# The Use of AI in Improving Student's Critical Thinking Skills

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| ARTICLE INFO | ABSTRACT |
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| | The use of artificial intelligence (AI) in education has the potential to significantly enhance students' critical thinking skills. This study explores how AI tools can improve critical thinking among students majoring in English Education at X University. Utilizing a mixedmethods approach, the research combines quantitative surveys and qualitative interviews to assess the frequency and contexts of AI usage and its impact on critical thinking. Survey results reveal that 64% of respondents use AI tools several times a week, predominantly in educational settings. A smaller percentage of respondents use AI daily (14%), while another 14% use AI rarely, and 7% use it several times a month. Interviews with frequent AI users indicate that AI assists in expanding ideas and providing deeper insights, but its effectiveness depends on the users' ability to ask precise questions and critically interpret AI-generated content. The findings highlight that while AI can significantly aid in developing critical thinking skills through personalized learning experiences and interactive simulations, challenges such as potential biases and the need for foundational understanding persist. Ultimately, this research underscores the importance of thoughtful and critical use of AI in education to foster improved critical thinking skills.<br><br> |

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## 1. INTRODUCTION

There are growing appeals for demand in education, with critical thinking as a 21st-century skills being paramount. The ability to actively analyze, evaluate, and synthesize information has always been pursued by many students. According to Bloom's taxonomy, these skills are classified as High Order Thinking Skills (HOTS), essential for success globalized education landscape (Jaenudin et al., 2020). It is the cornerstone of navigating a world full of information, solving complex problems, and fostering innovation.

Although critical thinking is important, it's something that many people are not good at. Critical thinking is something that everyone has but critical thinking skills must be honed to become sharper (Masadeh, 2021). Challenges in honing critical thinking can occur due to a lack of stimulation for critical thinking. The other challenges are caused by environmental influences, habits, culture, and educational conditions. In addition to that, egocentrism will influence the way a person thinks critically. This makes up for the problem of a person's difficulty in seeing things from different perspectives.

To address this, many attempts have been made, including utilizing technology. One such tool is Artificial Intelligence. AI refers to the simulation of human intelligence by a system or machine to mimic human behaviors

like perceiving, reasoning, learning, planning, predicting, and more (Xu et al., 2021). This innovation has great potential to impact education by creating personalized learning experiences and fostering critical analysis through interactive simulation.

However, AI is not a silver bullet. While AI can significantly improve efficiency and productivity in various fields, its effectiveness depends on the quality of the data it utilizes. The potentially unreliable source of data cannot be ignored (umnadmin, 2023) In education, this could be a challenge for educators to guide the students in analyzing such data provided.

This paper delves into the relationship between AI and critical thinking skills. We will explore its potential benefits in fostering critical thinking, from personalized learning experiences to interactive simulations. We will also examine the limitations of AI, particularly the dependence on reliable and high quality data. Ultimately, the study aims to highlight the impact of AI, specifically generative AI on education, its potential to change the flow of students' learning style in improving their critical thinking skills.

## 2. METHODOLOGY

This study uses a mixed method of quantitative and qualitative approach to determine how AI can improve students' critical thinking skills. The methodology involves surveying with questions:
1. How often do you use AI?
2. In what context do you often use AI? From the survey results, students with the highest frequency of AI use will conduct follow-up interviews to deepen the collected data. The interview is conducted with questions:
1. When you use AI to find answers, do you copy and paste or paraphrase the answers?
2. If you get an answer, do you ask follow-up questions?

This mixed methods approach ensures the findings are strong and multi-faceted, giving a broad trend and indepth perspective. By explaining how students interact with AI, this research aims to inform educational practice and the integration of AI tools in learning environments to foster critical thinking skills.

**Research questions:**
1. Does AI improve student's critical thinking skills?
2. How does AI affect student's critical thinking skills?

## 3. RESULTS AND DISCUSSIONS

This study aimed to explore how AI improves student's critical thinking and how it affects student's critical thinking. To gather data, a survey was conducted among students majoring in English Education from X university, which got 14 respondents. This was followed by in-depth interviews with select participants. The survey is the basis for conducting further interviews. The questions were used to determine the frequency of AI use by respondents and in what areas AI is used.



How often do you use AI?

| More Details | Insights | |
|---|---|---|
| Every day | | 2 |
| Several times a week | | 9 |
| Several times a month | | 1 |
| Rarely | | 2 |
| Never | | 0 |

**Frequency of AI Usage:**
- Daily Users: 2 respondents (14%) reported using AI every day.
- Weekly Users: 9 respondents (64%) indicated that they use AI several times a week.
- Monthly Users: 1 respondent (7%) mentioned using AI several times a month.
- Rare Users: 2 respondents (14%) stated that they rarely use AI.

The survey results show that the majority of respondents (64%) use AI on a weekly basis, which indicates a significant integration of AI tools in their regular activities. Daily and infrequently use each accounted for 14% of respondents, indicating varied levels of engagement with AI.

In what contexts do you most often use AI?

More Details      💡 Insights

● Education           12
● Entertainment       0
● Other               2
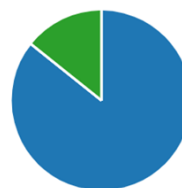
**Contexts of AI Usage:**
•   Education: 12 respondents (86%) reported using AI primarily in educational settings.
•   Entertainment: None of the respondents indicated using AI for entertainment purposes.
•   Other Contexts: 2 respondents (14%) mentioned using AI in contexts other than education and entertainment.

The survey results clearly show that the most dominant context of use for AI among the respondents is education. This includes applications such as research, teaching, and learning. The absence of using AI for entertainment purposes and the presence of a small percentage using AI in other contexts indicates the specific and goal-oriented application of AI by the respondents.

### 3.1   Interview Results
#### 3.1.1 AI Usage in Academic Responsibilities
Three respondents who actively use AI tools in their academic work were interviewed to gather insights on their perspectives. Respondents B and C consistently use AI, while Respondent A also frequently utilizes these tools.

#### 3.1.2 Expanding Ideas and Gaining Deeper Insight
Respondent A mentioned that AI assists in expanding ideas by providing new understandings. Similarly, Respondent C noted that AI offers new information relevant to prompts, helping to delve deeper into subjects. This aligns with findings by Berg and Plessis (2024) who state that AI supports teachers by offering structures, ideas, and resources, thereby enhancing critical thinking as educators evaluate various approaches for student engagement. The students interviewed highlighted their use of AI for developing materials and ideas, creating presentations, and preparing academic media.

#### 3.1.3 Perspective on AI-generated Content
When asked about their responses to new perspectives provided by AI, Respondent B explained that AI aids in gathering information about learning theories and their application in classes or writings. However, Respondent B emphasized the need to request further explanations from AI to ensure the information is comprehensible and not overly rigid. Similarly, Respondent A uses AI tools for paraphrasing to make the content sound more human and asks detailed questions to gain a deeper understanding of the material.

These responses illustrated how AI can help students engage in the material and think critically about the information provided and whether they can use it directly or not. However, the respondents agreed that AI-generated language can be too rigid and requires rephrasing for clarity. They often need to re-read AI responses to ensure relevance and ask AI to paraphrase answers for better comprehension.

#### 3.1.4 Ensuring Accuracy and Relevance
All three respondents expressed concerns about the accuracy and potential bias of AI-generated information. Respondent C pointed out the necessity of providing clear, specific prompts to AI to avoid general and irrelevant results. Walter (Zhao et al., 2024) supports this by noting that students need a foundational understanding of the material before using AI, as lacking context can lead to confusion and less useful information.

Based on the result, the interviews underscore that while AI can significantly aid in expanding ideas and providing deeper insights, its effectiveness depends on the user's ability to ask precise questions and interpret AI responses critically. The respondents highlighted the importance of rephrasing AI-generated content for clarity and ensuring the accuracy of the information provided. These findings suggest that AI is a valuable tool in education, but it must be used thoughtfully to maximize its benefits.

### 3.2   Critical Thinking Skills
Many academic soft skills have been pursued for a long time and one of them is critical thinking skills. Critical thinking skills have consistently been acknowledged as a key objective in higher education, representing an indispensable core competency for the 21st century (Zhao et al., 2024). It expands learners' perspectives and fosters their development as proficient and autonomous learners, enhancing learners' selfdirected learning

competency (Jin & Ji, 2021). As a formidable skill, critical thinking is highly demanded in education, especially for students. It is used in many situations despite the difficulty of defining critical thinking, the elements of critical judgment, reflection interpretation, and justification of decisions seem to be fundamental to it (Cossu et al., 2024).

According to Thornill-Miller et al. (2023), critical thinking is deemed essential for discerning false information and, in general for navigating, comprehending, and evaluating the vast volume of information in contemporary society. This explains why critical thinking is particularly important for students in their studies. In an academic context, students are often required to sift through numerous sources, identify credible information, and construct well-founded arguments. The ability to think critically allows students to question theories, analyze data, and make informed decisions. It will affect the student's academic performance and prepare them for the complexities of modern education.

While many agree that critical thinking is essential in education, some perspectives question its universal applicability. Some argue that emphasizing critical thinking may overshadow the acquisition of practical skills that are also essential in education. Lopez et al. (2023) state that critical thinking might divert attention from essential, job-specific competencies that directly impact workforce readiness. Additionally, critical thinking may not always be relevant or necessary for all types of learning and problem-solving. For example, some technical tasks might require specific procedural knowledge, rather than broader critical thinking. There are fields where operational orders are crucial and critical thinking might not significantly enhance performance or outcomes (Gosner, 2023). In the context of pre-service teachers, the ability to teach in a classroom is affected not only by their critical thinking but also by their practical skills. However, we can argue that critical thinking skills are still essential for education, especially in preparing students for real-world work.

### 3.3 Artificial Intelligence (AI) in Education

Artificial Intelligence (AI) is a powerful tool for improving critical thinking skills in education. In past years, AI has been recognized by many people and is also used in various fields, one of which is the field of education (Rahman & Watanobe, 2023). The use of AI can be found in educational contexts like paper writing. Some apps that are often used are generative AI, for example, ChatGPT, Gemini, Gamma, and other AI that can be used in exploring existing content and even generate new material. These technologies enable students to delve deeper into subjects by offering insights and generating ideas that can challenge their thinking and foster creativity.

The integration of AI into education promises to further empower learners by providing personalized learning experiences and facilitating the development of problem-solving abilities. For teachers, AI helps in preparing classroom needs. Berg and Plessis (2023) wrote that AI helps teachers by providing structures, ideas, and resources. They stated that when teachers use AI, it contributes to their critical thinking as they various approaches to students. By maximizing the use of these tools, teachers can provide an optimal classroom learning process that stimulates students' ability to discuss and hone their use of critical thinking skills.

In improving critical thinking, AI can engage in deeper material by providing interactive and adaptive learning experiences. For example, when students try to understand an idea or concept, AI can present it in multiple perspectives, fostering a more comprehensive understanding. In doing research, AI assists by finding relevant sources for students to read and utilize. One significant advantage of AI in education is its ability to provide immediate and constructive feedback to students by analyzing vast amounts of data to gain insight into students' strengths, weaknesses, and learning preferences (Kaledio et al., 2024).

However, the use of AI in education is not without its challenges. AI can pose threats to students or teachers, one of which is that it can prevent critical thinking skills for students or teachers. Karimi and Khawaja (2023) stated a refutation that AI cannot help students in critical thinking. It is caused by the automatic and easy process of searching for information, students are less encouraged to do further analysis and evaluate the search results. Due to this phenomenon, the learning environment becomes passive for students to use their critical thinking skills. The argument is also supported by Walter ((2024) who explains that if students do not comply with reading the basic context of a material of a lesson before using AI, then it does not encourage students to criticize the output of the AI results they get. Therefore, it can have a negative impact on students' critical thinking abilities.

### 4. CONCLUSIONS

Exploring the relationship between Artificial Intelligence (AI) and critical thinking skills, it is important to note that AI can be a valuable tool. There are some important key points: 1) Critical thinking skills are essential for success in education; 2) AI can help students expand ideas, gain deeper insights, and ensure the accuracy and relevance of information; 3) it is important for users to ask precise questions, interpret AI responses critically, and rephrase AI-generated content for clarity; and 4) AI can give new perspectives, but it is highly responsible that thoughtful use is needed to avoid hindering critical thinking.

In the end, AI has potential to be valuable to education and improvement of student's critical thinking skills. However, it is important to use AI thoughtfully and critically to maximize its benefits. It is recommended that readers or authors explore articles on specific AI tools usued in education, such as chatbots or adaptive learning

platforms. By understanding both the potentials and limitations of AI, we can utilize this technology to empower students to improve and become critical thinkers.

# REFERENCES

Cossu, R., Awidi, I., & Nagy, J. (2024). Critical thinking activities in fluid mechanics – A case study for enhanced student learning and performance. Education for Chemical Engineers, 46. https://doi.org/10.1016/j.ece.2023.10.004

Gosner, W. (2023, March 7). Critical Thinking | Education and Philosophy. Britannica.

Jaenudin, R., Chotimah, U., Farida, F., & Syarifuddin, S. (2020). Student Development Zone: Higher Order Thinking Skills (Hots) in Critical Thinking Orientation. International Journal of Multicultural and Multireligious Understanding, 7(9). https://doi.org/10.18415/ijmmu.v7i9.1884

Jin, M., & Ji, C. (2021). The correlation of metacognitive ability, self-directed learning ability and critical thinking in nursing students: A cross-sectional study. Nursing Open, 8(2). https://doi.org/10.1002/nop2.702

Kaledio, P., Robert, A., & Frank, L. (2024). The Impact of Artificial Intelligence on Students' Learning Experience. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4716747

Karimi, H., & Khawaja, S. (2023). The Impact of Artificial Intelligence on Higher Education in England. Creative Education, 14(12). https://doi.org/10.4236/ce.2023.1412154

López, F., Contreras, M., Nussbaum, M., Paredes, R., Gelerstein, D., Alvares, D., & Chiuminatto, P. (2023). Developing Critical Thinking in Technical and Vocational Education and Training. Education Sciences, 13(6). https://doi.org/10.3390/educsci13060590

Masadeh, T. S. Y. (2021). EFL teachers critical thinking behaviors and the challenges facing them in classrooms. Journal of English Language Teaching , 10(2).

Rahman, M. M., & Watanobe, Y. (2023). ChatGPT for Education and Research: Opportunities, Threats, and Strategies. Applied Sciences (Switzerland), 13(9). https://doi.org/10.3390/app13095783

Thornhill-Miller, B., Camarda, A., Mercier, M., Burkhardt, J. M., Morisseau, T., Bourgeois-Bougrine, S., Vinchon, F., El Hayek, S., Augereau-Landais, M., Mourey, F., Feybesse, C., Sundquist, D., & Lubart, T. (2023). Creativity, Critical Thinking, Communication, and Collaboration: Assessment, Certification, and Promotion of 21st Century Skills for the Future of Work and Education. In Journal of Intelligence (Vol. 11, Issue 3). https://doi.org/10.3390/jintelligence11030054

umnadmin. (2023, August 7). 5 Pros and Cons of Artificial Intelligence: Helps and Threats? UMN (Universitas Multimedia Nusantara).

van den Berg, G., & du Plessis, E. (2023). ChatGPT and Generative AI: Possibilities for Its Contribution to Lesson Planning, Critical Thinking and Openness in Teacher Education. Education Sciences, 13(10). https://doi.org/10.3390/educsci13100998

Walter, Y. (2024). Embracing the future of Artificial Intelligence in the classroom: the relevance of AI literacy, prompt engineering, and critical thinking in modern education. International Journal of Educational Technology in Higher Education, 21(1). https://doi.org/10.1186/s41239-024-00448-3

Xu, Y., Liu, X., Cao, X., Huang, C., Liu, E., Qian, S., Liu, X., Wu, Y., Dong, F., Qiu, C. W., Qiu, J., Hua, K., Su, W., Wu, J., Xu, H., Han, Y., Fu, C., Yin, Z., Liu, M., … Zhang, J. (2021). Artificial intelligence: A powerful paradigm for scientific research. In Innovation (Vol. 2, Issue 4). https://doi.org/10.1016/j.xinn.2021.100179

Zhao, Y., Liu, Y., & Wu, H. (2024). Relationships among critical thinking disposition components of Chinese undergraduates: A moderated mediating effect analysis. International Journal of Educational Research, 124. https://doi.org/10.1016/j.ijer.2023.102306