

Crossing Philosophical Divides: Adding Poststructuralist Insight into Building, Maintaining and Changing Teaching for Better Learning

Mary Klein
James Cook University
<mary.klein@jcu.edu.au>

Teaching mathematics responsibly involves more than the application of disciplinary and pedagogical knowledge; it also involves appreciating and implementing flexible and dynamic interactional patterns that value diversity and students' idiosyncratic attempts to make sense of learning. New ways-of-being a teacher that support the unpredictable and creative in learning reach into, yet beyond, the psychological and sociocultural for their philosophical ground. An overarching poststructuralist arm of analysis assumes that power relations inherent in interactional patterns in learning and work constitute or create practice.

Serious problems plague mathematics education in Australia and around the world; many of these relate to teachers' lack of subject-specific and pedagogical content knowledge. Representing popular opinion, Rubinstein (*The Australian*, 2007), for example, mentions the importance of disciplinary expertise in "well-trained and enthusiastic teachers of mathematics" (p. 33). While a lack of disciplinary knowledge is clearly a critical problem, disciplinary knowledge of itself can not ensure the construction of learning environments that shore up each learner's self-recognition as *being* numerate in a postmodern world. A teacher's pedagogical content knowledge is also important, though it too can be applied in ways that limit students' participation in learning. The *quality* of the learning environment or context is implicated, not just in relation to how well it fosters the production of rigorous disciplinary knowledge and collaborative, investigative skills, but in how it either supports or suppresses generative participation, wherein future practice is anticipated and prefabricated.

The contradictory and controversial point I am making in this paper is that learning can be unconscious and can have positive and/or negative effects on the nature and extent of participation in a discourse. I make this claim because I am assuming, through a poststructuralist lens, that learning encompasses more than the construction of disciplinary knowledge; an unconscious sense of self and satisfaction overlays and mobilises this knowledge or renders it useless and unused. Although modernist assumptions support the cognitive reconstruction or relearning of concepts and attitudes in relation to teaching mathematics, poststructuralists assume that this is but a start; for every moment teachers (and prospective teachers) participate in mathematics lessons they are undergoing a process of subjectification, subjected to power relations of inclusion and exclusion that constitute an unconscious knowledge of and about mathematics, of who can and should do it, and how it can be taught and learned. Lather (1991) referred to this constituted knowledge as *knowing*, an unconscious form of knowledge indivisible from a teacher's classroom practice.

In this paper I layer a poststructuralist interpretation over papers by Smith (2009) and Dimarco (2009). Both papers discuss crossing divides in mathematics education in relation to the quality of the learning process; both papers see contextual issues as primary. I add poststructuralist insight to these analyses, drawing attention to the operation of power in learning contexts or environments which constitute the participation and practices of the persons involved. I argue that generative action is constituted, it can not be taken for

granted and is not a personal attribute, with implications for the operation of mathematics education discourses in teacher education and schools.

Struggling for Legitimacy

Smith (2009) works with first year preservice teachers to help them bridge understanding, interest and identity gaps in establishing themselves as teachers of numeracy. In relation to Smith's (2009) paper I assert that it is not just that she manages to engage her students in learning mathematics that counts, it is *how* she engages them that augurs well for their future practice. It is clear that she is aware of the mathematics needed to contribute to a growing legitimacy as a teacher of mathematics, and of high quality collaborative participation as crucial to the construction of this knowledge, and identity. Pedagogical practices emphasise investigative, collegial ways of working that ignite students' thinking and reasoning processes. Clearly, from the few examples related in a short paper, Smith (2009) demonstrates that she is successful in having some students at least bridge understanding, interest and identity gaps at a conscious, intellectual level.

A poststructuralist lens is sensitive to power relations in pedagogical practice and how these constitute the novice teacher's sense of legitimacy, or identity as a teacher. In this case, it seems that power relations have operated in positive ways to allow the preservice teachers to sense an embryonic, though tentative and fragile, legitimacy. This sensing does not ensue from the construction of knowledge alone, but from the simultaneous positioning of the student as having a real *presence* in the discourse, as *author* or initiator of sense making streams and as one who can and should go beyond the given to forge new ways-of-being a teacher of numeracy. As Foucault asserts, power does not lie in the possession of knowledge alone, but in "the manifestation of a relation in which people position themselves in order to influence the outcomes of a situation using diverse tools" (Foucault, 1972; cited in Valero, 2004, p. 49). Active participation is important, as in psychological and sociocultural epistemologies, though it is now the *quality* of this participation, in relation to relationships of power, that matters.

One important element of Smith's (2009) practice is to engage the preservice teachers in understanding mathematical ideas and relationships. However, in *how* she does this she is able to evoke in her students a growing appreciation of the structural properties of mathematics itself:

I felt it [mathematics] was all silly computations that made no sense at all. Now I can see that it is all interrelated and that it is possible to understand...

Instead of maths being a jumbled set of ideas...I now have a much clearer idea of how to work things out for myself...instead of fear I now have a plan.

A second strong element is how Smith (2009) supports her students in establishing a sense of presence in the discourse, including the right to show initiative and author/initiate streams of thought. A sense of *presence* in poststructuralist thought has to do with positioning, with valuing and respecting each individual's contribution and right to make sense in personally meaningful ways. It also has to do with initiating discourse threads; with asking questions and being positioned as one whose questions and idiosyncratic views matter:

I understand that it isn't about knowing everything, but about exploring the ideas and coming to my own understandings...a challenge to my previous way of thinking.

This is how I approached it, I am not sure if it is correct, but...

I have no idea if I am on the right track. But am comfortable to submit my answers...

OK, done some more thinking...Here's what I came up with...

In each case the students take the initiative; they are actively authoring discursive threads. They are beginning to stake a tentative foothold in the discourse. They have access to a discursive space that values their presence and right to speak and be heard; even when what they have to say is not really what the lecturer wants to hear:

Still have a fear of getting it wrong and not wanting to discuss my ideas.

Struggling to Maintain Legitimacy

Dimarco's (2009) teachers work in a coercive and controlling political climate that they feel diminishes their professional standing and expertise. With the advent of national testing, these teachers sense a threat to their established legitimacy as teachers. They speak about cracks or divisions in their professionalism and practice, with dire results for their students' learning of mathematics. Here discursive practices at the level of teachers' professionalism and practice are relevant, and at the level of student learning; the political climate is all encompassing.

A poststructuralist analysis of the teachers' situation would recognise the coercive environment in which they work; however, all environments (comprising relations of power) are coercive in one way or another, and coercion can operate in positive ways. Participants can be coerced into ways-of-being in a discourse that are enabling and empowering. This notion has relevance for both the teachers and the students involved here.

First, the teachers feel that their professional identity is at stake on a couple of fronts; the tests were imposed without consultation, and if their students perform badly it will diminish their professional standing. One of the teachers laments:

I have a problem with some teachers at other schools that are teaching to the trial national test appearing to be the 'better' teachers.

A poststructuralist reading of the situation is that the discursive practices of the pedagogies with which these teachers feel so comfortable, are being rent asunder by the imposition of a new discursive practice. In this context, the mathematics education discourse will not operate in quite the same way again. This affects professional identity, as the discursive practices of mathematics education constitute identity, and vice versa. However, identities are malleable and changing, they should not be seen to be set in stone, and out of confusion and disarray new practices become possible.

For teaching professionals the needs of students are primary; while the context or environment in which they work is coercive and controlling, so too is that in which their students struggle to establish themselves as competent users of mathematical ideas. They must ensure that the learning context to which their students are exposed facilitates the construction of the highest quality mathematics and engagement. It should not come down to an either/or situation; quality in teaching or the national test? These are experienced teachers, they have a large repertoire of strategies and understandings of mathematics at their fingertips; they could use this knowledge to coerce their students into demonstrating robust and flexible understandings of mathematics in a variety of contexts. The national test is just one more context in which students need to be able to perform mathematically; a robust knowledge base and their own sense of competence and confidence will make it just another discursive practice to negotiate. Curriculum in its widest sense comprises

knowledge, and discursive practices that ensure its construction and application; teachers don't have to wait to be asked to construct curriculum. As Van de Walle (2007, p. 92) says: "A student oriented, problem based approach is the best course for raising scores".

Further Research

More research needs to be done on whether the on-line students (Smith, 2009), sense a higher level of legitimacy than the face-to-face or internal students? The on-line students seem to spend more time and effort on thinking and reasoning; the whole process is made visible to others in the group so that they can pick up on new ways of thinking and can ask questions as the need arises. A poststructuralist reading, sensitive to power relations, could assert that on-line students are empowered through participation in less-threatening environment; even though each group has the same teacher, past demeaning experiences may float closer to the surface for internal students, limiting the extent and depth of their participation. The on-line students are arguably constructing more rigorous mathematics and sensing a growing legitimacy as they participate in on-line discussions and e-mail exchanges. Since their future is made recognisable in the present moment, these discursive events of interaction, explaining and asking questions would seem to be appropriately constitutive of future practice.

A second avenue of further research is that of teacher change. Out of Dimarco's (2009) paper comes the notion that teachers feel threatened by change. A poststructuralist interpretation is that teachers find comfortable spaces within the discursive parameters that constitute professional practice; each day they operate within these parameters and each day their professional identity is nourished without change. A case in point arises in Dimarco's (2009) paper where she asks the teachers about their teaching strategies, about which they are vocal; however, when she asks "How/in what ways do you consider that these strategies enhance learning?" there is silence, except to mention the imposition of the tests which is seemingly the only impediment to learning. The teachers take for granted a linear link between what they do and outcomes; they do not consider how the learning context they establish with their students can operate to empower or sanction engagement.

Conclusion

Poststructuralism adds circumspection to all mathematics education practice because it is suspicious of the operations of power in the learning environment; it makes visible how contexts and environments affect participation and identity. The learning process comprises not only intellectual components, but also an unconscious *knowing* (Lather, 1991) about mathematics and education and one's position or place relative to discursively produced truths. While the data discussed in this paper are often classified as *soft* in comparison to those of hard science, the learning effects of discourse are potent and deserve further investigation in relation to building, maintaining and changing teaching practice.

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