

Using Video to Inform Pedagogical Practices of Female Mathematics Teachers

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This paper reports a study investigating the use of videotaping for professional development of female mathematics educators. Participants in the study were two elementary and two secondary mathematics teachers who videotaped a self-selected mathematics lesson. Using criteria defined in Alba Thompson's study of mathematics teaching, participants identified and explored desirable pedagogical practices. Participants then used this critical understanding of desirable pedagogical practices to reflectively analyze their videotaped lesson. Researchers added additional reflections based on their observations.

Using videotapes in conjunction with lesson study adds new opportunities for mathematics educators to reflect and refine their practice. In this paper, we analyze the reflective writings of participants, identifying specific issues of pedagogical practice made visible by analysis of video. We also consider the commonalities between research participants. While not generalizable, our results provide insight into the aspects of classroom pedagogy that female teachers value and can be considered when designing learning environments for pre-service teachers.

Keywords: innovative methodology, teacher education, reflective practice, video recording

Introduction

In an ideal world, teachers would be able to explain their classroom practice by detailing everything they say, every action they take, and every technique they use. However, real classroom practice is rarely so precise. Teachers and students are involved in constant spontaneous interaction. Teachers may not be able to identify all of the activities in their classrooms. Specifically, there may be a difference between what classroom teachers think they do and what they actually do.

AlbaThompson (1982, 1984, 1992) recognized that this difference in perception was the case for teachers of mathematics. She suggested that teachers needed to reflect on specific aspects of their classroom practice to identify both strengths and challenges in their classrooms. In doing so, Thompson defined categories and criteria for teacher reflection. Our work is based on Thompson's foundational work. We add the use of video as a vehicle to facilitate reflection. Video creates a rich space for self-reflection because teachers are able to see parts of a lesson that they missed while teaching. They are also able to see their classrooms, quite literally, from a different angle.

In this paper, we report the self-analysis of four female teachers, two elementary teachers and two high school teachers, who used Thompson's list of characteristics of classroom pedagogy as a basis for reflective analysis of a previously videotaped lesson. We present and analyze their journal reflections, particularly those that involve comfort and challenge in the classroom, and add additional observations.

Theoretical Background

It is becoming increasingly clear to professionals in the field of teacher education that reflective practice should be a component of teacher's classroom preparation (McCurry, 2000; Moore & Whitfield 2008; Rich & Hannifin, 2009a, 2009b). This idea is not new to mathematics educators. A number of researchers have studied and reported on the need for mathematics teachers' reflective practice (Thompson, 1982, 1984, 1992; Relich, 1996; Korthage & Wubbels, 1991). For example, Thompson

(1982, 1987, 1992) used reflective practice as a tool to mediate between teachers' perceptions of their teaching and their actual classroom practice. In Korthagen and Wubbels (1991), researchers studied a mathematics teacher education program that sought to promote reflective practice. Specifically, they studied the role of reflection in good teaching, identifying aspects of teaching that distinguished reflective practitioners from other teachers. Relich (1996) expanded the research on reflective practice of teachers by adding mathematics teachers' self-concept, defined as perceptions of themselves as mathematicians and teachers, to an analysis of teaching practice. In the process of identifying the components of teacher reflective practice, the gender of the teacher is an important consideration. Researchers indicate that male and female teachers place different emphases in their reflection and in their teaching. Several research studies (Korthagen & Wubbels, 1991; Duffy, Warren, Walsh, 2001; Meece, 1987; Smith, 1992) examine these differences. In the study of classroom interactions, Duffy, Warren and Walsh (2001), focused on the relationship between teachers' gender, students' gender and content. They found that female mathematics teachers tended to interact more with male students than female students in their classrooms. Relich (1991) also did research on gender of mathematics teachers. He found that the majority of female mathematics teachers expressed concerns for the welfare of their students and made a genuine attempt to make mathematics relevant to them; their male counterparts were more concerned with the subject matter knowledge. It was also noted that teachers who had low confidence in their own mathematical abilities expressed great concern for students' comfort in their classrooms. While this second finding does not necessarily indicate a gender difference, it does indicate that there are differing views on the importance of mathematics content and affective characteristics in the classroom. This distinction is useful when analyzing the range of responses to self-reflection.

Although reflective practice has been identified as a component of good teaching for quite some time, its benefits and effects on classroom teaching are still being uncovered. Current technology enables researchers to revisit old findings, and refine old claims. Video has become increasingly popular in teacher training because of its unique ability to capture the richness and complexity of the classroom environment. In recent years video-recording has become very popular: lesson studies (Fernandez, Cannon, & Chokshi, 2003) and problem-solving circles (Borko et al, 2008). Rich and Hannafin (2009a) found a positive impact of various video annotation tools on pre-service teachers' reflective practice, and respectively on their teaching. Several research studies in mathematics teacher education have also identified the benefits of using video-recorded mathematics instruction as an effective learning tool for pre-service teacher education (Beck, King, & Marshall, 2002). Lastly, Rowland et al (2005), Storeygard and Fox (1995) and Breyfogle (2005), document the effectiveness of using video-recorded instruction as a research tool. Simon and Tzur (1999) define teachers' practice as "... not only everything that teachers do that contributes to their teaching (planning, assessing, interacting with student) but also everything teachers think about, know and believe about what they do" (p. 254). This definition is at the base of this paper's discussion of pedagogical practice. Using this definition, reflection can be understood to be a component of pedagogical practice. Moreover, we add to Simon and Tzur's definition by embracing Thompson's (1982, 1984, 1992) experimental approach to defining desirable pedagogical practices. We use Thompson's empirically derived list of effective pedagogical practices of mathematics teachers to frame our inquiry into the practice of our research participants.

Research Questions

This study centers around three research questions.

1. First, what pedagogical practices do female mathematics teachers value?
2. Second, is there a difference in pedagogical practice between primary and secondary level female mathematics teachers

3. Third, is there a difference between what female mathematics teachers think they do in the classroom and what they actually do? Does video aid in discovering this difference?

Analytical framework

In order to analyze and compare student reflections, researchers used a table to record relevant facts. Column one contained the pseudonym of the participant. Column two contains the code for the objective(s) that the participant designated most important (assigned a number five). Columns three and four contain a list of participant-observed consistencies (column three) and contradictions (column four) between the ranked objectives and the video. Column five contains researcher observations.

Results

In our study we find several interesting results:

1. Female teachers list affective traits as most important in the classroom
2. Video review confirms that teachers of early elementary are most successful in addressing affective traits
3. Video review reveals that middle grades and secondary teachers engage their students less, but still place a premium on comfort
4. Video allows both teachers and researchers to analyze the lesson in more detail

As all of the teachers were female, the fact that all participants placed emphasis on affective objectives corresponds to Gilligan's (1982) theory that women operate using an ethic of care. It is also consistent with studies by Korthagen and Wubbels (1991), Duffy, Warren, and Walsh, (2001) and Meece (1987), all of which indicate that female classroom teachers elevate the importance of the affective environment in their classrooms.

Our observations of the videotaped lessons confirmed the lack of engagement in the cases of three of our participants' classrooms. In these classrooms, the emphasis on comfort that the teachers valued was difficult for us to observe. Two participants appeared to be disconnected from their students, while other was openly judgmental of her female students.

In summary, viewing the videotape in conjunction with the list of important pedagogical traits gave both participants and us as researchers a framework for analyzing the lesson. Confirming prior research findings (Borko et al 2008: Brophy, 2003: Rich and Hannafin, 2009b) structured reflective analysis of participants own videotaped lessons proved to be an effective learning environment for the practicing mathematics teachers.

While most research studies on reflective practice through video-recorded lessons are about pre-service teachers and collaborative/team learning, our study is about practicing teachers, and individual reflections on their own lessons. In placing this emphasis, researchers have made each teacher responsible for her own progress. In other words, researchers positioned the use of video as a medium for private reflective practice rather than a teaching tool for group use.

In analyzing the videos, researchers found that their analysis did not always agree with that of study participants. Researchers took the position that while their insights were important in discovering the lens teachers use to view their lessons, ultimately it is the teacher who decides on the changes to be made in her classroom. Therefore, the teacher's interpretation of the videotaped lesson is should be privileged over that of the researcher.

This study looks at female teachers ideas of desirable pedagogical practice. However, video was also used in the analysis of other characteristics of good teaching. In the future, we will extend our study to include all six sets of characteristics. We are particularly interested in discovering whether the results of this analysis are consistent with other data collected and plan to continue this project in the near

future. In addition, we are interested in extending this research to a larger participant pool, so that research also can be analyzed quantitatively.

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