

Chapter 57

Primary Grades Teachers' Fidelity of Teaching Practices during Mathematics Professional Development

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ABSTRACT

This chapter shares the findings from a study that examined primary grades teachers' fidelity of implementation during a year-long professional development program on formative assessment in mathematics. The project provided over 80 hours of professional development to elementary school teachers regarding their use of an internet-based formative assessment system for their students' mathematics achievement. This study examined teachers' online reflections and data in the internet-based assessment system to identify themes that lead to either a high fidelity or low fidelity of implementation. High fidelity teachers expressed beliefs that formative assessment supported their mathematics teaching, improved their students' learning, and was feasible to carry out in their classrooms. Low fidelity teachers' reflections were associated with numerous barriers to implementation as well as a lack of buy-in that the formative assessment system could benefit their teaching.

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EXPLORING PRIMARY GRADES TEACHERS' FIDELITY OF FORMATIVE ASSESSMENT PRACTICES DURING MATHEMATICS PROFESSIONAL DEVELOPMENT

Introduction

Research continues to document the struggles that United States elementary school teachers face related to teaching mathematics effectively (National Mathematics Advisory Panel, 2008). Barriers to effective mathematics teaching include teachers' beliefs in more traditional approaches (Clark et al., 2014; Stipek, Givvin, Salmon, & MacGyvers, 2001), a lack of knowledge related to the mathematics that they teach (Thames & Ball, 2010), insufficient curricula materials or a lack of knowledge on how to use them (Sherin & Drake, 2009), and pressure to teach a certain way in an effort to increase test scores (McGee, Wang, & Polly, 2013). In light of the research on mathematics teaching, it can clearly be stated as a complex process that requires specific skills and knowledge related to both pedagogy and content (Thames & Ball, 2010).

In an effort to support teachers' mathematics instruction, professional development programs are commonly viewed as a mechanism to positively support teachers and also improve student achievement. Mathematics professional development projects are most effective when they simultaneously can support teachers' development of knowledge related to content and pedagogy as well as how students develop an understanding of fundamental mathematics concepts. One, of the pedagogy-related processes, that has gained attention in the literature is formative assessment, specifically examining students' mathematical thinking, analyzing data, and then making sound instructional decisions based on that information (Wiliam, 2007a; Wiliam, 2007b). Teachers who are able to effectively carry out a formative as-

essment process have been empirically linked to gains in their students' mathematics achievement (Polly et al., 2014; Wiliam & Thompson, 2007).

This chapter presents a study in which we analyzed participants who completed a professional development project designed to support primary school teachers' use of an internet-based mathematics formative assessment system to support their mathematics teaching. Teachers participated in an 80-hour learning experience and data was collected on their use of the assessment system, their responses to reflection prompts, and their students' scores in the formative assessment system.

BACKGROUND

Formative Assessment in Mathematics

The purpose of formative assessment is to elicit and collect data that directly impacts instruction for individual learners (Koellner, Colman, & Risley, 2009). Further, when working on activities related to formative assessment, teachers must connect evidence with instruction, which in turn requires them to understand and apply their expertise of learning progressions and how students best learn (Wiliam, 2007a, 2010). To that end, research on formative assessment has noted that the process is only valuable to the teaching and learning when the data is closely examined to modify instructional goals, instructional activities, and instructional pedagogies (Black, Harrison, Lee, Marshall, & Wiliam, 2004; Heritage, 2007).

Formative assessment processes can positively impact student learning. Formative assessment has been empirically associated with gains in student learning, teachers' increased knowledge of their students' understanding, and an increase in the alignment of instructional activities to students' abilities (Polly et al., 2014; Black & Wiliam, 1998; Wiliam, 2007b). With students who are at-risk

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