Chapter 11

Synchronous Online Model for Mathematics Teachers’ Professional Development

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ABSTRACT

In this chapter, the authors present the design rationale for and empirical results from a predominantly synchronous three-part online model for the professional development of mathematics teachers in rural contexts. They describe how the design of the components are complementary and are intended to support teachers to develop challenging instructional practices, even when the teachers are geographically remote and dispersed. The three parts include an online course, online video coaching, and online demonstration lessons. They describe how they used conjecture mapping to enhance collaboration within the project team and to inform iterations of the model. They then present empirical results related to each of the components of the model and draw conclusions based upon what they have learned.

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INTRODUCTION

There is a dearth of research on synchronous online professional development in mathematics education, despite the emergence of online platforms and learning environments in professional development (Johnson et al., 2018; Keengwe & Kang, 2012; Means, Toyanna, Murphy, Bakia, & Jones, 2009). Much of online learning and research on online learning has been situated in asynchronous environments. We argue that synchronous learning environments have the potential to provide professional learning experiences for teachers. Synchronous learning environments can incorporate many important features of face-to-face models while adding new features, and consequently are valuable sites for teacher learning and research.

We originally designed and implemented the three professional learning components in face-to-face formats, which we then iteratively transformed into fully online formats. The three parts of the model included an online course, online video coaching, and online demonstration lessons, each of which will be described we will describe below. Our project utilized a series of mostly synchronous online experiences, in contrast to the typical asynchronous nature of much of the current online professional development, educational coursework, and virtual teacher communities. We designed the model to support teachers to take up instructional practices that involve the use of high cognitive demand tasks, clear mathematical goals, and productive mathematics discussions, following the work of Smith and Stein (2011). We recruited 16 middle school mathematics teachers from rural western New York and Idaho in the United States.

The objectives of the chapter are to explain the model, including the design rationale our efforts to transform the model from face-to-face to an online synchronous form, and our research on the effectiveness of the model. We conclude with lessons learned and future work related to the model.

BACKGROUND

The goal of our NSF-funded project was to provide rural teachers access to professional learning experiences that would support visions of rigorous instruction articulated in the Common Core State Standards for Mathematics (CCSSM) (Common Core State Standards Initiative [CCSSI], 2010). Research in mathematics education has shown that using rich tasks to elicit and make public student thinking in ways that involve disciplinary rigor helps students to learn with understanding and broadens access to mathematics (Boaler & Staples, 2008; Lampert et al., 2010). Furthermore, we saw the use of rich tasks and practices associated with disciplinary rigor as aligned with the intentions of the CCSSM authors and the local policy makers who adopted the CCSSM or modified versions of the CCSSM.

Comprehensive analyses of professional development programs in the United States have shown that in order for teachers to develop competency in such ambitious instructional practices they need to engage in sustained, intensive professional development situated close to their own practices and curriculum contexts (Clarke, 1994; Garet et al., 2001; Loucks-Horsley, Hewson, Love, & Stiles, 1998). Furthermore, the professional development should focus teacher attention on how student thinking develops in relation to particular content or instructional sequences (Carpenter et al., 2004; Gamoran et al., 2003; Secada & Adajian, 1997). Such professional development requires sustained access to the kinds of resources that are rarely present in rural contexts (Howley et al., 2005).