

Positioning the Personal in Mathematics Teacher Education Through Pedagogical Conversations

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This paper presents a narrative inquiry into the personal dimensions of mathematics teacher education. It describes my experiences as a teacher educator exploring the use of *personal theories* to develop and share *pedagogical conversations* with prospective teachers. *Personal theories (PTs)* can be thought of as a set of beliefs and practices that are personally meaningful, and based on experience. This narrative describes the developmental process involved in establishing personal theories, and outlines three levels of authority and ownership that were evident in final versions of prospective teachers' personal theories.

For prospective teachers, becoming a teacher of mathematics is a very personal experience that is “felt” differently by each individual, depending on his or her past and present lived experiences. As mathematics teacher educators, one of the most vital actions we can take is to put the personal upfront and explicitly address these lived mathematical experiences through the use of *personal theories* (PTs) within teacher education programs. PTs can have their origins; in the past, perhaps as a result of an “apprenticeship of observation” (Lortie, 1975) or other compelling experiences; in present contexts as prospective teachers move through their teacher education courses; or they may be related to imagining future possibilities for action. It is argued that developing PTs can provide opportunities for learning from experience by reflecting on experiences and then theorising those lived experiences.

An important aspect of learning from experience in relation to this inquiry is the use of reflective tools that allow for continuous and meaningful *interactions* between learners in a teacher education setting. These inner (personal) and outer (social) interactions, or conversations can enable and empower prospective teachers to become theory generators and well as theory users as they reflect on their own practice (Cole & Knowles, 2000). The term *personal theories* describes one such reflective tool that provides an opportunity for educative conversations that explicitly address personal beliefs. Such an approach to teacher education can be thought of as *pedagogy as conversation*.

Underlying Principles of “Pedagogy as Conversation”

There are two important underlying principles of *pedagogy as conversation*. First, there is a need to maintain a “stance of inquiry” (Nelson, 1997) within our teaching programs so that we provide opportunities for “learning from experience” (Boud, Cohen and Walker, 1993). Learning from experience needs to occur within a community of learners where all participants involved in an inquiry are viewed as learners who create and recreate *ways of coming to know*. Recognising that there are many *ways of coming to know* that coexist and support each other is essential if we are to celebrate the diversity of individuals. A “stance of inquiry” suggests a generative and purposeful view of learning through making meaning from experience. These experiences need to be explicitly articulated and shared within a

community of learners if they are to be critiqued and validated (Belenky, Clinchy, Goldberger & Tarule, 1986; Jaworski, 1999).

Second, *pedagogy as conversation* requires a reflective orientation towards learning so that learning can be shared conversationally in written and oral forms. In this way, the dichotomy between theory and practice can be somewhat disturbed when we look at theorising practice through a more personal and relevant process of reflection in the form of PTs. Writing reflectively fixes thought on paper and externalises what is essentially internal thinking (van Manen, 1997). From this perspective, the writing of PTs can become a meaning making process for recording lived experiences and their relationship with internal feelings, thoughts and beliefs. This form of recording allows PTs to be shared, revisited and perhaps reframed. One way of explicitly articulating ways of *coming to know* emerges through the development of PTs about teaching, learning and assessing mathematics. The writing of PTs is put forward as a pedagogical practice that can be thought of as written and oral conversations between learners that are purposefully focused on learning about pedagogy. The use of *pedagogical conversations* requires a shift in practice from telling to listening.

The term “pedagogy” in *pedagogy as conversation* embodies the reciprocal relationship between the three educative processes of teaching, learning and assessing. In van Manen’s (1999) terms, pedagogy can be thought of as ways of interacting as we live and work responsibly with learners. In this sense, “pedagogy” recognises that the holistic and relational nature of *coming to know* exists within the three synergistic processes of teaching, learning and assessing. The term “conversation” refers to both written and oral interactions within a community of learners. Davis’ (1996) notion of conversation as a “reciprocal engagement” in a topic of mutual concern is particularly useful for this inquiry. A conversation suggests talk among friends where understanding emerges as a joint construction by participants who are seeking a deeper, shared understanding of the issue at hand. An important characteristic of conversations is their open-ended nature that allows for unexpected revelations and destinations.

The Emergence of Personal Theories (PTs)

PTs are grounded in a teacher’s “appreciation system” that is based in beliefs and consists of a repertoire of values, knowledge, theories and practices (Schon, 1983). On the other hand, *public theories* represent all other forms of traditional research that are represented in books, journals and other related literature. Both theories can be thought of as the “living, intertwining tendrils of knowledge, which grow from and feed into practice” (Griffiths & Tann, 1992, p. 71).

Research on learning to teach has begun to support a focus on the need to provide opportunities to make explicit, and build on, prospective teachers’ existing knowledge, beliefs and attitudes about teaching and learning because “...what has to be learned is intimately connected to what is already known” (Beattie, 2000, p. 19). By acknowledging and eliciting prospective teachers’ beliefs about teaching, learning, and assessing mathematics using PTs (Bullough & Gitlin, 1995; Connelly & Clandinin, 1990; Griffiths & Tann, 1992), teacher educators can explicitly address these PTs and provide links to more public theories to help bridge the gap between theory and practice, and the knower and the known (Beattie, 2000; Feiman-Nemser & Remillard, 1995).

The writing of PTs is one technique for positioning the personal within a mathematics teacher education context so that the personal “interconnected web of ideas” developed by

prospective teachers can be explored (Ball, 1988). This technique was designed to provide opportunities for prospective teachers to author their own learning and make explicit their beliefs and concerns related to mathematics education.

Using a Narrative Inquiry Method

This inquiry tells a story of experience – my own experience as a teacher educator and inquirer, and the experiences of the prospective teachers that I worked with as we explored the development and use of PTs. This paper provides a snapshot of how PTs appeared to reflect varying levels of authority and ownership as they were developed over a twelve-month period. To locate a sense of our experiences, I adopted a narrative inquiry approach that Clandinin & Connelly (2000) describe as both methodology and phenomenon. Narrative inquiry is the study of experience that involves people in relation contextually and temporally. In describing narrative inquiry, Clandinin & Connelly (2000) outline a three-dimensional inquiry space that acknowledges the importance of *context* (celebrating a diversity of settings) *conversation* (both personal and social), and *continuity* (between past, present and future experiences). These three dimensions of narrative inquiry have been used to provide a conceptual framework for this inquiry and are now described.

In relation to the *contextual* dimension, this inquiry took place within a rural university setting where final year B Ed (Primary) prospective teachers were enrolled in a yearlong subject *Assessment and Diagnosis across the Curriculum: Mathematics Lobe*. During this twelve-month period, prospective teachers developed their PTs related to teaching, learning and assessing mathematics. This inquiry traces the changes in those PTs over that period in an effort to interpret the generative nature of those changes. An important component of the *contextual* dimension is the variety of settings that the prospective teachers experienced during their involvement with this subject. While this inquiry is only reporting on personal theory development, the fifty-one prospective teachers involved in this inquiry experienced a ten-week internship in one school setting, five weeks of microteaching in a different school setting, and three hours of lectures and workshops per week over a total period of sixteen weeks.

The *conversational* dimension of this inquiry refers to the written PTs that provided occasion and opportunity for understanding the pedagogical experiences related to mathematics. As personal theories took shape throughout the subject, they were shared by prospective teachers and continually referred to as part of our pedagogical conversations. The relational aspects of sharing personal theories allowed for a conversational relationship to be formed as I read prospective teachers' PTs and responded with feedback. The conversational quality of PTs was enhanced as they were shared, critiqued and reconstructed throughout the yearlong subject related to the assessment and diagnosis of mathematics. Other elements of *pedagogy as conversation* not referred to in this paper included two case investigations (in each of the school settings mentioned earlier), and poster presentations that synthesised prospective teachers' findings from the two case investigations, which were also shared and critiqued as part of the yearlong course.

The dimension of *continuity* recognises that prospective teachers' PTs are affected by past and present experiences that will be reflected in their theories about future practices. Such a temporal dimension acknowledges the importance of making connections between experiences in different *contexts*, including various *pedagogical conversations*. As educators, emphasising the temporal aspects of learning from experience acknowledges the importance of connecting personal experiences from the past and the present with the

theories of others (public theories) to produce PTs that outline a personal pedagogical stance. The three dimensions are interrelated, and when connected allowed for a closer look at the themes emerging from prospective teachers' PTs that indicated a generative growth in agency and ownership of learning.

Emerging Themes Within Personal Theories

Although this paper describes findings from the final version of prospective teachers' PTs, it is important to briefly talk about prospective teachers' initial PTs. In essence, the initial attempts at capturing pedagogical beliefs related to mathematics generally lacked any authority and ownership. Instead, the PTs were personally silent and held onto other people's theories to reflect their own beliefs. Where there was some evidence of personal beliefs, for example, sentences that began with "I believe" or "Personally, I think that", there was no elaboration of theories using personal anecdotes of experience to support their beliefs. The absence of personal commitment, elaboration and the ability to personally name beliefs became the shared growth points that framed the criteria for marking the final PTs.

One initial limitation of this inquiry can also be thought of as a positive outcome. I am committed to assessment tasks that are formative and have an educative component. I believe, along with Clarke (1997) that we flag what we value as educators by what and how we assess. While I chose to use prospective teachers' PTs as an assessment task to value the time and personal commitment required in their writing, I acknowledge that this may have influenced what they chose to write about. However, the overwhelmingly honest responses to these tasks during focus group conversations after the completion of the subject reflected the general feeling that "you treated us as teachers in our own right and valued what we thought as teachers and not just what you wanted to hear" (Maria, focus group transcript Nov 13, 2001). This excerpt was representative of the twelve prospective teachers who volunteered to attend the focus group conversations and reinforces the importance of a sense of personal authority, or agency in learning to teach mathematics.

The principles of *pedagogy as conversation* emphasise the importance of listening within dialogical relationships. As a teacher educator, reading and analysing prospective teachers' PTs provided an opportunity to "listen in" to their inner conversations to determine the conditions within PTs that made personal understanding and *coming to know* possible. As I "listened in" to what prospective teachers wrote, some of what I "heard" in their final version of their PTs can be characterised to illuminate three *ways of coming to know*. These characterisations may contribute to framing future learning experiences and describing some vital aspects related to learning from experience and assessing that learning. I have taken excerpts from prospective teachers' PTs that are representative of three levels of authority and ownership that emerged from the final analysis, which was achieved through the process of "analysis of narratives" (PTs) outlined by Polkinghorne (1988).

Silent Theories: A Lack of Authority and Ownership

A small number of prospective teachers' final PTs could be characterised as *silent theories*. As a teacher educator, a shift "from looking to listening" (Davis, 1996, p. 30) led to experiencing the *sounds of silence* in some prospective teachers' PTs. The *sounds of silence* refer to the absence of personal voice, commitment, creativity, and "internal

authority” that belonged to the prospective teacher. In short, there was no ownership of what was being written. Instead, the PTs simply reiterated or restated public theories that had been explored in our subject and offered no elaboration of personal experiences or connections to other lived experiences or public theories that could support their personal theories. An excerpt from Molly’s PTs illustrates this point:

For learning to be effective, I am obliged to provide experiences that foster and promote every child’s socio-emotional, cognitive, aesthetic, moral and physical development...These experiences need also be offered in a supportive, trusting and rich sensory environment that offers opportunities to engage in hands on, concrete experiences which invite children to observe, to be active, to make choices, experiment and encourage creative energy and curiosity. (PT entry, Nov 2001)

While any teacher educator would celebrate such insightful theories, this excerpt is personally silent and could have been written by anyone who had access to journals, textbooks or teacher resources (public theories). *Silent theories* reflect the absence of personal experiences that would authenticate these theories as personal understandings. This characterisation reflects the notion of a “silenced” or “received” knower described by Belenky et al. (1986) as ways of knowing knowledge, authority and truth that are reproduced from “external authority”. Molly’s excerpt was representative of a small number of prospective teachers whose final version of their PTs still lacked authentic and supportive evidence of *how* and *why* their personal theories were formed. As a teacher educator, I characterised these theories as *silent theories* because I was left wondering whether any personal and meaningful learning had been experienced. In contrast, many more prospective teachers were able to take personal ownership of their own theories by elaborating, to varying degrees, on *how* and *why* their theories had emerged. I believe that this next level of ownership reflected the nature of our shared conversational experiences where explicit criteria were developed collaboratively to provide clear guidelines for theory development.

Elaboration of Theories: The Emergence of Authority and Ownership

The majority of prospective teachers were able to quell the *sound of* silence by elaborating, to some extent, on their stated personal theories. This elaboration took the form of anecdotes of personal experiences, and explicit connections between past and present experiences and future possibilities. *Elaboration of theories* provided “a few more layers to give them (PTs) more depth” (Kathryn’s PTs, Nov. 2001) and represented a deeper level of ownership. Prospective teachers’ theories related to such things as: the importance of making personal connections with students to enhance learning; the importance of maintaining a balance between structure and flexibility when dealing with culturally diverse students; being taught by students to listen with eyes and ears; and the transferable nature of Working Mathematically outcomes into all KLA’s. These theories were all elaborated and authenticated with an anecdote from personal experience that may have originated in any number of learning contexts (for example their internship setting, their microteaching experience or the learning community developed at university).

An excerpt from Sally’s PTs described in detail a turnaround in her commitment to life long learning as a result of her interactions with a student who had learning difficulties in mathematics. I have omitted some phrases and sentences to enhance the flow of the one idea, but I hope I have maintained Sally’s intent and purpose:

I found through reading, dealing with the student and speaking to the support teacher that I was able to develop specific strategies for teaching maths to this particular student which I could integrate

into the maths lessons for the rest of the class...I recognised that she loved bright, shiny objects, so I created ten frames and redesigned "Count me in too" activities so that they were made of fluoro coloured paper and used large sequins as counters...Working with this particular student helped me to realise that meeting the changing needs of my students from year to year would mean a continued process of learning... So, with some initial reluctance, I have eaten my words and acknowledged the value of the ideal of life long learning. In-services and further study here I come!!! (PT entry, Nov. 2001)

In this anecdote, Sally's use of the words "created" and "redesigned" suggested a level of ownership and creativity that exemplified the authenticity of personal theories. Her commitment to the "ideal of life long learning" was elaborated with personal reference to *how* this theory emerged from her own past experience (practice), which was then connected to a future theory of action (in-services and further study here I come).

This elaborative process represents the integration of emotional and personal knowing with knowledge learned from others. In other words, it represents the integration of personal practice with other people's theories. Belenky et al. (1986) described this as "constructed knowing", a balance between subjective and objective strategies that, once experienced, foster a passionate approach to learning. Prospective teachers' reflective responses at this level encompassed a passion for authoring their own learning and "feeling important enough to have our own ideas" (Trina, focus group transcript, Nov 13, 2001).

Noticing and Naming Theories: A Developed Sense of Authority and Ownership

Another *way of knowing* that exemplified a developed sense of authority and ownership was the ability to create your own knowledge by using a personal language of experience. I have called this the process of *noticing and naming*, which was influenced by the notion of "noticing and marking" outlined by Mason (1998). My change of phrase from *marking* to *naming* is deliberate because *naming* suggests a more creative, authentic and personal opportunity to author learning through the language we choose to name our noticing. Noticing requires a heightened awareness of *context, conversation and continuity*.

The concept of *resonance* identified by Conle (1996) in her work with prospective teachers helped to frame the construct of *noticing and naming* that was evident in prospective teachers' PTs. The term *resonance* describes an experienced awareness, or a "metaphorical correspondence" between current or past personal experiences and another new experience with self or others. To illustrate the construct of *noticing and naming* as a result of a moment of resonance, I have chosen an excerpt from Elizabeth's PTs that embodies the notion of *noticing and naming* an understanding, or "meaningful whole" that becomes part of a language of experience (Polkinghorne, 1988). It is important to note the *context* that this excerpt was written. Elizabeth wrote this reflection *during* a workshop as a result of an "Aha" experience working with isometric dot paper. While this inner conversation could not have been anticipated or planned for, it led to a metaphorical correspondence in her PTs as she formulated them later that day:

During class today, I was the child off task. Well, this is what I was thinking as I was playing and drawing a picture on the paper (isometric paper) that you provided. However, I still learnt. In fact I learnt more than I thought. Through my play, I discovered something about 3D space...I now have a new metaphor for representing my understanding of the teaching, learning and assessing process – a 3D staircase to understanding.

The conversational tone of Elizabeth's entry reflects my goal for a relational and dialogic process of reflective writing that can become a shared conversation. Her written reflections continued to describe the process of "talking to know":

I write as though I am talking because talking is how I make sense of things, it is how I interpret meaning of a particular concept. By writing this I become the pupil reporting to my guide about the journey I have just taken...My philosophy is that our life experiences, our "doings" are a much stronger way of learning because we have a hold of it, it's in our hands, we own it, we play with it and then we put it away only to bring it back out to show someone who might want to know how to use it. The friend will only know how to use it once they have played with it too. It's fine to read about it and see it but doing it and feeling it is how I learn. No that's not completely true I think I learn more from talking about it. My name for this is "talking to know"...in the end I work it out from talking and making sense. (Personal theory entry 21/10/01)

By writing reflectively, Elizabeth was able to name the learning process "talking to know". As a result, her personal, inner conversations could be shared with others in more collaborative ways. This process allowed me to "listen in" and then join her inner conversation through my written feedback that was both personally relevant to her beliefs, and part of a shared process of *coming to know*. I would argue that listening attentively to inner and outer conversations and noticing what resonates with you as a learner is a vital aspect of effective learning. Elizabeth's reflection-in-the-moment during a workshop exemplifies the process of naming a resonating thought using a personally meaningful language (talking to know). Prospective teachers (in fact, any learners) who have opportunities to author their own learning can become more empowered to be theory generators as well as theory users, which further disturbs the dichotomy between practice and theory. Rediscovering mathematics through reflective writing can clearly lead to a deeper level of understanding and agency for prospective teachers.

As you read this paper, you may be *noticing and naming* similar experiences if they have resonated with you as a teacher educator or inquirer. Perhaps you are shaking your head as a result of a sense of dissonance with this written text. Either way, I believe your response signals an authentic *way of coming to know* that is relevant to you personally. The opposite of *noticing and naming* would be a sense of disengagement where you have not experienced any resonating moments and you are thinking about how long this paper has to go!

A Closing Conversation...

Open-ended tasks such as writing and sharing PTs about the pedagogy of mathematics can be an enabling and enlightening experience for both prospective teachers and teacher educators. The narrative space created by PTs provides an important context for pedagogical conversations that lead to the theorising of practice. By passing the intellectual authority onto prospective teachers, they can feel more empowered to find their own intellectual voices (Cooney & Shealy, 1997). PTs illustrate one way that the affective and cognitive aspects of learning to teach can live side-by-side in relative harmony. In many ways, the development of PTs require prospective teachers to experience and theorise about mathematics with new eyes and ears so that they may see, hear and feel mathematics in new ways. PTs can then provide empirical evidence of what Jaworski (1999) described as the "plurality of knowledge growth" so that the many ways of *coming to know* mathematics teaching can begin to be captured and described.

A crucial factor related to the development and use of PTs in this inquiry is the move from writing *silent theories* that are personally silent, towards an *elaboration of theories* that reflect personal authority and ownership of coming to know. To achieve this, a culture of heightened awareness needs to be established so that learners are listening in to inner and outer conversations with the intellectual authority to author their own learning. This level of ownership requires a sense of agency on the part of the prospective teacher, a sense of “feeling important enough to have our own ideas” (Trina, focus group transcript, Nov 13, 2001).

As outer conversations (other people’s theories) resonate with personal theories, a process of *noticing and naming* those theories can create a personal stance that leads to the development of personally meaningful theories that have emerged from practice. A pedagogical tool for developing personal theories is the establishment of criteria for the writing of PTs that is collaboratively developed to provide a shared purpose and direction.

The contribution that PTs can make to the mathematics research and teacher education communities can be judged by its apparency and invitational quality (Connelly & Clandinin, 2000), and the extent to which this narrative resonates with its readers and informs future action.

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