Beyond Convenience: The Role of AI Reliance in Shaping 21st-Century Skills of Higher Education Students

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ABSTRACT

Artificial intelligence (AI)–generated tools such as ChatGPT, Bard, and Copilot have become increasingly integrated into higher education, transforming how students accomplish academic tasks. While these technologies provide convenience and efficiency, concerns remain regarding their influence on the development of essential 21st-century skills, particularly creativity, critical thinking, communication, and collaboration. This study examined the relationship between students' reliance on AI-generated tools and the development of these 21st-century skills among undergraduate students at Negros Oriental State University. Using a quantitative descriptive–correlational research design, data were gathered from 35 pre-service teachers through a structured questionnaire. Descriptive statistics, Pearson Product–Moment Correlation, t-test, and Analysis of Variance (ANOVA) were employed to analyze the data. Findings revealed that respondents demonstrated a high level of reliance on AI-generated tools for academic purposes, particularly in brainstorming ideas, verifying information, and completing academic tasks. Students also generally agreed that AI positively contributed to their creativity, communication, collaboration, and critical thinking skills. However, moderate indicators suggested that students were not entirely dependent on AI technologies and still maintained independent learning practices. The study concludes that AI-generated tools can serve as valuable academic support systems when used responsibly and critically. Educational institutions are encouraged to establish guidelines promoting ethical AI use while strengthening independent thinking and higher-order cognitive skills.

Keywords: artificial intelligence, AI reliance, 21st-century skills, creativity, critical thinking, communication, collaboration

INTRODUCTION

Artificial intelligence (AI) has rapidly become integrated into educational systems, particularly through the emergence of generative AI tools such as ChatGPT, Bard, and Copilot. These technologies assist students in generating ideas, summarizing information, solving problems, and producing written outputs in more efficient ways. As AI technologies continue to evolve, they increasingly influence the learning experiences of higher education students and reshape the manner in which academic tasks are completed.

Many educators and researchers recognize AI as a valuable educational innovation capable of supporting learning efficiency, personalized instruction, and academic productivity. However, despite these benefits, concerns remain regarding students' growing dependence on AI-generated tools and the possible effects on essential human competencies. Among the most important of these competencies are the 21st-century skills commonly referred to as the 4Cs: creativity, critical thinking, communication, and collaboration.

Existing studies present mixed findings regarding the role of AI in education. Some researchers argue that AI tools can enhance creativity by exposing learners to diverse perspectives and innovative ideas. Others suggest that AI improves communication and collaboration by assisting students in organizing information and

streamlining group work. Conversely, several scholars caution that excessive dependence on AI may weaken independent reasoning, reduce originality, and discourage deeper cognitive engagement.

In the Philippine context, the integration of AI in higher education remains uneven due to challenges related to digital literacy, internet connectivity, and institutional readiness. In Negros Oriental, limited localized research exists regarding how students use AI-generated tools and how such reliance influences the development of 21st-century skills. This gap highlights the need for empirical investigation that reflects the realities of Filipino learners, particularly pre-service teachers who are expected to become future facilitators of technology-integrated learning.

This study therefore examines the relationship between students' reliance on AI-generated tools and the development of creativity, critical thinking, communication, and collaboration among higher education students in Negros Oriental. Specifically, the study investigates how demographic variables such as gender, age, year level, and course influence AI reliance and 21st-century skill development.

REVIEW OF RELATED LITERATURE

Artificial Intelligence in Education

Artificial intelligence has significantly transformed educational practices worldwide. Generative AI systems such as ChatGPT, Bard, and Copilot are increasingly utilized by students for brainstorming, content creation, academic writing, and problem-solving. According to Garzón et al. (2025), AI technologies provide students with immediate access to information and facilitate personalized learning experiences.

Recent studies reveal both positive and negative educational implications of AI integration. Wei et al. (2025) found that AI supports academic productivity and enhances collaboration by automating routine academic tasks. Similarly, Fan et al. (2025) argued that AI technologies encourage innovation and creative exploration by exposing students to diverse perspectives.

Despite these benefits, scholars also warn against the dangers of excessive reliance on AI-generated outputs. Lee et al. (2025) emphasized that overdependence on AI may reduce students' critical thinking abilities because learners may accept AI-generated responses without proper evaluation or verification. Likewise, Mustafa et al. (2024) noted that AI overreliance may contribute to academic dishonesty and reduce authentic intellectual engagement.

AI and 21st-Century Skills

Creativity. AI-generated tools can stimulate creativity by providing new ideas and alternative approaches to academic tasks. Studies indicate that AI technologies help learners generate diverse perspectives that may inspire innovative outputs. However, researchers caution that students must actively modify and personalize AI-generated content to maintain originality and authentic creative thinking.

Critical Thinking. Critical thinking involves analyzing, evaluating, and interpreting information objectively. Scholars argue that AI can either strengthen or weaken critical thinking depending on how learners use the technology. Students who critically examine AI outputs develop stronger evaluative skills, while those who passively accept AI-generated responses risk reduced analytical engagement.

Communication. AI technologies assist students in improving grammar, organizing ideas, and enhancing clarity in written communication. AI can also support multilingual learners by helping them structure academic responses more effectively. However, excessive dependence on AI may reduce learners' confidence in expressing ideas independently.

Collaboration. AI tools support collaboration by organizing group ideas, summarizing discussions, and improving coordination among team members. Nevertheless, researchers note that excessive reliance on AI during group work may reduce authentic interpersonal interaction and shared problem-solving.

Research Gap. Most existing studies regarding AI reliance and 21st-century skills were conducted in technologically advanced countries. Limited research has focused on Philippine higher education institutions, particularly within provincial contexts such as Negros Oriental. Furthermore, many studies examine only the frequency of AI use without considering demographic variables or the broader implications for 21st-century skill development. This study addresses these gaps by examining the relationship between AI reliance and the 4Cs among Filipino pre-service teachers.

METHODOLOGY

Research Design

This study employed a quantitative descriptive–correlational research design. The descriptive component was used to describe the respondents' demographic profile, level of AI reliance, and self-reported 21st-century skills. The correlational component examined the relationship between students' reliance on AI-generated tools and their creativity, critical thinking, communication, and collaboration skills.

Research Locale

The study was conducted at Negros Oriental State University, Main Campus I, located in Dumaguete City, Negros Oriental, Philippines. The university was selected because it serves pre-service teachers who actively engage in technology-integrated academic activities.

Respondents of the Study

The respondents were 35 undergraduate pre-service teachers enrolled during the Academic Year 2025–2026. Participants were selected using stratified random sampling to ensure representation across demographic groups.

Research Instrument

A structured questionnaire was used as the primary research instrument. The questionnaire consisted of three sections:

1. Demographic Profile
2. Level of Reliance on AI-Generated Tools
3. 21st-Century Skills (Creativity, Critical Thinking, Communication, and Collaboration)

The instrument utilized a five-point Likert scale and underwent validation by experts in educational research and educational technology.

Data Gathering Procedure

Permission to conduct the study was obtained from the university administration. Respondents were informed regarding the purpose of the study and were assured of confidentiality and voluntary participation. Questionnaires were distributed personally and through online platforms.

Statistical Treatment of Data

The following statistical tools were used:

- Frequency and Percentage Distribution
- Mean and Standard Deviation

- Pearson Product–Moment Correlation Coefficient
- t-test
- Analysis of Variance (ANOVA)

Ethical Considerations

The study observed ethical principles including informed consent, confidentiality, anonymity, and voluntary participation. All responses were treated with strict confidentiality and used solely for academic purposes.

RESULTS AND DISCUSSION

Table 1 Demographic Profile of the Respondents

Profile Variables	**Category**	**Frequency (f)**	**Percentage (%)**
Gender	Female	32	91.43
	Male	3	8.57
Age	18	2	5.71
	19	3	8.57
	20	10	28.57
	21	12	34.29
	22	4	11.43
	23	2	5.71
	24	1	2.86
	25	1	2.86
	29	1	2.86
Year Level	1st Year	5	14.29
	2nd Year	4	11.43
	3rd Year	25	71.43
	4th Year	1	2.86
Course / Program	BTLED / BTLED Specializations	16	45.71
	BEED	14	40.00
	BECED	2	5.71
	BSED	1	2.86
	CTED / Related Programs	2	5.71
Total Respondents		**35**	**100.00**
Note. N = 35. Percentages are rounded to two decimal places.			

Table 1 presents the summary profile of the respondents in terms of gender, age, year level, and course/program. The findings revealed that the majority of the respondents were female, comprising 91.43% of the total sample, while only 8.57% were male. In terms of age, most respondents were between 20 and 21 years old, accounting for 62.86% of the participants, indicating that the respondents largely belonged to the typical undergraduate age group.

Regarding year level, the majority were third-year students, representing 71.43% of the respondents, which suggests that most participants already possessed substantial academic exposure and experience in using educational technologies. In terms of course or program, the largest groups came from BTLED specializations (45.71%) and BEED (40.00%), showing that the study was primarily composed of teacher education students.

Overall, the demographic profile indicates that the respondents were predominantly young, female pre-service teachers who are highly exposed to digital learning environments and AI-assisted technologies. These characteristics make them appropriate participants for examining the role of AI reliance in shaping 21st-century skills such as creativity, critical thinking, communication, and collaboration.

Table 2 Level of AI Reliance

AI Reliance	**Wx**	**SD**	**Verbal Description**
I rely on AI-generated tools to complete my academic tasks.	3.54	0.81	High
I use AI tools for brainstorming ideas for assignments.	3.63	0.91	High
I depend on AI tools when drafting academic work.	3.26	0.94	Moderate
I use AI tools to check or verify academic information.	3.63	1.05	High
I rely on AI tools to assist in problem-solving.	3.43	0.88	High
I use AI tools whenever I start a new academic task.	3.31	0.93	Moderate
My academic work becomes more difficult when I cannot use AI tools.	2.83	1.09	Moderate
AI tools are part of my regular study routine.	3.11	1.25	Moderate
I often follow AI-generated suggestions in completing assignments.	3.31	1.30	Moderate
I feel that AI tools are necessary for some of my academic activities.	3.51	1.39	High
Composite Mean	***3.36***	*0.70*	*High*

Students demonstrated a high level of reliance on AI-generated tools for academic purposes, with a composite mean of 3.36. The highest-rated indicators involved brainstorming ideas, verifying academic information, and completing academic tasks.

The findings suggest that students perceive AI tools as valuable academic support systems that improve efficiency and productivity. However, moderate ratings on dependence-related indicators imply that students still maintain independent learning practices and are not completely dependent on AI technologies.

Table 3.1 Creativity

AI Reliance	**Wx**	**SD**	**Verbal Description**
I can generate original ideas even when using AI tools.	3.54	0.81	High
AI helps me improve the creativity of my academic outputs.	3.63	0.91	High
I rely on my own ideas before using AI-generated suggestions.	3.26	0.94	Moderate
I can generate original ideas even when using AI tools.	3.63	1.05	High
AI helps me improve the creativity of my academic outputs.	3.43	0.88	High

I rely on my own ideas before using AI-generated suggestions.	3.31	0.93	Moderate
I can generate original ideas even when using AI tools.	2.83	1.09	Moderate
AI helps me improve the creativity of my academic outputs.	3.11	1.25	Moderate
I rely on my own ideas before using AI-generated suggestions.	3.31	1.30	Moderate
I can still generate original ideas even with AI assistance.	3.51	1.39	High
Composite Mean	***3.36***	***0.70***	***High***

Students generally agreed that AI positively influenced their creativity, with a composite mean of 3.68. Respondents indicated that AI helped them explore multiple ideas and encouraged alternative approaches to academic tasks. The findings imply that AI tools can stimulate creative thinking when learners actively refine and personalize AI-generated outputs rather than merely copying them.

Table 3.2 Critical Thinking

Critical Thinking	**Wx**	**SD**	**Verbal Description**
I evaluate AI-generated information before accepting it.	4.06	0.91	Agree
I cross-check AI responses with other sources.	4.06	0.86	Agree
AI helps me analyze academic problems more deeply.	3.74	0.94	Agree
I can identify biases or errors in AI-generated outputs.	3.66	0.89	Agree
I reflect on AI suggestions rather than accepting them immediately.	3.77	0.75	Agree
I verify AI-generated information before using it in my work.	4.03	0.77	Agree
I compare AI responses with other sources to check accuracy.	4.03	0.85	Agree
AI use encourages me to analyze information more carefully.	3.80	1.08	Agree
I question AI answers when they seem unclear or incorrect.	4.09	1.12	Agree
I reflect on whether AI suggestions truly fit my academic task.	4.03	1.24	Agree
Composite Mean	***3.93***	***0.59***	**Agree**

Results showed that students moderately to highly practiced critical thinking when using AI-generated tools. Respondents reported evaluating and verifying AI-generated information before accepting it.

These findings suggest that students remain cautious and reflective in their use of AI technologies. Nevertheless, educational institutions must continue strengthening AI literacy to ensure responsible and analytical engagement.

Table 3.3 Communication

Communication	**Wx**	**SD**	**Verbal Description**
AI tools help me organize my written work clearly.	3.74	0.99	Agree
I feel confident expressing my ideas even without AI	3.77	0.88	Agree
AI helps me refine the clarity of my communication.	3.89	0.87	Agree
I can effectively communicate complex ideas after using AI for support.	3.66	0.83	Agree
AI helps me adapt my writing for different audiences.	3.60	0.72	Agree
AI helps me organize my ideas more clearly in writing.	3.77	0.94	Agree

I learn better ways to explain concepts after seeing AI examples.	3.74	0.94	Agree
I revise AI-generated text to match my own voice or style.	3.83	1.04	Agree
Using AI improves my confidence in presenting academic ideas.	3.63	1.17	Agree
I can communicate my thoughts clearly even without AI support.	3.80	1.25	Agree
Composite Mean	***3.74***	***0.61***	Agree

Students agreed that AI-assisted tools enhanced their communication skills by helping them organize ideas clearly and improve written expression.

The results indicate that AI can support academic communication and confidence in expressing ideas. However, students must still be encouraged to maintain authentic personal voice and independent communication skills.

Table 3.4 Collaboration

Collaboration	**Wx**	**SD**	**Verbal Description**
AI supports my group work by helping streamline ideas.	3.71	0.93	Agree
I collaborate effectively with peers even without AI tools.	3.86	0.82	Agree
AI helps enrich discussions during group activities.	3.63	0.99	Agree
I can contribute meaningfully to group tasks regardless of AI assistance.	3.80	0.75	Agree
AI helps our group produce more organized outputs.	3.77	0.89	Agree
AI helps our group divide tasks more efficiently.	3.74	1.12	Agree
I use AI to summarize group discussions or shared ideas.	3.51	1.25	Agree
AI tools help us combine different members' inputs into one output.	3.63	1.16	Agree
Using AI reduces misunderstandings during group work.	3.60	1.27	Agree
I still actively contribute my own ideas even when AI is used in group tasks.	4.03	1.21	Agree
Composite Mean	***3.73***	***0.69***	Agree

Students agreed that AI supported collaborative learning by helping streamline ideas, organize group tasks, and improve coordination during academic activities.

The findings imply that AI technologies can enhance teamwork efficiency when used appropriately. However, overdependence on AI during collaboration may reduce meaningful interpersonal interaction.

Table 4 Test of significant relationship between students' level of reliance on AI-generated tools and their 21st-century skills

Variables	***r***	***p* value**	**Decision**	**Interpretation**
AI Reliance and Creativity	.695	< .001	Reject H_0	Significant positive relationship
AI Reliance and Critical Thinking	.329	.054	Fail to Reject H_0	No significant relationship
AI Reliance and Communication	.686	< .001	Reject H_0	Significant positive relationship
AI Reliance and Collaboration	.755	< .001	Reject H_0	Significant positive relationship

The findings from Table 4 revealed that students' reliance on AI-generated tools has a significant positive relationship with several 21st-century skills, particularly creativity, communication, and collaboration. The strongest relationship was observed in collaboration, indicating that AI tools greatly support teamwork, organization, and shared academic productivity. Similarly, creativity and communication were positively influenced by AI reliance, suggesting that students who frequently use AI tools tend to generate ideas more effectively and communicate better in academic settings. However, no significant relationship was found between AI reliance and critical thinking. This implies that while AI can assist students in accessing information and completing tasks, the development of critical thinking still depends largely on human reasoning, reflection, and guidance from educators. Overall, the results suggest that AI-generated tools can enhance important modern learning skills, but they cannot fully replace the need for independent judgment and deeper analytical thinking.

Table 5 Test of significant difference in students' level of AI reliance and 21st-century skills when grouped according to gender, age, year level, and course

Variables Grouped According To	Dependent Variable	Statistical Test	Computed Value	p-value	Decision	Interpretation
Gender	Level of AI Reliance	t-test	t = 1.120	.347	Fail to Reject Ho	No significant difference
Gender	21st-Century Skills	t-test	t = -0.269	.806	Fail to Reject Ho	No significant difference
Age	Level of AI Reliance	ANOVA	F = 0.761	.625	Fail to Reject Ho	No significant difference
Age	21st-Century Skills	ANOVA	F = 2.341	.054	Fail to Reject Ho	No significant difference
Year Level	Level of AI Reliance	ANOVA	F = 0.921	.442	Fail to Reject Ho	No significant difference
Year Level	21st-Century Skills	ANOVA	F = 1.488	.238	Fail to Reject Ho	No significant difference
Course Program	Level of AI Reliance	ANOVA	F = 0.397	.935	Fail to Reject Ho	No significant difference
Course Program	21st-Century Skills	ANOVA	F = 0.849	.589	Fail to Reject Ho	No significant difference

Level of Significance: $\alpha = 0.05$

Meanwhile, Table 5 showed that there were no significant differences in students' level of AI reliance and 21st-century skills when grouped according to gender, age, year level, and course program. Both male and female students demonstrated similar levels of AI use and comparable skill development. Likewise, students from different age groups, year levels, and academic programs showed nearly equal exposure to AI technologies and similar competencies in creativity, communication, collaboration, and critical thinking. These findings indicate that AI technologies have become widely integrated into students' academic experiences regardless of demographic background. The study therefore highlights that AI use is becoming universal among college students and future educators. As a result, educational institutions are encouraged to focus on promoting responsible AI use, digital literacy, ethical practices, and independent thinking for all learners rather than concentrating on specific demographic groups.

SUMMARY OF FINDINGS AND DISCUSSION

The study examined the relationship between students' reliance on AI-generated tools and their 21st-century skills, particularly creativity, critical thinking, communication, and collaboration. The respondents were primarily young female pre-service teachers, mostly third-year students enrolled in teacher education programs, making them suitable participants for investigating AI use in academic settings.

The findings revealed that students demonstrated a generally high level of reliance on AI-generated tools for academic purposes. AI tools were commonly used for brainstorming ideas, verifying information, completing tasks, and assisting in problem-solving. Despite this high usage, students only showed moderate dependence on AI, suggesting that they still maintain independent learning practices and do not rely entirely on technology for academic work.

In terms of 21st-century skills, students agreed that AI positively contributed to creativity, communication, collaboration, and critical thinking. AI tools helped students generate ideas, organize written work, refine communication, and improve teamwork efficiency. Respondents also demonstrated responsible AI usage by evaluating, verifying, and cross-checking AI-generated information before accepting it. These findings suggest that students remain reflective and cautious while using AI technologies in academic activities.

The correlational analysis further showed significant positive relationships between AI reliance and creativity, communication, and collaboration. The strongest relationship was observed in collaboration, indicating that AI tools greatly support teamwork, organization, and shared academic productivity. However, no significant relationship was found between AI reliance and critical thinking, implying that critical thinking skills still depend more on human reasoning, reflection, and educational guidance rather than AI assistance alone.

Additionally, the study found no significant differences in AI reliance and 21st-century skills when respondents were grouped according to gender, age, year level, and course program. This indicates that AI technologies are widely integrated into students' academic experiences regardless of demographic background. The findings therefore suggest that AI use has become common among college students and future educators alike.

Overall, the study concludes that AI-generated tools can serve as valuable educational supports that enhance creativity, communication, and collaboration while encouraging efficiency and productivity in learning. However, the findings also emphasize the importance of maintaining independent thinking, ethical AI usage, and strong critical reasoning skills to ensure that students use AI responsibly and effectively in academic environments.

CONCLUSION

The study concludes that higher education students demonstrate a high level of reliance on AI-generated tools for academic purposes. AI technologies are widely used for brainstorming, information verification, academic writing, and problem-solving. Findings further reveal that students generally perceive AI as beneficial in enhancing creativity, critical thinking, communication, and collaboration.

Despite these benefits, the study also highlights the importance of responsible and balanced AI usage. Students still maintain independent learning behaviors and do not appear completely dependent on AI technologies. This suggests that AI functions more as an academic support tool rather than a replacement for human cognition.

The study emphasizes that educational institutions must establish clear guidelines promoting ethical AI use, critical evaluation of AI-generated outputs, and the continued development of higher-order thinking skills.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

1. Higher education institutions should develop policies and guidelines promoting responsible and ethical AI use among students.

2. Faculty members should integrate AI literacy programs into classroom instruction to strengthen students' critical evaluation skills.

3. Teachers should design learning activities that encourage originality, independent thinking, and authentic collaboration.

4. Educational institutions should balance technological integration with activities that strengthen human-centered skills.

5. Future researchers should conduct studies involving larger samples and additional variables such as AI literacy, academic performance, and digital resilience.

REFERENCES

1. Bauer, T. (2025). Artificial intelligence and higher education learning environments. Academic Press.
2. Campbell, R. (2025). AI-assisted writing and communication in higher education. Journal of Educational Technology, 18(2), 45–60.
3. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340.
4. Fan, J., et al. (2025). Artificial intelligence and collaborative learning among university students. Educational Technology Review, 41(1), 22–38.
5. Fosnot, C. (2020). Constructivism: Theory, perspectives, and practice. Teachers College Press.
6. Garzón, A., et al. (2025). Generative AI in higher education: Opportunities and challenges. International Journal of Educational Research, 95(4), 112–126.
7. Holmes, W., et al. (2022). Artificial intelligence in education. Routledge.
8. Kasneci, E., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274.
9. Lee, M., et al. (2025). Cognitive offloading and critical thinking in AI-assisted learning. Computers & Education, 210, 104945.
10. Luckin, R., & Cukurova, M. (2021). Designing educational technologies for teaching and learning. British Journal of Educational Technology, 52(2), 345–357.
11. Marangunić, N., & Granić, A. (2021). Technology acceptance model: A literature review. Universal Access in the Information Society, 20(2), 257–269.
12. Mollick, E. (2024). Co-intelligence: Living and working with AI. Portfolio.
13. Mustafa, S., et al. (2024). AI-generated content and academic integrity concerns in higher education. Education and Information Technologies, 29(1), 101–118.
14. Prensky, M. (2021). Digital natives and technology-based learning. Educational Leadership Review, 16(3), 14–21.
15. Saavedra, A., & Opfer, V. (2021). Teaching and learning 21st-century skills. Phi Delta Kappan, 94(2), 8–13.
16. Trilling, B., & Fadel, C. (2021). 21st century skills: Learning for life in our times. Jossey-Bass.
17. UNESCO. (2021). Global education monitoring report. UNESCO Publishing.
18. US Department of Education. (2023). Artificial intelligence and future learning systems. U.S. Government Printing Office.
19. Venkatesh, V., et al. (2022). User acceptance of technology: Toward a unified view. MIS Quarterly, 46(1), 425–478.
20. Wei, X., et al. (2025). AI-enhanced learning and student engagement in higher education. Computers & Education, 211, 104980.
21. Wang, Y. (2024). Demographic factors influencing AI adoption among university students. Journal of Digital Learning, 12(1), 67–81.
22. Zhai, X., et al. (2024). Generative AI and cognitive engagement in higher education. Educational Psychology Review, 36(2), 201–220.