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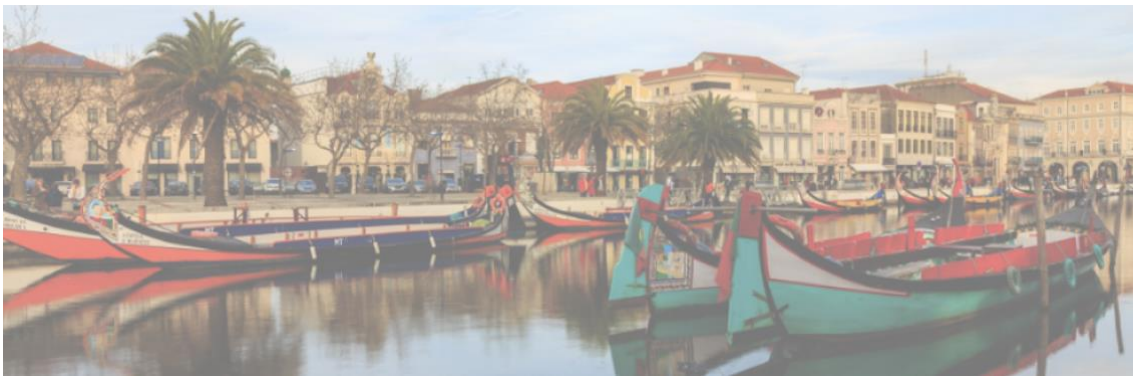
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Exploring Pre-service Mathematics Teachers' Perceptions of Generative AI in Mathematics Education: A Pilot Study

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Abstract

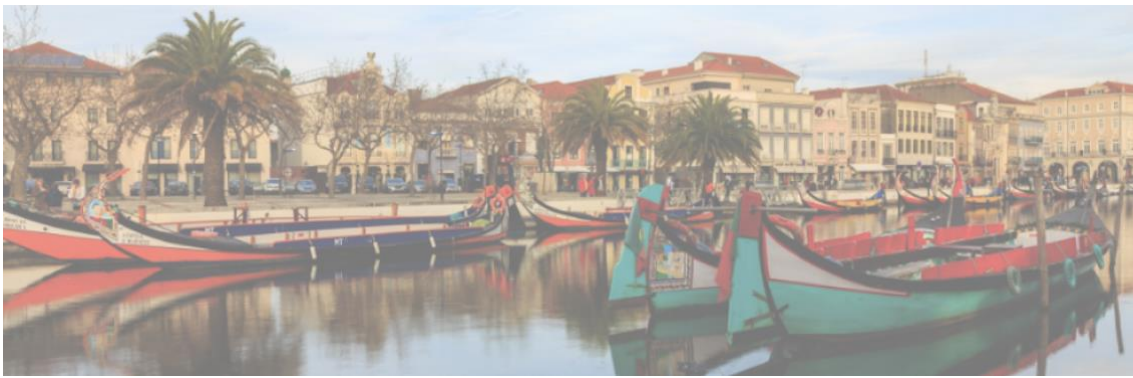
In contemporary education, the landscape is being reshaped by the rapid evolution of technology, with generative Artificial Intelligence (genAI) emerging as a promising tool to revolutionize teaching and learning experiences. Within this context, our study delves into the integration of genAI, specifically focusing on ChatGPT, within mathematics education. We aim to explore the perceptions of pre-service mathematics teachers regarding the relevance and challenges associated with incorporating generative AI into the design and implementation of teaching activities. The research question we attempt to answer in our study is: to what extent pre-service mathematics teachers perceive generative AI as relevant to design and implement teaching activities?

Central to our investigation is the framework of Instrumental Approach (Trouche, 2005), which frames the process by which individuals acquire proficiency in utilizing a new tool to accomplish tasks effectively. Drawing upon the theoretical underpinning of the Knowledge for Teaching Mathematics with Technology (KTMT) model (Rocha, 2020), we delve into the intricate interplay between pre-service teachers' knowledge and their engagement with ChatGPT, examining how this interaction shapes their perceptions of its potential utility in educational contexts.

To elucidate these dynamics, we conducted a pilot study involving seven pre-service mathematics teachers. They were tasked with envisioning potential applications of ChatGPT in teaching mathematics to an 8th-grade class. Through a qualitative and interpretative methodology, which included audio recording and direct observation, we closely examined the initial interactions and discussions of the participants as they engaged with the technology.

Our findings reveal a multifaceted landscape characterized by both promise and challenge. While pre-service teachers recognized the potential of ChatGPT to enhance teaching practices, they encountered significant hurdles in navigating its complexities and leveraging its capabilities effectively. Struggling to reconcile the gap between theoretical knowledge and practical application, participants faced difficulties in developing a robust instrumental genesis with the technology.

Moreover, our analysis underscores the critical role of targeted professional development in equipping pre-service



teachers with the requisite skills and knowledge to harness the transformative potential of generative AI in mathematics education. By fostering a deeper understanding of the technology and its applications, educators can empower future teachers to navigate the evolving landscape of educational technology adeptly.

In conclusion, although some studies (see, for example: Barana, et al., 2023; Blake, 2024; Capone and Faggiano, to appear) show worthwhile results, our study offers valuable insights into the complexities surrounding the integration of generative AI in mathematics education from the perspective of pre-service teachers. By elucidating the challenges and opportunities inherent in this endeavor, we attempt to provide a foundation for future research and underscore the importance of continuous professional development in preparing educators to embrace the potential of emerging technologies in education.

Keywords: Generative Artificial Intelligence; instrumental genesis; KTMT; mathematics.

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