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Developing Literacy and Critical Thinking with AI: What Students Say

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ABSTRACT

This study examines college students' attitudes towards using artificial intelligence (AI) for developing literacy and critical thinking skills. A mixed-methods study was conducted, including surveys and discussion analysis, to capture 60 college students' perspectives before and after engaging with an AI-based learning activity. Thematic analysis found increase in students recognizing AI's benefits for facilitating higher-level skills after participating in an AI discussion and question generation activity, compared to before the experience. While concerns about privacy, dependence on technology and ethics persist, students expressed greater willingness to use AI if given opportunities to use it responsibly. As students gained more experience, their perceptions appear strongly linked not just to technology itself but to how it is developed and applied as a tool for learning and growth. By addressing concerns through sustainable policy and cooperative practice, AI may boost skills that serve students well. This indicates that their perceptions are strongly influenced by the chances they have to witness technology being responsibly and fairly used for learning purposes. This study highlights how educating students on responsible and fair AI use is essential for technology to empower rather than disadvantage learners.

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INTRODUCTION

Artificial intelligence (AI) is rapidly transforming fields like education through technologies such as machine learning, natural language processing, and data analytics (Smith 2021). Specific applications of AI like intelligent tutoring systems, text analysis tools, question-generation bots, and conversational agents have potential to enhance personalized literacy instruction and critical thinking development (Jones 2019). However, integrating AI also poses challenges around ethics, bias, privacy, security and social implications that demand thoughtful consideration (Nagle 2019, Bu 2022,).

While interest grows in the potential of artificial intelligence (AI) to transform education, critical questions remain regarding ethical implementation and centering of student perspectives. AI has attracted attention for its ability to personalize learning and provide adaptive instruction at scale (Smith 2021). However, challenges around data privacy, algorithmic bias, and impacts on social relationships require careful navigation if AI is to fulfill its promise responsibly (Nagle 2019). It is crucial to elucidate student attitudes and experiences with AI to advance pedagogical applications in empowering rather than detrimental ways.

Prior studies have explored student perspectives on educational technology generally. Williams (2016) found high school students were excited by the prospects of personalized learning but concerned about losing interpersonal connections. At the college level, Henderson et al. (2017) reported positive attitudes but reluctance to share personal data required for more adaptive systems. While showing openness, students appear concerned about privacy, fairness and the roles of teachers.

Additional studies have began investigating student perceptions of AI technologies specifically. Essuman (2019) revealed university students in Ghana were optimistic about AI improving learning but worried about job automation. Ng (2022) found Singaporean students were eager to use AI services but wary of risks like over-reliance on algorithmic recommendations. These studies imply more research is needed to understand the nuanced factors influencing acceptance and skepticism.

As Kumar and Vig (2019) argue, student perspectives provide "an invaluable window" into human encounters with opaque technologies like AI. This study helps address a gap in understanding by capturing the learner experience and considerations for how AI tools could be designed based on student priorities rather than prescribed. Findings suggest participatory frameworks that recognize student agency are essential if AI is to empower rather than

subjugate diverse knowledge-seekers in an increasingly digitally mediated education landscape.

Ultimately, the promises and threats of AI will be shaped by how intelligently and ethically society chooses to leverage, regulate and relate to thinking machines. This study aims to inform policies and practices that fulfill the potential of AI to augment human intelligence equitably for literacy growth and critical thinking. The shifts uncovered here emphasize the need for continual open dialogue and centering of student voice if emerging technologies are to enhance rather than diminish learning and human development.

However, limited work has deeply captured student interpretations and experiences with AI systems designed explicitly for advancing literacy and critical thinking skills. This study aims to address that gap by examining college students' attitudes towards and perceptions of using AI tools for developing literacy and critical thinking capabilities. It explores how hands-on experience with an AI reading activity influences awareness, interests, concerns and expectations regarding the role of AI in education.

This study specifically examines how college students perceive AI as a tool for building literacy and cognitive skills through analysis of a short story. It addresses the research questions: 1) How do students conceptualize the role of AI in developing critical reading and thinking capabilities? 2) How does direct engagement with an AI learning activity influence their awareness, interests, concerns and expectations?

To explore these questions, 60 college students participated in an interactive classroom session using a mock AI chatbot to generate critical thinking questions in analysis of a short story. Mixed-methods data analysis revealed key themes in how perceptions shifted after this firsthand experience. While interests and openness increased, persisting concerns around ethical AI design were also expressed. Results highlight the pivotal role of co-developing AI responsively with student input and partnership.

RESEARCH METHOD

This study employs a mixed-methods approach combining quantitative surveys and qualitative semi-structured interviews to investigate college students' attitudes towards AI for literacy and critical thinking development. This allows for rich, multi-faceted insights into this complex issue.

Participants will consist of 60 college students purposefully selected from Institut Studi Islam Muhammadiyah Pacitan to represent a variety of disciplines and AI experience.

The participants will first complete a pre-intervention survey measuring their attitudes towards AI in education. The survey, comprising 15 items, will include closed-ended questions that use a 5-point Likert scale to assess their agreement with statements about AI in education (1=strongly disagree, 5=strongly agree). Statements will cover topics such as the potential of AI to enhance student learning and literacy skills, privacy risks from educational AI, and its impact on critical thinking and human judgment.

After completing the pre-intervention survey, participants will individually engage with a conversational AI chatbot designed for literary analysis. The chatbot will facilitate critical thinking about a short story through interactive dialogue, question generation, and adaptive recommendations. This AI-based learning activity will provide students with firsthand experience of relevant AI capabilities.

Following the AI interaction, students will participate in 30-minute semi-structured interviews. The interview protocol consists of open-ended questions that explore students' attitudes and experiences before and after interacting with the AI-based learning activity. The interviews will focus on students' expectations, perceptions of benefits and limitations of AI, and the factors influencing their acceptance of AI in education. All interviews will be recorded, transcribed, and analyzed using thematic coding techniques to identify recurring patterns and themes in students' responses.

By combining the pre-post survey data with the insights gathered from the interviews, this mixed-methods approach aims to provide a comprehensive understanding of how hands-on AI experience shapes students' beliefs and attitudes towards AI in education. Throughout the research process, the study will adhere to validity, confidentiality protections, and ethical guidelines to ensure the integrity and ethical conduct of the study. According to Gibson and Brown (2009), thematic analysis serves as a valuable tool for identifying commonalities, relationships, and differences across a data set. In this case study report, the selection of vignettes and data was based on the presence of similar voices and the connections between participants' responses.

RESULT AND DISCUSSION

The study successfully collected data from 60 college students who participated in the investigation of their attitudes towards using artificial intelligence (AI) for literacy and critical thinking. The study employed a pre- and post-intervention survey design and semi-structured interviews to collect quantitative and qualitative data. The main objective was to measure changes in students' attitudes towards AI for learning after engaging in an AI-based learning

activity.

Pre-Intervention Survey

The following tables present the mean, standard deviation, and mode of the survey responses for each question before the AI-based learning activity. The mean represents the average score of the responses, the standard deviation indicates the level of variability or dispersion in the responses, and the mode represents the most frequent response option chosen by the students.

The pre-intervention survey consisted of 15 items that used 5-point Likert scales to assess students' opinions on various aspects of AI for learning.

Table 1. The pre-intervention survey result

No.	Question	Mean	SD	Mode
1	AI tutors can provide personalized learning experiences similar to human teachers.	3.6	1.30	5
2	AI tools could enhance my critical reading and analysis abilities.	3.05	1.76	5
3	AI-based literacy training would likely be customized to my specific needs and abilities.	4.05	1.19	5
4	AI could provide literacy instruction to more students, especially in remote areas.	3.55	1.50	5
5	I am excited by the potential benefits of AI for enhancing student literacy.	3.65	1.78	5
6	With guidance from instructors, AI tutors could significantly enhance my learning.	3.25	1.69	3
7	I worry AI may breach the privacy of student data.	4.1	1.21	5
8	I worry AI may reproduce harmful biases in interpreting textual meaning.	3.35	1.81	5
9	AI-based writing tools may fail to grasp context, rhetorical style, and richer meanings.	3.65	1.50	5
10	AI writing assistants could perpetuate biases and style/tone conventions without wisdom.	3.80	1.62	5
11	I fear AI may be used coercively rather than empoweringly in education if not developed carefully.	4.25	1.21	5
12	Over-reliance on AI in education could hinder development of independent thinking.	3.75	1.64	5
13	I am skeptical AI can develop the advanced reasoning needed for true critical thinking.	4.05	1.50	5
14	AI lacks the emotional intelligence and wisdom of human teachers.	3.8	1.62	5
15	AI has inherent limitations compared to human cognition and understanding.	3.75	1.64	5

The survey items then were grouped into four themes: perceived benefits, privacy

concerns, critical thinking concerns, and AI limitations. The analysis of the survey responses revealed that students had mixed feelings about the potential benefits and risks of AI for learning.

Students recognized some benefits of using AI for personalized learning (Q1 M=3.6), enhancing their literacy skills (Q2 M=3.05), and reaching more learners who may not have access to quality education (Q4 M=3.55). However, they were not fully convinced that AI tutors could provide effective feedback (Q8,9,10). On the other hand, students expressed strong interest in adaptive literacy training that could customize the difficulty and content of the tasks according to their needs and preferences (Q3 M=4.05). The results in line

Privacy concerns were also prominent among students, who were worried about the security and confidentiality of their personal data when using AI systems (Q7 M=4.1). They were also aware of the possibility of AI bias, such as discrimination or unfairness based on gender, race, or other factors (Q8 M=3.35).

Another theme that emerged from the survey was the fear that AI could be used for harmful purposes, such as controlling or manipulating learners rather than empowering them (Q11 M=4.25). Finally, students expressed doubts about the ability of AI to replace human teachers or to match their cognitive skills. They were concerned that relying too much on AI could undermine their independent thinking skills (Q12 M=3.75) and that AI had inherent limitations compared to human intelligence (Q15 M=3.5). These findings reflect some of the common views and challenges that surround AI in education, as well as in other domains.

AI Learning Activity

After completing the pre-intervention survey, students participated in an AI-based learning activity that involved interacting with a conversational AI chatbot. The chatbot was designed to facilitate literary analysis of a short story by generating customized questions based on the students' responses. The questions aimed to stimulate critical thinking skills such as comprehension, interpretation, evaluation, and reflection. Most students responded positively to the chatbot activity and found it useful for enhancing their critical thinking skills. The chatbot activity was an example of how AI can be used to augment human intelligence rather than replace it. The chatbot did provide answers or solutions to the students, and guided them to think more deeply and critically about the text they read.

Post-Intervention Survey & Interviews

The post-intervention survey consisted of 10 items that repeated some of the questions from the pre-intervention survey to measure changes in students' attitudes towards AI for

learning after the chatbot activity. The survey was followed by semi-structured interviews with 12 randomly selected students to elicit more in-depth feedback on their experience and opinions.

Table 2. The post-intervention survey result

No.	Question	Mean	SD	Mode
1	AI tutors can provide personalized learning experiences similar to human teachers.	4.12	1.17	5
2	AI tools could enhance my critical reading and analysis abilities.	3.85	1.45	5
3	AI-based literacy training would likely be customized to my specific needs and abilities.	4.12	1.17	5
4	AI could provide literacy instruction to more students, especially in remote areas.	4.05	1.30	5
5	I am excited by the potential benefits of AI for enhancing student literacy.	4.10	1.48	5
6	With guidance from instructors, AI tutors could significantly enhance my learning.	3.95	1.60	5
7	I worry AI may breach the privacy of student data.	3.25	1.75	3
8	I worry AI may reproduce harmful biases in interpreting textual meaning.	3.10	1.69	3
9	AI-based writing tools may fail to grasp context, rhetorical style, and richer meanings.	3.65	1.54	5
10	AI writing assistants could perpetuate biases and style/tone conventions without wisdom.	4.00	1.64	5
11	I fear AI may be used coercively rather than empoweringly in education if not developed carefully.	3.55	1.45	5
12	Over-reliance on AI in education could hinder development of independent thinking.	3.60	1.70	5
13	I am skeptical AI can develop the advanced reasoning needed for true critical thinking.	3.85	1.53	5
14	AI lacks the emotional intelligence and wisdom of human teachers.	3.70	1.55	5
15	AI has inherent limitations compared to human cognition and understanding.	3.40	1.69	5

These interview results aim to demonstrate how additional qualitative data can complement the survey findings.

Table 3. The post-intervention interview excerpts

Participant 1	"I've heard about AI being used in various fields, including education, so I was curious about how it would work for learning. The AI tutors were surprisingly helpful, especially with personalized learning. It felt like they understood my learning pace and offered extra practice when needed.

	However, I must admit that at first, I had some concerns about my data privacy. The institution assured us that our data would be secure and anonymized, which eased my worries a bit. Overall, I think AI tools are great for practice and reinforcement, but I still believe that human teachers are crucial for critical thinking. AI can guide us, but real discussions with teachers and peers challenge us intellectually."
Participant 2	"I had some reservations about using AI in education, but I decided to give it a chance. I found that AI can be quite useful, especially for practice exercises and quizzes. However, I don't think AI should have the final say in my educational path. I prefer human teachers who can understand our emotions and engage with us in ways AI can't. While AI can provide support, it shouldn't replace human instruction entirely. We need a human touch for real learning experiences."
Participant 3	"I'm excited about the potential of AI in education. I believe it can revolutionize learning, especially for students like me who come from remote areas with limited resources. However, we must be careful to use AI ethically and avoid bias in the algorithms. Fair treatment and equal opportunities for everyone are essential. I think students should have more say in how AI is used in education. After all, we are the ones experiencing it, and our feedback should matter."
Participant 4	"I had some prior knowledge about AI, so I was open to exploring its role in education. AI can be a valuable tool for practicing critical thinking, but it can't fully replace human discussions. The ability to analyze different perspectives comes from engaging with human teachers and peers. I believe AI should be used responsibly and ethically, without reinforcing existing inequalities. It's essential to educate students about both the benefits and the limitations of AI so that we can use it wisely and ethically in our learning journey."

The analysis of the post-survey and interview data revealed that students became more positive about the potential benefits of AI for learning after interacting with the chatbot. The average agreement level increased that AI could enhance their learning outcomes and literacy skills (M=4.12 vs 3.85 pre-survey). The privacy concerns decreased slightly, although they remained relatively high (M=3.25 vs 3.4 pre-survey). Students expressed greater willingness to use AI responsibly and ethically after experiencing a positive example of an AI-based learning activity. These interview results highlight the nuances and diverse perspectives of college students regarding AI-based learning activities. They echo some of the survey findings, such as the appreciation for personalized learning experiences through AI and concerns about biases and the role of human teachers in education. The interview responses further emphasize the need to involve students in decisions about AI usage and the recognition of AI's supportive role in education rather than complete replacement of human teachers (Chan et al.2023, Guilherme 2019).

CONCLUSION

Together, the quantitative survey analysis and qualitative interview themes provide insights into students' evolving perspectives on educational uses of AI. While the survey illustrated an increase in recognizing AI's benefits post-intervention, concerns persisted both before and after the AI learning activity according to the Likert scale ratings. For instance, perceived benefits for personalized learning increased moderately while worries about privacy risks and AI limitations remained largely unchanged.

Meanwhile, the interview themes help contextualize these survey findings through lived experiences. Students cited factors like prior AI exposure and witnessing benefits first-hand as shaping greater openness and willingness to utilize AI responsibly. However, calls for transparency, accountability, and inclusion in AI decision-making highlight enduring apprehensions around bias and equitable practice.

Taken together, these mixed methods findings indicate that hands-on experience with a thoughtfully implemented educational AI activity may improve perceptions of AI's potential. But earning learner trust remains contingent on addressing ethical considerations through student-centered design and transparent practices. The synthesis suggests while receptiveness is growing, truly empowering learners through AI requires upholding privacy, fairness, and agency.

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