Chapter 11
Mathematics Teaching and Assessment in the Age of Generative AI

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ABSTRACT

The advent of generative AI technologies has presented both opportunities and challenges for teaching and assessing mathematics. While there have been several studies that broadly address AI uses in education, few however have examined context specific uses of AI such as ChatGPT in mathematics. This study examined preservice teachers' experiences with using generative AI tools in solving mathematics problems. With students increasingly turning to generative AI tools to aid them in completing assignments, the study also presents a mathematics instructor own experiences with AI in mathematics as he looked to re-imagine teaching and assessment in this environment. Findings indicated that the preservice teachers recognize the potential of AI however they were uncertain on how to integrate it into their teaching of mathematics. Based on these experiences, recommendations for changes needed in assessment of mathematics learning are provided.

INTRODUCTION

Mathematics education today is influenced by several factors that are changing the aims and thereby what math educators consider the goals of mathematical understanding and consequently the assessment of students' learning. One major influence has been advances in and accessibility of technology especially artificial

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intelligence (AI). The rapid and profound permeation of artificial intelligence technology into all aspects of modern society has led to several significant developments in its widespread adoption and use including in the education field. The advent of generative AI technologies such as ChatGPT, have presented both opportunities and challenges for teaching, learning and assessing mathematics. Several researchers have noted that artificial intelligence (AI) technologies have played an important role in improving learning, teaching, assessment, and educational administration (Chen et al., 2020; Zhang & Aslan, 2021; Chiu et al., 2023). However, while the advent of these generative AI tools has been accompanied by several research projects, there is little discussion of the methods used to assess teaching and learning when teaching and learning in this environment.

This study examined generative AI use in mathematics teaching and assessment. Specifically, the researcher examined preservice teachers' perspectives and experiences with using AI with goal of providing feedback to the instructor on what the capabilities of AI are, while at the same time helping students gain first-hand knowledge of using AI tools within the context of mathematics. Like with any technology, by providing teachers with exposure to the use of AI early in their program, they will be more likely to see its usefulness and relevance. Further, understanding students' experiences and beliefs helps educators understand how teaching and assessment will need to change in response to generative AI. This study also describes a math faculty experiences with AI in mathematics as he mulled with how to rethink assessment of student learning in this environment. As noted by Bower (2023) the ability of ChatGPT and similar generative AI tools to provide students and teachers with often high-quality responses to a wide range of common educational tasks raises fundamental questions about what educators should be teaching and how students should be assessed. Thus, with students increasingly using generative AI tools to aid them in completing tasks, it is essential that AI educators begin to reimagine teaching and assessment in this context.

There have been several studies that broadly address AI uses in education, but few have examined teachers' perceptions and experiences in a context specific area such as mathematics. This study therefore adds to this research literature. The study is important in that for teachers to be able to incorporate technology effectively into their teaching, they first need to understand its value and its potential to enhance learning. Further faculty own experiences with generative AI are also important as this is key to learning how teacher educators can help their pre-service teachers use AI effectively in their future mathematics classrooms.