

## **Students' Perceptions of AI Use in Supporting Critical Thinking: A Small-Scale Survey of English Education Students**

**By:**

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**Abstract:** When Artificial Intelligence (AI) was incorporated into higher education, there was a major change. However, AI's influence on critical thinking remains an important issue for teachers. This study uses a quantitative survey design to explore the role of AI in developing critical thinking skills. The sample for this study comprised 10 fifth-semester students from the English Language Studies Study Program at IAIN Curup who followed the STEM education path. Data were collected using a structured questionnaire instrument with a 5-point Likert scale, validated to measure the frequency of AI use and critical thinking indicators. The findings show diversity in students' perceptions of AI's effectiveness in supporting their cognitive processes. From the descriptive findings, it has been revealed that 30 percent of the respondents strongly agreed and another 20 percent agreed with the proposition stating that the use of artificial intelligence increases efficiency in learning and processing information. However, there are also plenty of doubts: 30 percent of respondents were unsure about this issue, while 20 percent disagreed. This suggests a risk of dependence that may interfere with critical thinking and rational judgment when technology is used improperly. It is important to note that the results of the current study cannot be generalized due to the limited sample size.

**Keywords:** AI usage, critical thinking, perceptions, STEM education, sustainable learning

## **INTRODUCTION**

The integration of Artificial Intelligence (AI) in higher education is growing rapidly. It is beginning to change how students access, process, and evaluate information, especially in learning contexts that demand analytical and problem-solving skills. Critical thinking is operationally defined as a series of high-level cognitive processes that include synthesis (the ability to integrate various sources

into a coherent understanding), analysis (the ability to identify the relationships and fundamental structures of arguments), and information verification (the ability to cross-check and validate the accuracy of data).

However, the increasing use of AI-based technologies, such as automated text generators, adaptive learning systems, and instant feedback, raises a fundamental question in the pedagogical realm: to what extent do these technologies really support, rather than replace, students' critical thinking processes?

Empirical findings on this issue remain mixed. On the one hand, several studies show that AI can improve learning efficiency by personalizing materials and providing real-time feedback (Alam, 2022; Kamalov et al., 2023). Conversely, there is a possibility of dependency when students receive AI results without an in-depth evaluation process, which reduces the likelihood of high cognitive engagement (Shibani et al., 2024; Salim Jr. et al., 2023). Therefore, the connection between the use of artificial intelligence and the enhancement of critical thinking skills does not follow a linear pattern but rather a highly interactive one.

Another important issue is a clear discrepancy between students' perceptions of AI and its role in their English education. The majority of students consider AI as a partner who would help them analyze things in greater depth, rather than just a facilitator that would help them become more efficient by completing tasks, such as writing essays and translating texts. This misconception may lead to mere involvement with AI to complete tasks rather than to analyze anything critically. To evaluate the effect of AI on the development of critical thinking skills, some research should be conducted among students.

Furthermore, most existing research still focuses on the general context of higher education or environments with high levels of technology adoption, so there has been little study of the specific context, both in terms of disciplines and institutional characteristics. In the context of English Language Teaching students, who are at the intersection of language proficiency and analytical thinking skills, the role of AI can take on different dynamics.

The focus of this research is the English Study Program at the Curup State Islamic Institute (IAIN Curup), an institution that prioritizes English language skills

and academic literacy. In this class, students are increasingly exposed to AI tools to complete tasks such as essay writing, reading comprehension, and translation. However, there are no clear institutional standards for properly using AI in pedagogy, which can affect how students interact with the tool cognitively.

While the use of AI technology among Indonesian students is increasing, there is very little material on its impact on critical thinking among these students. Students from the state-owned Islamic Institute IAIN Curup have started using artificial intelligence to complete their assignments. However, there is no systematic way to know how it is used and its cognitive impact.

The need for this research stems from the need to empirically and contextually fill the aforementioned gap. Education without understanding of how artificial intelligence affects students' critical thinking skills may result in dependence on technology rather than enhanced cognitive freedom. This statement is further supported by evidence indicating that unrestricted use of artificial intelligence can diminish students' analytical skills and reduce their participation in critical thinking (Castillo-Segura et al., 2023). Therefore, research on how artificial intelligence influences students' education should be conducted. In light of the above information, this study aims to analyze the impact of artificial intelligence on the development of critical thinking skills among fifth-semester students majoring in English at IAIN Curup. In particular, this study seeks to: (1) How do English education students perceive the use of AI in supporting critical-thinking-related learning activities? (2) What benefits and challenges do students perceive when using AI for academic thinking tasks? By focusing on specific contexts, this research is expected to make an empirical contribution to understanding the pedagogical implications of AI use and to serve as a basis for developing more critical and reflective learning strategies in higher education.

## **METHODS**

The research design used in this study was quantitative. Sugiyono (2010) defines quantitative research as an approach based on positivism that complies with scientific principles concretely or empirically, is objective, measurable, logical, and

methodical. A quantitative research methodology focuses on the analysis of numerical data (numbers), which are then evaluated using proper statistical procedures.

A small exploratory research design was employed for quantitative surveys. The intention here was to examine the uses of AI and its relevance to learners' critical thinking. Generalization is not intended in this particular research project.

A sample was selected based on three criteria: (1) students enrolled in the IAIN Curup English Study Program, (2) students who have used artificial intelligence tools in schoolwork, and (3) students who are in semester five to ensure that they have comparable academic exposure. A total of ten participants were selected based on these criteria. Therefore, everyone involved in the study is a fifth-semester student, ensuring that their learning experience and academic level are aligned. The researchers sent them an online questionnaire via a Google Form link.

**Table 1. The Subject of the Research**

No	Name	Semester
1	Student 1	5
2	Student 2	5
3	Student 3	5
4	Student 4	5
5	Student 5	5
6	Student 6	5
7	Student 7	5
8	Student 8	5
9	Student 9	5
10	Student 10	5

The data-gathering technique used is a questionnaire, in which a set of questions is presented to respondents who choose from predetermined responses. This research used a Likert scale. A Likert scale was used to evaluate the respondents' perceptions in this study. Sugiyono (2018) argues that the Likert scale is used to assess people's or groups' attitudes, opinions, and perceptions regarding social phenomena. A theoretical framework of critical thinking was used to create this survey, which includes factors such as analysis, evaluation, synthesis, information verification, and reasoning. In addition, items measuring AI use are compiled based on previous research on the adoption of technology in education and on how students interact with AI tools. This theoretical foundation ensures that

the instrument captures cognitive and perceptual aspects relevant to the research objectives.

In a Likert scale, the factors to be evaluated are expressed via variable indicators, which are then transformed into quantifiable indicators. The indicator serves as a foundation for developing instrument items, which may consist of statements or questions.

The instrument uses a 5-point Likert scale as proposed by Sugiyono (2018) to measure respondents' attitudes and perceptions. Each statement is rated on a scale ranging from 1 to 5, where 1 indicates strongly disagree, 2 indicates disagree, 3 indicates undecided, 4 indicates agree, and 5 indicates strongly agree. This scale allows respondents to express varying degrees of agreement or disagreement with each item in a structured, quantifiable manner.

The researcher uses a questionnaire to collect data and answer the two research questions listed above. This study did not use conversational or interview data collection methods; the instruments used consisted solely of structured questionnaire items.

The data collection process followed several systematic steps. First, the researcher developed and distributed the survey questionnaire for validation purposes. After receiving feedback from the validators, the questionnaire was revised and tested on students who were not part of the research population to examine its validity using IBM SPSS Statistics 30.0.0.0. The validity of each item was evaluated using the correlation coefficient, and items that did not meet the minimum validity threshold were either revised or removed from the final instrument. Once the questionnaire was confirmed to be valid, it was administered to the actual participants. The completed questionnaires were collected and analyzed using percentage formulas, and conclusions were drawn based on the results.

Students' responses were collated to determine the use of AI in learning to develop critical thinking skills, using several steps. First, data verification was conducted to ensure the trustworthiness and completeness of the questionnaire responses. Next, the verified data were systematically classified and tabulated in

tables for easier interpretation. Finally, the data were analyzed by calculating the percentage using an appropriate formula to obtain meaningful results.

Then the researcher used this formula:

$$P = \frac{\sum \text{score}}{\text{Max score}} \times 100\%$$

Where:

P: Percentage of students

$\sum$ score: Total Score

Max score: Maximum Score

The average rating and percentage for each item on the questionnaire are determined by the researcher using the formula below.

$$P = ((f \text{ SA} \times 5) + (f \text{ A} \times 4) + (f \text{ U} \times 3) + (f \text{ D} \times 2) + (f \text{ SD} \times 1)) / N \times 100\%$$

Where:

f: Frequency

SA: Strongly Agree

A: Agree

U: Undecided

D: Disagree

SD: Strongly Disagree

N: Total Number of Frequency

Using Alpha Cronbach, the instrument's reliability was assessed, with a coefficient of 0.923 indicating high internal consistency. However, because the sample is small, these results should be interpreted with caution as they may affect the stability of the reliability estimates.

**Table 2. Agreement of Terms**

<b>Category</b>		
Strongly Agree	Combined	Positive Perception
Agree		
Undecided	Combined	Neutral Perception
Disagree		
		Negative Perception

Based on the total Likert-scale responses, student perceptions are categorized into three main groups: positive, neutral, and negative.

## **RESULTS AND DISCUSSION**

The study identified a disparity in the use of AI to foster Critical Thinking Skills in STEM Education, as indicated by the questionnaire results. These results were derived from questionnaires administered to fifth-semester students in the Tadris Language research Program at IAIN Curup, class of 2022, specifically those enrolled in the STEM Education track. This study presents data to address the research questions: (1) In what manner does the use of AI affect the enhancement of students' critical thinking skills? (2) What are the perspectives of these STEM Education students about the efficacy of AI in augmenting their critical thinking skills? The researcher gathered data from a questionnaire issued to STEM Education students regarding the use and perceived usefulness of AI in building and improving their critical thinking skills.

**Table 3. Measurement Instruments**

<b>Item</b>	<b>Instruments</b>	<b>Variable</b>
1	I compose new sentences, using the reference sources I obtained through the AI.	X1
2	I collect all the information and design a paragraph based on the ideas obtained from the AI.	X2
3	I combine various pieces of information to produce a paragraph	X3
4	I select the main idea that fits the topic	X4
5	To evaluate information, I check multiple sources obtained through the use of AI.	X5
6	I like to collect different opinions and compare them with each other	X6
7	When I am interested in information, I try to check if the information is correct.	X7
8	I break down information into parts to explore a better understanding, such as argument, supporting evidence, thesis statement, reasoning, etc.	X8
9	I categorize the types of ideas obtained through the use of AI	X9
10	I can analyze information obtained through the use of AI logically and objectively.	X10

In this study, the SPSS 30 program was used to calculate item validity. Table 4 displays the following findings.

**Table 4. Validity Test Result**

<b>Item</b>	<b>Variable</b>	<b>Pearson Correlation</b>	<b>Value r table</b>	<b>Category</b>
1	X1	0.895**	0.632	Valid
2	X2	0.608	0.632	-
3	X3	0.900**	0.632	Valid
4	X4	0.917**	0.632	Valid
5	X5	0.601	0.632	-
6	X6	0.576	0.632	-
7	X7	0.885**	0.632	Valid
8	X8	0.847**	0.632	Valid
9	X9	0.754*	0.632	Valid
10	X10	0.794**	0.632	Valid

The validity test findings in the table above indicate a positive and substantial association between AI use and critical thinking ( $\alpha > 0.05$ ). Pearson's correlation is a validity analysis technique that compares item and total scores (50). This implies the validity of respondents' responses to each variable regarding the connection between AI use and critical thinking. The responses to the questionnaire can therefore provide insight into the complex relationship between the development of critical thinking and the use of AI.

In this study, item reliability was determined using SPSS 30. Table 5 shows the following findings.

**Table 5. Reliability Test Result**

<b>Cronbach's Alpha</b>	<b>Category</b>
0.923	Reliable

The Cronbach alpha for the study variable, as shown by the data above, is 0.923. Cronbach's alpha is the most widely used reliability statistic for assessing the consistency of questionnaire items. A Cronbach's Alpha score of 0.50 to 0.60 indicates that an item's scale has strong reliability. This indicates that within each variable, there are adequate and reliable measures of the research variable. As a result, even after repeated use, the measuring equipment can consistently produce the same data or responses.

**Table 6. Tabulation Data**

Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total Score	Category
Participant 1	3	2	2	2	5	4	4	1	3	2	28	undecided
Participant 2	3	2	2	3	3	4	4	4	3	2	30	undecided
Participant 3	5	3	5	5	5	5	5	5	4	4	46	strongly agree
Participant 4	3	2	4	4	2	4	4	4	2	3	32	undecided
Participant 5	5	4	5	5	5	4	5	5	5	5	48	strongly agree
Participant 6	2	4	2	2	2	1	2	3	3	3	25	disagree
Participant 7	3	1	2	2	3	2	2	1	3	3	21	disagree
Participant 8	3	2	5	5	2	5	4	4	3	4	37	agree
Participant 9	5	4	5	5	5	3	5	5	4	4	45	strongly agree
Participant 10	3	4	4	4	4	4	4	4	4	4	39	Agree

The survey results from 10 participants are displayed in the table, which also analyzes their responses to 10 questions (Q1–Q10) and classifies their general opinions. The analysis includes scores for each question, total scores, and group scores based on total scores.

The 10 survey responses were grouped into four categories: "strongly agree," "agree," "hesitant," and "disagree." There is a range of agreement levels within this group. Student 1 scored 28, and the other student scored 30. The other students scored 32, placing them in the "unsure" category, indicating they do not have clear emotions. They are both "unsure" because they do not have any concrete opinion regarding the survey question. However, several students scored highly, 46, 48, and 45, meaning that they "strongly agreed" with the subject matter. They are very much in favor of the topic under discussion.

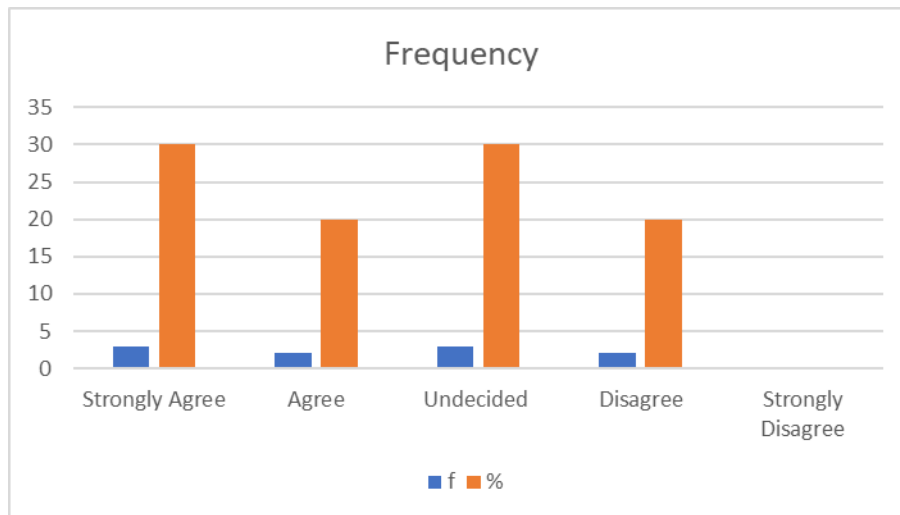
Meanwhile, two students scored 21 and 25, placing them in the "disagree" group. This means they had a problem with the study or did not like what it discussed. One student scored the lowest at 21, indicating that he/she had many issues with the study, whereas Melati Puspita scored the highest at 48.

The participants had five responses, all of which were either "strongly agree" or "agree." Their attitude was generally positive, but three responses were "undecided," and two were negative, as shown in the "disagree" category. The findings show considerable participation, with a positive majority. More research is needed to determine the determinants of negativity and neutral positions, such as survey clarity or participants' familiarity with the topic, as seen in current reactions

that are uncertain or disagreeing. Such data provides a good baseline for understanding participants' opinions and for refining areas.

**Table 7. AI Usage, Development, Critical Thinking, and Students' Perception**

Interval	Category	f	%
43-50	Strongly Agree	3	30
35-42	Agree	2	20
27-34	Undecided	3	30
19-26	Disagree	2	20
10-18	Strongly Disagree	0	0
	Total	10	100



**Figure 1. AI Usage Development, Critical Thinking, and Students' Perception**

According to Table 7, thirty percent of respondents fall into the "Strongly Agree" category, twenty percent fall into the "Agree" category, thirty percent fall into the "Not Sure" category, twenty percent fall into the "Strongly Disagree" category, and none fall into the "Strongly Disagree" category. This can be calculated directly using the frequency distribution (n=10).

The percentage classified as "Strongly Agree" was 20%, while 30% were classified as "Agreed," indicating that most students held a highly favorable perception. Furthermore, 30% were classified as "Unsure," indicating significant hesitation about AI's role in fostering critical thinking. Lastly, 20% were classified as "Strongly Disagree," which meant that most students had highly favorable perceptions.

Overall, the trend is quite positive, but responses are 50% lower for both "Strongly Agree" and "Agree." At the same time, the same percentages of "Not Sure" and "Disagree," which are 50% correspondingly, also suggest that students have varied opinions.

Despite being categorized into only four sections, every ten answers were categorized into five Likert scale categories. Among all of them, one can notice a high percentage of "Unsure," which constitutes 30%.

From an analytical perspective, the trend shows that many students wonder whether AI works. This is consistent with the notion that implementing AI in education makes learning more efficient but does not, per se, guarantee cognitive engagement.

No "Strongly Disagree" responses indicated that participants had no strong objections to AI. However, neutral and negative responses indicated that more structured guidance is needed to incorporate AI into learning, especially to ensure that its use supports rather than hinders critical thinking.

Generally, the findings revealed that, despite 50% of respondents having a positive attitude towards AI, an equal percentage had negative or ambivalent attitudes. Therefore, educational measures are key to fostering the critical application of AI. Further research should focus on ensuring that students can use AI to improve their evaluation skills and that AI is a cognitive support tool rather than a substitute for independent thinking.

The findings of this study should be interpreted based on the actual distribution of responses: 30% of students expressed positive perceptions ("Strongly Agree" and "Agree"), 30% were unsure, and 20% expressed negative perceptions ("Disagree"). While these patterns are not dominant or conclusive, this example shows a tendency toward positive perceptions. These findings revealed that 50% of the participants believed that artificial intelligence helped their critical thinking, particularly in analysis, evaluation, and synthesis. However, these findings did not show a significant increase or causal effect of artificial intelligence on students' critical thinking abilities. These findings align with previous research (e.g., Darwin et al., 2024; Sharma & Kumar, 2023) that suggests artificial

intelligence could aid learning through personalization. However, the results of this study should not be taken as evidence of actual improvement in critical thinking abilities; rather, they should be considered as perceived support.

At the same time, 30% of undecided responses indicated that most participants lacked a clear understanding of AI's role. Limited experience, inadequate knowledge, or even inconsistent utilization of AI technologies could be one reason behind it. Rather than pointing to success or failure, these findings suggest that students are still in the adaptation stage to AI in learning. Thus, it is clear that ensuring students not only use AI technology but also develop critical thinking skills goes hand in hand. 20% of students think AI is unsupportive or potentially problematic. This kind of perception can be attributed to issues such as over-dependence, lack of independent thinking, or distrust of AI outcomes. Previous studies (such as Ulfah, 2024; Johnson & Hall, 2024) have also found that overreliance on artificial intelligence can reduce deeper cognitive engagement. However, this interpretation is visual only within the context of this research paper and therefore cannot be applied to any particular sample size.

Student perspectives on artificial intelligence's role in enhancing critical thinking vary and are not homogeneous, as evidenced by the spread of responses: 50% of the sample population had a positive opinion, 30% were doubtful, and 20% expressed a negative opinion. This underscores the importance of learning designs that incorporate artificial intelligence not only for success but also to foster analytical thinking. However, these results do not imply that AI has any direct impact on critical thinking ability, either positively or negatively; rather, its effect depends on how the student uses it. If used critically, AI can serve as a supporting resource, but if used passively, AI can also lead to weak engagement. The characteristics of descriptive data are still consistent with this interpretation.

The Nguyen et al. (2024) model of human-AI collaboration for the best outcomes is an ongoing learning process. This shows that it is not enough to have access to the technology to get the most out of it; instead, skills on the part of the individual user need to be cultivated in a bid to utilize AI effectively. AI could be a revolutionary tool in education, but a lot still needs to be figured out in how

to implement it. Making such tools induce deep critical thinking capacities instead of replacing human thinking capacities is one of the high-order challenges. Various perceptions about applying AI to education have been evidenced in the past from existing studies. An example is Sabaruddin et al. (2024), where learning about information is supported at a fast pace by AI, while excessive use may create dependency. Through such dependency, students would be inclined toward technology when looking for instant feedback instead of progressing their critical thinking. Such dependence would increasingly slow down or discourage students' capacity to think autonomously as well as innovate. Another work created by Johnson and Hall (2024) noted that while AI allows learning to be more personalized, e.g., through learning material recommendation based on learners' requirements, there is a probability that learners would turn out to be too passive as a side effect, as a result of overdependence on output generated by a particular system. Due to such a prospect, teachers have to embed AI such that priority is given to efficiency alongside encouraging learners' critical as well as active interaction with learning content. Additionally, AI-based learning is commonly related to automated feedback that is timely as well as precise. In an article including Hooda et al. (2022), it has been theorized that AI-based feedback could help learners learn better about complex conceptions. Such a scholarly work did establish, however, that such feedback ignores learners' critical or creative parts of their pieces of writing to only highlight technicalities such as structure or grammar. For educators who envision using AI as a learning tool, such a limitation is therefore a chief concern. In educating about writing, for instance, it's important to ensure students still get human feedback that encourages them to think beyond the algorithm's horizon. But according to how it is implemented into learning spaces, scholarly research into AI's integration with critical thinking skills acquisition also draws opposite conclusions. For instance, in one article by Ahmad et al. (2023), a situation is presented where AI-supported decision-making aid through scenario testing and case analysis is what allows the students to have an experience that provokes critical thinking. However, Ahmad et al. (2023) add

that how much such apps allow for active learning participation is the first impetus towards their use. That is, to what degree AI is created to facilitate interaction with and reflection about learning is to what degree it becomes an effective learning tool. AI's learning application is also an ethical consideration that is a chief preoccupation among much of the literature. In the opinion of some scholars, the social and cultural background of learners is commonly overlooked because AI-based tools are being developed (Lim et al., 2023). For instance, because of their non-representative data being used to train such algorithms to evaluate critical thinking skills, they are prone to having a bias towards some specific groups. Because of such a consideration, AI deployment in learning spaces with students with different backgrounds from different social, cultural, and economic contexts is a serious challenge. Thus, it becomes necessary to make sure that AI systems are not only efficient but also equitable. However, keep in mind that AI is just a tool, and how it's used determines its usefulness. Iqbal et al. (2024) affirm that AI education would be more suitable with clear regulations and more training for educators. Educators trained to use AI tools to facilitate students to think critically will be in a good position to appreciate the pros and cons of the tools. Moreover, educational policies ensuring proper utilization of AI can minimize the risk of over-reliance, enabling the proper integration of the technology. One of the methods in which artificial intelligence is implemented in teaching is through the blended learning method, where technology is utilized to enable face-to-face learning. According to an editorial by Jiang (2025), this practice offers educators the ability to merge human interaction with customized learning, referring to the benefit of AI, such as data analysis and grading without the need for humans, to write that such methods can work extremely well. As an integrated whole, such elements can constitute an extensive learning experience that enables critical thinking among learners even as they take advantage of prevailing technological developments. In summary, the reality that 30% of stakeholders were curious whether AI would be effective to boost critical thinking ability only stresses both the promise and

the challenge related to incorporating such a technology into one's learning environment.

To counteract such issues, educators, technologists, and legislators will be compelled to join forces to formulate solutions that are not only practicable but also morally right, inclusive, and reasonable. AI has a good chance of effectively complementing learners' critical thinking when used with a well-designed strategy, provided it is guided by pedagogical principles and situated within a context.

Necessarily select to bring artificial intelligence (AI) to classrooms with a great deal of caution, as agreed by the 20% who disagreed that AI significantly enabled critical thinking. Such rejection can be attributed to several influential reasons, ranging from concerns related to ethics to algorithmic bias itself to AI's limited ability to understand local contexts as outlined by Wang et al. (2021). Such concerns about algorithmic bias, for example, constitute a leading area of concern within the overall literature. Moreover, according to Eden et al. (2024), biases inherent in the data used to train AI systems would validate pre-existing biases within society as long as such data is unrepresentative or serves the purpose of institutionalizing discrimination. Biased algorithms tend to discourage critical thinking among learners and destroy the variety of perspectives important for effective learning. Algorithmic bias is thus not simply a technical challenge, but a full-fledged pedagogical issue.

Apart from that, the lack of transparency in the AI decision-making process also poses a significant challenge to the development of critical thinking among students. Phillips et al. (2023) emphasized the importance of transparency in AI systems so students can see how judgments or suggestions were made. To help students and teachers better understand the AI process and critically consider the results generated by AI, the study developed a toolkit to support teacher reflection. Otherwise, if such openness were absent, students would accept only what AI announces, neither assessing information for credibility nor for accuracy, thus impairing their critical faculty. Thus, to help students acquire topic knowledge and succeed in the information age, AI applications in education

should also include means for users to perceive and grasp the reasoning behind AI recommendations. Contextual locality is also applicable to AI usage success in education. AI systems are often developed to suit homogeneous global environments, i.e., local features and requirements take a back seat. Demartini et al. (2024) noted that AI systems that are both adaptable and flexible to suit local requirements tend to be highly effective in supporting student learning. It became clear from their inquiry into AI in physical education that if AI systems were developed with a specific context in mind to support it, not only did they reinforce students' competence, but they also created a learning process with even greater relevance to culture. These results indicate the significance of designing AI systems with consideration of regionally determined requirements, whether linguistic, socioeconomic, or cultural. Unless this is realized, AI ends up being an inefficient or even counterproductive facilitator of learning improvement.

There should be a balanced approach to integrating AI to offset such hurdles. Maulana et al. (2024) detail a process that combines pedagogy to facilitate self-evaluation and reflection with AI technology. Such a process emphasizes that AI should be used as an aid, not a replacement, for human learning. In such a scenario, AI technology can introduce information or observations that students can use as a starting point for deeper analysis, and teachers can guide learners in developing critical thinking skills to facilitate analysis of such data. Such an analysis of arguments or the coherence of ideas should ultimately be undertaken collectively by students and teachers.

Ethical issues that often accompany such applications can be addressed through pedagogical interventions that blend AI with humans. How critical is building student autonomy with AI-driven classrooms? Such an autonomy is possible by enabling students to evaluate and compare AI-based results with conventional practices. Students become more comfortable with their decision-making as they use various sources of information, and this process develops critical thinking skills as a byproduct. It also helps reduce students' reliance on technology, a serious issue in learning based on artificial intelligence. Heading

toward a long-term future with AI integration into learning spaces brings these issues to the fore even more acutely.

Learners' autonomous and creative thinking capabilities can be hampered if they over-rely on AI to complete tasks. In another Sudrajad et al. (2024) investigation, learners who depend heavily on AI to prepare for tasks have a lower capacity for creative thinking. It thus indicates that AI should never be introduced to diminish human intellectual capability, but rather as part of software that should be utilized with care. Educators can ensure they introduce a clear distinction between AI's purpose and learners' role in acquiring knowledge, so that technologies end up enhancing learners' ability to think critically and creatively, rather than weakening it. To ensure AI systems are introduced effectively and ethically, equal weight should be given to incorporating accountability and transparency into these systems. Transparency within AI systems, according to Cheong (2024), entails making the data used to train a system available and explaining algorithms. In doing so, educators can introduce AI to maximize learning and urge learners to challenge the biases and assumptions present in the data used. Educators, policymakers, and such technology creators should collaboratively work here. Whilst educators should be aware of how to use such technologies to facilitate learning quickly, developers or creators of such systems should ensure their systems are open to education.

Legislators should create appropriate laws to protect students' rights and ensure that AI is incorporated into education. Since only 20% of individuals argue that AI enhances critical thinking skills, collaboration among relevant parties will help overcome integration challenges and ensure the maximum positive impact of AI use. Indeed, one must take a responsible, moderate approach to the use of AI in the educational environment. On this note, it would be appropriate for AI to positively impact the development of critical thinking by addressing ethical issues, algorithmic bias, local conditions, and pedagogical approaches that encourage reflection. Project-based learning that uses artificial intelligence complements, rather than replaces, human critical thinking.

Therefore, strong policies, ongoing user education, and systematic monitoring of AI's impact are essential. Policy development should be based on educational needs and prioritize effective user training.

When interpreting the results, it is crucial to consider some shortcomings. First, the generalizability and validity of the findings based on statistical analysis are highly compromised by an extremely low sample size ( $n=10$ ). Second, due to the lack of measurement beyond self-report questionnaires, there was no empirical basis for assessing students' critical thinking. Third, survey research cannot establish causality or temporal relationships. In addition, many uncertain responses suggest that some participants may not have enough AI experience to conduct a stable assessment. Further research should increase the sample size, adopt a mixed-methods approach, and use more objective tests to measure critical thinking skills to improve understanding of the relationship between the two variables.

## **CONCLUSION**

The use of artificial intelligence (AI) to support critical thinking tasks is perceived differently by students, as reflected in this study's findings. The results indicate that the role of AI in learning is not yet fully understood or consistently practiced. While AI can support thinking processes and data analysis, particularly when used as a supplementary learning tool, it does not automatically enhance students' critical thinking skills. Its effectiveness largely depends on how it is integrated into the learning process and whether students are trained to engage reflectively and critically evaluate AI-generated outputs. Furthermore, the presence of uncertain responses suggests that some students may lack sufficient experience or understanding to assess the role of AI in their learning fully. This highlights the importance of implementing instructional strategies that promote critical reflection on AI rather than treating it merely as a tool for efficiency.

This study has several limitations. The relatively small sample size limits the external validity of the findings, and the reliance on self-report measures may

not fully capture students' actual critical thinking abilities. Future research should involve larger and more diverse samples to improve the generalizability of the results. In addition, since this study employs a descriptive survey design, it does not allow for causal conclusions. Therefore, incorporating direct measures of critical thinking, such as experimental designs or task-based assessments, would provide deeper insights into how AI influences higher-order cognitive skills.

Overall, AI has the potential to enhance higher education when used appropriately. However, fostering critical thinking requires careful pedagogical design and ongoing evaluation. This study offers valuable insights for educators and policymakers seeking to optimize the use of AI in academic contexts. By addressing practical challenges and encouraging critical engagement with AI-generated knowledge, educational institutions can ensure that AI functions as a catalyst for intellectual development and equips students to face contemporary challenges.

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