TEACHING BECOMES YOU: THE CHALLENGES OF PLACING IDENTITY FORMATION AT THE CENTRE OF MATHEMATICS PRE-SERVICE TEACHER EDUCATION

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In spite of introducing new forms of instruction and assessment during teacher education programs, traditional textbook and teacher-directed approaches prevail in mathematics classrooms. Such approaches still dominate because of a number of socio-cultural issues relating to pedagogical identity, classroom culture, the perceived nature of mathematics, and personal epistemological beliefs. Because new and innovative forms of instruction and assessment look very different from current classroom practices, attempts to implement them highlight several obstacles to change in the teaching of mathematics. In this paper, I briefly discuss three such obstacles that emerged and dominated the discourse during a research process with secondary mathematics pre-service teachers.

INTRODUCTION

As many mathematics researchers have documented, there are a range of personal, political, and social factors that influence the development of mathematics teachers and their pedagogical identities (Goos, 2005; Kaartinen, 2003, Lerman, 2005; Nichol & Crespo, 2003; Walshaw, 2005). If one acknowledges the importance of these factors, many dimensions of a mathematics teacher's pedagogical identity can be viewed through socio-cultural lenses. For instance, in terms of the preparation of mathematics teachers within a teacher education program, a socio-cultural perspective would propose that “teacher preparation is not just the technology that equips future teachers with knowledge and proficiency. It rather lays the foundations for novice teachers’ enacting of new or modified patterns of interaction.” (Jaworski & Gellert, 2003, p. 850) In spite of introducing new modes of classroom interaction during teacher education programs, traditional textbook and teacher-directed approaches prevail in mathematics classrooms. According to several researchers (Jaworski & Gellert, 2003; Lerman, 2005), such approaches still dominate because of a number of socio-cultural issues relating to classroom culture, the perceived nature of mathematics, acceptable styles of interaction, and personal epistemological beliefs. These issues are often neither trivial nor overt in the lives of pre-service teachers but, instead, embedded within their actions and motivations.

As will be discussed in this paper, enacting such new and modified patterns is not an easy task for novice teachers who find themselves faced with the conservative power of school tradition and culture. Since new and modified patterns of interaction often fly in the face of current status quo practices, they highlight the obstacles to change in the teaching of mathematics. While it is important to recognize that “teachers of mathematics are all in the process of pedagogical identity development through...
which they are learning to see themselves as becoming the teachers that they value most” (Bishop, Seah & Chin, 2003, p. 755), it became apparent in this study that placing an exploration of mathematics pedagogical identity ‘at the centre’ is a challenging task indeed. Rather, the data gathered through the study described in this paper indicates that at the centre of mathematics teacher education lie many unexplored and unquestioned obstacles to change.

DESIGN AND PURPOSE OF STUDY

The research study was designed as a case study to investigate the experiences of three pre-service teachers during their internship in secondary school mathematics classrooms. The study emerged out of a recognized disconnect between the theory of a university-based curriculum course on alternative instruction and assessment and the practical implementation of these ideas in mathematics classrooms. The university curriculum course focused on studying the theory and practice of alternative instruction and assessment strategies such as problem-based learning (PBL), portfolio assessment, journal writing, anecdotal records, student interviews, and self-assessment. The strategies clearly represented a paradigm shift in mathematics teaching and learning for these pre-service teachers (Nolan, 2004; Nolan & Corbin Dwyer, in press). Their perceptions of what it means to know, to teach, and to learn mathematics did not readily enable (let alone encourage) them to integrate these new and different ideas into practice. In fact, as the instructor, I encountered substantial student resistance based in their perceptions of the reality of mathematics classrooms, curricula, and students.

The study referred to in this paper was designed to mentor pre-service secondary mathematics teachers as they negotiated transitions from the theories of this university course to the practices of the classroom. The intent was to provide opportunities for pre-service teachers to ‘try out’ the innovative instruction and assessment strategies they studied in their university course work through a reflective and integrated approach during their internship field experience. The main question posed in the study was: What happens in a secondary mathematics classroom when pre-service teachers who have been introduced to alternative and innovative instruction and assessment strategies in a university-based curriculum course attempt to realize the strategies in practice? Since this question was explored throughout the pre-service teachers’ internship semester, the research study attempted to view the mathematics classroom as a curriculum laboratory (Vithal, 2000) where new ideas could be tried under the guidance of experienced cooperating teachers and a mentoring teacher educator. While the results of this study successfully point to a number of key issues for future directions and further research (Nolan, forthcoming), in this paper I wish to highlight results of a different sort—results that point to how the research was resisted and ‘explained away’ (Skovsmose, 2005). The data and results presented in this paper describe how the original intent to explore the kind of teacher one wants to become, while providing opportunities to ‘try out’ one’s developing pedagogical identity, ended up being overshadowed by obstacles to change and to the research process itself. In other words, in this paper the results
point to a need to reflect on the question: do you become a math teacher or does a math teacher become you?

THEORETICAL FRAMEWORK AND DESCRIPTION OF STUDY

While there are a range of theoretical landscapes for describing and understanding how/when/if learning occurs, socio-cultural views of learning are being drawn upon more and more by educators and researchers due to an increasing belief that learning embodies social, political, historical and personal dimensions. To explore learning through socio-cultural lenses means to open the nature(s) of learning to scrutiny by (1) viewing learning as situated within the social interactions of members of a social group (Bauersfeld, 1988), (2) understanding cognition to be both in the minds of individuals and distributed across communities of practice (Bohl & Van Zoest, 2003; Eames & Bell, 2005), (3) exploring how particular practices of schooling are implicated in the constitution of teacher and student identities (Walshaw, 2005) and, (4) exploring how meaning is negotiated through the cultural tools (especially language) that operate within school discursive practices (Lerman, 1994; Radford, 1997). In addition, research within a socio-cultural framework can highlight the importance of a critical mathematics education (Skovsmose & Borba, 2004) by drawing attention to assumptions that remain unquestioned while highlighting possible alternative images of mathematics practices and discourses (Simmt & Nolan, in press).

Unquestioned assumptions came to the foreground more in this study than was originally anticipated and, in the words of Skovsmose (2005), the data revealed a noticeable tendency to ‘explain away’ some of these assumptions. The assumptions functioned as obstacles to change in much the same way as Begg, Davis & Bramald (2003) describe how it is necessary for teachers to ‘overcome the momentum of habit’. These authors discuss how certain teacher habits are “tied to our long history with traditional schooling practices and are supported by such things as curricula, evaluation regimes, and student expectations [and that] changes in practice involve more than conscious decisions to do things differently” (p. 622). But what about conscious decisions to not do things differently? Such decisions that resist and obstruct a change process can be ‘explained away’ in a number of ways that remove any chance for personal and professional agency in the formation of a teacher’s pedagogical identity. In analyzing how pre-service teachers encounter a myriad of socially-sanctioned filters, Brown (2003) indicates that a set-of-rules approach to teacher education is generating resistance to the desire to work toward a professional identity of one’s own (p. 155). The data in this study points to such a resistance, with a focus on the tendency to deny agency and to ‘explain away’ the obstacles to change.

METHODS AND DATA SOURCES

Acting in the capacity as both the researcher in this study and the instructor for the university curriculum course, I wanted to make a deliberate effort to follow the
course discussions, assignments, and learnings into secondary mathematics classrooms. My main criterion for selection of the case study pre-service teachers was that they expressed a willingness to make an effort to incorporate alternative instruction and assessment practices into their internship classroom. Once the three pre-service teachers were selected, I met with each of them (and their cooperating teachers) to discuss the instruction and assessment strategies they preferred to try in their classroom and to create a tentative plan for the internship semester.

Since the primary objective of the study was to understand what happens when pre-service teachers attempt to incorporate alternative instruction and assessment practices into their classroom, the methods chosen to gather information needed to be such that the pre-service teachers’ beliefs, concerns, and practices could be brought to light. The methods included individual interviews with the three pre-service teachers (monthly), focus group discussions with the pre-service teachers and their cooperating teachers (monthly), and maintaining an ongoing reflective artefact in the form of a written journal or a weblog. Data was collected by audio-taping and then transcribing the interviews and discussions and also by keeping a researcher’s journal, in which I made notes of the issues discussed, any challenges or questions encountered by the interns, and general thoughts and feelings regarding the research conversations. In addition to these formal methods for data collection, my commitment to an on-going mentorship approach meant making an effort to maintain regular contact with the interns throughout the semester through individual conversations (in person, via telephone, webcam, and e-mail).

RESULTS AND DISCUSSION

As previously mentioned, the alternative instruction and assessment strategies introduced in the university course represented a paradigm shift in mathematics teaching and learning for pre-service teachers. Since their experiences and perceptions of what it means to know, to teach, and to learn mathematics did not prepare them to integrate such new and different ideas into practice, I was not entirely surprised (or even initially discouraged) by the reluctance of my participants to dive headfirst into the study and try several forms of alternative instruction and assessment strategies in their internship classroom. What did surprise and discourage me, however, was the extent to which the interns and their co-operating teachers spent time ‘explaining away’ the obstacles to change in ways that had me ‘backing away’ from my original intentions in the study.

The data gathered through interviews and focus groups in this study indicate that at the centre of mathematics teacher education lie many obstacles to change. These centre-stage obstacles include such concerns as the drive to cover content, to master a set of management techniques, to bring student skills up to an established grade level norm, to passively mimic (rather than actively engage in) problem solving, and a host of other issues that became the fodder for ‘explaining away’ possibilities for change. For the purposes of this paper, I will briefly discuss three change obstacles that emerged during the research process and ended up dominating the
discourse. These three obstacles were brought to light through conversations with the interns and co-operating teachers in which they chose to ‘explain away’ a change process in instruction and assessment. Tied closely to each ‘explaining away’ experience was another obstacle—one that emerged and became part of my own researcher identity in deciding to ‘back away’ from the planned research process.

“Just like my mom”

One intern explained away her ability to implement alternative instruction and assessment by comparing her cooperating teacher’s expectations to those of her mother. She stated: “It’s just like when I was growing up—with my mom there was always a particular way to fold the towels. According to my mom, this was not only a best way to fold towels, but a correct way. It’s like that with [my coop] in teaching math—she’s been teaching for a long time and she knows the best way to do it. I just don’t think I can go against that right now.” This intern felt that the effort involved in attempting to convince her cooperating teacher that group problem solving was a valuable instructional strategy, and a way to supplement the traditional individual class work on mathematics problems, was just not worth it. This, of course, was tied closely to the intern’s already skeptical view about whether she actually believed herself that the change in instructional approach was worthwhile. My response as a researcher and mentor was to back away from applying pressure. I thought to myself that it would be best to allow her to go with the flow of the established classroom dynamics for the sake of her internship experience, rather than try to force my research plan.

“It’s my duty”

During a conversation with one cooperating teacher, she made it abundantly clear that the Department of Education has charged her with the responsibility of teaching all the content in the curriculum guide and she feels it is her duty (to government, to students, to parents, etc.) to cover everything. “I do not have the right to choose and make decisions about what content to cover and what not to cover. It’s all there and I need to be sure to not miss anything. What if I skip a topic that would have been of interest to even one or two of my students?” This was the cooperating teacher’s effort to explain away the possibility of teaching in a constructivist manner through a math trail or investigation because it would take too much time. As a researcher and colleague, my response was to remain silent. In doing so, however, I believe I reinforced her views as I backed away from my desire to draw her attention to the differences between covering curriculum content and learning curriculum content.

“I tried teaching that way”

During the first meeting with interns and their co-operating teacher I found myself treading water, walking on thin ice, and a number of other clichés to describe how I introduced the research project. I was confident that implementing alternative instruction and assessment strategies would create opportunities for the currently
unsuccessful mathematics student to experience and demonstrate mathematics knowledge in diversely legitimate ways. When speaking with cooperating teachers and interns, however, I became quite cautious in how I advocated for changes in mathematics teaching and learning. I felt that, ultimately, a desire to change practice reflects dissatisfaction with current practice. How was I to express this dissatisfaction with the very source of the current practice without alienating myself and the research project from the practicing teachers and interns? As part of the conversation, one cooperating teacher responded to my call for more student-centred problem solving by saying, “I tried teaching in more constructivist ways where the students try to solve the problem on their own, but the students said they preferred it if I just did an example first and then they could follow it to do more.” I felt strongly that this teacher was explaining away the obstacle of student resistance to alternative (that is, new) ways to learn mathematics by, in fact, confessing that students do not actually learn better that way and that they prefer the way things are done now. I wanted to talk to her about how students have learned to play the rules of the game over many years and so it is expected that they would resist changing the rules and/or the game without understanding why, but I remained silent. In remaining silent, I took another step backward from my research agenda.

CONCLUDING THOUGHTS

Given the intense motivation and perseverance required to resist the strong current of tradition once inside the classroom walls, my research study sought to design a means to assist pre-service teachers as they negotiated their way through theory/practice transitions on their journey to shaping a pedagogical identity of their own. I desired to conduct a study that could bring about significant changes to the cultural and discursive practices of schooling that currently stifle innovative instruction and assessment in mathematics and work to maintain the power of dominant school traditions and images of mathematics knowledge. The obstacles encountered were not so much surprises in themselves but the ways in which they were explained away left me speechless and, in some cases, paralyzed with/in the research process.

Begg et al. (2003) discuss that obstacles can work in invisible ways to “channel our activities in particular ways—the patterns of acting, the habits of interpretation, the momentum of history, and so on that give shape and meaning to everyday activities” (p. 596). If truly invisible, then it is reasonable to ‘explain away’ resistance to change as hegemony at work—masking the obstacles “as the natural shoreline” (p. 596). The data in this study, however, suggests that explaining away functions to take the spotlight off teacher agency in the development of a mathematical pedagogical identity, and instead places the spotlight on a predetermined ‘destiny-focused’ math teacher identity. In other words, if we continue to explain away and back away from perceived obstacles to change then maybe all we really have left to study is how a math teacher becomes us. And this seems, in fact, not very becoming at all.
References


