Chapter 4
Teachers' Perspectives Using the Instructional Quality Assessment as a Professional Development Tool

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ABSTRACT

This chapter will provide readers with an overview of professional development created and enacted to support teachers' selection and implementation of cognitively demanding tasks using the Instructional Quality Assessment as the professional development tool. This case study seeks to give voice to mathematics teachers in third through eighth grades who participated in the professional development as they share their perspectives on using the instructional quality assessment rubrics and structure of professional development. The goal of this chapter is to provide an overview of the structure of the professional development, and share the aspects of the professional development the teachers identified as supportive or a hindrance when planning and implementing tasks in their mathematics classrooms. With this information, the article concludes by discussing ideas for future professional development aimed at providing teachers with instructional practices to incorporate into classrooms.

INTRODUCTION

As one of the most important decisions a teacher will make is choosing the mathematical task their students will engage in (Lappan & Briars, 1995), it is crucial that teachers not only realize the importance of choosing tasks, but also have the knowledge of what tasks can engage students in high quality mathematics. According to the National Council of Teachers of Mathematics (2014), "to ensure that students have the opportunity to engage in high-level thinking, teachers must regularly select and implement tasks that promote reasoning and problem solving" (p. 17). Teachers can impact students' opportunities to learn by engaging students in high cognitive demand tasks (Smith & Stein, 2018). Cognitive demand

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refers to the amount of effort a student needs to expend thinking about a problem. Henningsen and Stein (1997) outlined and characterized four different levels of cognitive demand of tasks: memorization tasks, procedures without connections tasks, procedures with connections tasks, and doing mathematics tasks. Memorization and procedures without connections tasks have a low level of cognitive demand while procedures with connections and doing mathematics tasks have a high level of cognitive demand. Memorization tasks involve recalling facts or definitions and do not require computation. An example of a memorization task is stating the Pythagorean theorem. Tasks labeled as procedures without connections involve using a procedure to solve a problem but do not connect the procedure to any other mathematical ideas, such as solving equations for missing variables. Procedures with connections tasks involve using a procedure but connecting it to other mathematical ideas. One such problem is solving a quadratic function, interpreting what the solution means, and relating these values to the graph of the function and the overall given situation. A task labeled doing mathematics does not give an explicit way to solve the problem and may include multiple solution methods, such as figuring out a pattern and coming up with generalized formula. (See Figure 1 for descriptions of the four levels of demand). Many of the descriptors of tasks with a high level of demand align with characteristics of tasks that promote conceptual understanding of mathematics (Doyle, 1983).

While teachers should be able to select tasks appropriately and implement tasks at a high level to support students' mathematical thinking, they also need to be able to maintain the level of demand during implementation (Henningsen & Stein, 1997). Researchers found that teachers who participated in professional development around high cognitive demand tasks increased both the number of high cognitive demand tasks used and their ability to maintain the level of demand throughout the lesson (Boston & Smith, 2009). Stein and colleagues (1996) found teachers involved in professional development targeted at implementing high cognitive demand tasks had success selecting and setting up high cognitive demand tasks that encouraged students to use multiple solutions and representations, participate in group work, justify answers, and engage in complex mathematical thinking and reasoning.

While implementing high cognitive demand tasks can provide students with opportunities to engage in complex thinking about mathematics, Doyle (1988) found most tasks in classrooms involved memorization, and students only needed to remember what procedure to use to solve the problem correctly. Doyle's caution coupled with prior studies suggest teachers may not have the knowledge, time, or necessary resources to find and implement high cognitive demand tasks (e.g., Boston & Smith, 2009; Smith, Bill, & Hughes, 2008; Stein, Engle, Smith, & Hughes, 2008). Even when teacher select cognitively demanding tasks, the demand of the task may decline depending on how the teacher the implements the task. Different teachers can implement the same cognitively demanding task, but not maintain the demand, depending on each teacher's implementation of that task (Son & Kim, 2015; Tekkumru-Kisa & Stein, 2015). This means it is not enough just to pick a high cognitive demand task, teachers also need to think through the implementation of that task. This yields the goal of this chapter: to support teachers in finding, planning, and implementing high cognitive demand tasks in their classroom. This chapter describes professional development utilizing the Instructional Quality Assessment (Boston, 2012) as a frame to support teachers' selection and implementation of cognitively demanding tasks and the teachers' perspectives on using the Instructional Quality Assessment in a professional development setting.