Chapter 23
Lessons Learned from Designing and Implementing a Three-Year Professional Development Program

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ABSTRACT
This chapter highlights a process of creating, revising, and evaluating a professional development (PD) program for in-service upper elementary teachers (grades 3-6), titled the Central New Jersey Partnership to Enhance Mathematics Achievement (CNJ PEMA). Beginning with the research base that informed the initial design of the multi-year program, a description of the program components and implementation, a discussion of the revision process, and lessons learned from formal evaluation (daily feedback forms) and teacher reflections are provided. In particular, attention is focused on how the program sought to include teachers as partners in the creation and revision process as a way to provide them with a voice and choice in their own professional learning.

INTRODUCTION
The report from the National Mathematics Advisory Panel (NMP, 2008) calls for more research using direct measures of teacher knowledge, rather than numbers of courses taken, or the types of certification or professional development (PD) programs attended. Baumert et al. (2010), pursuing this recommendation, define content knowledge as “a profound mathematical understanding of the curricular content to be taught,” (p. 142) and use the three-part definition of Krauss et al. (2008) for pedagogical content knowledge (PCK): “knowledge of mathematical tasks as instructional tools, knowledge of students’ thinking and assessment of understanding, and knowledge of multiple representations and explanations

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of mathematical problems” (p. 142). Earlier research has established the positive relationship of teachers’ knowledge of content and pedagogical content knowledge and student learning. This particular type of knowledge can be measured through the validated Learning Mathematics for Teaching (LMT) instrument; its scores have correlated with students’ achievement measures (Hill, Rowan, & Ball, 2005; Hill et al., 2008; NMP, 2008). Baumert et al. confirm the substantial positive effect of PCK, mediated by individual learning support.

Thus research on effective PD for mathematics teachers points toward specific mathematical knowledge important for pedagogy, beyond what is generally learned in present pre-service programs (Birman et al., 2007). Research further suggests the nature of successful PD models. They include learning that takes place in professional learning communities (PLCs), i.e., interactive activity with colleagues that includes feedback from practice (DuFour et al., 2008; Wei et al., 2009); sustained, coherent activity occurring over time (ideally a full year) and connecting PD with students’ learning and retention processes (Darling-Hammond, 2010; Garet et al., 2010; Clements & Sarama, 2004, 2009); and, an emotionally supportive environment encouraging conjecture, discussion, and exploration (Philipp, 2007). As Darling-Hammond summarizes this research,

Effective professional development is sustained, ongoing, content-focused, and embedded in professional learning communities where teachers work over time on problems of practice with other teachers in their subject area or school. Furthermore, it focuses on concrete tasks of teaching, assessment, observation, and reflection, looking at how students learn specific content in particular contexts. It is often useful for teachers to be put in the position of studying the very material that they intend to teach to their own students. (Darling-Hammond, 2010, pp. 226-227, quoted in Larson et al., 2012).

This research base informed the project’s design, and the authors here present a qualitative case study to complement that research. This chapter describes the process and implementation challenges presented in designing a three-year mathematics PD program for upper elementary teachers. The authors include lessons learned and solutions addressing these challenges, as well as recommendations for the design of future multi-year PD programs.

BACKGROUND

Responding to a three-year math science partnership grant opportunity administered through the New Jersey Department of Education (NJDoe), a partnership between Rutgers University and two neighboring school districts was formed. This partnership included district curriculum leaders, university mathematics faculty, and mathematics education faculty and was designed to create a supportive, collegial environment for the participating teachers. All members of the institute of higher education (IHE) team were experienced teacher PD facilitators. The team included faculty and staff in the fields of mathematics, mathematics education, adult learning and numeracy, and STEM (science, technology, engineering, and mathematics). Keeping in mind that each year was contingent upon funding, each year of the PD proposal was designed as a stand-alone program. Initial design of the CNJ PEMA program was informed by previous professional development collaborations between mathematics teachers and researchers, with grant specifications requiring a collaborative partnership.