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AI Dependency in Numeracy, Reading and Writing and its Relationship to Critical Thinking Among First-Year Hospitality Management Students

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Abstract: **This study examined the relationship between AI dependency and critical thinking among first-year Bachelor of Science in Hospitality Management (BSHM) students. Anchored on the Cognitive Offloading Theory of Risko and Gilbert (2016), the study emphasized that the use of external tools such as artificial intelligence can reduce cognitive load while supporting learning processes. Specifically, the study aimed to determine the level of AI dependency in terms of numeracy, reading, and writing, assess the level of critical thinking skills, and examine the significant relationship between AI dependency and critical thinking among first-year BSHM students. The study utilized a descriptive-correlational research design and was conducted at IBA College of Mindanao Inc.. The respondents consisted of 132 first-year BSHM students selected through convenience sampling. Survey questionnaires patterned from the studies by Capinding A. T. (2024) and Kobylarek et al. (2022) were used as the primary data-gathering instruments. The mean and standard deviation were used to assess the levels of AI dependency and critical thinking, while Pearson's r was used to examine the significant relationship between the variables. Findings revealed that the respondents demonstrated a high level of AI dependency, particularly in writing, followed by reading and numeracy. The students also exhibited a high level of critical thinking. Furthermore, writing dependency and numeracy dependency showed significant positive relationships with critical thinking, while reading dependency did not show a significant relationship. Overall, AI dependency was found to have a moderate and statistically significant relationship with critical thinking. The study concluded that AI, when utilized as a learning support rather than a replacement for thinking, can complement students' cognitive development. It is recommended that educational institutions promote responsible AI use and design learning activities that strengthen critical analysis and independent reasoning.**

Keywords: *AI Dependency, Critical Thinking, Numeracy, Writing, Hospitality Management Students.*

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I. INTRODUCTION

The rapid advancement and widespread use of artificial intelligence (AI) have significantly transformed education, particularly in how students accomplish academic tasks. AI-powered tools such as chatbots, grammar checkers, and problem-solving platforms provide convenience, efficiency, and personalized learning support (Alneyadi et al., 2023). However, excessive dependence on AI has raised concerns regarding its possible impact on students' critical thinking skills, as reliance on AI-generated responses may reduce opportunities for independent analysis and deeper learning (Riaz, 2023).

Critical thinking is an essential skill in hospitality management due to the dynamic and service-oriented nature of the industry. Hospitality students are expected to demonstrate effective problem-solving, decision-making, and adaptability in addressing customer concerns and operational challenges (Kim & Park, 2022). As AI becomes increasingly integrated into academic activities, it is important to examine whether AI dependency supports or hinders the development of these essential skills among future hospitality professionals.

Although previous studies, such as Lee et al. (2025), explored the relationship between AI use and critical thinking among knowledge workers, limited research has focused on educational settings, particularly among

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hospitality management students. Moreover, there remains a gap in examining AI dependency across specific domains such as numeracy, reading, and writing.

To address this gap, the present study examined the relationship between AI dependency and critical thinking among first-year BSHM students at IBA College of Mindanao Inc.. Specifically, the study determined the level of AI dependency in terms of numeracy, reading, and writing, assessed the level of critical thinking skills, and examined the significant relationship between AI dependency and critical thinking among the respondents.

This study was anchored on Vygotsky's The study was anchored in the Risko and Gilbert (2016) Cognitive Offloading Theory, which emphasizes that using external tools such as notes, calculators, or digital tools like AI can reduce the cognitive load on an individual's memory. While this can free up cognitive resources like problem-solving, decision-making, or creative generation, it may lead to a decline in cognitive engagement and skill development. According to this theory, the pervasive availability of AI tools, which offer quick solutions and ready-made information, can discourage users from engaging in the cognitive processes that reduce mental effort and internal thought processes that are essential for critical thinking.

This framework guided the study in exploring how students' dependence on technology relates to their critical thinking skills. It considers whether students who rely more on technology show differences in their ability to analyze, evaluate, and integrate information on their own. The theory offers a foundation for understanding the connection between technological use and students' engagement in critical thinking.

AI is defined as the ability of machines to perform tasks that typically require human intelligence. It is assumed that when students rely on AI for tasks such as arithmetic, reading, and writing, their own ability to think will be impacted. This framework guided the investigation into whether AI dependency has a relationship with critical thinking.

II. STATEMENT OF THE PROBLEM

The study aimed to examine the relationship between dependency on AI and critical thinking among BSHM students of IBA College of Mindanao Inc.

➢ *Specifically, The Study Sought to Answer the Following Questions:*

- What is the level of AI Dependency among first year students in terms of:

✓ Numeracy/Arithmetic;
✓ Reading; and
✓ Writing?

- What is the level of critical thinking skills of hospitality management students?
- Is there a significant relationship between AI dependency and critical thinking among first year BSHM students?

III. METHODOLOGY

This study utilized a quantitative research approach employing a descriptive-correlational research design. According to Copeland (2022), descriptive-correlational design determines the relationship between variables without manipulating them. The study was conducted at IBA College of Mindanao Inc., a private educational institution located in Valencia City, Bukidnon, Philippines.

The respondents of the study were first-year Bachelor of Science in Hospitality Management (BSHM) students enrolled during the first semester of the Academic Year 2025–2026. From a total population of 199 students, a sample size of 132 respondents was determined using the Raosoft calculator with a 95% confidence level and 5% margin of error. Stratified sampling was employed to ensure proportional representation from the five existing class sections and to minimize sampling bias. First-year students were selected because they are in the initial stage of their academic journey and are likely to demonstrate varying levels of AI dependency while still developing foundational critical thinking skills.

Survey questionnaires served as the primary research instrument of the study. The instrument was patterned from the works of Capinding A. T. (2024) and Kobylarek et al. (2022) and was contextualized to examine AI dependency and critical thinking among first-year BSHM students. The questionnaire underwent expert validation and pilot testing among 30 students outside the hospitality department to ensure clarity and relevance. Reliability testing yielded a Cronbach's alpha coefficient of 0.871, indicating good internal consistency.

For data analysis, mean and standard deviation were used to determine the level of AI dependency and critical thinking. Pearson product-moment correlation coefficient was employed to examine the significant relationship between AI dependency and critical thinking among the respondent.

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IV. PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

Table 1 Summary of the Level of Participation in Socio-Cultural Activities

AI Dependency	Mean	SD	Interpretation
Reading Dependency	2.89	0.65	High Dependency
Writing Dependency	2.92	0.62	High Dependency
Numeracy	2.74	0.65	High Dependency
Overall	2.84	0.64	High Dependency

The result shows that students are highly involved in socio-cultural he findings revealed that writing dependency obtained the highest mean (M = 2.92), indicating that students heavily relied on AI tools for drafting, editing, and organizing written outputs. This suggests that AI assisted students in producing clearer and more polished academic work. However, the high level of dependency also implies a potential risk of reduced independent writing ability and overreliance on AI-generated assistance. This finding supports the study of Amores et al. (2024), which found that Filipino students frequently utilized AI tools for writing-related tasks.

Reading dependency (M = 2.89) also manifested a high level of AI reliance, particularly in summarizing texts and clarifying complex reading materials. The results suggest that while AI tools support comprehension and make reading tasks more manageable, students may engage less deeply with complete texts and critical interpretation. This finding is consistent with Smith et al. (2025), who reported that AI tools reduced cognitive effort during reading activities.

Meanwhile, numeracy dependency obtained the lowest mean (M = 2.74), although still interpreted as high. This indicates that students were comparatively less dependent on AI in solving mathematical tasks than in reading and writing activities. The findings suggest that many students still attempted to solve problems independently before consulting AI tools, reflecting retained confidence in their basic computational and analytical abilities. This supports the findings of Opesemowo (2025), who noted that moderate AI use can help preserve foundational mathematical skills.

Table 2 Distribution of the Level of Critical Thinking Skills Among the First-Year BSHM Students

Indicator	Mean	SD	Interpretation
1. After reading, I verify important information even if it initially seems true.	3.14	0.58	High
2. I enjoy combining information from different sources to deepen my understanding.	3.14	0.64	High
3. I am open to sharing newly acquired information with others.	3.05	0.59	High
4. I believe that critically analyzing situations leads to better decision-making.	3.10	0.59	High
5. After reading, I can clearly recall and summarize key ideas from the text.	3.11	0.58	High
6. I recognize that a single concept can be expressed in multiple ways.	3.02	0.60	High
7. I am able to comprehend texts from various academic and professional disciplines.	2.98	0.57	High
8. I develop opinions based on integrating information from different references.	3.04	0.61	High
9. I believe that innovation comes from combining and reinterpreting existing knowledge.	3.07	0.63	High
10. When communicating, I use relevant examples to explain my points clearly.	3.11	0.67	High
Overall	3.07	0.61	High

The findings revealed that the highest mean indicator was “After reading, I verify important information even if it initially seems true” (M = 3.14, SD = 0.58). This indicates that students consistently evaluated and verified information rather than accepting it immediately, reflecting cautious and reflective thinking. The result suggests that students possess strong evaluative skills necessary for academic research, decision-making, and professional practice in the hospitality industry. This finding supports Bautista (2024), who emphasized that critical thinkers in the digital era must validate information and distinguish credible sources from misleading content.

Similarly, the indicator “I enjoy combining information from different sources to deepen my understanding” (M = 3.14, SD = 0.64) also obtained a high mean. This suggests that students actively synthesize ideas from multiple perspectives, promoting deeper comprehension and analytical thinking. Such findings imply that students are capable of higher-order thinking skills,

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particularly in tasks involving case analysis, research, and problem-solving. This result aligns with Sung et al. (2021), who found that exposure to diverse information and viewpoints in digital learning environments enhances analytical and evaluative thinking skills.

On the other hand, the lowest mean indicator was "I am able to comprehend texts from various academic and professional disciplines" (M = 2.98, SD = 0.57), although it remained within the high interpretation. This suggests that students were relatively less confident in understanding materials outside the hospitality field, indicating the need for greater exposure to interdisciplinary readings to broaden comprehension and reasoning skills. This finding is supported by Ra et al. (2022), who argued that exposure to diverse academic perspectives strengthens critical thinking and reasoning abilities.

Likewise, the indicator "I recognize that a single concept can be expressed in multiple ways" (M = 3.02, SD = 0.60) suggests that while students generally understood alternative interpretations of ideas, some still relied on familiar explanations and perspectives. This implies the need for instructional strategies that encourage conceptual flexibility through activities such as paraphrasing, debates, reflective writing, and problem-based learning. Indrasiene et al. (2023) similarly highlighted that critical thinking in the AI era requires students to interpret information from multiple viewpoints rather than relying on a single explanation.

Table 3 Test of Significance

AI Dependency		**Critical Thinking**
Reading Dependency	*r*	0.11
	p-value	0.20
Writing Dependency	*r*	0.22*
	p-value	0.01
Numeracy	*r*	0.21*
	p-value	0.01

*. Correlation is Significant at the 0.05 Level (2-Tailed).
**. Correlation is Significant at the 0.01 Level (2-Tailed).

Table 4 Test of Significance

Variables	***r***	**p-Value**	**Decision on H_0**	**Interpretation**
AI Dependency	0.423**	<0.01	Reject	Significant
Critical Thinking				

*. Correlation is Significant at the 0.05 Level (2-Tailed).
**. Correlation is Significant at the 0.01 Level (2-Tailed).

The findings revealed that writing dependency demonstrated the highest significant relationship with critical thinking (r = 0.22, p = 0.01). This suggests that students who relied more on AI tools for writing tasks tended to exhibit higher levels of critical thinking. AI-assisted writing tools, such as grammar checkers, paraphrasing applications, and content structuring systems, may have encouraged students to evaluate suggestions, refine ideas, and make informed decisions regarding their written outputs. These processes likely engaged analytical and reflective thinking skills rather than replacing them. This finding supports Khalifa and Albadawy (2024), who emphasized that AI-assisted writing environments promote critical review and improvement of written work, thereby enhancing students' analytical abilities.

Similarly, numeracy dependency showed a significant positive relationship with critical thinking (r = 0.21, p = 0.01), although slightly weaker than writing dependency. This indicates that students who frequently utilized AI for mathematical tasks also tended to demonstrate stronger critical thinking skills. AI tools used for problem-solving, pattern recognition, and step-by-step explanations may have encouraged students to interpret results, compare methods, and verify accuracy, thereby strengthening analytical reasoning and logical thinking. This result aligns with Dolapcioglu and Doğanay (2022), who argued that AI tools can enhance students' problem-solving and reasoning abilities when utilized as learning supports rather than shortcuts.

In contrast, reading dependency showed the lowest and non-significant relationship with critical thinking (r = 0.11, p = 0.20). This finding suggests that reliance on AI-assisted reading tools, such as summarizers and comprehension applications, did not meaningfully contribute to students' critical thinking skills. The results imply that excessive dependence on AI-generated summaries may encourage passive consumption of information rather than deep analysis and interpretation of texts. This finding supports Cahyani et al. (2023), who reported that while AI-assisted reading tools improve comprehension efficiency, they do not necessarily enhance critical thinking when students rely heavily on condensed information.

Overall, the results revealed a moderate and statistically significant positive relationship between AI dependency and critical thinking (r = 0.423, p < 0.01). This suggests that increased engagement with AI tools was associated with improved critical thinking skills among first-year BSHM students. The findings imply that AI can support cognitive development when used strategically as a learning

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aid rather than as a substitute for independent thinking. This result supports Sung et al. (2021), who found that intelligent learning technologies expose students to diverse perspectives and problem-solving strategies that strengthen analytical and evaluative thinking. Likewise, Wang et al. (2025) emphasized that strategic AI use enhances learning efficiency and cognitive engagement, whereas habitual reliance may reduce deep learning behaviors.

V. CONCLUSIONS AND RECOMMENDATIONS

The findings of the study indicate that first-year BSHM students demonstrate a high level of AI dependency, particularly in writing-related tasks, suggesting that AI tools have become important academic supports in organizing ideas, improving clarity, and completing written outputs. Despite this reliance, students maintained a high level of critical thinking, as reflected in their ability to verify information, synthesize ideas from multiple sources, and make reasoned judgments. These findings imply that AI use does not necessarily diminish critical thinking when utilized strategically and responsibly.

Moreover, the significant positive relationship between AI dependency and critical thinking suggests that AI tools may support cognitive engagement when used as learning aids rather than substitutes for independent thought. Writing and numeracy dependency demonstrated meaningful relationships with critical thinking, indicating that AI-assisted activities in these domains may encourage evaluation, analysis, and reflective reasoning. In contrast, reading dependency did not significantly relate to critical thinking, implying that excessive reliance on AI-generated summaries may reduce opportunities for deeper engagement with texts and independent interpretation.

In general, the study highlights that the impact of AI on students' critical thinking depends largely on how AI tools are utilized in the learning process. When used responsibly, AI can function as a supportive educational tool that complements students' cognitive development rather than replacing essential thinking skills.

In light of these findings, students are recommended to engage with AI tools critically and responsibly by using them to support brainstorming, verification, organization, and reflection while still practicing independent problem-solving and analysis. Greater exposure to interdisciplinary readings and authentic learning tasks may also help strengthen comprehension and broaden critical thinking skills. Educational institutions and faculty members are likewise encouraged to establish ethical AI-use guidelines and integrate AI literacy into instruction through activities that promote critical analysis, reflection, and independent reasoning. Furthermore, future studies may explore AI dependency across different academic programs and year levels and examine its long-term influence on students' cognitive and academic development.

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