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TEACHERS REFLECTING DIFFERENTLY: DECONSTRUCTING THE DISCURSIVE TEACHER/STUDENT BINARY

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This session explores the ways that practicing teachers came to reflect differently regarding the discursive teacher/student binary during a graduate-level course entitled "Mathematics Education within the Postmodern." Using Dewey's concept of reflective thinking, as well as Foucault's discourse and Derrida's deconstruction, we show how the course provided new suggestions for the students as they continued their journey of becoming teachers. Through interweaving comments written by the students with concepts borrowed from postmodern philosophers and theorists, we illustrate how the teachers began to understand that teachers and students might indeed be described differently in the postmodern.

Introduction

Most, if not all, mathematics teachers, educators, and policymakers would agree that the documents produced by the National Council of Teachers of Mathematics (NCTM) over the past 30 years describe a different mathematics classroom than that which is experienced by most students in U.S. schools (see, e.g., NCTM, 2000). Although the impact of these documents in reforming mathematics teaching has been somewhat limited (see, e.g., Wilson & Goldenberg, 1998), research has shown that these documents have had an impact on how mathematics teachers define and practice "good" mathematics teaching (see, e.g., Wilson, Cooney, & Stinson, 2005).

Wilson, Cooney, and Stinson's (2005) research on the perspectives of seasoned mathematics teachers about good teaching suggests that efforts to reform mathematics teaching are seldom all or nothing affairs. Their research illustrated that even as seasoned teachers reformed (some of) their teaching practices that most often they continued to maintain a belief in the teacher-centered classroom and the infallibility of mathematics. It has been argued that the latter of these beliefs is counter to reform-oriented mathematics teaching, thus securing the continuation of traditional practices (see, e.g., Davis & Hersh, 1981; Ernest, 1998). To make it possible for teachers to create mathematics classrooms that are consistent with the constructivist, student-center objectives of reform-oriented mathematics teaching, we believe that teachers must be provided an opportunity to challenge and "trouble" both traditional mathematics teaching and the reform efforts themselves. In understanding the mathematics classroom as a pedagogical space for teachers and students to "reason together" (David and Hersh, 1981, p. 282) through the socially constructed discipline of mathematics (Ernest, 1998), we argue that postmodern (or poststructural) theory provides a *different* theoretical framework for teachers to trouble both traditional and reform-oriented mathematics teaching as they explore their own pedagogical philosophies and practices.

The value of postmodern theory is found in its awareness of and tolerance toward social differences, ambiguity, and conflict; it requires developing new languages, conventions, and skills to address the moral and political implications of knowledge (Seidman, 1994). In short, postmodern theory requires shifting the "focus from foundations and familiar struggles of establishing authority toward exploring tentativeness and developing scepticism of those

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principals and methods that put a positive gloss on fundamentals and certainties" (Walshaw, 2004b, pp. 3–4).

Foucault's Discourse, Derrida's Deconstruction, and Dewey's Reflection

As Foucault (1969/1972) reinscribed the concept *discourse*, he argued that discourses are not a mere intersection of words and things but are "practices that systematically form the objects of which they speak" (p. 49). That is to say, for Foucault, "discourses do not merely *reflect* or represent social entities and relationships; they actively construct or *constitute* them" (Walshaw, 2007, p. 19, emphasis in the original). Foucault (1976/1990), however, also conceived discourses "as a series of discontinuous segments whose tactical function is neither uniform nor stable" (p. 100), which provides for the occasion of developing different discourses—and, in turn, different knowledges. Thus, we are not forever doomed by discourses. In general, Foucault's (1969/1972) analysis of discourse replaces the concept of the "nature" of knowledge with the "discursive formation" (p. 38) of knowledge. His analysis rejects the "natural" or taken-for-granted concepts of knowledge found in humanism, such as Descartes' dualism of mind-body (which argues that the thinking subject is the authentic author of knowledge) or Comte's positivism (which argues for a "scientific" knowledge gained from methodologically observing the sensible universe) (St. Pierre, 2000). Foucault uncovered knowledge as a discursive formation through the means of performing an archeological analysis, which examines the history of a discourse. But rather than being concerned with uncovering the "truth" by an examination of facts and dates, it is concerned with the "historical conditions, assumptions, and power relations that allow certain statements, and by extension, certain discourses to appear" (St. Pierre, 2000, p. 496). In short, this methodology allows for the understanding of "how knowledge, truth, and subjects are produced in language and cultural practice as well as how they might be reconfigured" (St. Pierre, 2000, p. 486).

In other words, there is no origin, or understood in another way, no center to discourse. Derrida (1966/1978) argued that accepting discourse as having no center allows discourse to be open for the "movement of play" (p. 289). He defined play as the "disruption of presence" (p. 292). In this context, play rejects the totalization of humanism with its "dreams of deciphering a truth or an origin which escapes play" (p. 292). This movement of play provides more freedom. This reconstitution of freedom as play is implicated in Derrida's *deconstruction* of discursive binary oppositions (see, e.g., Derrida, 1974/1997). Although Derrida refused to limit the possibilities of deconstruction through definition (1983/1991, see also Derrida & Montefiore, 2001), others have described it as the methodology of exposing discursive binary oppositions defined interdependently by mutual exclusion, such as good/evil or true/false (Dillon, 1999). For Derrida, these binary oppositions shape the very structure of thought by constructing an "essential" center and authorizing presence—a center and presence that, it is assumed, will collapse if the binary opposition is undermined (Usher & Edwards, 1994). Within the context of mathematics education, some of these binary oppositions are: mathematical *T*ruths/mathematical *t*ruths, teacher/student, effective teacher/non-effective teacher, reform teaching/traditional teaching, mathematically able student/non-mathematically able student, high-level course/low-level course, and so forth.

The deconstruction of binary oppositions identifies the first term, the "privileged" term, as being dependent on its identity by the exclusion of the other term, demonstrating that primacy really belongs to the second term, the subordinate term, instead (Sarup, 1993). Deconstruction, therefore, involves unsettling and displacing (or troubling) binary hierarchies, uncovering their

historically contingent origin and politically charged roles, not to provide a "better" foundation for knowledge and society but to dislodge their dominance, creating a social space that is tolerant of difference, ambiguity, and playful innovations that favors autonomy and democracy (Seidman, 1994). In short, deconstruction acknowledges that the world has been constructed through language and cultural practices; consequently, it can be deconstructed and reconstructed again and again (St. Pierre, 2000).

In the past 2 decades or so, the discourse of *reflection* has been identified as a crucial characteristic of exemplar teachers by numerous national, state, and local organizations, foundations, and boards (Rodgers, 2002). For example, the NCTM (2000) stated, "opportunities [for teachers] to reflect on and refine instructional practice—during class and outside of class, alone and with others—are crucial in the vision of school mathematics outlined in *Principles and Standards*" (p. 19). Mewborn (1999), in her study on reflective thinking among preservice elementary mathematics teachers, traced the emphasis of teacher reflection to Dewey, suggesting that he believed the primary purpose of teacher education should be to help teachers reflect on problems of practice. Although Mewborn rightly noted that there is little agreement as to the content and nature of Dewey's reflective thinking in general, she did find some commonalities present within the literature, including that reflective thinking is qualitatively different from recollection or rationalization, and is both an individual and shared experience. Rodgers (2002) argued that reflection is not an end in itself but a tool used in the transformation of raw experience into meaning-filled theory—grounded in experience and informed by existing theory—to serve the larger purpose of the moral growth of the individual and society.

The Course

Teacher reflection was a primary objective as I (the first author) planned the course "Mathematics Education within the Postmodern," a graduate-level, mathematics education course. The course, a reading intensive seminar, began by engaging students in a brief overview of postmodern theory, reading book chapters by foundational French scholars such as Gilles Deleuze and Félix Guattari (1980/1987), Jacques Derrida (1966/1978), Michel Foucault (1976/1990), and Jean-François Lyotard (1979/1984). In addition, the students read book chapters and essays by education theorists who position their scholarship within postmodern theory, such as Patti Lather (2000), Robin Usher and Richard Edwards (1994), and Elizabeth St. Pierre (2000, 2004). This overview provided the foundation for students to begin an initial critical analysis of essays contained in Margaret Walshaw's (2004a) edited book *Mathematics Education within the Postmodern*, essays that deconstruct and trouble the discourses of knowledge, learning, teaching, power, equity, and research, among others, within the context of mathematics education (for a review of this book see Powell, 2007).

The specific learning objectives of the course were for students to develop an introductory understanding of the philosophical underpinnings of postmodern theory and to explore and (re)position the philosophical and structural foundations of mathematics, mathematics teaching and learning, and research in mathematics education within a postmodern framework. The intended purpose was not to "change" their teaching practices per se, but rather to provide the opportunity for mathematics education professionals to reflect differently on mathematics, mathematic teaching and learning, and, in turn, their pedagogical practices in light of postmodern theory. In short, the purpose of the course was for students to take the familiar discursive binaries of mathematics education (noted earlier) and to undergo a deconstructive process, individually and collectively.

Twelve students (8 women and 4 men) took the course; all but one were part-time graduate students and full-time mathematics teachers, ranging from elementary to college, with 5 to 15 years of teaching experience. A daily written assignment for the course was to maintain a reading journal (i.e., annotated bibliography) that included written summaries of each assigned reading, student-selected significant quotations from each reading, and comments regarding the student's struggles with each reading and how it might (or might not) assist in her or his teaching (and research). The final for the course was a reflective, academic essay (eight text pages in length) in which each student was to discuss her or his understanding of mathematics education framed in the postmodern and her or his struggles with and remaining (or new) questions of such a framing.

Teachers Reflecting *Differently*

No matter what the students' initial comfort level with the ideas of postmodern theory, in the following discussion we argue that their final reflective essays demonstrate that in most cases each student's thinking attempted to take a new "line of flight," in which they endeavored to "make a map and not a tracing" (Deleuze & Guattari, 1980/1987, pp. 11–12) of the meanings and *t*ruths of mathematics teaching and learning. Through using the first phase of Dewey's (1933/1989) five phases of reflecting thinking—suggestion—the discussion attempts to capture (some of) these new lines of flight, illustrating how these practicing teachers began to reflectively think differently. The discussion is not about tracking or documenting mathematics "teacher change." We understand mathematics teacher change to be a complex endeavor that most often occurs when teacher professional development opportunities are long-term, school-based efforts conducted within a community of learners that provide teachers opportunities to grapple with significant mathematics and to consider how students might engage with that mathematics (Mewborn, 2003). Like the NCTM *Principles and Standards* (2000), however, we believe that teaching is a continual journey. "Effective teachers" do not master teaching, but rather find themselves in a continuous state of growth and change (Mewborn, 2003).

Within Dewey's (1933/1989) reflective thinking phase of "suggestions, in which the mind leaps forward to a possible solution" (p. 200), we believe that postmodern theory offered these seasoned teachers the possibility of different suggestions as the familiar discursive binaries of mathematics education underwent deconstruction, and, in turn, motivated different suggestions. Given the space limitation of this paper, we focus the discussion on the discursive practices that classify and describe teachers and students through interweaving comments written by the students with concepts borrowed from postmodern philosophers and theorists, illustrating how the teachers began to understand that teachers and students might indeed be described differently in the postmodern (Hardy, 2004).

In a postmodern frame, a new suggestion emerges that attempts to pry loose the binary (Spivak, 1974/1997) teacher/student, deconstructing the binary both in identity and relations of power. Within postmodern theory, teachers and students are (re)defined as *subjects* rather than as individuals. The term *individual* is a humanist term that implies that there is an "independent and rational being who is predisposed to be motivated toward social agency and emancipation—what Descartes believed to be the existence of a unified self" (Leistyna, Woodrum, & Sherblom, 1996, p. 341). A postmodern perspective, on the other hand, defines the person as a multiplicitous, fragmented subject who is subjugated, but not determined, by the social structures and discourses that constitute the person.

This conception provides for a different suggestion of power and, in turn, agency. *Power* in a postmodern frame is reconstituted, not as an object that can be shared, deployed, or taken away, but as a dynamic and productive event that exists in *relations of power* (Foucault (1976/1990). Deanne (a pseudonym, as are all student names throughout) used this Foucauldian reconstitution of power when she argued that teachers can challenge discourses by the decisions they make in their classes, for their students, everyday. Deanne also wrote, "Teachers in a postmodern classroom (occupied by subjects who transfer power between the teacher and each other in order to gain knowledge) attempt to create a space where students [and teachers] can learn through communication with others in the class." Similarly, Lauren wrote, "I must consciously acknowledge my students, not as objects, but as [subjects], using power, resisting power, and interacting with each other and with the mathematics." While reconstituting power as "'letting go' of the control in their classroom" and allowing "for the possibility of being 'found out' as not being *the* authority," Charles wrote: "Teachers need to embrace their lack of expertise. …By joining the learning process in the classroom, teachers can model the open-mindedness necessary for students so that they might begin questioning, discussing, and constructing their own mathematical knowledge." This joining in the learning process allows for a different interaction between teacher and students—and mathematics—that supports the mathematics classroom in becoming a pedagogical space that is open for *"negotiation of intentionality*" (Valero, 2004, p. 49, emphasis in original).

Valero (2004) suggested that when students (and teachers) are defined as agents who negotiate the intentions of the mathematics classroom—using power, resisting power, interacting with each other and the mathematics—that real empowerment might take place. Here, empowerment is understood as *self*-empowerment: "a process one undertakes for oneself; it is not something done 'to' or 'for' someone" (Lather, 1991, p. 4). Within the context of a postmodern mathematics classroom, Valero claimed that empowerment is not passed from teacher to student through the transference of "powerful knowledge," but rather might be defined in terms of the potentialities for students (and teachers) to participate in (i.e., to negotiate) the discursive practices of school mathematics. Sarah noted, "I hope to help my students empower themselves to overcome the discourses…to overcome the limitations society and our culture has put on them."

Coupled with this different understanding of student and teacher empowerment was a different suggestion of understanding students and teachers as fragmented subjects. Lauren wrote: "I have been many in my life—there is no one *woman* who defines me. I am mother, wife, teacher, daughter, boss, and student—each time made anew by social context and relationships with others." As these seasoned teachers began to understand themselves as fragmented subjects constructed through discourses and relations of power, they, in turn, began to view their students as fragmented subjects. For example, Nancy stated: "Educators should begin to look at their students as multiplicitous subjects rather than as individuals; it is important to remember students are not identical in math or English class, in sports or hobbies, at home or school." She continued, "I need to accept my students as multiplicitous—each one coming to me with different levels of prior mathematical knowledge and different ways of learning." Likewise, Susan wrote: "If nothing else, I have come out of this class knowing that students think differently, react differently, and position themselves differently; I need to recognize and respect these multiplicities."

The multiplicitous is a key reconstitution of self, others, and knowledge found within Deleuze and Guattari's (1980/1987) characterization of the rhizome. The rhizome, as described

by Deleuze and Guattari, is not "reducible neither to the One nor the multiple. …has neither a beginning nor end, but always a middle (*milieu*) from which it grows and overspills" (p. 21). Fleener (2004), building upon the rhizome, argued for the importance of seeing teachers and students (and the mathematics curriculum) as multiplicitous, and that teachers should shift their "focus to the in-between, the relational, and the dynamic" (p. 213). Through "engaging the in-between, students build their own understanding, not as foundations, but as complex webs of the nexus of relationship in the abstract world of mathematics" (p. 214). Sarah began engaging in the in-between, writing: "Typically, in mathematics we think there is one right answer to a problem and focus on developing our students' knowledge of how to get to that answer, [but] it is…the 'in-between' that matters the most."

A new suggestion of the in-between brought about a different suggestion regarding the possibilities of classroom communication. Within the postmodern, Cabral (2004) claimed, language ceases to be regarded as a means of "communication," but as the very process of constitution of the subject; that is, the discipline of mathematics, students, and teachers are constituted within a language community. Therefore, Cabral argued, "we need to stop talking and start listening to the student...it is through speaking that one learns and through listening that one teaches" (p. 147). Lauren wrote: "I will listen more, talk less. …Let the students guide the lesson, hear what they have to say, to me and to each other, about the mathematics, about their understandings, questions, and confusions." Nancy noted, "Actively listening to students' questions and concerns may lead to further areas of exploration outside of the daily…lesson." Dorothy, a doctoral student, spoke about the importance of teachers listening to their students, and of students listening to each other: "There have been many times in my classroom when I could not understand the point a student was trying to make. It took another student, in different words, to relay the message so that I could understand."

Conclusion

The preceding discussion attempted to capture the different suggestions that engaging in the postmodern provided these seasoned teachers as they began to think differently about the discursive binary teacher/student. These suggestions motivated different classifications and descriptions for teachers' and students' identity, agency, and empowerment, and, in turn, a different suggestion of teacher and student participation in the mathematics classroom. There were several other instances in the teachers' final essays in which other familiar discursive binaries were deconstructed or troubled. Some troubled the binary of mathematical-able student/non-mathematical-able student, while others troubled the effective teacher/non-effective teacher binary. And, in rare occasions, even the discursive binary mathematical *T*ruths/mathematical *t*ruths was troubled. For instance, Marcus, a doctoral student, wrote, "Are we confining ourselves and our students by the rules and laws of mathematics that do not allow for them to do the unexpected, to go beyond their own reality?" Likewise, Nicholas noted, "I was blown away by the thought that mathematics, something that I had found comfort in because of its absolute nature, was being viewed as a science of uncertainty that could not be defined by its absolutes any longer." In general, the teachers limited their comments regarding the *t*ruths of mathematics, or, similar to Nicholas, somehow resisted reconstituting the "absolute nature" of mathematics. It appears that although mathematics has been argued to be the roots of postmodern thought (see, e.g., Tasić, 2001), to deconstruct the capital-T truths of mathematics might prove to be the most difficult deconstruction to undertake; it may be, nonetheless, the most important.

References

Cabral, T. (2004). Affect and cognition in a pedagogical transference: A Lacanian perspective. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 141–158). Greenwich, CT: Information Age Publishing.

Davis, P. J., & Hersh, R. (1981). *The mathematical experience* (First Mariner Books ed.). Boston: Houghton Mifflin Company.

Deleuze, G., & Guattari, F. (1987). *A thousand plateaus: Capitalism and schizophrenia* (B. Massumi, Trans.). Minneapolis, MN: University of Minnesota Press.

Derrida, J. (1978). Structure, sign and play in the discourse of the human sciences (A. Bass, Trans.), *Writing and difference* (pp. 278–293). Chicago: University of Chicago Press. (Lecture delivered 1966)

Derrida, J. (1991). Letter to a Japanese friend. In P. Kamuf (Ed.), *A Derrida reader: Between the blinds* (pp. 269–276). New York: Columbia University Press. (Letter written 1983)

Derrida, J. (1997). *Of grammatology* (G. C. Spivak, Trans. Corrected ed.). Baltimore, MD: Johns Hopkins University Press. (Original work published 1974)

Derrida, J., & Montefiore, A. (2001). "Talking liberties": Jacques Derrida's interview with Alan Montefiore. In G. Biesta & D. Egéa-Kuehne (Eds.), *Derrida & education* (pp. 176–185). New York: Routledge.

Dewey, J. (1989). How we think. In J. A. Boydston (Ed.), *John Dewey: The later works, 1925–1953* (Vol. 8, pp. 105–352). Carbondale, IL: Southern Illinois University Press. (Original work published 1933)

Dillon, M., C. (1999). Derrida, Jacques. In R. Audi (Ed.), *The Cambridge dictionary of philosophy* (2nd ed., p. 223). Cambridge, UK: Cambridge University Press.

Ernest, P. (1998). *Social constructivism as a philosophy of mathematics*. Albany, NY: State University of New York Press.

Fleener, M. J. (2004). Why mathematics? Insights from poststructural topologies. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 201–218). Greenwich, CT: Information Age Publishing.

Foucault, M. (1972). *The archaeology of knowledge* (A. M. Sheridan Smith, Trans.). New York: Pantheon Books. (Original work published 1969)

Foucault, M. (1990). *The history of sexuality. Volume I: An introduction* (R. Hurley, Trans.). New York: Vintage Books. (Original work published 1976)

Hardy, T. (2004). "There's no hiding place": Foucault's notion of normalization at work in a mathematics lesson. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 103–119). Greenwich, CT: Information Age Publishing.

Lather, P. (1991). *Getting smart: Feminist research and pedagogy with/in the postmodern*. New York: Routledge.

Lather, P. (2000). Drawing the line at angels: Working the ruins of feminist ethnography. In E. A. St. Pierre & W. S. Pillow (Eds.), *Working the ruins: Feminist poststructural theory and methods in education* (pp. 284–311). New York: Routledge.

Leistyna, P., Woodrum, A., & Sherblom, S. A. (Eds.). (1996). *Breaking free: The transformative power of critical pedagogy*. Cambridge, MA: Harvard Educational Review.

Lyotard, J. F. (1984). *The postmodern condition: A report on knowledge* (G. Bennington & B. Massumi, Trans.). Minneapolis, MN: University of Minnesota Press. (Original work published 1979)

Mewborn, D. S. (1999). Reflective thinking among preservice elementary mathematics teachers. *Journal for Research in Mathematics Education, 30*(3), 316–341.

Mewborn, D. S. (2003). Teaching, teachers' knowledge, and their professional development. In J. Kilpatrick, G. Martin, & D. Schifter (Eds.), *A research companion for NCTM Standards* (pp. 45–52). Reston, VA: National Council for Teachers of Mathematics.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Powell, G. C. (2007). The view from here: Opening up postmodern vistas [Review of the book *Mathematics education within the postmodern*]. *The Mathematics Educator, 17*(1), 42–44.

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *Teachers College Record, 104*(4), 842–866.

Sarup, M. (1993). *An introductory guide to post-structuralism and postmodernism* (2nd ed.). Athens, GA: University of Georgia Press.

Seidman, S. (1994). Introduction. In S. Seidman (Ed.), *The postmodern turn: New perspectives on social theory* (pp. 1–23). Cambridge, UK: Cambridge University Press.

Spivak, G. C. (1997). Translator's preface (G. C. Spivak, Trans.). In J. Derrida, *Of grammatology* (Corrected ed., pp. ix–lxxxvii). Baltimore: Johns Hopkins University Press. (Original work published 1974)

St. Pierre, E. A. (2000). Poststructural feminism in education: An overview. *International Journal of Qualitative Studies in Education, 13*(5), 467–515.

St. Pierre, E. A. (2004). Care of the self: The subject and freedom. In B. Baker & K. E. Heyning (Eds.), *Dangerous coagulations?: The uses of Foucault in the study of education* (pp. 325–358). New York: Peter Lang.

Tasić, V. (2001). *Mathematics and the roots of postmodern thought*. Oxford, UK: Oxford University Press.

Usher, R., & Edwards, R. (1994). *Postmodernism and education*. NY: Routledge.

Valero, P. (2004). Postmodernism as an attitude of critique to dominant mathematics education research. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 35–54). Greenwich, CT: Information Age Publishing.

Walshaw, M. (Ed.). (2004a). *Mathematics education within the postmodern*. Greenwich, CT: Information Age.

Walshaw, M. (2004b). Introduction: Postmodern meets mathematics education. In M. Walshaw (Ed.), *Mathematics education within the postmodern* (pp. 1–11). Greenwich, CT: Information Age Publishing.

Wilson, P. S., Cooney, T. J., & Stinson, D. W. (2005). What constitutes good mathematics teaching and how it develops: Nine high school teachers' perspectives. *Journal for Mathematics Teacher Education, 8*, 83–111.

Wilson, M., & Goldenberg, M. (1998). Some conceptions are difficult to change: One middle school mathematics teacher's struggle. *Journal of Mathematics Teacher Education, 1*, 269–293.