A QUALITATIVE STUDY OF RESPONSIVE TEACHING IN THE PRIMARY MATHEMATICS CLASSROOOM

by

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Mathematics education reforms (e.g. CCSSM, 2010; Kilpatrick, Swafford, & Findell, 2001; NCTM, 2000) suggest that good teaching requires attention to students' reasoning. However, taking students' mathematical conceptions seriously multiplies complexities of teaching because teachers must navigate relationships among mathematical content, students, and students as they are learning content (Lampert, 2001). Choices regarding the best course of action may arise in the form of dilemmas to be managed (e.g. Lampert, 1985; Ball, 1993) rather than either-or decisions to be made. Thus teacher learning is a matter of developing knowledge of content and pedagogy and of developing a stance (e.g. Cochran-Smith & Lytle, 2009) that enables teachers to make productive use of student conceptions.

In this qualitative case study I analyze the practice of two first grade teachers who are seeking to be responsive to students' mathematical ideas. Both teachers participated in a National Science Foundation-funded professional development program aimed at supporting K-3 teachers in developing mathematical, pedagogical, and leadership knowledge and skills. A central component of pedagogy coursework was cultivating teacher characteristics thought to be important when teaching in ways that are responsive to students' mathematical ideas.

The central question of this study is: What does it mean to engage in a teaching practice that gives students access to meaningful mathematical content while being responsive to students' mathematical ideas? Data analyzed includes videotaped classroom observations, post-observation conversations between the teacher and researcher, teacher lesson plans and notes, and written coursework. Analysis suggests that teachers find ways to navigate particular tensions while being responsive to students' ideas. First, teachers allow space for student thinking while providing classroom structure. Second, teachers draw on their existing knowledge while building new conceptions based on unfolding classroom events. Third, teachers work with individuals while simultaneously shaping the entire lesson. Finally, I find that learning while teaching is in fact a task of teaching (Ball, Thames & Phelps, 2008) that is critical to eliciting, understanding, and responding to students' mathematical ideas in productive ways.

For JP

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CHAPTER 1

FRAMING THE PROBLEM: TALKING ABOUT TEACHING

"Then you should say what you mean," the March Hare went on.

"I do," Alice hastily replied; "at least – at least I mean what I say – that's the same thing, you know."

"Not the same thing a bit!" said the Hatter. "You might just as well say that 'I see what I eat' is the same thing as 'I eat what I see'!"

- Lewis Carroll

This is a project about teaching practice. It is about what teachers do and how they go about doing it, but I have learned that talking about teaching is difficult. Words like teaching, practice, learning, and content are so common understanding is easy to assume. Yet when conversations push past pithy phrases and catchy slogans, shared understanding is elusive. Thus, I begin this dissertation in an effort to say what I mean about what teaching is and why we should pay attention to the ways teachers carry out their work.

This is a project about *teaching* practice. Teaching is commonly understood as "The act, practice, or profession of a teacher" (www.mirriam-webster.com) but the definition alone does not explain very much. To teach is "to cause to know something; guide the studies of; impart the knowledge of" (www.mirriam-webster.com). To teach requires "knowledge in transit" (Cohen, 2011, p. 24), the lack of which "empties teaching of an essential ingredient" (p. 24). In other words, teaching is an action that implies the

movement of knowledge between and among actors. When knowledge is not shared, teaching does not occur.

This is a project about teaching *practice,* but the definition of practice is not straightforward either. Practice might imply "actual performance or application; a systematic exercise for proficiency; or the continuous exercise of a profession" (www.merriam-webster.com). Teachers' work might be described as a practice in order to distance classroom work from theory, to describe what teachers habitually do while teaching, or to portray teaching as a profession with a shared set of activities, ideas, and values (Lampert, 2010). Broadly defined, a practice is something that one deliberately engages in with the intention of doing it well. It is in this sense that I use the word *practice.*

This is a project about *teaching practice.* It is about describing the deliberate, attentive work (Cohen, 2011) teachers engage in that is inextricably connected to subject matter and student learning. When teachers are engaged in and with content and students, whether planning alone in their rooms, interacting with children, or thinking back on a lesson, with the intent of moving knowledge between and among actors, they are engaged in teaching practice.

Teaching as Triadic

Teaching practice is relational work that involves the movement of knowledge in three relationships: the relationship between the teacher and the student, the relationship between the teacher and the content, and the relationship between the students and the content (Hawkins, 1967/2002; Cohen, Raudenbush and Ball, 2003; Lampert, 2001).

These three relationships are not only conduits for moving knowledge; they are the substance of teaching and learning. It is only by working in and through relationships amongst the teacher, students and content that teaching and learning can happen.

Hawkins (1967/1974) insists that relationships between persons – teachers and students included - be rooted in respect. Respect, Hawkins explains, is different from affection or love and developed from "mutual interest and exchange" (p. 57) in some "It" that exists outside the teacher and the student. A parent may love a child for his or her own sake, but the child's personhood grows out of his or her interactions with the world around him. To teach the child, Hawkins maintains, is to come alongside the child and help him or her process what is received from engaging with an "It."

> Children are not always able to sort out all this feedback for themselves. The adult's function, in the child's learning, is to provide a kind of external loop, to provide a selective feedback from the child's own choice and action. The child's involvement gets some response from an adult and this in turn is made available to the child. The child is learning about himself through his joint effects on the non-human *and* the human world around him. (p. 58)

Thus, Hawkins identifies three fundamental relationships in teaching: one between the "I" (the teacher) and the "Thou" (the child), a second between the "I" and the "It" (the subject matter), and a third relationship between the "Thou" and the "It."

In mathematics education, triadic relationships in teaching practice are represented through different versions of the "instructional triangle" (Cohen, Raudenbush and Ball, 2003; Lampert, 2001). In Lampert's view, teaching creates a "problem space"

(2001, p. 31) between the teacher and student, the teacher and content, and the student and content. Lampert (2001) sees teaching practice as actions proceeding "simultaneously in relations with students, with content, and with the connections between students and content, in a single three-pronged space" (p. 33). Cohen, Raudenbush and Ball (2003) note that relationships between different students are also occurring and place the triangle in instructional environments. Figures 1.1 and 1.2 show the instructional triangle as conceived by Lampert and by Cohen, Raudenbush and Ball.

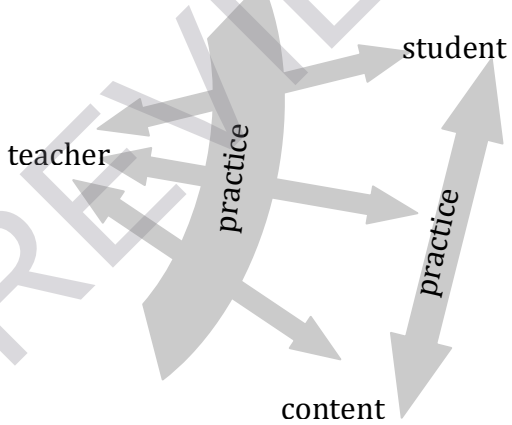

Figure 1.1. Lampert's instructional triangle (Lampert, 2001, p. 31).

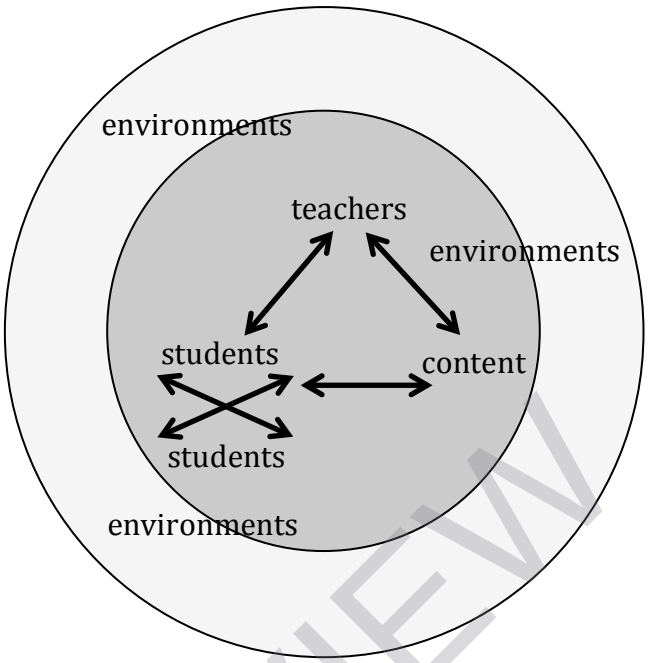

Figure 1.2. Cohen, Raudenbush and Ball's instructional triangle. (Cohen, Raudenbush, & Ball, 2003, p. 88).

In short, teaching practice is deliberate work aimed at sharing knowledge between and among the actors in a triadic space. Teaching practice is fundamentally relational and cannot be understood without careful investigation of the work that occurs between and among the teacher, the students, and the content.

Teaching as Controversial

Characterizing good teaching practice, particularly in mathematics, has been and remains controversial (Franke, Kazemi, & Battey, 2007; Schoenfeld, 2004). For the last half-century, the pendulum has swung between traditionalists, on the one side, and extreme reformists on the other. Propelled by international events such as the launch of Sputnik in 1957, politically charged publications like 1983's *A Nation at Risk* and the heated "Math Wars" of the 1990's, the debate surrounding mathematics teaching and