powered tool every day.	2.38	Disagree
3. I rely on AI-powered tools for the majority of my academic requirements.	2.20	Disagree
4. I consistently use AI tools during the entire academic semester.	2.31	Disagree
5. I usually use AI-powered tools whenever I have assignments or upcoming examinations.	2.68	Agree
6. I use AI-powered tools to organize my daily study activities.	2.22	Disagree
7. I use AI-powered tools even when completing minor academic tasks.	2.08	Disagree
8. I increase my use of AI-powered tools whenever I have several assignments to complete.	2.75	Agree
9. AI-powered tools are a regular part of my weekly study routine.	2.55	Agree

Statement / Construct	Weighted Mean	Verbal Description
10. I usually access AI-powered tools before I begin studying.	2.16	Disagree
<i>Average Weighted Mean</i>	<i>2.45</i>	<i>Disagree</i>
Tool Variety		
11. I regularly use different AI-powered tools for my academic work.	2.36	Disagree
12. I use different AI-powered tools depending on the subject or academic task.	2.76	Agree
13. I utilize AI tools for note-taking, creating flashcards, and reviewing lessons.	2.94	Agree
14. I switch between different AI-powered applications according to my academic needs.	2.98	Agree
15. AI-powered tools I use support various academic purposes, such as writing, studying, and organizing schoolwork.	2.88	Agree
16. I frequently try newly available AI-powered study applications.	2.84	Agree
17. I use specialized AI tools for complex subjects.	2.91	Agree
18. My academic requirements often require the use of multiple AI-powered tools.	2.40	Disagree
19. I adjust my choice of AI-powered applications according to the requirements of each subject.	3.05	Agree
20. I am comfortable using multiple types of AI tools that match various learning preferences.	2.83	Agree
<i>Average Weighted Mean</i>	<i>2.80</i>	<i>Agree</i>

Table 1 details the behavioral patterns of pre-service teachers regarding their deployment of AI-powered applications. For *Usage Frequency*, the composite weighted mean (WM = 2.45, "Disagree") reveals that these digital resources are not yet deeply entrenched in the learners' daily routines. The highest-rated metric, focusing on routine application for schoolwork (WM = 3.14, "Agree"), highlights that respondents activate these platforms selectively rather than universally. This is further evidenced by the lowest-scoring indicator regarding minor tasks (WM = 2.08, "Disagree"), which suggests an aversion to utilizing AI for simple or trivial assignments. Ultimately, while students are familiar with mainstream applications like Grammarly and ChatGPT, their engagement is strictly pragmatic—typically reserved for navigating complex cognitive hurdles where immediate, AI-generated guidance proves strategically advantageous for task completion (Anders, 2023).

Regarding *Tool Variety*, the aggregate score (WM = 2.80, "Agree") demonstrates a generally positive disposition toward leveraging a diverse digital toolkit. Participants exhibited high adaptability in tailoring specific platforms to distinct subject requirements (WM = 3.05, "Agree"). However, a contradiction emerges: despite understanding the utility of varied toolsets, students scored lowest on frequently switching between platforms overall (WM = 2.36, "Disagree"). This indicates that while teaching candidates demonstrate adaptive technological practices, they still habitually rely on a narrow repertoire of applications. Broadening this familiarity is critical, as true technological integration relies heavily on a user's proactive exploration of diverse platforms tailored to specific academic demands (Zhao et al., 2025).

Qualitative Question 1: Influence on Learning and Digital Engagement

The numerical data highlighted a paradox of moderate usage frequency paired with positive attitudes toward tool adaptability. To contextualize this, the 24 purposively selected participants provided narrative insights detailing how AI influences their educational and digital realities, revealing that these tools function simultaneously as academic safety nets and drivers of broader social value.

AI as an Academic Support Companion

Sixteen (16) of the 24 respondents characterized AI as an essential supplementary aide for decoding complex lectures and executing assignments. Despite their moderate overall usage frequency, students reported targeted usage spikes during challenging periods, confirming AI's role as a vital productivity catalyst.

"To support my coursework, I regularly turn to AI applications like Grammarly and ChatGPT, particularly when I need to refine my assignments or grasp challenging concepts."

"Whenever my assignment load piles up, I heavily rely on AI tools since they enable me to structure my outputs and complete my tasks much faster."

Building Digital Readiness and Social Value

Corroborating the survey data showing students flexibly apply different AI tools based on academic needs, 18 of the 24 narratives highlighted how this exposure builds digital agility. Participants emphasized that navigating these systems cultivates technological confidence and adaptive proficiencies—skills that transcend immediate academic relief to foster responsible civic and professional participation in a digitized society.

"Operating a variety of AI platforms suited for diverse learning methods feels natural to me, and this builds up my overall technological confidence."

"Testing out the latest AI study applications sharpens my digital competencies, helping me adjust to modern tech that proves beneficial far beyond my university classes."

Table 2: Students' Perceived Motivation Towards AI

Ease of Use	Weighted Mean	Verbal Description
1. Operating AI applications is a simple process for me.	3.28	Strongly Agree
2. I am confident in my ability to apply AI tools to my learning tasks.	2.76	Agree
3. Adapting to brand-new educational AI platforms happens rapidly for me.	2.98	Agree
4. I find the mechanics of AI applications clear and simple to understand.	3.18	Agree
5. I rarely need someone to help me navigate AI platforms.	2.74	Agree
6. Encountering technical issues while using academic AI tools is rare for me.	3.02	Agree
7. AI applications are reliable resources for fulfilling my school requirements.	2.78	Agree
8. I trust the accuracy of the data produced by AI platforms.	2.56	Agree
9. Finishing assignments rapidly is highly convenient when utilizing AI.	3.09	Agree
10. Integrating AI into my study routines comes with almost no hassle.	3.07	Agree
Average Weighted Mean	2.95	Agree

Usefulness	Weighted Mean	Verbal Description
11. Grasping complex academic concepts is made much easier with AI support.	3.28	Strongly Agree
12. My general academic standing benefits from the use of AI applications.	3.06	Agree
13. The general caliber of my academic submissions is improved by AI platforms.	3.75	Strongly Agree
14. Memorizing and keeping information is enhanced when I use AI tools.	2.89	Agree
15. AI applications are highly beneficial for tackling schoolwork with efficiency.	3.05	Agree
16. Submitting requirements on time is much more manageable thanks to AI.	2.97	Agree
17. My test-taking outcomes are positively influenced by AI platforms.	2.66	Agree
18. Structuring my learning resources is streamlined by AI assistance.	2.90	Agree
19. Because AI makes tasks less overwhelming, I am able to maintain my focus better.	2.75	Agree
20. AI technologies play a significant role in my educational achievements.	3.08	Agree
Average Weighted Mean	3.04	Agree

Table 2 captures the motivational outlook of pre-service teachers regarding AI adoption. For *Ease of Use*, the composite mean (WM = 2.95, "Agree") confirms that participants find these systems highly intuitive. The peak indicator (WM = 3.28, "Strongly Agree") underscores seamless operational mechanics. However, a critical caveat exists: the lowest-rated item (WM = 2.56, "Agree") reflects restrained trust in the actual precision of AI-generated information. Thus, while the interfaces are universally accessible, students maintain a healthy skepticism regarding factual reliability. This highlights an urgent necessity to cultivate robust evaluative judgment, enabling learners to critically verify outputs before integration. Harnessing the true educational capacity of artificial intelligence requires coordinated efforts among institutional leaders and educators to ensure integration is both responsible and complementary to human intellect (Llego, 2023).

Similarly, perceptions of *Usefulness* were highly favorable (overall WM = 3.04, "Agree"). Participants robustly affirmed that AI elevates the caliber of their academic submissions (WM = 3.75, "Strongly Agree"). Yet, they expressed notably lower confidence regarding AI's capacity to boost actual examination scores (WM = 2.66, "Agree"). These outcomes suggest that future educators utilize AI predominantly as a mechanism for assignment refinement and workflow efficiency, rather than a direct study apparatus for high-stakes assessments. This mirrors insights from Fosner (2024), who observed that learners typically exploit AI for grammatical polishing, translation, and summarization, rather than for authentic idea generation or rigorous exam preparation.

AI for Meaningful Learning Engagement

Seventeen (17) of the 24 qualitative respondents echoed that the frictionless interfaces of AI platforms significantly bolster their academic participation. The intuitive nature of these tools minimizes technical frustration, fostering more confident and robust digital engagement.

"Because AI platforms are so intuitive, I can finish my schoolwork quickly rather than wasting hours trying to figure out the software."

"These tools are designed to be so straightforward that I almost never run into issues while operating them."

AI-Enabled Learning Productivity and Social Contribution

Twelve (12) participants highlighted AI's capacity to streamline workload management and clarify intricate topics. Crucially, this operational efficiency does more than elevate personal grades; it lays the groundwork for broader social value by equipping students to collaborate effectively, share knowledge, and engage responsibly within their learning communities.

"Using AI applications allows me to decode complex lectures and significantly elevate the standard of my submitted work."

"AI is incredibly practical for me; it streamlines the way I sort my learning materials and speeds up my task completion."

Table 3: Students' Perceived Academic Performance

Exam Scores	Weighted Mean	Verbal Description
1. My scholastic grades have seen an increase since I started using AI tools.	2.72	Agree
2. AI applications give me a stronger sense of readiness before taking tests.	2.66	Agree
3. My memory retention for crucial exam topics is fortified by AI resources.	2.78	Agree
4. The standard of my academic deliverables is improved by AI platforms.	2.96	Agree
5. Sitting for exams feels less intimidating because of my AI study aids.	2.60	Agree
6. To solidify my understanding of test subjects, I depend on AI platforms.	2.55	Agree
7. My comprehension of the materials covered in exams is deepened by AI.	2.84	Agree
8. AI helps me pinpoint exactly which subjects I need to study more before a test.	2.75	Agree
9. Reviewing with AI generally leads to higher scores on my exams.	2.61	Agree
10. Recalling specific data while taking tests is much simpler thanks to AI.	2.74	Agree
Average Weighted Mean	2.72	Agree
Assignment Quality	Weighted Mean	Verbal Description
11. The overarching quality of my submitted tasks is upgraded by AI.	2.97	Agree
12. I make fewer mistakes on my assignments when guided by AI.	2.95	Agree

Assignment Quality	Weighted Mean	Verbal Description
13. My coursework is presented with much better structure due to AI tools.	2.88	Agree
14. Utilizing AI platforms has enhanced my analytical and problem-solving skills.	2.75	Agree
15. The coherence and logical progression of my essays are improved by AI.	2.92	Agree
16. AI assistance ensures I can hit my submission deadlines with minimal stress.	3.02	Agree
17. My academic submissions contain fewer inaccuracies because of AI tools.	2.96	Agree
18. Brainstorming concepts and expanding on coursework content is facilitated by AI.	3.01	Agree
19. Finding reliable academic references is much faster when I use AI.	2.90	Agree
20. AI gives me confidence that my coursework directly aligns with the grading criteria.	2.94	Agree
Average Weighted Mean	2.93	Agree

Table 3 evaluates self-reported academic performance. For *Exam Scores* (WM = 2.72, "Agree"), participants recognized AI's general utility but were notably less inclined to depend on it for reinforcing examination topics (WM = 2.55, "Agree"). This hesitation implies a lingering preference for traditional review strategies, reflecting a reserved level of trust in AI-assisted support for formal test preparation. This caution aligns with findings by Weeks et al. (2024), who reported that students heavily dependent on generative AI frequently recorded lower examination scores compared to their non-using peers.

Regarding *Assignment Quality* (WM = 2.93, "Agree"), students overwhelmingly praised AI for facilitating timely submissions (WM = 3.02, "Agree"). Conversely, its perceived impact on strengthening independent problem-solving capabilities scored the lowest (WM = 2.75, "Agree"). Therefore, while AI effectively polishes the structural formatting and surface-level accuracy of academic submissions, its contribution to cultivating deep, higher-order analytical reasoning remains largely negligible among the respondents.

Qualitative Question 2: Influence on Performance and Professional Development

The statistical analysis established that pre-service teachers find AI accessible and beneficial, particularly regarding assignment execution. To unpack these mechanisms, the 24 qualitative participants detailed how AI influences their scholarly work and future professional trajectories.

Strengthening Quality-Oriented Learning Outputs

Sixteen (16) respondents affirmed that AI interventions directly upgraded their coursework by structuring concepts and refining prose. The instant feedback loops empower them to generate polished, academically rigorous deliverables that meet higher educational standards.

"By helping me structure my thoughts and clarify my writing, AI platforms have noticeably raised the quality of my coursework."

"With the aid of AI, I can generate highly precise and organized submissions that perfectly match my professors' expectations."

Academic Growth Toward Social Contribution

Seventeen (17) narratives expanded on the quantitative data by directly linking AI usage to future professional readiness. Participants emphasized that mastering these digital workflows enhances information curation and

technological adaptability—vital competencies that generate enduring societal value far beyond the university setting.

"Because AI changes the way I process and manage data, I feel much more equipped to handle the demands of my future career."

"The technological proficiencies I am building through AI aren't just for passing classes; they will allow me to assist others and thrive in the workplace."

Table 4: Correlation of AI-Powered Study Tools and Academic Performance

AI-Powered Tools (Usage Frequency) and	r-value	p-value	Interpretation
Exam Scores	0.328	0.012	Significant
Assignment Quality	0.265	0.041	Significant
AI-Powered Tools (Tool Variety) and	r-value	p-value	Interpretation
Exam Scores	0.468	0.001	Significant
Assignment Quality	0.405	0.003	Significant

Table 4 maps the inferential statistics linking AI utilization to academic outcomes. *Usage Frequency* displayed a statistically significant, positive correlation with both exam scores ($r = 0.328$, $p = 0.012$) and assignment quality ($r = 0.265$, $p = 0.041$), prompting the rejection of the null hypothesis. Likewise, *Tool Variety* significantly correlated with both exam scores ($r = 0.468$, $p = 0.001$) and assignment quality ($r = 0.405$, $p = 0.003$). These metrics substantiate that greater engagement with varied AI platforms translates into measurable scholastic enhancements, fortifying both conceptual mastery and output quality. Furthermore, this sustained digital interaction cultivates essential proficiencies in adaptive learning and tech-mediated decision-making. Consequently, pre-service teachers who adeptly leverage these tools are significantly better positioned to lead and innovate within future digitally enriched societal and educational environments.

Table 5: Correlation of AI-Powered Study Tools and Student Motivation

AI-Powered Tools (Usage Frequency) and	r-value	p-value	Decision	Interpretation
Ease of Use	0.235	0.071	Failed to Reject H0	Not Significant
Usefulness	0.208	0.105	Failed to Reject H0	Not Significant
AI-Powered Tools (Tool Variety) and	r-value	p-value	Decision	Interpretation
Ease of Use	0.344	0.008	Reject H0	Significant
Usefulness	0.286	0.025	Reject H0	Significant

Table 5 investigates the relationship between AI utilization parameters and learner motivation. Interestingly, *Usage Frequency* showed no statistically significant relationship with either Perceived Ease of Use ($r = 0.235$, $p = 0.071$) or Perceived Usefulness ($r = 0.208$, $p = 0.105$). Consequently, the null hypothesis was retained. This pivotal finding indicates that merely using AI tools frequently does not automatically drive user motivation. As Delgado and Moreno (2020) postulate, technological presence alone cannot guarantee motivated learning unless it is structurally coupled with robust, learner-centered pedagogy.

Conversely, *Tool Variety* yielded a statistically significant relationship with both Ease of Use ($r = 0.344$, $p = 0.008$) and Usefulness ($r = 0.286$, $p = 0.025$). This distinction is critical: it is the exposure to a diverse technological ecosystem—rather than the repetitive use of a single application—that amplifies students' appreciation of AI's utility and navigability. For teaching candidates, establishing this diversified digital fluency is paramount, as it

directly enhances their capacity for responsible digital engagement and adaptability in modern, technology-mediated frameworks.

Discussion

The empirical outcomes confirm a statistically significant correlation between the deployment of AI-powered tools and the academic performance of pre-service teachers. Regarding learner motivation, the data revealed a nuanced dynamic: while the mere frequency of AI utilization yielded no statistically meaningful impact in isolation, engagement with a diverse array of AI applications (tool variety) significantly elevated both perceived ease of use and perceived usefulness. As educational frameworks increasingly embed digital innovations into pedagogical practice, platforms such as generative AI, intelligent tutoring systems, and automated feedback loops have become foundational to the scholarly experiences of future educators. Crucially, integrating these systems cultivates proficiencies that transcend traditional academic boundaries, generating broader social value through the ethical application of technology (Vieriu & Petrea, 2025). Qualitative insights reinforce this, demonstrating that teaching candidates perceive AI not strictly as a study aid, but as an instrument for enhancing technological adaptability, information management, and digital accountability. Ultimately, mastering these platforms bolsters students' capabilities to thrive within heavily digitized educational ecosystems (Niyazova et al., 2026).

The quantitative analysis demonstrated that pre-service teachers who utilized AI applications more frequently achieved superior academic performance. This trend likely stems from the inherent capacity of AI-driven platforms to offer tailored academic support, clarify convoluted topics, and supply immediate instructional feedback. By leveraging features like automated assessments and structured resource curation, students can execute their coursework with heightened efficiency. Consequently, the cognitive load associated with mundane tasks is alleviated, freeing learners to direct their mental faculties toward higher-order analytical reasoning and deep conceptual mastery. Developing these advanced cognitive proficiencies empowers students to engage meaningfully within digital communities, where responsible knowledge sharing and virtual collaboration hold profound social significance (Duki et al., 2025). Beyond quantifiable grades, the narrative data suggests that AI-integrated learning yields expansive developmental benefits. Respondents reported increased confidence in vetting digital sources, extracting data, and maneuvering through complex online platforms. Such capabilities are essential in modern, knowledge-driven societies that demand technological agility and informed critical judgment. Effectively navigating these multifaceted digital terrains directly reflects competencies highly esteemed as socially valuable in today's interconnected world (Naeem et al., 2025).

Analyzing learner motivation, the evidence indicates that the intentional integration of AI tools significantly amplifies student engagement and academic confidence. When applied deliberately, these technologies construct dynamic learning environments characterized by personalized assistance, immediate corrective feedback, and interactive digital tasks (Lin & Chen, 2024). Although the isolated frequency of AI usage failed to correlate significantly with motivation, interacting with a diverse tool variety proved highly significant in shaping both perceived ease of use and perceived usefulness. Exploring multiple AI platforms empowers students to identify and deploy the specific technologies best suited for distinct academic requirements, thereby reinforcing their appreciation for the tools' practical utility and navigability (Zhou & Peng, 2025). Participants confirmed that AI streamlined their academic burdens, transforming demanding assignments into manageable, interactive experiences that fostered a profound sense of academic autonomy. Furthermore, these platforms stimulated creative problem-solving and facilitated robust collaborative practices, particularly in content generation and lesson planning. These qualitative reflections indicate that diverse AI adoption not only optimizes individual learning but also drives active, collaborative participation across digitally mediated educational spaces.

Ultimately, this investigation positions AI-powered tools as collaborative pedagogical partners rather than mere technological conveniences. Their strategic application empowers pre-service teachers to satisfy rigorous academic standards while simultaneously nurturing self-regulated learning, digital fluency, and professional preparedness. These insights compel teacher education institutions to actively champion the ethical and purposeful integration of AI, ensuring that future educators cultivate a sophisticated critical awareness alongside their technical skills. Most significantly, the accumulated evidence affirms that the impact of artificial intelligence eclipses immediate scholastic milestones, driving the broader societal outcomes of digital citizenship, technological adaptability, and informed civic engagement. Because tomorrow's educators bear the responsibility of guiding subsequent generations through increasingly complex technological landscapes, mastering AI-powered tools serves as a vital mechanism for preparing socially responsible, highly capable contributors to modern society.

Conclusion

Ultimately, this research establishes artificial intelligence as an indispensable pedagogical asset that significantly elevates the scholarly journey of pre-service teachers. The collected empirical data demonstrate that intentional interaction with these digital platforms streamlines information retrieval, elevates the caliber of submitted

coursework, optimizes study organization, and drives overall scholastic efficiency. Consequently, these results validate the capacity of AI-integrated systems to deepen the learning process and solidify academic success within teacher preparation curricula.

In terms of learner motivation, the analysis uncovered a highly nuanced dynamic. While the sheer frequency of AI deployment yielded no statistically meaningful correlation with motivational metrics, active engagement with a diverse array of AI applications (tool variety) strongly correlated with both perceived ease of use and perceived usefulness. This indicates that cultivating a broad technological repertoire fosters deeper technology acceptance. By satisfying distinct academic requirements and aligning with diverse learning styles, a varied digital toolkit actively promotes a more engaging and highly favorable educational experience.

Crucially, this inquiry advances the academic conversation past standard scholastic metrics, proving that artificial intelligence yields profound social value. Qualitative narratives confirm that continuous engagement with AI platforms nurtures digital readiness, technological agility, ethical digital conduct, rigorous information curation, and robust collaboration across virtual ecosystems. Surpassing mere classroom achievement, these essential competencies equip future educators to seamlessly adapt to technological shifts, participate ethically in knowledge-driven networks, and successfully meet the complex demands of a rapidly evolving modern society.

In synthesis, the evidence verifies that the influence of AI applications decisively extends beyond academic advancement to generate enduring societal impact. Far from being simple mechanisms for boosting grades, these digital innovations act as catalysts for lifelong learning, career readiness, principled digital citizenship, and active civic participation. Therefore, it is imperative for teacher education institutions to champion the ethical and pedagogically aligned integration of artificial intelligence. Fostering this environment ensures the development of future educators who are not only scholastically proficient but also technologically resilient, empowering them to drive meaningful social progress in an increasingly AI-driven world.

References

1. Anders, B. A. (2023). Is using ChatGPT cheating, plagiarism, both, neither, or forward thinking?
2. Byers, C. M. (2024). AI-powered educational tools and their effect on student motivation in online learning environments: A preliminary study. <http://scholarworks.umd.edu/cgi/viewcontent.cgi?article=13506&context=etd>
3. Chui, J., Jong, M. S., & Mok, M. M. (2020). Sustainable curriculum planning for artificial intelligence education: A self-determination theory perspective. <https://www.sciencedirect.com/science/article/abs/pii/S0360131522001531>
4. Chukwuemeka Wisdom, Chisom & Nguyen, Chloe. (2025). The Social and Cultural Impacts of Artificial Intelligence on Modern Society.
5. Dahri, M., Yahaya, N., Al-Rahmi, W., Almutairy, S., Shutaleva, A., & Soomro, M. (2024). Extended TAM-based acceptance of AI-powered ChatGPT for supporting metacognitive self-regulated learning in education: A mixed-method study. *Heliyon*. [https://www.cell.com/heliyon/fulltext/S2405-8440\(24\)05348-9](https://www.cell.com/heliyon/fulltext/S2405-8440(24)05348-9)
6. De la Vall, R. R. F., & Araya, F. G. (2023). Exploring the benefits and challenges of AI language learning tools. *International Journal of Social Sciences and Humanities Invention*, 10(1), 7569–7576.
7. Delgado, J. G. L., & Moreno, J. A. (2020). School motivation through the use of information and communication technology (ICT). *International Research Journal of Management, IT and Social Sciences*, 7(2), 50–58. <https://doi.org/10.21744/irjmis.v7n2.879>
8. Diamante REJ, Martin AB, Berry EB, et al. Developing trust and confidence in the delivery of Ai-Oriented teaching strategies among Non-ICT expert teachers. *Environment and Social Psychology* 2025; 10(8): 3851 doi:10.59429/esp.v10i8.3851
9. Duki, Duki & Malik, Abdul & Hadi, Tb. (2025). The Influence of Digital Communication Competence on Social Interaction Between Students and Lectures. *Representamen*. 11. 55-70. 10.30996/representamen.v11i02.132113.
10. Fosner, A. (2024). University students' attitudes and perceptions towards AI tools: Implications for sustainable educational practices.
11. Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*. <https://doi.org/10.1111/bjet.12864>
12. Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education*. <https://doi.org/10.1111/ejed.12533>

13. Legarde MAA, Mundo MD, Chavez JV, et al. Empowering learning engagement in higher education with active learning experiences in STEM classrooms. *Environment and Social Psychology* 2025; 10(9): 3878 doi:10.59429/esp.v10i9.3878
14. Lin H, Chen Q. Artificial intelligence (AI) -integrated educational applications and college students' creativity and academic emotions: students and teachers' perceptions and attitudes. *BMC Psychol.* 2024 Sep 16;12(1):487. Doi: 10.1186/s40359-024-01979-0. PMID: 39285268; PMCID: PMC11403842.
15. Llego, M. A. (2023). The impact of artificial intelligence (AI) on the future of education: Teachers in the Philippines.
16. Mariyono D, Nur AlifHd A (2025), "AI's role in transforming learning environments: a review of collaborative approaches and innovations". *Quality Education for All*, Vol. 2 No. 1 pp. 267–290, doi: <https://doi.org/10.1108/QEA-08-2024-0071>
17. Mundo MAD, Reyes EFD, Gervacio EM. Discourse analysis on experience-based position of science, mathematics, and Tech-Voc educators on generative AI and academic integrity. *Environment and Social Psychology* 2024; 9(8): 3028. Doi: 10.59429/esp.v9i8.3028
18. Naeem, NiK., Mushibwe, C.P. Navigating digital worlds: a scoping review of skills and strategies for enhancing digital resilience among higher education students on social media platforms. *Discov Educ* 4, 39 (2025). <https://doi.org/10.1007/s44217-025-00432-7>
19. Niyazova GZ, Duisekeyeva BM, Berdi DK, Usembayeva IB and Mindetbayeva AA (2026) The effects of gamified AI-supported digital learning environments on personalized learning and student engagement in school education: a systematic review and meta-analysis. *Front. Educ.* 11:1754080. Doi: 10.3389/educ.2026.1754080
20. Nur Fitria, Tira. (2021). Artificial Intelligence (AI) In Education: Using AI Tools for Teaching and Learning Process.
21. Rodrigo, M. (2023). The truth about using AI in schools. *Philstar Life*.
22. Salido, V. (2023). Impact of AI-powered learning tools on student understanding and academic performance.
23. Sánchez-Prieto, J. C., Cruz-Benito, J., Therón Sánchez, R., & García-Peñalvo, F. J. (2020). Assessed by machines: Development of a TAM-based tool to measure AI-based assessment acceptance among students. *International Journal of Interactive Multimedia and Artificial Intelligence*, 6(4), 80–90.
24. Sharpless, M. (2022). New AI tools that can write student essays require educators to rethink teaching and assessment. *LSE Impact Blog*. <https://blogs.lse.ac.uk/impactofsocialsciences/2022/05/17/new-ai-tools-that-can-write-student-essays-require-educators-to-rethink-teaching-and-assessment/>
25. Stokel, W. (2022). How the chatbot ChatGPT can write essays and the implications for professors and academic integrity.
26. Thomas, K. F., Chiu, T. K., Xia, Q., et al. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118. <https://doi.org/10.1016/j.caeai.2022.100118>
27. Vieriu, A. M., & Petrea, G. (2025). The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Education Sciences*, 15(3), 343. <https://doi.org/10.3390/educsci15030343>
28. Weeks, J. O., Voshaar, J., et al. (2024). Generative AI usage and exam performance.
29. Xia, Q., Chiu, T. K., Lee, M., Sanusi, I. T., Dai, Y., & Chai, C. S. (2022). A self-determination theory (SDT) design approach for inclusive and diverse artificial intelligence (AI) education. *Computers & Education*, 189, 104582.
30. Xia, X. (2022). ChatGPT user experience: Implications for education. *SSRN*. <https://doi.org/10.2139/ssrn.4312418>
31. Zhao, Z., Qi, A., & Liu, J. (2025). Exploring AI tool adoption in higher education: Evidence from a PLS-SEM model integrating multimodal literacy, self-efficacy, and university support.
32. Zhou M, Peng S. The Usage of AI in Teaching and Students' Creativity: The Mediating Role of Learning Engagement and the Moderating Role of AI Literacy. *Behav Sci (Basel)*. 2025 Apr 27;15(5):587. Doi: 10.3390/bs15050587. PMID: 40426365; PMCID: PMC12109026