Chapter 35
Professional Development to Develop Elementary School Teachers’ Assessment Practices in Mathematics

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ABSTRACT

The climate of high-stakes tests has greatly influenced the way mathematics is taught in schools in the United States. In this study the author shares the findings of a professional development project focused on cognitively-demanding mathematical tasks and performance tasks that can be used for both instruction and assessment. Through an inductive analysis of open-ended surveys, the professional development increased teachers’ awareness and use of cognitively-demanding mathematical tasks that align to their standards. However, many teachers reported their beliefs that assessments should be multiple choice and reflect the format of their high-stakes state-wide end-of-year assessment. Implications for professional development related to assessment in mathematics education are also shared.

DEVELOPING TEACHERS’ KNOWLEDGE AND SKILLS RELATED TO ASSESSMENT

A Call for More Effective Assessment

“[T]he effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.” (NCTM 2014, p. 53)

In the Common Core State Standards for Mathematics (CCSS-M; Common Core State Standards Initiative 2011) and other rigorous mathematics state standards both in the United States and internationally, students are expected to demonstrate a balance of procedural and conceptual understanding while solving rigorous mathematical tasks. The opening quote from the NCTM Principles to Action (NCTM
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2014) and the requirement of rigorous mathematics standards requires teachers to be effective at various aspects of assessment, including posing cognitively-demanding tasks, in-the-moment assessments of students’ understanding, examining student work, and selecting or creating differentiated follow-up tasks. These teacher practices are challenging to carry out consistently on a daily basis.

As a result, there is a need to carefully think about how to best support teachers to use some of these aspects of assessment. This chapter provides an overview of teachers’ knowledge and skills related to assessment in mathematics and shares data from a study about Grade 5 and 6 teachers’ use of assessment through a professional development project.

Research on Mathematics Assessment

A large-scale meta-analysis of thousands of research studies on student achievement found that teachers’ use of formative assessment was one of the most impactful teacher practices associated with gains in achievement (Hattie, 2009). Specifically, in mathematics, the process of looking at formative data collected during instruction and using that information to differentiate and modify instruction has been associated with gains in students’ understanding (Wiliam, 2007). Further, processes associated with formative assessment were linked to gains in students’ mathematics achievement for students who were performing below grade level (Black & Wiliam, 2010; Polly, 2014). By formative assessment, I mean ongoing assessment that occurs naturally during the school day to check students’ understanding and progress.

Teachers often view assessment though, as a barrier to teaching, and do not see assessment as part of the teaching and learning processes, therefore seeing it as an add-on or additional duty in their day. Research studies have found this to be especially true with large-stakes end-of-year tests that are typically implemented at the state level in the United States. In one study Plank and Condliffe (2013) noted that in the period immediately before large-scale assessments teachers who had been using student-centered pedagogies all year long modified their instruction and used teacher-centered pedagogies and direct instruction as the tests approached. Further, Polly (2014) found that the types of mathematical tasks posed by the teacher decreased in cognitive demand and became more focused on basic skills as tests approached. Prior studies have also noticed that teachers decrease the rigor of mathematical tasks and focus primarily on basic mathematical skills when students are struggling or in high stakes environment where pressure to perform on tests is high (McGee, Polly, & Wang, 2013). In most cases teachers claim that they feel pressure from their school administrators to focus on having their students perform well on these tests (McGee et al., 2013).

There is a need for research examining how to best prepare mathematics teachers to effectively assess their students while also maintaining a culture of rigorous tasks focused on conceptual understanding and mathematical reasoning. This chapter examined the broad question, “How did the professional development support teachers’ development and application of skills related to mathematics assessment?” Based on the literature, this study focused on the use of cognitively-demanding mathematical tasks, in-the-moment assessment of student understanding, examining students’ written work, and selecting or creating follow-up, differentiated tasks. Specifically, this study examined, “What was the influence of professional development focused on mathematical tasks and assessment in mathematics?”
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