Chapter 12
Effective Strategies for Teaching Mathematics in Virtual Higher Education Environments

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ABSTRACT

This chapter provides a comprehensive guide for higher education instructors on effective strategies for teaching mathematics in virtual environments. As the shift to online education accelerates, particularly after the COVID-19 pandemic, educators must adopt evidence-based methods to enhance student learning. The chapter explores key principles of instructional design tailored for online mathematics, focusing on creating interactive and personalized learning experiences. Strategies for fostering student engagement, leveraging educational technologies, and promoting self-regulation are discussed. Additionally, the chapter highlights the importance of formative assessment in virtual settings, emphasizing methods that provide constructive feedback and opportunities for self-assessment. By addressing the challenges and opportunities of online mathematics education, this chapter aims to equip educators with the tools needed to optimize teaching and learning in the digital age.

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1. INTRODUCTİON

Purpose of the Chapter

The main objective of this chapter is to offer a comprehensive framework for mathematics instructors in higher education, focusing on the unique demands of teaching in virtual environments. As remote and online education continue to grow, particularly in the aftermath of the COVID-19 pandemic (Estrada-Araoz et al., 2020), it is essential for educators to apply strategies specifically designed to address the complexities of mathematics instruction. Unlike other subjects, mathematics requires specialized approaches to support students' understanding of abstract and often visually complex concepts (Artigue, 2007; Felmer, Perdomo-Díaz, & Reyes, 2019).

This chapter, therefore, seeks to explore best practices and innovative methods that enhance student engagement and promote active learning in virtual mathematics settings. To effectively support this process, the chapter will discuss the use of technological tools tailored to mathematics, such as augmented reality (Tout, 2020) and interactive platforms (García et al., 2020), as well as approaches to fostering mathematical competencies for interpreting data, which has become especially relevant in a global context marked by increased reliance on statistics (Aguilar & Castañeda, 2021; Gal & Geiger, 2022).

Moreover, the chapter will consider psychological factors impacting students' learning experiences, such as stereotype threat and self-efficacy. These elements significantly influence students' attitudes towards mathematics and their overall performance, particularly in an online context where self-perception and confidence play vital roles (Auzmendi, 1992; Huda, Wahyuni, & Fauziyah, 2021). Addressing these psychological dimensions, as well as practical instructional strategies, this chapter aims to equip math educators with insights and tools for creating effective, inclusive, and resilient virtual learning environments.

Importance of Teaching Mathematics in Virtual Environments

Teaching mathematics in virtual environments has become increasingly significant, driven by advancements in educational technology and a rapid shift to online learning models following the COVID-19 pandemic (Estrada-Araoz et al., 2020). Mathematics, as a discipline that demands both abstract reasoning and hands-on interaction with concepts, presents unique challenges in the online setting. Unlike other subjects, mathematics often requires specialized approaches to foster deep conceptual understanding and to mitigate issues such as math anxiety and stereo-