

USING AUTOBIOGRAPHY TO CHANGE PRESERVICE TEACHERS' ATTITUDES TOWARDS MATHEMATICS

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This paper is part of a significantly larger piece of research, designed to explore the role of reflective writing in its various forms as a tool for qualitative data. Key forms include autobiography, narrative and fictive writing. The potential limitations of these forms are obvious and need to be addressed by linking these forms of data to clear standards of professional excellence and quality. This research makes extensive use of my own autobiographical writing, and the autobiographical writing and journalling of preservice teachers in maths education courses.

There are at least three different branches within the realm of autobiographical research occurring at this time: Auto-ethnography (Brodkey, 1996; Reed-Danahay, 1997), Life History research (Casey, 1993) and Writing as Inquiry (Richardson, 2000). Ethnography refers to the detailed observation of people in their natural environment. Perhaps one of the most interesting aspects that has led to an increase in writing (for example autobiography, fictive writing) in the pursuit of understanding mathematics learning, is a growing awareness of the human dimension of mathematics. The traditional view of mathematics has been one of 'theorem and proof', a notion of a collection of scientifically proven facts which may be studied, learned and transmitted. A newer view has been to think about the personal dimension of mathematics. In dealing with areas such as maths phobia and Maths Anxiety, writing techniques tap into and help us understand how this phenomenon affects sufferers, teachers and other learners.

Treating, preventing and overcoming Maths Anxiety requires teachers and teaching strategies that develop positive and realistic self concepts towards mathematics. It has been clearly demonstrated that one of the most effective ways to reduce Maths Anxiety is to increase maths skills through the teaching of the content of mathematics especially to preservice primary school teachers (Fiore, 2003). Fiore used a strategy called 'Maths and Me' and had students in his maths classes write their personal maths stories. Whilst he experienced some reluctance from students to engage, the results were surprisingly powerful and a number of students disclosed at a level which indicated to Fiore that he needed to refer them on to counselling services to deal with previous issues related to maths that were blocking their learning. The benefits that came out of the writing were very significant and the students reported reduced anxiety through the experience of writing about what they had been through. Whilst there are numerous factors proposed as likely to lead to increases in Maths Anxiety amongst preservice teachers, the work of Brady and Bowd (2005) is particularly interesting as it shows that one of the most significant indicators of Maths Anxiety in preservice teachers is their own personal experiences as a learner at school. Furthermore, their future professional practice as teachers of mathematics will be highly related to the way they personally experienced mathematics at school unless specific intervention occurs if it is necessary.

The post-modernist climate and culture has significantly changed our ability to use writing as a form of qualitative research, which is regarded as highly as quantitative data. Richardson (1994) challenges us to demystify writing, to nurture the researcher's voice in using writing as a tool of high quality qualitative research, and encourages the use of writing as a process of discovery of one's own learning. Post-structuralism gives us the capacity to link our writing and social organization through language. We are not trying to capture social reality, but rather to explore it and experience it through writing. An increasing use is being made of fictive writing (Tobin, 1993). Fictive writing enables a link to be made to move beyond our own professional life experiences to embrace the lived experiences of other people involved in similar situations or scenarios. It is very much a question of wondering 'if this was happening for one person within it, what was happening to the other significant people around that situation' as well. Fictive writing enables us to explore the thoughts, feelings, understandings and issues for others in a way that helps us to see a different perspective. What I am seeking in the use of autobiographical work is developing a form of grounded theory rather than testing pre-conceived theories. Post-modern qualitative research is making increasing use of literary genres, such as autobiography and fictive writing, and post-epistemological research standards, such as those elaborated by Denzin and Lincoln (2000) and Geelan and Taylor (2002).

As expressed by Taylor and Settelmaier (2004), critical autobiographical research focuses on the researcher's own life story and provides a unique insight into the social and cultural forces shaping his or her life. Stanford's (1998) review of exemplary teachers provides very interesting insight into the power of role models for teachers. Stanford analyzed the autobiographies of teachers nominated for excellence awards, noting the clear links between the way they perceived their own teachers and the way their students perceived them – the relationship between the two is fascinating, and frequently almost verbatim, albeit describing different people. Autobiography is an ancient tool of writing that dates back at least as far as St Augustine's confessions. Numerous researchers have praised the virtues of autobiographies as tools for learning and personal growth. Telling one's life story can be a powerful and transformative experience (Larson & Brady, 2002).

A traditional maths metaphor is the *power of mathematics*. Note well, this refers to the innate power within mathematics, not the power of being numerate. The metaphor of knowledge as power (learning empowers) is in strong contrast to almost every piece of preservice autobiographical writing in this research, in which my students describe strongly and clearly feeling disempowered. One of the things that I have really learned from the research is the power of writing about mathematics as a way of viewing our lives and the way we have acquired mathematical knowledge, particularly for the purpose of assisting those whose process of acquisition of mathematical knowledge has been a self-limiting or self-harming one.

One of the most important tools of using writing to understand the behaviours and attitudes of preservice teachers is their use of metaphor. By getting people to analyse the metaphors that exist for them and the related metaphors for mathematics in their own lives, a great deal of insight can be obtained into their thinking.

At the start of ED1116 in 2005 one of core tasks in class was some reflective journaling on our own maths learning. In an answer to the question: "Are you looking forward to teaching maths?", one student outlined a quite amazing metaphor which reflected so sadly her experiences of maths to date. She writes:

Throughout Years 8, 9 and 10 I used to just sit quietly looking at the paper, doodling on it, in all maths lessons. Because I was quiet and didn't muck around, I didn't get noticed and all the teachers just thought I was doing my work. I actually never handed in any assignments and I've got no idea how they calculated my marks since I failed all the tests that I did. Maths to me, is a really hard model plane with all those silly little pieces that you have to patiently stick together. But for me, the glue's really crappy and it won't stick. So, as I stick a piece on, and then go to stick the next piece on, the other piece falls off. Then in the end, I get frustrated, call the whole thing 'stupid', and storm off. Because I don't understand maths I don't see how I'm going to be able to teach it. I'll be the teacher at the front with a calculator in my hand and the teaching manual open on the answer page. I don't know how I'll ever teach maths because for me, learning maths is a process where it goes in one ear, bounces around, and flies out the other ear.

Another student wrote the following:

I'm both looking forward to teaching maths and also quite scared about it. I really want to get every student that I teach maths to, to feel the way I DIDN'T feel throughout primary school. Even when we were playing games in primary school, I would shy away into the corner. I want to make every child feel comfortable and excited about maths, so that they can enjoy it throughout their schooling. When I went into Year 7 everyone had come from different primary schools, with different abilities and different levels of maths. I

came from a primary school and it was clear that we were in the lowest level of maths coming in. My Year 7 teacher didn't notice this and expected everyone to be at the same level. Therefore, I struggled with maths and was too afraid to show her this. She always favoured students who were good at maths and I feel that if she'd helped the low level students then, if we'd been nurtured a bit, then we would have enjoyed it a lot more and achieved far more success. Having had two years of hell with the same teacher in maths in Years 7 and 8, I stumbled across a great teacher in Year 9 who helped me get back onto my feet. She understood what I had been through and made me feel confident with maths.

The reflections of another student included:

I totally think teachers make a huge difference on students learning maths. My best experience was in Year 8 after leaving primary school, I found that I wasn't very good at maths and I wasn't much better in Year 8. However my teacher was a lovely lady, very helpful and she made sure that I really improved greatly over that year. I was so lucky that I had this fantastic teacher for both Year 8 and Year 9, and I made such great strides ahead. Maths became an enjoyable subject that I seemed to be doing quite well in. But when I got into Year 10 the teacher I had was absolutely horrific. She wasn't patient, she wasn't understanding, and she didn't explain things well. And my maths grades began to fall rapidly. I found myself not wanting to be there or participating in her class. That's why in Year 11, when I had the choice, I didn't do any maths at all.

For me, one of the emerging metaphors that came through my research was the notion of *mathematics as story* which resonates very strongly with the 1970s feminist researchers who attempted to change the traditional metaphors that had been associated to tap into the role of story (Belenky *et al*, 1997).

An autobiography enables us to open events to the affective domain of our human experience and to experience personal story in a way that helps us to make sense of a particular historical event, time or situation. When an autobiography is experienced, there is a natural emotional engagement with the story that is deeply impacting. This can be the case when one reads the autobiography of a person whom one despises or loves. It still touches that affective domain and is transformative because feelings that are important to the person are touched upon, opened up and experienced.

To teach in a manner that respects and cares for the souls of our students is essential; if we are to provide the necessary conditions where learning can most deeply and intimately begin. (Hooks, 1994, p.13)

An autobiography may have the power to be transformative for the writer of the autobiography, the reader of the autobiography and again taking the Sloan model, in discussing the autobiography with other people, it may have the potential to be further enhanced by connecting together in discussion the reader's life experience, the life experience of other readers, and the text. As teachers have spent many years as students watching teachers teach, those experiences become part of the process of learning to teach (Stanford, 1998, p.229).

Studies have demonstrated that an effective technique for reducing Maths Anxiety in preservice teachers is to engage in a process of writing reflections through journals and autobiographies (Countryman, 1992; Tobias, 1978). Through their writing experiences, preservice teachers are able to unpack their personal maths story and recognize critical events which may have led to an increase in anxiety or phobic levels of behaviour towards mathematics, and in identifying them be able to work towards overcoming them (Arem, 1993).

Research shows that preservice teachers tend to teach as they themselves were taught (Smith & Latosi-Sawin, 2000). Autobiographical tools and journalling may enable preservice teachers to

explore their own story of schooling and identify the practices, beliefs and attitudes that they hold as strong memories of their own schooling to ensure they are able to select the memories that they wish to see as the foundation of their own teaching work within the classroom. It is important that preservice teachers understand that they are likely to teach as they were taught unless they consciously do otherwise, or unless they consciously work through the aspects of their own learning which were negative experiences.

There are two distinct aspects to this unpacking of prior experiences. The first is the gradual, gentle, almost indiscernible wave of everyday experience of school. For example, if a student's entire mathematics education was from textbook work, they are likely to consider this as a natural way to operate as a classroom teacher, because of the experience range they're drawing upon. Another aspect that requires significant unpacking is anything which is distinctly episodic or cathartic in its nature. Critical incidents have a deep impact on an individual's learning (Schartz & Walker, 1998). Critical incidents related to learning can include specific learning experiences, personal events outside the school, issues related to interpersonal relationships, teacher-student relationships or the comorbidity of several of these factors. Critical incidents can be highly personal and remain undisclosed to others, and others may be unaware that a critical incident is, or has, occurred. This experience can be either a great emotional high or low. The preservice teacher can be helped to reconsider the event, to work out its context and scenario and to analyse its components and thus gain understanding and insight into how the event might affect their future teaching.

For example, a preservice teacher's episodic event might be about a particular teacher who taught him or her over a period of time and brought a great sense of humour and vitality to the classroom. This teacher might have impacted so significantly that she or he has become a role model for the preservice teacher's desire to become a teacher. It is possible to use this episodic event to enable the preservice teacher to recognize the attributes of this teacher and to develop or enhance them in their own teaching style.

Equally, an episodic event might be something school related or non-school related that impacted on school learning. For example, a student who became ill during a certain period of their schooling and had a significant amount of time off might have not developed key concepts within a learning area such as mathematics. This might have been the factor that led to the student developing a negative attitude towards the subject and a sense of failure in tackling it. However, when fully unpacked through reflective writing and dialogue, the preservice teacher may be able to identify the factor and let go of the block around this particular learning area.

An autobiography can be a very powerful writing tool. When one engages with writing autobiographical content, one can be challenged to re-experience an event which occurred in one's past. This re-experiencing can be very painful and difficult, or it can be simply without feeling a response at all. It may be that in re-telling a particular event that humour is now able to replace previous embarrassment. Or it may be that in re-telling the autobiographical event and sharing it with people who were there at the time, one is challenged to consider that memory is distorted and that the event did not occur the way in which we believed it did.

Writing some aspects of one's autobiographical story might involve such a deep emotional struggle that professional guidance is required for the person to safely engage with the material from the past. Examples may include sexual and physical abuse and periods of family breakdown. Re-engagement with those events as part of a memory journey might be very difficult. This is an important consideration for teachers and researchers to bear in mind when directing students to work with autobiographical recounts.

Bushnell and Henry (2003, p.39) note:

Students frequently focus on obtaining a degree for the acquisition of a job rather than becoming educated for the purpose of improving a democratic society and they may not need to bother.

It's almost an anachronistic view that teaching is a vocation rather than merely paid employment. Those teachers who really do make a significant difference, those teachers who we may well read about in autobiographical accounts, who have inspired generations of teachers, are people who have a vocational view of their career path.

To be a good teacher, you really need a critical awareness of your own learning. You need to be able to understand how you learn and to find that learning and the quest for knowledge to be an invigorating process. This is an essential skill that very good teachers carry.

Bushnell and Henry (2003, p.57) also note:

Many female students come to college with experiences that have rendered them intellectually silent. They have not yet awakened the power to name their own lives.

I believe that many educational experiences have actually deadened people to being excited about their own learning. It's very easy in the fast pace of tertiary studies for preservice teachers to simply focus on completing tasks and assessment pieces rather than learning about themselves. If that is the way they have experienced their own studies, then that is the way they are likely to teach. They will see learning for students in their care as stepping through criteria of assessment and learning tasks, rather than feeling empowered by learning. I believe that it is only the teacher with that sense of vocation who can inspire students to see learning as cathartic.

Every person has a maths autobiography, because every person has been to school. People bring a rich maths autobiography to their adult life, because not only do they have all of their school experiences related to maths learning but they have the elements of their own personal and family stories that also relate to maths learning. A great deal of maths learning does occur in family life, and the intricacies of relationships between family members who have either a love or hate relationship with mathematics are profoundly important in the lives of children growing up. Many children have been told in a wide variety of settings by at least one parent that the parent cannot help them with their maths homework because they were "never any good at maths" at school. The impact of such statements may be profound on developing attitudes and values of children. Wright (2003) uses his autobiographical essay as a way to provide the reader with a transformative experience of understanding the journey that he went through as a student, and in particular the relationship that his cultural heritage and racial background had within his professional work. Importantly Wright deliberately uses autobiography as a tool to avoid pitfalls of over-generalisation and to maintain an authority of authenticity with his writing.

An educator who writes extensively about the values and benefits of mathematical autobiographies is Countryman (1992) who notes that students to use of autobiographical data helps them to focus on their personal learning styles, take greater responsibility for their own learning, and see themselves as being central to the learning process. Countryman notes that maths does engender feelings. One of the skewed beliefs we have about maths is that it is an unemotive subject, however this is untrue. When people write their maths histories and personal stories, often they are rich in emotional experience and clearly identify strong feelings they experienced related to certain people, times, and events, often many years after the event.

Learning that connects with us emotionally can be profound learning, and events that elicit an emotional response can have a lasting impact on the way we remember them. Countryman notes that issues such as confidence and self-esteem which are important considerations in learning, particularly in the mathematics area, can be brought into the open and discussed through tools such as maths autobiographies.

One of the most important benefits that a teacher can derive through having students write maths autobiographies is to gain insights into classroom practice. It may be more appropriate as genre forms to consider a journal as descriptive of current everyday life events and an autobiography as a re-telling of the past. Whether writing a journal or autobiography, a student has the opportunity to identify aspects of the classroom learning environment that are both positive and negative for their learning, and a teacher reading the work, or talking about it with the student, can use this information to improve and enhance their own professional practice, thereby enriching the learning of students, and recognizing the diversity of needs that exist within the classroom. The growth that preservice teachers can achieve through maintaining a journal has been demonstrated in several significant

research projects (Christensen, Wilson, Sunal, Blalock, *et al*, 2004). Journalling requires a set of well understood professional language skills that are used to describe teaching and learning processes and practices.

Karen, a mature age UNDA student, provided detailed and evocative insights into the power of memory to be incredibly painful. Whilst advocating the power and usefulness of writing as a tool of learning and self-reflection, practitioners need to be aware that the process can be extremely challenging and may require the support of a professional therapist, in this case, referring the student to the university counselling service. This particular student had long avoided a return to study, and the gap for her had been nearly twenty years since her last course. As her writing unfolded and she reflected on her own learning journey, it was little wonder that reluctance to study existed. Her autobiography will be used at the presentation session for this paper.

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