

CONNECTING THEORY AND REFLECTIVE PRACTICE THROUGH THE USE OF PERSONAL THEORIES

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This paper outlines a way of connecting theory and reflective practice in mathematics teacher education. The construct of personal theories is put forward as an innovative pedagogical tool for connecting theory to practice through reflective writing. The cognitive process of 'noticing and naming' emerged as way of theorising practice and helped to track a pathway of professional and personal growth. Personal theories highlight how a narrative and reflective orientation to teacher education can enhance the process of learning to teach mathematics by acknowledging the affective factors involved in developing an autonomous mathematical identity. It is argued that connecting theory and reflective practice can be particularly useful in developing a reflective disposition and should begin with eliciting and analysing personal beliefs and theories.

DEVELOPING A THEORETICAL PERSPECTIVE

The term 'reflective practice' is a common term within the discourse of teacher education, but it is rarely illustrated in practical terms. Recently, research on learning to teach has begun to 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). In mathematics teacher education, it is acknowledged that changing the beliefs and practices of prospective teachers so they reflect a more constructivist approach to teaching and learning is problematic (Grouws & Schultz, 1996; Mewborn, 1999). Rather than focusing on *changing* beliefs and practices, Korthagen & Kessels (1999) describe a more innovative approach to pedagogy for teacher development where the prospective teacher and their personal theories become a *starting point* for teaching programs. They argue for an emphasis on the development of reflective practice, inquiry-oriented activities, and interaction amongst learners. Support can then come from teacher educators who could provide 'fruitful' and meaningful theories (public theories) that relate to student teachers' practical problems and personal theories. Korthagen & Kessels (1999) describe this as a 'realistic approach' that has strong parallels with theories of mathematics learning and teaching.

The use of a theory/reflective practice interactive model of teacher education can provide opportunities for collecting, examining and beginning to codify the 'wisdom of practice' (Shulman, 1987) that emerges from prospective teachers' personal theories about their lived experiences. As Shulman (1987) reminded us "the neophyte's struggle becomes the scholar's window" (p. 103), therefore, exploring prospective teachers' reflective narrative texts related to the process of becoming a teacher of mathematics could help bridge the well-documented 'gap' between theory and practice in mathematics teacher education courses and shed further light on the influence of personal beliefs about mathematics in relation to the type of pedagogical practices that are adopted to teach mathematics (Korthagen & Kessels, 1999; Mewborn, 1999).

For this study, reflective narrative texts refer to written texts elicited from prospective teachers for the explicit purpose of thinking about beliefs and actions with a view to critical reflection and improvement (Hatton & Smith, 1995, Sullivan & Mousley, 1998). In this study, the texts can be thought of as a pedagogical tool that took the form of personal theories (Bullough & Gitlin, 1995) about teaching, learning and assessing students in mathematics. The writing of personal theories provided opportunities for theorising and sharing experiences and beliefs through verbalising, clarifying and recording reflective thoughts related to theory and practice.

Personal and public theories

An important aspect of the theory/reflective practice connection is that the word ‘theory’ refers to both *personal and public theories*. For some, this notion will require a paradigm shift in how theory is perceived. *Personal theories* are grounded in a person’s ‘appreciation system’ that is based in beliefs and consists of a repertoire of values, knowledge, theories and practices (Schon, 1983). Eliciting *personal theories* becomes particularly important for the professional growth of prospective teachers of mathematics because ‘the level of consciousness about beliefs influences their disposition to realize change’ (Cooney & Shealy, 1997, p. 91). On the other hand, *public theories* represent all other forms of traditional research that are represented in textbooks, journals and other related literature, and also through the theories chosen for study by a teacher educator. Both personal and public theories can be thought of as the ‘living, intertwining tendrils of knowledge, which grow from and feed into practice’ (Griffiths & Tann, 1992, p. 71).

The notion of *personal and public theories* was influenced by Mason’s (1998) description of ‘inner research’ and ‘outer research’. To talk about inner research is to talk about awareness of, and being explicitly articulate about personal and practical sensitivities, experiences and ideas (personal theories) that may affect mathematical attitudes and identity. These sensitivities require *introspection*, a metacognitive process of observing oneself from the inside (Mason, 1998). The need to maintain a personal awareness and sensitivity to the teacher within can be thought of as maintaining a reflective disposition. The writing of personal theories represents a constructive way of talking to ourselves that helps develop the authority and identity to teach through personally conceptualising mathematics teaching (Cooney & Shealy, 1997; Sullivan & Mousley, 1998). Concomitantly, *outer research* (public theories) represents a more public type of theory that attempts to explain rather than to experience. This form of research requires a distancing from practice where there is an attempt to objectify activities. Perhaps most important is the fact that ‘outer and inner research do not displace or replace each other, but rather are complementary’ (Mason, 1998, p. 375). This complementarity between inner or *personal theories* and outer or *public theories* is needed to generate and support authentic and legitimate reflective texts.

Reflective practice

The term reflective practice describes the nexus between *reflection* and *practice*. If the term *practice* encompasses both the practice of teaching and the practice of learning, then practical experience becomes a site for learning. However, this will only occur if the learner possesses a disposition to be reflective. Perkins, Jay & Tishman’s (1993) ‘dispositional theory of thinking’ helps to frame the need for a reflective disposition that

has three qualities. A reflective practitioner would need to have: the *inclination*, or felt tendency to be reflective about their practice; *sensitivity* or awareness of a personal stance, and to occasions or opportunities when reflection is warranted; and the *ability* or know how to follow through with reflection in order to develop future practice (Perkins, et al., 1993). Reflective practice (of both teaching and learning) could then lead to the reframing of personal theories that assimilate public theories and possibilities for future action. The underlying premise of reflective practice is that any reflection requires thought which leads to action that is dependent on the result of the thinking that occurred. Mewborn (1999) suggested that action (practice) and reflection can be seen as a ‘bridge across the chasm between educational theory and practice’ (p.317). Mewborn (1999) also highlighted the importance of both individual (introspective) reflection and shared reflection so that prompting and probing can foster the reflective process.

The synergy between personal and public theories and reflective practice is now explored in more detail to illustrate how a reflective disposition can be developed to cognitively enhance the process of learning to teach mathematics. Following Perkins, et al. (1993) reflective practice does not just require the ability, or skill building to be reflective. We also need to consider the more affective qualities of sensitivity and inclination within the teacher if reflective ability is to be enacted. Acknowledging the importance of sensitivity and inclination in the development of reflective practice can help to ‘close the gap between ability and actual behavior’ (Perkins, et al., 1993 p. 12). It is also possible to imagine that the development of a reflective disposition could raise awareness of the importance and place of theories in actual practice. In mathematics teaching in particular, a reflective disposition can assist prospective and practicing teachers to maintain a heightened and critical awareness of their pedagogical practices and an open mind towards more authentic and constructive approaches to teaching, learning and assessing.

CONTEXTUAL SETTING AND INQUIRY METHOD

This study took place in a rural university in New South Wales, Australia. Although fifty-five participants engaged in writing reflective narrative texts during a year-long subject (Assessment and Diagnosis in Mathematics) in their final year of an undergraduate education degree, this paper reports on a case study (Stake, 2000) conducted with one participant. Prior to the present subject, the participants had engaged in three mathematics subjects that emphasized and modeled constructivist principles of teaching, learning and assessing mathematics in the first three years of their course.

In particular, an ‘instrumental case study’ was chosen as an illustrative technique. Stake (2000) suggested that this type of case study is chosen to advance the understanding of an external interest, in this case to provide insights into the nature and role of personal theories in the theory/reflective practice cyclic approach to mathematics teacher education. Consequently, Elizabeth’s story is not necessarily representative of all the participants in the study, but is told to illustrate how theory and reflective practice can coexist in a mathematics teacher education program. The use of a narrative approach (Connelly & Clandinin, 2000) to tell Elizabeth’s story is consistent with the philosophy behind the use of reflective narrative texts such as *personal theories* to enhance the development of a reflective disposition. The use of narratives in mathematics teacher education allows for the extensive use of participant voice to tell stories of personal and

professional growth that can heighten our awareness of the dispositions that shape our practice (Cooney & Shealy, 1997; Mewborn, 1999; Sullivan & Mousley, 1998).

ELIZABETH'S STORY: A NARRATIVE ANALYSIS

Elizabeth is a self confessed 'struggler' when it comes to learning. But what I sense in her descriptions of her learning experiences is the struggle to make sense of things and find herself as a learner in order to find herself as a teacher. Elizabeth grew up with a supportive family and enjoyed happy childhood experiences at elementary school. Her high school experiences were where she 'lost the plot' and 'got in with the wrong crowd because I was a follower instead of a leader'. Elizabeth sought a 'second chance at learning' when she enrolled in a college to do her final year of school again. She attributed her success there to a renewed desire to learn, being surrounded by adults and realising, finally, that she was the only one who could make her learning successful.

Gaining entry into university fulfilled a life-long goal for Elizabeth. Becoming a teacher was something that she had always thought about, her learning journey had turned itself around and she was ready to move forward. Two years at university saw her achieve mixed success and she felt she needed to take a break from learning to decide what she really wanted. After six months, she was 'back on track' and knew for certain that she wanted to become a teacher. Academically, Elizabeth found a new desire to learn. Her grades improved considerably and she had a renewed sense of self as she embarked on her final two years of teacher preparation.

Initial personal theories

Prospective teachers were asked to document their personal theories about teaching, learning and assessing mathematics at the beginning of the year and again at the end of the year. Elizabeth's initial personal theories reflected a 'socially-critical orientation that needed to give students a voice in their learning'. An example of the theory/reflective practice interface occurred as I read Elizabeth's reference to student voice and recommended a journal article for her to read that related to listening to children's voices in the classroom. This recommendation emerged from the process of reflective writing and created a meaningful and purposeful connection between Elizabeth's personal or inner theory and a more public or outer theory.

In mathematics, Elizabeth always needed to know 'why $2 + 2 = 4$ ' but was never told. She attributed her lack of success in school mathematics to being 'treated like idiots' and never being told 'what we were learning or even why it was important that we learnt it'. This perceived lack of communication became an underlying theme of all Elizabeth's reflective texts during the year. She felt 'cheated by her teachers' in the past because she often 'took time to catch on to a concept' and saw herself as a 'feeler rather than a thinker'. Experiences from Elizabeth's past clearly affected her beliefs and attitudes towards teaching mathematics in the future. Not surprisingly, her initial personal theories reflected that students should learn through a 'three-way process of modelled, guided and independent learning'. She believed that 'students and teachers learn together and in the same way'. That is, when they are: 'challenged and motivated, able to build on knowledge skills and values; able to make connections between knowledge and experiences; able to see a purpose in what they are doing; and acting, reflecting and interacting with each other in a supportive environment'. Elizabeth acknowledged in her

initial personal theory that her ‘learning and values are changing continuously, even after two weeks back at Uni’. It seems clear that Elizabeth wanted learning to be different to what she had experienced as a student at school, and communication with students was obviously going to play an important role.

I have drawn on the work of Belenky, Clinchy, Goldberger & Tarule (1986) to describe the personal and professional growth evident in the conceptualising of personal theories. Very briefly, Belenky et al. (1986) used the metaphor of voice to describe five different perspectives in which to view knowing: *silence* describes a voiceless stance that relies totally on external authorities as a way of knowing; *received knowing* refers to the perspective that knowledge can be received or even reproduced from an all knowing external authority, but individuals are not capable of creating their own knowledge; *subjective knowing* describes a shift in the authority of knowing to view it as personal and private; *procedural knowing* refers to a more reasoned reflection related to an investment in learning and applying objective ways of knowing; and *constructed knowing* that views all knowledge as contextual and created by using both objective and subjective strategies for knowing (p. 15).

Like many of her peers, Elizabeth’s initial theories reflected a received way of knowing theory. Essentially, her theories reflected a reproduction of other people’s theories to help her frame her own theories. Risk-taking and creativity were not evident. Her reference to ‘modelled, guided and independent’ learning reflected a more public theory that had been shared during her course. Similarly, Elizabeth’s description of how students and teachers learn reflected the flavour of a number of learning theories that had been shared and critiqued during her study. While this is not necessarily a negative aspect of theory development, following Belenky et al., I would argue that a more constructed way of knowing would have included more creative and contextualised descriptions of theory that were supported by personal and meaningful practices that had been developed as a result of multiple experiences. Elizabeth’s received way of framing her personal theories appeared to reflect the nature of her past experiences learning mathematics. For Elizabeth, knowledge was given by an external authority (teacher) and she was expected to reproduce it with little or no interaction or shared negotiation. While Elizabeth’s personal theories appeared to describe a more dialogic approach to teaching mathematics, she provided no elaboration of how this could be achieved in her initial theories.

Final personal theories

The personal theories written by Elizabeth at the end of the year-long subject took on a remarkably different form to her first attempt. She presented her theories as a ‘learning journey I have undertaken over the year through personal experiences, lectures, case stories, theories and reflection’. Elizabeth’s personal theories took the form of a learning portfolio that made many connections to cartoons, quotes and pictures to ‘contribute to what I believe’. It could be said that Elizabeth’s final personal theories reflected a more constructed way of knowing because she had used a blend of other people’s theories to construct her own personally meaningful theories. Two examples of her personal theory development will help to illustrate a constructed way of knowing that blends personal (subjective) and public (objective) theories together and explicates the process of *noticing and naming* that appeared to contribute to meaningful ways of conceptualising teaching.

The process of ‘noticing and naming’

One of Elizabeth’s personally created theories was named ‘Talking to know’ and is described in the following entry in her learning journal:

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. It’s strange, it’s not listening to someone, although sometimes they trigger my thinking off, it’s more about me talking, making sense. I’m still discovering how I learn but I am enjoying my journey. This is what I mean by ‘talking to know’. I am talking to you and trying to sort out stuff in my head. This subject is like the missing piece of the puzzle. I am making connections. However, you’re very clever Tracey. I am going to call you Queen Epiphany from now on because you are allowing us to open our minds and create something that is ours. Understanding. I’ve never felt more at ease with my thinking. I wonder if everyone else is feeling the benefits of this? I am making this point to you Tracey because when you have a conversation with me or anyone I guess and they’re trying to make sense of something and then they do and it clicks for them then you are having what I call a teacher moment. (Personal theory entry October, 2001)

The conversational quality of this entry epitomises a significant aspect of prospective teachers’ writing that I have identified as *noticing and naming* and was adapted from Mason’s (1998, p. 366) term ‘noticing and marking’. Elizabeth’s reflective writing provided an opportunity to heighten an awareness of her beliefs and *notice* what was important to her. *Naming* the learning process ‘talking to know’ allowed me to listen into and then join her conversation through my written feedback that was potentially meaningful, and part of a shared process of ‘coming to know’. The process of *noticing and naming* emerged from one of our classroom conversations about listening to your inner voice and to other people’s conversations (public theories) and *notice* what resonates with you as a learner and prospective teacher, then *name* that resonating moment so it becomes a part of your personal theories for the future. I would argue that the *noticing and naming* process is an authentic learning experience that leads to teachers authoring their own learning and empowers them to be theory generators as well as theory users. Moreover, I believe the cognitive process of *noticing and naming* enhances the development of a reflective disposition in prospective teachers and helps to build a more positive and autonomous mathematical identity.

The second theory that Elizabeth noticed and named was the ‘It’s like theory’. The following entry explains the development of this theory:

The ‘it’s like’ theory is about making links. It’s about learning and connecting with other schema in my head. I then thought about when a child did this in my classroom and they used an allegory to make their point. That was a real teacher moment! ...they are a great way for both adults and students to achieve “it’s like”...but how do we as teachers get the students to think this way or get to this point? Well, maybe the teacher can ask the children if anyone has had a similar experience? I know that I have done this possibly daily when teaching, but I never really made the connection before of why this is one way that a child can learn. Well, I’m not that stupid, sub-consciously I would have been aware but I guess saying it makes my connection more powerful. (Personal theory entry, November, 2001).

Elizabeth’s description of the ‘it’s like’ theory illustrates how reflective writing can both capture and theorise a personal learning experience such as the use of analogies or allegories and connect it to a pedagogical practice for the teaching of mathematics.

During a presentation to her peers, Elizabeth explained her ‘it’s like’ theory in practice. She used an anecdote from her internship to describe how a young boy in her class made a connection between writing in their mathematics learning journal and the posters they had created as a class. The young boy said that ‘the journal is like the posters that tell how we think about something in mathematics. You want to know how we think about maths’. In this anecdote, Elizabeth’s implementation of an alternate assessment strategy (journals) was a practical example of her personal theories that had been developed as a result of exposure to more public theories that were shared during the year-long subject she had participated in.

There are noticeably common elements between Elizabeth’s initial personal theories and her final theories. For example, the ‘it’s like theory’ suggests the use of analogies and allegories that might provide an opportunity for ‘modeled, guided and independent learning’ referred to in Elizabeth’s initial theory, but the *noticing and naming* of the ‘it’s like’ theory provided a personal commitment and elaboration of the strategies behind the theory. This process of elaboration is an important aspect that would therefore suggest a more constructed way of knowing that highlights the nexus between personal and public theories that were the result of the writing and sharing of personal theories.

IMPLICATIONS FOR TEACHER EDUCATION

In a sense, this search for finding words, speaking for oneself and feeling heard by others are all part of a ‘discourse of becoming’ (Britzman, 1991), a search for voice that enhances agency and advocates that teacher educators adopt an approach of *listening more and telling less*. A reflective orientation to teacher education can be achieved through the use of related reflective narrative stories such as those illustrated in Elizabeth’s case story. The writing of personal theories provided an opportunity for framing and reframing beliefs about the teaching and learning of mathematics by stimulating teacher reflection (Sullivan & Mousley, 1998). The articulation of personal theories appeared to enhance the development of a reflective disposition that was supported by the key process of *noticing and naming*, which provided opportunities for teacher educators to *listen more* to personal theories rather than simply selecting and telling predetermined public theories. In addition, the process of *noticing and naming* appeared to signal a more *constructed knowing* (Belenky et al., 1986) that led to visions of practice that were more personally meaningful and authentically developed.

Such a narrative approach has been relatively unexplored in mathematics teacher education. The explicit use of narrative stories in the form of personal theories can provide an innovative pedagogical tool for empowering teachers to explore and direct their own learning and make meaningful connections to more public theories. Personal theories have the potential to contribute to the growing body of knowledge in mathematics teacher education that sheds light on the process of becoming a mathematics teacher and how existing beliefs and experiences can affect and shape who we are as teachers. Moreover, *noticing and naming* our own personal theories that are connected to more public theories means that theory need not be dispensed in a language separated from the teacher’s reality, which can then open the door wider for prospective teachers to become theory generators as well as theory users. As Elizabeth often said ‘you have to

love it to use it in mathematics'. When theories are personally generated (through the process of noticing and naming), they are more likely to be 'loved' and used.

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