

Designing With ChatGPT: A Critical Conversation

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In recent years there has been an explosion of mathematics software supported by artificial intelligence that has supported the ways students think about mathematics. With the advent of generative AI (ChatGPT, NotebookLM, Gemini, etc.), the use of AI has steadily grown among the student population. This creates the demand to both understand the use and capabilities of AI by mathematics educators and how it can be leveraged for teaching (Frieder et al., 2023; Hodge-Zickerman & York, 2024; Sapkota & Bondurant, 2024; Wardat et al., 2023). Generative AI can take on several different supporting roles (Eager & Brunton, 2023; UNESCO, 2023) including being a creative engine, personal tutor, conversational buddy, etc. We approach the use of generative AI from the perspective of task design for an undergraduate mathematics educator. In this work we will address the research question: What are the affordances and constraints of the use of AI for undergraduate mathematics task design? We will be focusing on the capabilities of AI to provide background research for task design, generate code for use in task design, provide contexts for task generation, and create entire tasks and task sequences from user prompting.

For this research, we plan on doing a self-study approach (LaBoskey, 2004) – a qualitative approach of practice, analysis, and critical conversations – to reflect upon our designing and supporting the design of tasks for undergraduate mathematics students. Both authors are experienced task designers in undergraduate mathematics education, often make use of technology in task design, and have published work on the task design. For this analysis, each of us used ChatGPT in different ways to aid in the design of tasks. We shared our dialogues with ChatGPT, read through the dialogues, and then had critical friend conversations for each dialogue about how we used ChatGPT for different stages in task design. These conversations centered on the affordances and constraints of using ChatGPT for task design, the role of the task designer in the conversation, and the possible implications/uses for undergraduates using ChatGPT in a mathematics classroom. The transcripts of these conversations were transcribed, and we will present our initial analysis of these conversations on the poster.

The four dialogues that serve as a basis for this research include topics the following topics:

- Prompting ChatGPT to explore the mathematics behind the single value decomposition and related applications to data science from a mathematical source.
- Using ChatGPT to develop coding for Python and Matlab to illustrate different calculations in linear algebra.
- Exploring the use of ChatGPT to synthesize different frameworks for task design, modify the framework according for specific considerations of the instructor, and generate tasks using the modified framework.
- Generating realistic starting points for advanced mathematical topics such as Lie groups that can be leveraged for task design.

We will build on this work by examining the intricacies of task design more broadly, and particularly how technology and AI can be effectively integrated with current task design best practices.

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