Chapter 6
Mathematics Education Technology Professional Development:
Changes Over Several Decades

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ABSTRACT

The effective use of digital technologies in school settings calls for appropriate professional development opportunities that will transform inservice teachers' knowledge for integrating technologies as effective mathematics learning tools. To inform such opportunities, this study examined the contents of published mathematics education technology professional development papers over several decades using Sztajn's (2011) standards for high quality reporting in mathematics professional development research studies, the Technological Pedagogical Content Knowledge framework, and the Comprehensive Framework for Teacher Knowledge. Both the Professional Development Implementation and Evaluation Model and Education Professional Development Research Framework are recommended for further guidance on reporting key features of mathematics education technology professional development.

INTRODUCTION

The professional development of teachers with regard to technology integration in mathematics is especially important in today's society. The present study examined the contents of published mathematics education technology professional development papers, and recommends both the *Professional Development Implementation and Evaluation Model* and the *Education Professional Development Research Framework;* these provide additional direction for reporting important features of mathematics education technology professional development. Guskey (2000) defined professional development as "those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students" (p. 16). Guskey's definition of professional development was used throughout this study.

Leading professional organizations have advocated for teachers to receive training related to teaching effectively with technology. In 1998, the International Society for Technology and Education (ISTE) released the National Education Technology Standards for Students (NETS●S) with the goal of supporting effective use of technologies in school settings. ISTE recognized that these new standards called for different types of teacher knowledge, and thereafter released the NETS Teacher Standards (NETS●T) in 2000. In the 2007 and 2008 revisions, ISTE shifted its focus from skills and knowledge needed to operate the technology to a) skills and knowledge for students to effectively use technology and b) skills and knowledge for teachers to teach with technology. Likewise, in 2006, the Association of Mathematics Teacher Educators (AMTE) stated that, "Mathematics teacher preparation programs must ensure that all mathematics teachers and teacher candidates have opportunities to acquire the knowledge and experiences needed to incorporate technology in the context of teaching and learning mathematics" (p. 1).

The United States Department of Education released Title II-D, Enhancing Education Through Technology Act of 2001, within the No Child Left Behind Act of 2001 (USDOE, 2001), which advocated for effective technology integration through teacher training and curriculum development to ensure that by 2006, each student was technology literate by the end of eighth grade. Likewise, the National Council of Teachers of Mathematics (NCTM), in the *Principles and Standards for School Mathematics* (2000) as well as in their 2011 technology in teaching and learning position statement and in their *Principles to Actions* (2014), advocated for technology as an important tool to enhance mathematics instruction.

A strong research foundation is critical for developing effective professional development for technology integration in mathematics education (Ronau et al., 2015). To advance this foundation, our study examined the contents of published mathematics education technology professional development literature over the course of several decades.

BACKGROUND

Research about general professional development (i.e., not specific to mathematics or technology) lays an important foundation for understanding mathematics education technology professional development research. The effectiveness of professional development has been an area of research for many years; this research helped frame our definition of professional development. At the core of Guskey's (2000) definition of professional development is improving students' learning through enhancing teachers' professional knowledge, skills, and attitudes. Similarly, Loucks-Horsley, Stiles, Mundry, Love, and Hewson (2010) contended that the core of effective professional development is improving student

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