

# Demonstrating AI as Collaborator for Undergrad Thesis Advising: Student Perceptions of AI-Guided Interactions to Enhance Critical Thinking

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学部卒業研究指導における AI の協働者としての実証

—批判的思考力を高めるための AI ガイド付き  
インタラクションに対する学生の認識—

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## Abstract

This study explores the integration of AI tools, specifically ChatGPT, as collaborative partners in undergraduate thesis advising to enhance critical thinking skills. Over an 11-week period, three undergraduate students interested in diverse research topics engaged in structured AI-facilitated interactions while developing their theses. Using researcher-provided prompts, the students conducted dialogues with the AI, maintained interaction journals, and reflected on their experiences. Pre- and post-assessments using the AAC&U VALUE Rubric evaluated their critical thinking skills, complemented by a perception survey adapted from the Technology Acceptance Model (TAM).

The findings revealed students held positive attitudes toward using AI in their academic work, regularly employing AI tools for assignments, idea generation, and understanding complex topics. They expressed strong intentions to continue integrating AI into their studies, citing perceived usefulness and enjoyment. However, the assessments did not show significant improvement in critical thinking skills over the study period, suggesting that merely incorporating AI interactions may not directly

enhance these skills. Factors such as topic familiarity and the study's duration may have influenced the outcomes.

## **Introduction**

This study investigated the impact of structured AI-facilitated interactions on critical thinking among three undergraduate thesis writers over an 11-week period. The findings from a perception survey showed the students had positive attitudes towards using AI in their academic work. They reported regularly using AI tools for tasks, such as assisting with assignments, brainstorming ideas, understanding complex topics, and satisfying curiosity. The students expressed strong intentions to continue using AI in their studies, highlighting its perceived usefulness (PU) and enjoyment, which aligns with the Technology Acceptance Model (TAM) constructs adopted from Güner et al. (2024). However, the responses also emphasize the need for proper guidance and instruction to ensure that students can effectively and responsibly integrate AI into their learning processes while being aware of the potential drawbacks and concerns associated with AI use in education.

Pre- and post-assessments using the AAC&U VALUE Rubric did not show significant improvement in critical thinking skills over the 11-week period. The initial assessments were slightly better overall. This could be due to factors such as the students' familiarity with the topic and the short duration of the study, which may not have been enough to observe measurable changes in critical thinking skills. Moreover, the prompts for AI interaction journals need to be improved to better foster critical thinking skills in the students.

Additionally, to maximize the benefits of AI tools in education, it is essential to provide students with guidance on effective AI use. Educators should focus on developing students' abilities to critically assess AI-generated information, encouraging them to question assumptions, evaluate evidence, and synthesize insights meaningfully. Incorporating activities that require students to reflect on their interactions with AI, challenge AI responses, and consider alternative perspectives could foster deeper engagement and critical analysis. Educators should also be mindful of the potential for over-reliance on AI and strive to balance the use of technology with the development of independent thinking skills.

## **Literature Review**

I let my seminar students choose their own topics of study. In more cases than

not, I discover something that can improve my students or myself. This is the case in my student wishing to research metacognition and discussion. This led to an article by Maeda on the pedagogical philosophy of Paulo Freire. Maeda indicates that “true dialogue is not about being obedient to the other person’s words, but it should include critical thinking and be accompanied by actions to transform reality” (2024, p. 29). Notions of reality being warped by dialogue is beyond the scope of this paper. The relevant part of that student’s research, and this paper is being critical in our understanding of our partner’s words. This led me to the source of that quote, Paulo Freire who posits that “dialogue, which requires critical thinking, is also capable of generating critical thinking. Without dialogue there is no communication, and without communication there can be no true education” (Freire, 2018, pp. 92–93). Correct dialogue fosters critical thinking. This led to the potential of AI-guided interactions to enhance critical thinking for undergraduate thesis writers. Since I am not an expert in the fields that my students wish to research, the use of AI as a “discussion” partner is appealing. Tada expands on the idea of discussions as something to be created in tandem. He uses the term Co-creative Dialogue which he states “the purpose of dialogue lies in reaching heights that one could not have achieved alone through the continuation of such interactions. Co-creative dialogue emphasizes and develops the idea of diverse people sharing their wisdom and reaching new intellectual worlds together” (Tada, 2013, p. 215). This is the ideal goal of dialogue. And Tada give guidelines for a teacher’s mindset in entering such an interaction with a student, which includes encouragement, patience and giving “advice to encourage re-investigation, re-examination, and re-consideration, which learners may not easily become aware of” (Tada, 2013, p. 216). In the past, I would read articles with students and guide to some extent, but always felt inadequate because of my lack of background knowledge on a topic. Beyond my anecdotal thesis advising, students will always outnumber teachers. Baskara paraphrases Veenman et al. and Bax to agree that AI can help overcome these challenges. “In traditional settings, providing individualised metacognitive guidance is often limited by time and resource constraints. The AI-driven approach allows for continuous, personalised metacognitive support for many learners simultaneously, potentially democratising access to high-quality language education” (Baskara, 2024, p. 146). Two facts that lead me to give AI a larger role in the collaborative teaching of students.

However, I wished to better understand how my student perceived AI to allow me to better use AI tools like ChatGPT as co-creative collaborator. This could also help

me establish best practices for its proper adoption. Güner et al. had already created and conducted a survey that I could adapt to my research. They used the Technology Acceptance Model (TAM) “to identify how students’ attitudes and behavioral intentions were influenced by several external variables (perceived enjoyment, personal innovativeness, internet privacy concerns, and social influence)” (Güner et al., 2024, p. 387). Thus, I had an ideal instrument for understanding my students’ attitudes toward using AI in such a capacity.

## **Methods**

### **Participants**

The study involved three undergraduate students, who were in the process of writing their graduation theses at a Japanese university. The three students have a diverse range of research interests and academic backgrounds within the humanities and social sciences. Participation was voluntary, and all students provided informed consent prior to the commencement of the study.

### **Research Design**

A mixed-methods research design was employed to investigate whether structured prompts for AI-facilitated interactions could enhance students’ critical thinking. The study spanned 11 weeks, wherein students maintained ongoing AI interaction journals. I administered a pre-assessment to check the students’ critical thinking skills. The 11-week period is about the first fourth of the students’ research process. Besides reviewing student journal entries, I checked the students’ progress and perceptions with a post-assessment and perception survey. The pre- and post-assessments were preceded by a 10-minute discussion period with a similar task to acclimate the students to the assessment format. I graded the students’ results with the AAC&U VALUE Rubric.

### **AI Interaction with Structured Prompts**

Throughout the 11-week intervention period, students engaged in regular interactions with an AI language model (ChatGPT, NotebookLM, Perplexity, etc.) using researcher-provided prompts. These prompts guided the students in exploring their thesis topics more deeply, encouraging reflection, questioning, and critical analysis.

**Students were instructed to:**

1. Start an interaction with the AI using the prompt.
2. Engage in a dialogue, primarily in English, to encourage language practice.
3. Use additional prompt tools if needed to clarify concepts or vocabulary.
4. Record the entire interaction and paste it into their AI interaction journal.
5. Request a summary of the interaction from the AI and include it in the journal.
6. Reflect on the interaction by answering specific closing questions provided.
7. Submit their journal entries for review.

**Perception Survey**

Students completed a survey containing both closed-ended and open-ended questions to capture their perceptions of the AI interaction. I adapted the survey to evaluate the students' perceived impact on critical thinking skills based on research by Güner et al. mentioned in the literature review section. I used a 6-point Likert scale based on my previous experience with Japanese students predominantly choosing the middle choice on a 5-point scale. The scale ran as such: Strongly Disagree, Disagree, Slightly Disagree, Slightly Agree, Agree, Strongly Agree. Thus, students are forced to choose one side or the other. In the average class, there are still students who select one of the "slightly" options. However, I can better understand their tendencies based on the 6-point scale.

**Data Collection**

The primary data sources were the AI interaction journals maintained by each student, containing the prompts used, full transcripts of AI interactions, AI-generated summaries, and student reflections. Pre- and post-assessments evaluated skills such as critical analysis, argument development, and the ability to identify opposing viewpoints. The perception survey collected both quantitative ratings and qualitative comments on the students' experiences.

**Results****Survey**

Using the Technology Acceptance Model from the research by Güner et al. to understand to what extent university students accepted ChatGPT, I conducted a survey at the end of the 11-week period. One student, the most AI friendly, who often referred to ChatGPT as a "best friend," was absent. Thus, only two of the students

took the survey. However, they are possibly more representative of the average student regarding AI adoption. I first wished to find how experienced they were with AI tools. They revealed that they regularly use AI tools as part of their learning—specifically, they indicated they used AI to assist with assignments, brainstorm ideas, understand complex topics, and satisfy curiosity. In an open-ended question asking them to describe how they used AI one wrote they use it to summarize meanings and examples of new English words and phrases, while the other wrote they use AI to broaden perspectives by sharing opinions on varied topics with AI to get feedback and find other opinions.

The next, and longest, section of the survey was the 6-point Likert scale. These two students choose the “slight” choice approximately 20% of the time (11/52) and one student had the majority with 9 of the 11 “slight” responses. This indicates a stronger feeling of agreement or disagreement. The “slight” responses are noted below in each category.

Again, I phrased most of the TAM questions to address critical thinking skills. Regarding Perceived Usefulness (PU), Perceived Ease of Use (PEU) and Attitude Toward Using AI (ATU) with one exception, they either agreed or strongly agreed. The exception being that both students choose “slightly agree” in response to “learning to use AI tools is easy for me.” Perhaps better instruction is needed if we are to expect students to use AI.

They strongly agree on their intention to use AI in their education and are eager to explore more ways to use AI regularly to improve their analytical skills. However, they split between strongly agree and agree regarding planning to use AI in study routines. Despite this one small variation, these two students strongly lean toward using AI.

The largest variation in responses between the two students was in their reaction to the emotions felt when using AI. Most of the “slightly” responses by the student skewing toward slightly are in this category. Although the students’ responses differed in degree, they are on the same side of the scale in all cases—agreeing that their interactions evoked positive emotions, and disagreeing that they induced negative emotions.

The students find using AI tools enjoyable and agree that AI makes learning more fun, which connects well with their openness to trying new technologies and experimenting with AI in their studies.

Neither student express concerns about data privacy with AI tools. And the only

time the students come down on opposite sides of the Likert scale is in response to the question, "I worry that information I provide to AI tools could be misused."

And, again, the slight-skewing student felt much less pulled by social influences. Yet, as in all but one question, they both answered on the same side of the scale, agreeing that friends and teachers encourage AI use. As in all research, hindsight is 20-20, I wish I would have distinguished between all teachers and myself in so far as I am pushing the students to use AI in weekly journaling sessions.

The final three questions of the survey were open-ended. I found that one student thinks AI can provide ideas to enhance thinking skills but worry about over-reliance, while the other sees AI as a positive "treasure trove of knowledge" linked to skill improvement.

When asked to write about the merits and demerits of AI in education, both recognize advantages like increased learning progress and access to desired information, but note potential drawbacks, such as misuse impacting thinking skills and uncertainty about AI's ability to give correct answers.

And, lastly, their concerns were how difficult it can be to judge proper AI use and accuracy, worries about getting overly absorbed, and concerns about AI's future evolution potentially surpassing humans.

Despite the limited sample size of two students, the responses are insightful. The students express strong intentions to incorporate AI into their education and are eager to explore more ways to regularly use AI to improve their analytical skills. However, the survey also highlights the need for better instruction on AI tools to ensure that students can effectively use them in their studies. The emotional responses to AI use varied between the two students, but both agreed that their interactions evoked positive emotions and disagreed that AI induced negative emotions.

The survey reveals the students find using AI tools enjoyable and agree that AI makes learning more fun. This positive sentiment aligns with their openness to trying new technologies and experimenting with AI in their studies. Although the students express minimal concerns about data privacy, they acknowledge the potential for misuse of information provided to AI tools.

The open-ended responses provide further insight into the students' perceptions of AI in education. While they recognize the advantages of AI, such as enhanced thinking skills, increased learning progress, and access to information, they also express concerns about over-reliance on AI, the difficulty in judging proper AI use and accuracy, and the potential for AI to surpass human capabilities in the future.

Additional proof of the students' positive perception of using AI is observational. Over the 11 weeks, the average number of pages of output in the AI interaction journals was eight pages per entry. Roughly 70% of the material was produced by AI. However, students proved their engaging with the materials by requesting clarifications or general questions about the AI output. Some of the AI-interaction sessions were done in the classroom. Often the students would marvel at how much better they could understand a concept, or how the interaction had given them a new point of view. And, they remained engaged throughout the session.

### **AAC&U VALUE Rubric Grades**

Surprisingly, for both students, the first attempts are slightly better overall. The students' responses are clearer and more directly address the questions with fewer grammatical issues, making their ideas easier to understand. They demonstrate a marginally better grasp of the issues and provide more relevant evidence relating to the impact of technology on personal interactions. I think that this could be due in part to the students' prior knowledge. The first attempt was about smartphones and computers, and the students focused much more on smartphones, an object they are quite familiar with. The second attempt was about online learning. These students had limited experience with online classes due to CoVid several years prior, but their exposure is limited compared to smartphones. I plan to have more attempts to follow up to see if student can improve at providing more detailed explanations, deeper analysis of context and assumptions, and more thoroughly supported positions. I will use this goal to create the journal prompts in the future and devise more explicit instruction on how to critically engage with AI outputs because I fear students may accept information without sufficient analysis or questioning.

### **Last Word for Now**

Integrating AI tools like ChatGPT into educational settings presents a significant opportunity to enhance students' critical thinking and analytical skills, particularly for undergraduate thesis writers. This study explored the effects of structured AI-facilitated interactions on three undergraduate students over an 11-week period, aiming to understand how such interactions could contribute to the development of critical thinking.

The findings from the perception survey indicate that the students hold positive attitudes toward using AI in their academic pursuits. Both students who completed



the survey reported regular use of AI tools for assisting with assignments, brainstorming ideas, understanding complex topics, and satisfying curiosity. They expressed strong intentions to continue incorporating AI into their studies, highlighting the perceived usefulness (PU) and enjoyment derived from these tools. The students agree AI enhances their learning effectiveness and makes learning more engaging and fun, aligning with the constructs of the Technology Acceptance Model (TAM) adopted from Güner et al. (2024).

The results of the pre- and post-assessments using the AAC&U VALUE Rubric revealed no significant improvement in critical thinking skills over the 11-week period. In fact, the initial assessments were slightly better overall. This could be attributed to several factors. First, the familiarity with the topic plays a crucial role; the students performed better when discussing smartphones—a subject they are intimately familiar with—compared to online learning, with which they have limited experience. Second, the relatively short duration of the study may not have been sufficient to observe measurable changes in critical thinking skills. Critical thinking is a complex skill set that develops over time with sustained practice and guidance. Thus, it would appear I need to improve on the prompts for AI interaction journals to foster critical thinking skills among the students.

This study underscores both the potential and the difficulties of integrating AI tools such as ChatGPT into undergraduate education. While students are enthusiastic about using AI and recognize its potential to enhance learning, there is a need for deliberate instructional strategies to ensure that AI use contributes to the development of critical thinking skills. Future research should consider longer-term studies with larger and more diverse student populations to acquire a deeper understanding of how AI-facilitated interactions influence critical thinking. Exploring specific pedagogical approaches that effectively integrate AI while promoting critical engagement will be crucial in harnessing the full potential of AI in education.

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