

Chapter 23

A Call for the use of Technology within Mathematics and Science Preservice Teacher Methods Courses

Darci J. Harland

Illinois State University, USA

Ydalisse Pérez

Illinois State University, USA

Cheri Toledo

Illinois State University, USA

ABSTRACT

Over the past several years, teacher preparation programs have used a variety of approaches to introduce their students to the integration of technology and pedagogy. However, once preservice teachers move into the classroom, many lack the confidence and ability to assimilate technology into their teaching. The purpose of this chapter is to provide teacher education faculty, specifically mathematics and science methods instructors, with a variety of approaches for integrating technology into their courses. Practical strategies are provided to assist faculty with effective uses of technology for delivering content and scaffolding student collaboration. Sample assignments are provided to assist faculty in encouraging their students (future teachers) to look beyond the textbook for teaching resources and learning assessments.

INTRODUCTION

This chapter introduces teacher education faculty, specifically mathematics and science methods instructors, to a variety of approaches for integrating technology into their courses. The first part

of the chapter, based on a review of the literature, presents a background of the methods that teacher preparation programs have employed to equip their preservice teachers to integrate technology into their future teaching practices. The remainder of the chapter delineates strategies that mathematics and science methods instructors can utilize when

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modeling technology use to their students. These methodologies have been categorized according to: integrating technology into content instruction, technology to encourage collaboration, and technology assignments and assessments. The last section provides a variety of projects for preservice teachers.

BACKGROUND

In addition to their current responsibilities, teachers are also expected to prepare students technologically for the workforce and professional life. For many years, the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics* (NCTM, 2000) and the National Research Council's *National Science Education Standards* (NSES, 1996) have expected science and mathematics teachers to integrate technology into their instruction. NCTM emphasizes that "technology is essential in teaching and learning mathematics" (p. 25), since technology is able to "furnish visual images of mathematical ideas, ... facilitate organizing and analyzing data, ... compute efficiently and accurately, ... [and] support investigation ... in every area of mathematics" (p. 24). Similarly, the NSES states, "the relationship between science and technology is so close that any presentation of science without developing an understanding of technology would portray an inaccurate picture of science" (p. 190). While these national standards highlight the importance of technology integration, preservice teachers' knowledge of technology integration comes from their own experiences.

Similarly, the National Council for Accreditation of Teacher Education (NCATE, 2008) requires teacher educators to "understand and demonstrate expertise in technology operation and concepts" (p. 52), and "assist teachers in identifying technology systems and resources to meet specific student learning needs" (p. 52). To meet these needs, teacher preparation programs have

tried many ways to introduce preservice teachers to technology.

In the past decade, government funds have been available to help teacher preparation programs redesign their technology training to make positive changes on preservice teachers' technology attitudes and abilities. *Preparing Tomorrow's Teachers to use Technology (PT3)*, a grant program funded by the U.S. Department of Education, was created to increase technology integration in teacher education programs. Many of these programs focused on training teacher education faculty to model effective technology integration (Polly, Mims, Sheperd, & Inan, 2010). Some programs targeted technological pedagogical knowledge, while others emphasized the content knowledge associated with technological pedagogy. One program sought to increase faculty knowledge of digital tools and to reflect on the value of technology for teacher preparation, focusing on the pedagogical advantages of technologies such as WebCT, BlackBoard, Word, PowerPoint, and other specific software (Whittier & Lara, 2003).. Unfortunately, there is limited research about the effectiveness of these PT3 programs (Polly et al., 2010), which makes it challenging to determine which methods had the most impact on preservice teachers' ability to integrate technology.

Methods of Technology Training for Teachers

The assumption that preparing college faculty to effectively utilize technology results in preservice teacher technology use has not been strongly supported or rejected by the literature (Adamy & Boulmetis, 2006; O'Bannon, Matthew, & Thomas, 1998; Parker, 1996). However, the structure of teacher education programs continues to change in attempts to help make that connection occur. There are two main ways that technology training occurs: a stand-alone technology course or an integrated approach (Toledo, 2002; Diem, 1982). Some teacher education programs separate education

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