

Charting the Digital Discourse: Understanding the Research and Instructional Value of Discursive Exchanges with AI

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Introduction

The integration of digital technologies is revolutionizing the instructional and research landscapes.

We have unprecedented opportunities for collaboration and intellectual inquiry.

Generative AI offers an additional tool to help with instruction, research, collaboration, and inquiry, especially with respect to an understudied area of science and scholarship:

problem-finding (especially for *ill-defined* problems)

Motivation

Why is a focus on **problem-finding** important?

Whole disciplines are dedicated to *problem-solving* but part of getting an education and part of being a great researcher is being able to ask **good questions**.

The role of outstanding scientists in influencing younger associates is repeatedly emphasized in the interviews with [Nobel] laureates. Almost invariably they lay great emphasis on the importance of *problem-finding*, not only problem-solving (Merton, 1968/1973, p. 453).

Merton, Robert K. (1968/1973). The Matthew Effect in Science. In N. W. Storer (Ed.), *The Sociology of Science: Theoretical and Empirical Investigations* (pp. 439–459). University of Chicago Press.

Motivation

Why is a focus on **problem-finding** important?

The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill (Einstein & Infeld, 1938, p. 92, as cited in Abdulla & Cramond, 2018, p. 198).

And:

Despite its theoretical and practical importance, it is surprising that PF [problem-finding] has received little attention ... (Abdull & Cramond, 2018, p. 200).

Abdulla, A. M., & Cramond, B. (2018). The creative problem finding hierarchy: A suggested model for understanding problem finding. *creativity. Theories – Research - Applications*, 5(2), 197–229. <https://doi.org/10.1515/ctra-2018-0019>

Einstein, A., & Infeld, L. (1938). *The evolution of physics*. New York: Simon & Schuster.

Discursive

Generative AI, as a **chat bot**, offers a way to develop problem-finding methodologies using discursive reasoning.

I define and use the term *discursive* in two ways:

- In education: types of teaching methods that involve **dialogue, discussion, or other forms of discourse** to facilitate learning
- In philosophy: a type of **reasoning** that proceeds through **argumentation and debate**
 - e.g., Socratic method

Socratic method: Problem-finding

For example, through dialogue, discussion, argumentation, and debate, the Socratic method can be used to:

- Identify assumptions
- Raise question
- Explore alternatives
- Refine a problem
- Expose contradictions
- Engage in collective inquiry
- Reach a conclusion or identify further questions

Motivation

But what's the problem I am responding to?

Instructor: Ask ChatGPT how to think about X problem.

Student asks one question and then stops.

Discursive, Learning, and Problem-Finding

Why discursive?

- To promote independent learning and exploration. To learn how to ask **good questions** through dialogue, discussion, argumentation, and debate.
- Generative AI chat bots are *chat* (conversation) centered.

Discursive, Learning, and Problem-Finding

Why discursive?

- Student led discursive practices may foster independent, critical thinkers

To the extent that knowledge acquisition and academic performance are the goals, teacher-controlled methods of students' active learning are superior—especially for younger students and in well-structured subject domains. In contrast, if the goal is to help students to “learn to become **independent thinkers and learners** rather than simply become able to perform basic computations and retrieve simple knowledge and facts” [...], then methods in which **students have opportunities to learn more independently, to identify, define, and solve problems in different ways**, and to use acquired insights to overcome other tasks are more likely to be successful (Weinert & Helmke, 1995, p. 141).

Weinert, F., & Helmke, A. (1995). Learning from wise Mother Nature or Big Brother Instructor: The wrong choice as seen from an educational perspective. *Educational Psychologist*, 30. doi: https://doi.org/10.1207/S15326985EP3003_4

Problem-Finding

- Because problem-finding is important to learning and to science,
- Because discursive practices help us problem-find,
- Because generative AI can be used as a discursive agent (i.e., chat bot),
- Then we have the opportunity to develop methodologies to using generative AI as a *problem-finding* tool.

As an example, I used ChatGPT to problem-find a framework for problem-finding.

Let's begin.

ChatGPT: Articulating a Problem

Interactions with ChatGPT have been abbreviated.

I asked: What are some approaches to articulating a problem that can be applied in instruction and research?

- Curiosity-driven research
- Gap in existing knowledge
- Applied needs
- Interdisciplinary approaches
- Funding and resources
- Social and ethical concerns
- Technological advances
- Peer and mentor suggestions
- Policy and regulation
- Competitive edge
- Personal interest or experience

ChatGPT: Narrowing to a Research Question

I followed up with: What are some approaches to refining a research question?

- Consultation and feedback
- PICO(T) framework
- The ‘So what?’ test
- The FINER Criteria
- The ‘Vice’ criteria
- The ‘Smart’ criteria
- Iterative refinement
- Gap analysis
- Interdisciplinary collaboration
- Hypothesis-driven
- Data driven
- Ethical considerations
- Real-world applicability
- Pilot studies

ChatGPT: Consultation and Feedback Approach

I focused on one answer: How might **consultation and feedback** help refine a research question?

- Feedback from experts
- Mentorship and advising
- Interdisciplinary collaboration
- Workshops and seminars

- Pilot testing
- Iterative process
- Ethical review
- Public or stakeholder input
- Online forums and social media

ChatGPT: Engagement

I asked for more refinement: What are methods and strategies to maximize the effectiveness of a conversation or brainstorming session to refine a research question?

- Preparation
 1. Background research
 2. Agenda
- Structure
 1. Time management
 2. Moderator
- Inclusivity
 1. Diverse perspectives
 2. Equal participation
- Techniques
 1. SWOT analysis
 2. Mind mapping
 3. Probing questions

ChatGPT: Engagement (cont.)

- Documentation
 1. Real-time notes
 2. Whiteboard or digital tools
- Critical thinking
 1. Devil's advocate
 2. Ranking and voting
- Ethical and practical considerations
 1. Ethical review
 2. Feasibility check
- Follow-up
 1. Action items
 2. Feedback loop
- Reflection
 1. Meeting Summary

ChatGPT: Develop a Framework Based on Prior Response

Based on the prior responses, I asked ChatGPT to develop a framework and to present it in tabular form.

ChatGPT: Develop a Framework Based on Prior Response

Phase	Strategy	How to Engage Generative AI (e.g., ChatGPT)
Preparation	Background Research Agenda	<ul style="list-style-type: none"> • Feed the AI summaries or key points from existing literature to set the context. • Clearly state your objectives for the AI session.
Structure	Time Management Moderator	<ul style="list-style-type: none"> • Decide in advance how long you'll engage with the AI and what topics you'll cover. • You'll act as the moderator, guiding the AI through the discussion topics you've outlined.
Inclusivity	Diverse Perspectives Equal Participation	<ul style="list-style-type: none"> • While AI doesn't offer diverse "personal" perspectives, it can generate a range of ideas based on its training data. • Ensure that all generated ideas are considered.
Techniques	SWOT Analysis Mind Mapping Probing Questions	<ul style="list-style-type: none"> • Ask the AI to list potential Strengths, Weaknesses, Opportunities, and Threats for your initial research question. • Use the AI to generate related terms or questions, which you can then organize into a mind map. • Use the AI to generate probing questions that could help refine your research question further.
Documentation	Real-time Notes Whiteboard or Digital Tools	<ul style="list-style-type: none"> • Keep a record of the AI's suggestions and your own thoughts as you go along. • Copy and paste the AI's suggestions into a digital whiteboard or note-taking app.

Phase	Strategy	How to Engage Generative AI (e.g., ChatGPT)
Critical Thinking	Devil's Advocate Ranking and Voting	<ul style="list-style-type: none"> • Ask the AI to generate counterarguments or criticisms of your initial research question. • Ask the AI to generate a list of refined questions, which you can then rank or vote on yourself or with your team.
Ethical and Practical Considerations	Ethical Review Feasibility Check	<ul style="list-style-type: none"> • While the AI may not provide ethical guidance, it can generate a list of ethical considerations you should be aware of. • Ask the AI for potential challenges or limitations related to your research question.
Follow-up	Action Items Feedback Loop	<ul style="list-style-type: none"> • Use the AI to help list next steps based on the discussion. • Return to the AI for additional sessions as you refine your question further.
Reflection	Meeting Summary	<ul style="list-style-type: none"> • After the session, review the AI-generated content and your own notes to create a summary.

ChatGPT: Create the Study

I asked ChatGPT to write up a description of a study that could test how the framework works as a problem-finding strategy.

Study Title

“AI-Enabled Discursive Exchanges and Their Influence on Research Conceptualization, Methodology, and Epistemic Limitations in Undergraduate STEM Research”

Objectives

1. To investigate how AI-enabled discursive exchanges influence the conceptualization and elaboration of research topics.
2. To identify patterns in these discussions that can be harnessed to refine research methodologies.
3. To explore the limitations and challenges posed by such interactions, especially concerning the epistemic nature of AI.

ChatGPT: Create the Study

Participants

Undergraduate students enrolled in STEM programs.

Methodology

Phase 1: Preparation

- **Background Research:** Students will be provided with literature on AI-enabled research methodologies and discursive exchanges.
- **Agenda:** An introductory workshop will set the objectives and agenda for the study.

Phase 2: Structure

- **Time Management:** The study will span one semester, with bi-weekly check-ins.
- **Moderator:** A research assistant will guide the AI sessions and discussions.

ChatGPT: Create the Study

Phase 3: Inclusivity

- **Diverse Perspectives:** Students from various STEM disciplines will be included.
- **Equal Participation:** All students will be encouraged to engage equally with the AI and in group discussions.

Phase 4: Techniques

- **SWOT Analysis:** Students will perform a SWOT analysis on their initial research questions using AI.
- **Mind Mapping:** AI will assist in generating mind maps for each research topic.
- **Probing Questions:** AI will generate probing questions to help students refine their research questions.

ChatGPT: Create the Study

Phase 5: Documentation

- **Real-time Notes:** A research assistant will document all AI sessions and discussions.
- **Whiteboard or Digital Tools:** Students will use digital tools to jot down AI-generated ideas.

Phase 6: Critical Thinking

- **Devil's Advocate:** AI will generate counterarguments to challenge the students' research questions.
- **Ranking and Voting:** Students will rank AI-generated refined questions to identify the most promising ones.

ChatGPT: Create the Study

Phase 7: Ethical and Practical Considerations

- **Ethical Review:** An ethics board will review the study design.
- **Feasibility Check:** Students will assess the feasibility of their refined research questions.

Phase 8: Follow-up

- **Action Items:** Students will list next steps based on their discussions with AI.
- **Feedback Loop:** Students will have the option for additional AI sessions to refine their questions further.

Phase 9: Reflection

- **Meeting Summary:** Students will submit a summary report of their experience and findings.

ChatGPT: Create the Study

Data Collection and Analysis

- Transcripts of AI sessions
- Student reports and mind maps
- Bi-weekly check-in notes
- Final summary reports

Expected Outcomes

- A better understanding of how AI can influence research conceptualization and methodology.
- Identification of patterns that can be harnessed for research refinement.
- Insight into the limitations and challenges posed by AI-enabled discursive exchanges.

ChatGPT: Conclusion

Finally, I asked ChatGPT to summarize and provide some key takeaways from our session:

Key Takeaways

- **Interdisciplinary Approach:** Combining human expertise with AI can lead to more refined and impactful research questions.
- **Methodological Innovation:** AI can be a valuable tool in modern research methodology, aiding in everything from idea generation to feasibility checks.
- **Ethical and Epistemic Considerations:** While AI offers many advantages, it's crucial to consider its limitations, especially concerning ethical and epistemic aspects.

Conclusion: Problem-Finding

- Because problem-finding is important to learning and to science,
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