Correcting Mathematical and Attitudinal Deficiencies in Preservice Teacher Education: The Conservative Effect of Blaming the Victim

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In this paper I examine current pedagogic emphases in preservice teacher education that focus on active, participatory learning as a means of redressing students' lack of knowledge of, and poor attitudes towards, mathematics. Against taken-for-granted assumptions about student identity and the agency needed to apply new methods in practice, I counterpose a poststructuralist understanding of these concepts which is then used to analyse a mathematics education subject I teach. This analysis makes visible unintended, previously invisible, conservative effects of inquiry based learning in this site. In conclusion, I argue that although preservice teachers do need to know the mathematics, they must also have a sense of themselves as agentic, reflective professionals which is not an individual attribute or disposition but is discursively determined, partly at least in pedagogic interventions in teacher education.

Over the past twenty years or so teacher education programs around the world (Jaworski, Wood and Dawson, 1999) have keenly embraced collaborative, inquiry based approaches to teaching mathematical and pedagogical content knowledges. This movement takes its inspiration from constructivism, a perspective on knowledge and learning, from which educators have derived pedagogic imperatives such as the need to create opportunities for preservice teachers to make sense of situations through collaborative activities which allow articulation and negotiation, and challenge incomplete or incorrect conceptions. The assumption behind such practice is that the collaborative arrangements constitute a supportive context where learner autonomy is fostered and confident knowledge building takes place. In keeping with the hoped for move away from transmission approaches, the role of the teacher educator becomes that of a "partner in the construction of knowledge" rather than a "giver of knowledge" (Department of Employment, Education and Training, 1989, p. 29).

In this paper I argue that although these activity based practices are useful to the extent that they develop a professional and mathematical knowledge base, they do not necessarily lead to more investigative (Raymond, 1997) or equitable (Popkewitz, 1988) practices in schools. My argument centres on the fact that this is because they ignore the relationships of power that inhere in all learning encounters, including teacher education, and their constitutive effects. Thus as teacher educators attempt to (re)teach the mathematical concepts, patterns and relationships that many students have not properly grasped at school, and introduce them to new and innovative ways of teaching, they unintentionally reproduce entrenched notions of a sense of individual pathology and failure and of mathematics as a difficult and confusing subject (Schuck, 1996). As well, it may be that relationships of power operate to position these students in much the same way as they were positioned as learners in school; they are not able to develop genuinely investigative *ways-of-being* in the mathematics education discourse that might be appropriately constitutive of a positive identity and later inquiry-based practice in classrooms.

Methodology

A poststructuralist analysis can be used in pedagogic matters not to prove, but perhaps to improve, by making visible formerly unseen aspects of practice. Based on a view of identity as inscribed and created in discursive, social practices it compels educators to attend closely to the productive quality of all pedagogic interventions. Moving beyond humanist notions of identity as an individual *perception* of feelings, actions or ideas, poststructuralist identity is an, often unconscious, emotional and intellectual *knowing about ourselves* in a particular field of endeavour (McNaughton, 2000). Thus autonomy or agency, too, is problematic where relationships of power in a discourse do not operate to allow learners to establish themselves in agentic, investigative ways; although in many cases preservice teachers may construct important knowledge and skills, it may be that the processes of construction have been sufficiently alienating as to turn students off further investigation in this area.

In this paper I analyse several students' experiences of investigation in a mathematics education subject I teach, using two interdependent uses of the term discourse (Weedon, 1997). On the one hand I use discourse as a noun, referring to the discourse of mathematics education or institutionalised *ways of speaking* about mathematics that have become constitutive of these students and their actions. On the other hand, I also make use of an understanding of discourse as *discursive practice*, which reveals how students' experiences of power relations in mathematical investigations become constitutive of their mathematical identities. Each of these interrelated notions of discourse is relevant to poststructuralist inquiry. Before examining the data collected, I examine humanist and poststructuralist theorisations of identity and agency in more detail.

Identity

Humanist discourses that currently frame practice in teacher education suggest that all adult, sane individuals *have* an identity. This identity is unified, rational and coherent. So that preservice teachers are suitably competent and confident for teaching, teacher educators need to address a lack of mathematical knowledge (Clarkson, 1998), poor attitudes towards (Carroll, 1998), and beliefs about, mathematics that students have previously constructed (Tillema & Knol, 1997). Emphasis is placed on (re)constructing prior and present beliefs about mathematics as a field of study, about how mathematics should be taught, how learning mathematics can be enjoyable, and so on. As Crawford & Deer (1993, p. 119) suggest, the preservice teachers need to "unlearn old beliefs and attitudes before they can begin the process of learning to put theory into practice".

In poststructuralist theory, which has been developed in large part in contrast to humanistic understandings of the individual, the person is the effect of a production, produced in power relations in many overlapping and intersecting discourses throughout life. One's identity, let's say one's mathematical identity, is constituted in discourses and is not under rational or conscious control. Rather, as Davies (1996, p. 17) makes clear, all discourses through which one is constituted leave lingering legacies, desires, that are not easily erased or replaced. This has important ramifications for teacher education. Students entering our programs have visceral, emotional, often unconscious experiences of learning mathematics that constitute their *knowing* about mathematics and about themselves as mathematically able or not. Lather (1991) reminds us that in our actions is our constituted *knowing*; preservice teachers' actions in the classroom will be partly at least based on this already constituted knowledge which is beyond the realm of cognitive (re)construction.

Agency

Humanist discourses assume that all rational individuals can choose to be competent and behave autonomously. For example, *A Discipline Review of Teacher Education in Mathematics and Science* (DEET, 1989) suggests that if preservice teachers construct mathematical and pedagogical knowledge through processes of active inquiry, they will be willing and able to implement similar approaches leading to robust mathematical understandings in their classrooms. Most of the examples in *Mathematics Teacher Education* (Jaworski, Wood and Dawson, 1999) are based on this assumption - that teachers will autonomously implement new teaching methods following intellectual (re)construction.

Alternatively, a poststructuralist view of the discursive construction of identity insists that individuals are produced through power relations in intersecting discourses and they cannot escape their effects; they may be able to teach in new ways or they may not. For example, preservice teachers may construct intellectual and professional knowledge in teacher education that they are unable to implement in classrooms despite their best intentions; it may be due to discrepant expectations of the schooling community or it may be that the preservice teacher doubts her/his competence (constituted identity) in applying what has been learned in teacher education. Either way, the beginning teacher cannot act independently of relationships of power and social structures that comprise all learning contexts. However, there is some room for movement, and this has important implications for practice in teacher education, and later application of constructed knowledge: students can experience a sense of agency in a discourse where they have a knowledge of themselves as respected and competent in (a) speaking and writing the commonly accepted truths of the discourse, in (b) enacting established ways-of-being, and in (c) going beyond these to forge something new (Davies, 1991). Agency has to do with authority, not in the sense of control over but in the sense of *authorship*; authorship of voice and action in a community conversation. All pedagogic discourses, regardless of whether we see them as transmissive, child-centred, constructivist or social constructivist, support agentic behaviour to the extent that they impart a robust knowledge and skills base and authorise student initiated constructions and ways of making sense of experience. A sense of agency is constitutive of identity, which affects agency……perhaps beyond the walls of teacher education.

Data Analysis

The data below are selectively chosen but representative of preservice teachers' writing about their experiences of mathematics at school and the mathematical *investigations* undertaken as part of the teacher education program. The subject ran for one semester in the second year of a four year program. My reading of the data is that students' experiences in teacher education may not be as liberating as one would hope; constituted notions of individual pathology and autonomy permeate teaching/learning interactions and operate conservatively to reproduce already constituted truths about mathematics and how it is done.

Identity

The first writings I selected have to do with identity. From these extracts I glean a sense of students' pathological *knowing about themselves* in relation to doing mathematics. It is not as simple as saying that these students lack confidence, because they are relatively

confident with the mathematics, especially the second student, but they are not confident in applying what they know (Ball, 1990; Foss & Kleinsasser, 1996).

> I carried out a sizeable portion of my activities during primary mathematics classes in a confused or uncertain state. There was no feeling of empowerment for me, no confidence in my abilities, just a growing conviction that I didn't have what it took to understand maths.
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> Over time I developed an understanding of what I was doing, due simply to maturity and experience, but in the meantime I'd built up a mega-negative subjectivity. This has continued to affect me into my adulthood in a variety of ways. I don't feel able to express or voice my own mathematical knowledge for fear of being wrong…I hesitate to answer any question related to maths, I never keep scores in dice or board games, I hand over the maths homework to 'their Dad' once my children get beyond primary school, I still feel I will never truly make sense of mathematics…not entirely.

> As a student I did feel that I could make sense of mathematics. Looking back though, I see that I was just good at remembering things and I could remember which procedures to follow or formula to use in a given situation. Mathematics had no connection to my life outside the mathematics classroom. There was no room for curiosity or speculation – it was a very 'black and white' subject and only the teacher could tell us the 'right' way to do things. Since I'm lazy, it did suit me to be told 'the way' rather than to find out for myself.
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> As a result, I did very well in examinations but I forgot everything mathematical the minute I stepped outside the exam room, because it had no relevance in my real world. It has affected my confidence in that I actually feel afraid to apply what I can remember about geometry to aspects of my life; for example in craft activities I'm afraid I won't apply the right thing if I'm not told 'the way' to do it.

From these examples we glean a sense of how classroom activities and practices can operate to disenfranchise or alienate students, negatively affecting identity. The former extract demonstrates how constituted feelings of personal pathology affect the student's competent use or application of mathematical ideas in context, including, no doubt, teacher education and the classroom in which s/he will later teach. The second example shows the alienation, or lack of agency felt by students when teacher authority so completely rules the learning process; learners intuitively come to know that they are not capable of finding their own way, or certainly that their own way is not valued. These coercive relations breed dependency.

Agency/Autonomy

An assumption that students will act autonomously can also have conservative effects on practice. For example, if teachers and lecturers take for granted that all students can choose to engage equally in investigative activities, they will not be inclined to question either the type of activity they are choosing or preferred ways of structuring the context for maximum engagement. Again, where often invisible relations of power are not given proper recognition, practice continues as usual; in taking autonomy or agency to be a personal attribute and in taking it for granted, nothing is done to ensure that students are in fact willing and able to establish themselves as competent and agentic in the discursive community.

> Perhaps my subjectivity regarding mathematics has meant that I am uncomfortable dealing with problem solving activities unless I have a clear structure to follow, at times I feel uncomfortable exploring as I lack confidence in my own ability. Mathematics for me has always been about giving the answer the teacher is looking for; it has not been concerned with my views or ways of dealing with problems. Also, when I am faced with a problem solving activity I feel as if I am under pressure to find the answer quickly as if there is a time limit placed on me.

> Even though never engaging, I did a lot of maths and did well because of my submission to authority. I knew not to expect the problems to make sense – you just do them anyway – take it at face value. Many of my friends could not do this and hence got set up as behaviour problems, failures or drop-outs.

From these examples of preservice teachers' past experiences of school mathematics we again get a sense of alienation; the context is heavily dominated by the authority of teacher and text. The first student is not comfortable in exploration; s/he is always under pressure to get to the correct answer. The second student is perhaps the most subjected of all; s/he knows not to expect problems to make sense, you just take them at face value and get them done. It's a sad fact of life that for so many students their experiences of school mathematics have left a constituted knowledge of mathematics as a competitive endeavour that doesn't always make sense. Of course, it's not that teachers tell students these things, but the activities they choose and the nature of interactions coercively form students in these ways.

Mathematical Investigations in Teacher Education

Like all teacher educators I want students to be able to establish themselves as agentic mathematics educators of the future. Towards this, I endeavour to provide a supportive environment in which they can learn mathematical and pedagogic knowledge and hopefully feel competent and confident to go beyond the given to forge new ideas and ways of interacting with peers, and later children in classrooms. In the mathematics education subject I taught, students worked in small groups investigating the patterns and relationships of mathematics. There was also an assessment component of the subject where they tried the various ideas in practice and reflected on what mathematics was actually learned and how well they thought they facilitated this learning. I imagined that the preservice teachers would establish themselves in agentic ways in the tutorials but I came to view these sessions as swirling, pounding hailstorms where, although there's always great potential for growth, there may also be destruction. The following are small passages from students' writing about their experiences of investigation:

> I found no enjoyment in this task of problem solving whatsoever. This activity made me feel my mathematical knowledge is inadequate and lowered my self-esteem in doing problem solving. To this day when I think about this activity I feel frustrated and annoyed that I do not know what the answer is. I suppose I could always ask someone, but I have always been a high achiever in mathematics and due to the discourse and power relations I experienced through my schooling, I will do as many others do and pretend I understand, rather than position myself to be at a lower standard than my peers.

> The task I was to perform regarding the nine by nine grid, and investigating the patterns in it, was very disempowering for me. I looked at the grid for over 10 minutes and then became very frustrated that I could not seem to find any patterns. I felt worthless and 'dumb'…I looked around the room to find that everyone was able to find some sort of pattern, yet somehow as hard as I looked nothing jumped at me.

> A constructivist approach hypothetically allows students to start from whatever level they are at but the hidden influence of the teacher's authority caused discomfort because we wanted to give the right answer (not go off in the wrong direction).

> The students in our group were not comfortable in asking questions because the unspoken agenda was that we should have known the answers.

> I feel that this activity was only beneficial for a small proportion of the class. This was evident just within our group where there was only one competent member who felt confident enough to speak

> to the class and explain the findings; the others were uncomfortable speaking their mathematics and uncomfortable in a group situation.

From the data above I again find damaging storylines about individual pathology, and about how engaging in mathematical activity can oppressively position learners, that is *reproduced*, not negated, in the mathematics education subject. There are instances of the two interdependent uses of discourse as previously mentioned in this paper; first, (a) discourse is used as a noun, and students reproduce institutionalised ways of speaking about themselves-in-mathematics and then (b) they speak about discursive practices that they find alienating. It is interesting to note that the feelings of individual pathology, and about discursive practices that alienate in school, are mirrored in teacher education. I draw from each of these contexts to demonstrate this point.

Examples of (a) include statements such as "I didn't have what it took to understand maths", "I still feel I will never truly make sense of mathematics", "I actually feel afraid to apply what I can remember", "I pretend I understand rather than…be at a lower standard than my peers", "I don't feel able to express or voice my own mathematical knowledge for fear of being wrong" and "I felt worthless and dumb". One of the truths of the discourse of school mathematics, and mathematics education, that becomes constitutive of students is that if you can't do the mathematics you are personally to blame. The competitive nature of the operation of the discourse effectively divides students into groups of those who can, and those who can't. Numerous students, including many who enter teacher education programs, have taken on the positioning of "those who can't". One has to be very sceptical of the ability of a couple of subjects in preservice teacher education to turn around this constituted identity. I have found that it is not as simple as engaging students in some (what I take to be) challenging yet enjoyable activities and telling them "Yes, you can". Constituted knowledges, built up over years of experience are not accessible to cognitive (re)construction and are difficult to erase.

As examples of (b) above, students talk of the discursive practices that they found alienating: "mathematics had no connection to my life", "there was no room for curiosity or speculation", "I am under pressure to find the answer quickly", "I knew not to expect the problems to make sense" and "we were not comfortable asking questions because…we should have known the answers". Here students demonstrate that relationships of power operate in all discourses, including in teacher education, to authorise specific truths and ways of acting. For example, one student in teacher education speaks of the "influence of the teacher's authority" which caused the group to want to get to the right answer rather than "going off in the wrong direction". It becomes clear that previously unseen relations of power actually militate against any form of real investigation or inquiry. Any rhetorical claim to autonomous inquiry on the students' part is revealed as a sham when power relations in many cases preclude this very option.

A further conservative force in teacher education is that preservice teachers who have come to see any failure to perform as pathology, don't ask many questions or blame the teacher educator. They may resist, be passive and indifferent to what is happening, but in blaming themselves they are rendered silent. For example, when using small square tiles to investigate the factors of numbers through making rectangles, one student wrote:

> A lesson such as this has the ability to create an inquiring investigative community atmosphere for both students and teacher…However…
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> I adopted a passive role, I remained distant from group participation, as I am not confident with the content or my mathematical ability.

The student blames her/himself rather than critique the activity and power relations.

A Way Forward?

If one accepts that all knowledge is constituted in discourse, one realises the futility of putting all hope on one particular discursive production of *good* pedagogic practice; for example, inquiry based mathematics education. All discourses deny their own partiality and portray one version of reality that represents particular interests (Weedon, 1997). Relationships of power operate in all discourses to enable or suppress an individual's meaningful and productive participation in the discourse. Surely the question for teacher educators must be: "How is my practice, a web of actions and interactions influenced by multiple identities, theories of learning and philosophical positions, operating to ensure that all learners are constituted as able and agentic mathematics educators of the future"?

As previously mentioned, the ability of students to act in agentic ways is discursively constituted; the discourse must operate in ways that the learner has a sense of him/herself as respected and competent in (a) speaking and writing the commonly accepted truths of the discourse, in (b) enacting established ways-of-being, and in (c) going beyond these to forge something new. Although one is subjected, one can also be constituted as an agentic (inquiring, going beyond the given), speaking subject. If language is taken to be constitutive, rather than merely representative or descriptive, then change is always possible.

In accordance with (a) and (b) above, and concerning identity, it is important that preservice teachers are taught the mathematics and the pedagogic skills that *they* deem important for teaching. They cannot establish themselves as agentic operators if they do not have the required knowledge and skills base, the essential *truths* of the mathematics education discourse. However, we, and they, must accept that learning to teach is a lifetime endeavour and that islands of understanding in a sea of uncertainty may have to suffice in this, the first stage of learning to teach.

Much more difficult for teacher educators, drawing on poststructuralist concepts of identity and agency, will be to have preservice teachers experience a way-of-being in (teacher) education that genuinely fosters (c), above. That is, a new experience of what it means to be a legitimate learner must be constitutive of teachers of/for the future. Foucault, in his later work (Mayo, 2000) reminds us of the positive force of identity formation; although discourses can operate in ways that foster dependency, disaffection and indifference, they can also foster agency as they impart important knowledge and skills. Ultimately, 'how' the discourse operates is what matters. Here again Foucault (cited in Bernauer and Rasmussen, 1987, p. 15) makes a contribution: he suggests we "play other trumps in the game of truth" (that is mathematics education) or "create another game". Teacher educators could attempt to have preservice teachers recognise how teaching/learning interactions position learners in various ways, they could together engage in analyses of how they are themselves positioned within the relationships of power in teacher education. In this way, the idea of the universal autonomous student, "*old* trumps in the game of truth" will be made problematic. Where educators recognise the coercive force of all pedagogies, they might be encouraged to work towards more positively productive relationships with their students. My reading of what happened in my teaching is that, despite the rhetoric, and because I imagined all students to be equally able to participate autonomously, I produced largely dependent learners who had little opportunity to come to know themselves as strategic, generative professionals in the making.

Conclusion

Just as all approaches to teaching have something to offer, so too research methodologies. Poststructuralist notions of the social construction of knowledge oblige educators to concentrate not only on student learning, but also on a new kind of learning about themselves as already produced through the pedagogies of everyday life, schooling practices and academic discourses. As De Gues (1977, cited in Hargreaves and Fullan, 1998, p. 6) reminds us, if we are to cope adequately with an ever changing world we must "develop the capability of shifting and changing, of developing new skills and attitudes: in short the capability of learning…the essence of learning is the ability to manage change by changing yourself".

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