



Artificial intelligence integration and student learning outcomes at Palompon institute of technology

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Abstract

This study examines the utilization of Artificial Intelligence (AI) tools and their influence on students' learning experiences, challenges, and ethical perceptions at the Palompon Institute of Technology. A descriptive-quantitative research design was employed using a stratified random sample of students across academic disciplines. A total of 100 student respondents participated in the study. Data were collected through a structured questionnaire and analyzed using frequency, percentage, Chi-square test, and Phi coefficient. Findings revealed that AI tools are widely used, with 75% of students engaging regularly, and OpenAI's ChatGPT emerging as the most preferred platform. AI utilization was associated with improved conceptual understanding, faster task completion, and enhanced self-paced learning. However, challenges such as poor internet connectivity and concerns regarding the reliability of AI-generated information were also identified. Ethical concerns, particularly plagiarism and reduced critical thinking skills, were likewise evident among respondents. Statistical analysis revealed significant relationships between AI usage and perceived learning benefits ($\chi^2 = 6.42$, $p = 0.011$) as well as academic integrity concerns ($\chi^2 = 4.87$, $p = 0.027$). The study concludes that while AI enhances learning experiences and academic efficiency, its effective integration in higher education requires improved technological infrastructure, strengthened digital literacy, and clear institutional policies to ensure responsible and ethical use.

Keywords: Artificial Intelligence; AI Utilization; Student Learning Outcomes; Educational Technology; Academic Integrity; Higher Education; Digital Literacy; Technology Integration; Student Perceptions; AI in Education

1. Introduction

Artificial Intelligence (AI) has emerged as a transformative force in education, reshaping how knowledge is delivered, accessed, and applied. Initially introduced as a support tool for administrative and instructional functions, AI has evolved into an intelligent pedagogical partner capable of enabling personalized learning, adaptive feedback, and enhanced student engagement. Foundational works highlight that AI technologies can significantly improve teaching efficiency and learning outcomes when effectively integrated into educational systems (Luckin et al., 2016; Holmes et al., 2019). More recently, global frameworks emphasize that AI adoption must remain human-centered, ethical, and inclusive to maximize its educational potential (UNESCO, 2023; World Economic Forum, 2025).

In higher education, AI-driven tools—particularly large language models—are increasingly utilized to support academic tasks such as writing, research, and problem-solving. Empirical studies demonstrate that these technologies can enhance students' conceptual understanding, productivity, and self-directed learning capabilities (Kasneci et al., 2023; Tlili et al., 2023). A comprehensive review by Zawacki-Richter et al. (2019) further confirms that AI applications in higher education contribute to adaptive learning systems, intelligent tutoring, and learning analytics, reinforcing their growing role in modern pedagogy.

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Despite these advantages, the rapid adoption of AI tools introduces significant challenges. Concerns regarding academic integrity have intensified, particularly with the widespread use of generative AI for content creation. Cotton et al. (2024) argue that AI systems may blur the boundaries between legitimate academic support and academic dishonesty, raising critical questions about assessment validity and student accountability. Furthermore, recent evidence suggests that excessive reliance on AI technologies may negatively impact students' cognitive development, particularly in terms of critical thinking and problem-solving skills (Zhai et al., 2024).

Within developing educational contexts, these challenges are compounded by issues of access, infrastructure, and digital literacy. While AI presents opportunities to bridge educational gaps, unequal access to reliable internet connectivity and technological resources may exacerbate existing disparities. Thus, the integration of AI in higher education requires not only technological adoption but also institutional policies that promote responsible use, ethical awareness, and equitable access.

Against this backdrop, the Palompon Institute of Technology (PIT), a state college specializing in maritime, engineering, and technical education, provides a relevant context for examining AI integration in a competency-based learning environment. As students increasingly incorporate AI tools into their academic routines, there is a pressing need to assess how these technologies influence learning outcomes, skill acquisition, and academic behavior.

Despite the expanding body of global literature on AI in education, localized studies within Philippine higher education—particularly in regional institutions—remain limited. This study aims to examine the utilization of Artificial Intelligence (AI) tools and their influence on students' learning experiences, challenges, and ethical perceptions at the Palompon Institute of Technology. Specifically, it analyzes students' demographic characteristics and patterns of AI usage across academic disciplines; evaluates the perceived benefits of AI in terms of conceptual understanding, task efficiency, and self-paced learning; identifies key challenges related to internet connectivity and the reliability of AI-generated information; and investigates concerns regarding academic integrity, particularly plagiarism and critical thinking.

Furthermore, the study determines the relationship between AI usage and selected variables, including perceived learning benefits and ethical concerns, using appropriate statistical analyses. Through this, the study provides empirical insights into the role of AI as both a learning support tool and a source of emerging academic challenges.

2. Methodology

This study employed a descriptive-quantitative research design to examine the utilization of Artificial Intelligence (AI) tools and students' perceptions of their impact on learning outcomes, challenges, and ethical concerns among students at the Palompon Institute of Technology. The design was appropriate as it allowed for the systematic collection and analysis of numerical data reflecting students' experiences and perceptions of AI use in an academic context. A total of 100 student respondents participated in the study. A stratified random sampling technique was utilized to ensure adequate representation across major academic disciplines, including Maritime Education, Engineering, and Technology programs. Respondents were proportionally selected from each group to capture variations in AI usage across different fields of study. Data were collected using a structured survey questionnaire composed of close-ended items measuring the frequency of AI usage, types of tools utilized, perceived benefits, challenges encountered, and ethical considerations. The research instrument underwent content validation by experts in educational technology and research methodology to ensure the clarity, relevance, and reliability of the survey items. Descriptive statistics, including frequency counts and percentages, were used to summarize the data. To determine the relationship between AI usage and selected variables such as perceived learning benefits and academic integrity concerns, the Chi-square test of independence was applied, while the Phi coefficient was used to assess the strength of association. All statistical analyses were conducted at a 0.05 level of significance. Ethical standards were observed by ensuring voluntary participation, informed consent, and confidentiality of respondents' information in accordance with established research guidelines.

3. Results and Discussion

The demographic profile of the respondents indicates that the majority are within the 18–24 age range, representing typical college-level learners. The respondents come from diverse academic programs, including Marine Biology, Automotive Technology, Culinary Arts, and other technical fields. This distribution suggests that Artificial Intelligence (AI) utilization is not limited to a single discipline but is widely adopted across various areas of study, highlighting its relevance in multiple learning contexts.

AI Usage Patterns

Table 1 AI Usage Frequency

Category	Frequency	Percentage
Daily	35	35%
Weekly	40	40%
Rarely/Never	25	25%
Total	100	100%

Table 2 Most Frequently Used AI Tools

AI Tool	Frequency	Percentage	Rank
ChatGPT	45	45%	1
Grammarly	30	30%	2
Google Gemini	25	25%	3

Tables 1 and 2 show that AI tools are widely utilized among students, with 75% reporting regular usage (daily or weekly). This indicates a high level of adoption and suggests that AI has become embedded in students' academic routines. Only 25% reported rare or no usage, reflecting that non-engagement with AI tools is relatively limited.

In terms of platform preference, ChatGPT emerged as the most commonly used tool (45%), followed by Grammarly (30%) and Google Gemini (25%). The distribution reflects a clear preference for multifunctional AI systems that support a wide range of academic activities. The concentration of usage toward ChatGPT suggests that students favor platforms capable of integrating multiple learning functions, reinforcing the role of AI as a comprehensive academic support tool.

3.1. Perceived Benefits of AI Tools

Table 3 Perceived Benefits of AI Utilization

Benefit	Frequency	Percentage
Improved understanding of concepts	70	70%
Faster task completion	65	65%
Enhanced self-paced learning	55	55%

Table 3 reveals that students generally perceive AI tools as beneficial to their academic performance. Improved understanding of concepts was the most frequently reported benefit (70%), indicating that AI contributes significantly to cognitive development and comprehension. Faster task completion (65%) also ranked highly, suggesting that AI enhances efficiency and productivity in academic tasks. Meanwhile, enhanced self-paced learning (55%) indicates that AI supports independent and flexible learning environments. The relatively close distribution of responses (55%–70%) demonstrates a consistently positive perception across different dimensions of learning. This suggests that AI tools provide both cognitive and practical benefits, reinforcing their role as effective educational support systems.

3.2. Challenges in AI Utilization

Table 4 Challenges Encountered in AI Usage

Challenge	Frequency	Percentage
Poor internet connectivity	50	50%

Accuracy/reliability concerns	40	40%
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Table 4 shows that students face notable challenges in utilizing AI tools. Poor internet connectivity was identified as the most significant barrier (50%), highlighting the importance of technological infrastructure in enabling effective AI integration. In addition, 40% of respondents reported concerns regarding the accuracy and reliability of AI-generated information.

The difference between the two challenges suggests that while infrastructural issues are the most immediate concern, cognitive factors such as trust in information are also critical. These findings indicate that effective AI implementation requires both improved access to technology and the development of students' ability to critically evaluate AI-generated content.

3.3. Academic Integrity Concerns

Table 5 Academic Integrity Concerns in AI Use

Concern	Frequency	Percentage
Plagiarism risk	60	60%
Reduced critical thinking skills	45	45%

Table 5 highlights significant ethical concerns associated with AI use. A majority of respondents (60%) expressed concern about plagiarism, indicating strong awareness of the potential misuse of AI-generated content. Additionally, 45% reported that AI may reduce critical thinking skills, suggesting apprehension about overreliance on automated systems.

The higher percentage for plagiarism concerns compared to critical thinking suggests that students are more immediately aware of issues related to academic dishonesty than long-term cognitive effects. These findings emphasize the need for clear institutional policies and ethical guidelines to ensure responsible use of AI in academic settings.

3.4. Students' Overall Perception of AI

Table 6 Students' Overall Perception of AI

Perception	Frequency	Percentage
AI facilitates cheating	55	55%
AI is a valuable learning tool	45	45%

Table 6 presents a divided perception among students regarding AI use in education. A slight majority (55%) believe that AI facilitates cheating, while 45% consider it a valuable learning resource. The narrow difference between these responses indicates a balanced yet conflicting perspective.

This dual perception reflects the complex nature of AI integration, where students recognize both its benefits and risks. The near-equal distribution suggests that while AI is widely used, concerns about ethical misuse remain significant, highlighting the need for structured guidance and policy development.

3.5. Inferential Analysis

Table 7 Chi-Square Test: AI Usage and Perceived Benefits

Variables	χ^2	df	p-value	Decision	Interpretation
AI Usage $\times$ Perceived Benefits	6.42	1	0.011	Reject H_0	Significant

The Chi-square test indicates a statistically significant relationship between AI usage frequency and perceived learning benefits ($\chi^2 = 6.42$, $p < 0.05$). This suggests that students who frequently use AI tools are more likely to experience and

report positive academic outcomes. Increased exposure to AI appears to enhance students' ability to utilize these tools effectively.

Table 8 Chi-Square Test: AI Usage and Academic Integrity Concerns

Variables	χ^2	df	p-value	Decision	Interpretation
AI Usage $\times$ Plagiarism Concern	4.87	1	0.027	Reject H_0	Significant

The results show a statistically significant relationship between AI usage and concerns about plagiarism ($\chi^2 = 4.87$, $p < 0.05$). This indicates that frequent users of AI tools are more likely to be aware of ethical risks, suggesting that exposure to AI may increase awareness of academic integrity issues.

The results demonstrate that AI tools are widely adopted and positively perceived in terms of learning enhancement and efficiency. However, challenges related to infrastructure and concerns about academic integrity remain significant. The presence of statistically significant relationships between AI usage and both perceived benefits and ethical awareness highlights the dual impact of AI in education.

These findings suggest that while AI offers substantial opportunities for improving learning outcomes, its effective integration requires improved technological infrastructure, clear institutional policies, and the development of students' digital and ethical competencies.

4. Conclusion

This study shows that Artificial Intelligence (AI) tools are widely utilized among students and have become integral to their academic practices. The findings indicate that AI enhances conceptual understanding, improves task efficiency, and supports self-paced learning, with significant evidence that increased usage is associated with better perceived learning outcomes. However, challenges such as poor internet connectivity and concerns about the accuracy of AI-generated content persist. Ethical issues, particularly related to plagiarism and potential declines in critical thinking, also remain significant, with increased AI use linked to heightened awareness of these concerns. Overall, while AI offers substantial educational benefits, its effective integration requires improved infrastructure, strengthened digital literacy, and clear institutional policies to ensure responsible and ethical use.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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