

## Chapter 24

# Innovative Instructional Strategies for an Online Community of Learners: Reconstructing Teachers' Knowledge

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### ABSTRACT

*This qualitative, design-based research identifies innovative instructional practices for teacher professional development that support an online community of learners in reconstructing their technological pedagogical content knowledge (TPACK) for teaching mathematics. This analysis describes instructional practices that guide inservice teacher participants in inquiring and reflecting to confront their knowledge-of-practice conceptions for integrating multiple technologies as learning tools. The research program describes an online learning trajectory and instructional strategies supporting the tools and processes in steering the content development in a social metacognitive constructivist instructional framework towards moving from “informal ideas, through successive refinements of representation, articulation, and reflection towards increasingly complex concepts over time” (Confrey & Maloney, 2012). The results provide recommendations for online professional development learning environments that engage the participants as a community of learners.*

### INTRODUCTION

In this digital age, today's teachers need opportunities to relearn, rethink, and redefine teaching and learning in mathematics as they know and learned it. Their experiences ultimately must reconstruct their knowledge-of-practice for teaching through “systematic inquiries about teaching, learners and learning, subject matter and curriculum, and schools and schooling” (Cochran-Smith & Lytle, 2001, p. 274). They

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need practical experiences for inquiring and reflecting in ways that confront their knowledge-of-practice conceptions for integrating technologies in teaching mathematics (Loughran, 2002; Shön, 1983). This conception “emphasizes that teachers have a transformed and expanded view of what ‘practice’ means” (Cochran-Smith et al., 2001, p. 276), reflecting the transformed knowledge at the heart of Technological Pedagogical Content Knowledge (described as TPACK).

Online avenues potentially offer access to professional development for teachers while they are actively teaching (Moon, Passmore, Reiser, & Michaels, 2013). In online educational avenues, teacher educators are challenged to design learning progressions that effectively transform teachers’ knowledge for integrating technologies in the teaching of mathematics. In essence, they must identify learning trajectories that incorporate the online instructional strategies towards reconstructing teachers’ knowledge of teaching with technologies (Niess & Gillow-Wiles, 2013; Sztajn, Confrey, Wilson, & Edgington, 2012). Ultimately, these learning trajectories need to identify an “ordered networks of experiences...to move from informal ideas, through successive refinements of representation, articulation, and reflection, towards increasingly complex concepts” (Confrey & Maloney, 2010, p. 968).

Lave and Wenger (1991) and Wenger (1998) describe the importance of social participation and active involvement in learning, suggesting that learning in a community is an essential ingredient, in essence promoting learning communities for online instruction. A virtual community of learners acknowledges the importance of learners in active roles, building their understanding and making sense of new information despite the lack of face-to-face instruction. Garrison and Cleveland-Innes (2005) advocate for a community of learners around an integration of cognitive, social, and teaching presences towards higher order learning while engaging learners in critical reflection and discourse (i.e., critical inquiry): “reflective and collaborative properties of asynchronous, text-based online learning are well adapted to deep approaches to learning (i.e., cognitive presence)” (p. 145). Conrad (2008) calls for “careful consideration of design and facilitation of learning environments” for the “creation of appropriate spaces for community development” within which the community can grow and become sustainable (p. 17). Akyol and Garrison (2008, 2011) focus on the process and integration of the social, cognitive and teaching presences in online courses as supporting more collaborative and social constructivist approaches. Sztajn, Confrey, Wilson, and Edgington (2012) connect the ideas as basic teaching guides for instructional decisions, suggesting the addition of a metacognitive aspect to the instructional decisions framed in a learning trajectory for online courses. However, the sparseness of virtual worlds presents challenges for teacher educators in developing and maintaining the envisioned community of learners as an essential attribute of a social metacognitive constructivist foundation (Holmes & Sime, 2012) in online educational environments.

This chapter presents a learning trajectory supported by innovative instructional practices for online professional development course design. In doing so, the work describes how teacher educators might transition their thinking from within a traditional face-to-face environment to an online distance education context for transforming teachers’ knowledge for teaching with technologies in the digital age.

## **BACKGROUND**

Technological Pedagogical Content Knowledge (TPACK) highlights the highly complex and challenging knowledge that teachers rely on for teaching mathematics with appropriate digital technologies – basically through an assimilation and accommodation of their technological, pedagogical, and content knowledge as

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