

## Chapter 12

# Mathematics Teachers' Knowledge-of-Practice With Technologies in an Online Masters' Program: Scoop Action Research Experiences and Reflections

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### ABSTRACT

*As teacher education leverages online instructional environments, an important research focus is how best to re-conceptualize mathematics inservice teacher classroom observations. This chapter proposes an alternative methodology to the structure of traditional observations, where the Scoop Notebook provides a window into mathematics teachers' Technological Pedagogical Content Knowledge (TPACK), specifically their TPACK-of-practice. In this descriptive, cross-case study, a re-designed Scoop process frames teachers' engagement in classroom practices, putting into practice their scholarly formal knowledge and developing in-depth, rich reflections from their classroom actions and artifacts. This study illustrates how embedding the Scoop process into a graduate instructional strategies course as part of a Master's degree curriculum results in engaging teachers in action research where they use artifacts as objects to think with for transforming their TPACK for integrating technologies in teaching mathematics.*

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## **INTRODUCTION**

The digital age illuminates multiple technological tools for supporting students in learning mathematics. Geometer's Sketchpad, virtual manipulatives, and graphing calculators offer some tools for teaching and learning mathematics in the spirit of the National Council of Teachers of Mathematics (NCTM) technology position statement:

*It is essential that teachers and students have regular access to technologies that support and advance mathematical sense making, reasoning, problem solving, and communication. Effective teachers optimize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. (NCTM, 2011, p. 1)*

Questions do arise in responding to this position. Do teachers have the knowledge, skills and understandings for optimizing the potential? How do they gain these skills while they are teaching?

Continuing education opportunities for inservice teachers are often limited by the demands of daily teaching activities and/or the distance to institutions offering needed programs. In addition to providing technology for teaching and learning in the classroom, digital technologies, in particular the Internet, have given institutions a pathway for offering inservice teachers educational opportunities for extending their knowledge of how to integrate digital technologies into their classrooms as teaching and learning tools. This knowledge is described by the Technological Pedagogical Content Knowledge (TPACK) construct (Mishra & Koehler, 2006; Niess, 2005). An important aspect of online (distance) education is that as a delivery method, students are not bound by time or place. Thus, inservice teachers can access their courses whenever and wherever best suits them.

A critical component of many teacher education programs is observing teachers in their classrooms as they engage in teaching (Caughlan & Jiang, 2014; Steinberg & Sartain, 2015). Observations provide teacher educators with knowledge of how teachers are bringing their developing knowledge into the classroom as knowledge into practice. From the diagnostic knowledge teacher educators' gain from classroom visits, they are able to provide feedback, suggest directions for improvement, and support teachers to extend and improve their knowledge of integrating technology into their teaching.

Given the importance of classroom observations as an essential component of teacher education, online teacher development programs need an analog that provides the same information for teacher educators about how teachers are transitioning their knowledge into practice in the classroom. A variety of remote observation methods have been explored, with a wide range of success (Bennett & Barp, 2008; Collins, 2010; Dyke, Harding, & Liddon, 2008). For the most part, the methods have relied on teacher self-reporting and have tended to focus on a limited number of aspects of classroom activities. In this study, we, as the researchers, recognized these limitations and proposed a portfolio type instrument called the Scoop Notebook, developed by Borko, Strecher, and Kuffner (2007) as an analog to traditional face-to-face classroom observations. This notebook, while still based on teacher self-reporting activities, was designed to provide an extensive view into what a teacher does in the classroom and what impacts these actions have on student learning. This chapter is devoted to exploring the Scoop Notebook as an online analog of face-to-face classroom observations, providing teacher educators with insight into their students' *TPACK-of-practice*. Given the self-analytic component of the Scoop Notebook design, we investigated how the reflective opportunities in the Scoop Notebook design affected teachers' thinking about integrating digital technologies into teaching and learning mathematics.

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