Scholarly Practice in Methods: Examining Revisions of a Task

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Introduction

In *Principles to Actions* (National Council of Teachers of Mathematics [NCTM], 2014), a call is made for teachers to "identify and work together toward the implementation of a common set of high-leverage practices that underlie effective teaching" (p. 8). The authors then describe eight research-based high-leverage mathematics teaching practices as a framework to use in working toward this goal. Four of the eight practices are focused on classroom discourse: "facilitate meaningful mathematical discourse, pose purposeful questions, support productive struggle in learning mathematics, and elicit and use evidence of student thinking" (NCTM, 2014, p. 10). As mathematics teacher educators, we wondered how best to help our prospective teachers [PTs] develop high-leverage practices and effectively carry them out as novices. We explored this question through examination of a series of modifications to a video-critique task focused on analysis of classroom discourse.

Lee and Mewborn (2009) discussed the importance of developing scholarly inquiry and scholarly practice in the field of mathematics teacher education as mathematics teacher educators work to move the field forward. This call has been carried into the specific work of mathematics methods course instructors at recent national conferences (e.g., Kastberg, Sanchez, Tyminski, Lischka, & Lim, 2013; Sanchez, Kastberg & Lischka, 2014) as discussions around teacher preparation practices are shifting "toward teaching practices that entail knowledge and doing" (McDonald, Kazemi, & Kavanagh, 2013). McDonald et al. argued that the re-imagination of

teacher preparation must accompany the movement toward focusing on core practices in the teaching of mathematics and proposed a cycle for learning to engage in ambitious teaching practices. The proposed learning cycle is centered on a core activity and moves through four cyclical stages: 1) introducing and learning about the activity, 2) preparing for and rehearsing the activity, 3) enacting the activity with students, and 4) analyzing enactment and moving forward. The research presented herein reflects efforts to develop and improve a task through such scholarly inquiry and practice with attention to the proposed cycle of learning concerning a core teaching practice for mathematics teacher educators.

Relevant Literature

In the complex work of preparing secondary mathematics teachers, many tools such as reflection on practice teaching, analysis of the work of seasoned teachers, and interactions with K-12 students are used to develop PTs' thinking and practice (Grossman et al., 2009). One such tool that has been shown to increase the pedagogical knowledge of teachers is the use of records of practice such as video recordings of practicing teachers (Seago, 2008). Through repeated viewing and analysis of videos of teaching, PTs can focus more closely on multiple aspects of classroom practice and become more aware of the intricacies of tasks. By viewing videos of their own teaching, PTs can focus discussion of their own teaching on specific topics, such as classroom discourse, in order to evaluate the effectiveness of their probing and questioning techniques (Maher, 2008).

The use of video in this study required PTs to view and reflect on video of their own teaching with a specific focus on their use of classroom discourse. Productive discourse is that which engages learners in grappling with mathematical ideas and promotes reasoning and sense-making, including conjecturing and justification of ideas (Hufferd-Ackles, Fuson, & Sherin,

2004; Stein, 2007). The difficult task of developing this type of discourse in the classroom requires teachers to listen in different ways (Davis, 1997) and to promote student-to-student discussion in which students are the authority for the mathematical ideas in the classroom (Hufferd-Ackles et al.).

In order to help PTs develop such practices, some researchers claim that we must focus on what PTs notice during classroom interactions (Jacobs, Lamb, & Philipp, 2010; Star & Strickland, 2008; van Es & Sherin, 2002). Noticing involves the ways in which teachers make sense of what is taking place in the complex environment of classrooms and includes a range of actions, from selecting an aspect of a classroom interaction on which to focus to interpreting that interaction and reacting to it (van Es & Sherin). What a teacher notices is framed by their experiences and beliefs and therefore varies from one teacher to another (Jacobs et al.). In the present study, we explored the question "How do changes in a video-critique task support prospective teachers in developing their skills to notice important features of their own classroom discourse practices?"

Methodology

In our secondary mathematics methods courses, we have required PTs to video record their own teaching and write a critique of this video. Our early uses of this task simply required PTs to watch the video and write a short reflection (used in Spring 2010). In an initial revision we moved toward an assignment that is more directly tied to required course readings on cognitive demand and discourse (used in Fall 2010). Then, in response to a session at the 2012 NCTM Research Presession (*Research Frameworks and Findings: Tools for Investigating and Improving Practice*), we revised our task to require PTs to provide a short transcript (10-15 minutes) from the video and a classification of statements made by the PT according to a

provided framework (Boaler & Brodie, 2004) (used in Fall 2012). In each semester, students responded to a specific set of questions in a reflective paper. The reflection questions required students to examine the cognitive demand of the teaching tasks and implementation of those tasks, the type of discourse present in the classroom, and reflections on changes they would or would not make in future use of the lesson.

We collected work samples from all PTs in these methods courses from Fall 2010 through Spring 2012. We then randomly selected four PTs from each semester that represented a different version of the task (Spring 2010, Fall 2010, and Fall 2012) and coded the PTs' written reflections according to a code list developed from literature on noticing frameworks (Jacobs et al., 2010; van Es & Sherin, 2002). Codes included (but were not limited to): carefully linking interpretations to specific details, complete (or incomplete) analytic chunks, connections among evidence, description, evaluate, and general strategy description. Because we were attending to the PTs' thinking about their own teaching, we did not analyze the transcript portion of the task and focused only on the reflective essay. However, the PTs written reflections included references to the transcript in the Fall 2012 data. Additional codes (discussed in the findings) were added as themes emerged.

Findings

Reflections on the Spring 2010 task included statements of approval of the work the PTs had completed in their teaching. Reflection was general and positive, such as: "I was pleased to find most of the students were very engaged in the lesson. Many students volunteered to answer questions and participated in the discussion" (Jane, Spring10). However, in the same paper, the PT wrote:

This particular lesson had a lot of lecture time in it, so there weren't a lot of questions,

but I think when I did have the parts where I was promoting class participation with

questions I could have asked more open-ended conceptual questions. (Jane, Spring10)

Jane classified the overall discourse as "good" without providing any qualifying examples. Amy

followed the same pattern as Jane by describing the changes she had to make in her lesson to re-

teach and review topics for which students could not demonstrate knowledge and then stating:

Overall, I was pleased with how the lesson went minus the reviewing of the quizzes. It was

unfortunate that I was not able to do all the things I wanted to do, but the biggest lesson I

learned was to be flexible. (Amy, Spring10)

In the data from the first version (Spring10) of the video critique task, statements approving the

lessons the PTs taught were prevalent and claims were not well supported with evidence.

After the final revision of the assignment (Spring12), students were more specific in

discussion of their teaching and were more critical of their teaching. For example, one student

analyzed the type of questions she asked, stating:

I asked questions like, "Do we distribute just a three or a negative three? Isn't there a

negative sign in front?" (Line 35) I could have easily raised the level of this question by

asking, "Now why did you distribute by a positive three?" I could have asked the students to

explain why they were taking the wrong steps instead of correcting them. (Heather, Fall12)

She continued on to critique the amount of time she spent talking, stating: "I spent the most time

talking (For example see lines 87 through 90). You can see from the transcription that I talked and

talked, and the students only had to answer with one or two word responses" (Heather, Fall 12).

As we noticed the change from approval to critical comments during the initial coding, we

chose to investigate this shift more closely. We noticed that data from the later semesters seemed to

include more statements critical of their work than earlier semesters. In addition, suggestions for changes seemed to be more focused on delivery of the lessons than on construction of a task or written lesson. We then added four codes to our code list that reflected whether or not the PT was pleased with the lesson as they watched their own video (Codes: I am pleased, I am not pleased) and whether the PT indicated changes were needed in the lesson plan or in the PTs' practice (Codes: Change in lesson, Change in teacher). The numbers of occurrences of each code are listed in Table 1.

Table 1

Number of Times Each Code Appeared Before and After Addition of Transcript

	Spring 10, Fall 10	Fall 12
I am pleased	25	3
I am not pleased	3	13
Change lesson plan	9	4
Change teacher	3	11

The data in the table demonstrates that there was a shift from PTs being pleased with the lessons and delivery in their videos to PTs finding fault with their work. In addition, PTs in the Fall12 group tended to focus on their delivery of the lesson rather than the construction and ordering of the tasks involved. Grace explained:

> I realized as I transcribed my video, that I need more mathematical discussion among the class not just me talking the mathematics. This is my job to create an environment where this is possible for my students. The majority of the questions that I asked in this lesson required immediate answers, rehearsed known facts/ procedures, and enabled the students to

state facts/procedures . . . [The] majority of the questions that I asked, I did not allow myself for the opportunity to listen to students comments/answers that explained their mathematical reasoning and thought process. This did not further the mathematical discussion throughout the lesson. (Grace, Fall12)

Discussion and Implications

Our goal in investigating the reflective essays produced for our video critique assignment over several semesters is to answer the question "How do changes in a video-critique task support prospective teachers in developing their skills to notice important features of their own classroom discourse practices?" Our findings indicate that including the requirement of an analyzed transcript in reflection on videos of PTs' own teaching changed the elements of the classroom interactions that our PTs noticed. Instead of noticing classroom management issues and student performance on assessments, the later PTs noticed the ways they used discourse in the classroom and commented on the affordances for learning they provided for their students. Prior to including the transcript, PTs generally qualified their teaching as effective. The inclusion of the transcript focused PTs' attention on quantity and quality of the statements they made. "I really thought I had asked better questions" was a frequent comment from PTs in Fall 2012 after analyzing their own videos. The Fall 2012 PTs were also more prone to suggest that they needed to improve their own technique as opposed to prior PTs suggesting that changes needed to be made in the task or written lesson. This indicates a shift toward thinking about implementation of ambitious teaching practices among the PTs.

The cycle of learning proposed by McDonald et al. (2013) includes: "introducing and learning about the activity, preparing and rehearsing the activity, enacting the activity with students, and analyzing enactment and moving forward" (p. 382). Although they propose this as a tool for

PTs' learning about an ambitious core practice, we have implemented a similar cycle in learning about our own practice as mathematics teacher educators. Using insights from scholarly inquiry, the revisions of this task enabled our PTs to notice particular aspects of and reflect on their practice more critically (Jacobs et al., 2010; Smith, 2012). We now question how we, as mathematics teacher educators, can continue to use insights such as these to improve other tasks used in our courses and to further build a scholarly body of work in methods courses.

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