

# Chapter 29

## Web-Based Instruction: A Case Study of Preservice Elementary Teachers' Efficacy in Modeling and Reasoning with Fractions

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### **EXECUTIVE SUMMARY**

*This case study explored the efficacy of web-based instruction on preservice elementary teachers' mathematics learning. Web-based instruction is appealing to many schools in urban settings because it helps them to face the two big challenges most akin to their schools: to motivate students' interests and to meet the diverse students needs with its interactive feature and adaptive capability. Ten preservice elementary teachers were interviewed regarding their ability to model and reason with fractions after receiving web-based instruction on these topics in their regular mathematics method course. The interview transcripts were used to provide information about the strength and weakness of participants' conceptual and procedural understanding of fractions. The findings of this case study identify promises and challenges in supporting the recommendations of many national reports, such as*

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*the NCTM Professional Standards for School Mathematics (2000) and the National Mathematics Advisory Panel (2008), in incorporating technology into the compulsory mathematics classrooms.*

## **BACKGROUND INFORMATION**

According to National Council of Teachers Mathematics (NCTM) (2000), “technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning.” (p. 24). Past studies on integrating technology in mathematics teaching and learning have investigated the impact of spreadsheets, and dynamic geometry software on student achievement (Isikal & Askar, 2005; Olkun, Altun, & Smith, 2005; Sinclair, 2004). The findings of the research have generally shown positive effects of computer-based instruction on students’ achievement.

With the recent enormous growth of the World Wide Web, web-based instruction has, in particular, received a lot of attention from mathematics education researchers. Studies have shown that using multimedia or interactive web-based modules can increase student learning (Aberson, Berger, Healy, & Romero, 2003; Bliwise, 2005; Fletcher-Flinn & Gravatt, 1995; McNeil & Nelson, 1991). Specifically, studies have examined the effect of web-based tutorial on learning various statistics concepts (Bilwise, 2005). A study conducted by Aberson et al. (2003) found that students who used a freely available web-based tutorial on hypothetical testing performed better on a quiz than did students who completed the standard laboratory.

### **Setting the Stage**

The purpose of this study was to investigate the effectiveness of web-based instruction in supporting preservice elementary teachers’ learning. Despite web-based instruction having a strong presence in mathematics teaching and learning, the empirical research conducted on the efficiency of web-based instruction in mathematics teacher education is limited. Our understanding about the nature and strength of web-based instruction is still insufficient. For example, it remains unclear whether web-based instruction can help learners achieve a high conceptual level regarding mathematical teaching and learning.

The mathematics content that we focus on in this case study is fractions, a critical component of elementary school mathematics. Through exploring preservice teachers’ efficacy in fraction modeling and reasoning, this case study will increase our understanding of the nature and effect of web-based instruction in the teacher education setting.

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