RELATIONSHIPS WITH/IN PRIMARY MATHEMATICS: IDENTITY, EMOTION AND PROFESSIONAL DEVELOPMENT

Jeremy Hodgen and Mike Askew

King's College London

In this paper we explore primary teachers' emotional relationships with mathematics. Drawing on the concept of identity as a "defended self", we describe and analyse the case of one primary teacher. We argue that emotion as both an individual and a social element. Finally, we consider the implications for teacher education.

This discussion is based on an analysis of our interactions with a primary teacher, Ursula, as a researcher (Jeremy) and as a Higher Education teacher (Mike) as she participated in professional development in mathematics. At an earlier day conference, one of us discussed how Ursula's desire to be a mathematics teacher was a crucial factor in her professional learning (Hodgen, 2004). Here, we focus on how she became drawn to mathematics despite her initial avoidance of the subject and relate this to the social aspects of learning. Our central theme is a narrative that Ursula told and re-told during these interviews concerning Ursula's relationships with school mathematics and mathematics teachers, one of whom was Mike.

METHODOLOGY

Ursula was a teacher-researcher in the Primary Cognitive Acceleration in Mathematics Education (CAME) Project between November 1997 and July 2001 (Johnson, Hodgen, & Adhami, 2004). [1] As part of this project, Jeremy studied Ursula's professional development (alongside that of five other teacher-researchers) (Hodgen & Johnson, 2004). Eighteen months previous to this, she had attended a 20 days mathematics course that had been taught by Mike. [2] The data that we analyse is drawn partly from interviews conducted with Ursula as part of Jeremy's research study and partly from Mike's reflections on teaching Ursula. [3]

THE RESEARCH CONTEXT: URSULA AND MATHEMATICS TEACHING

Our interest in Ursula is as a "telling" rather than a "typical" case (Mitchell, 1984). When we first met her, Ursula was a primary class teacher. Later, in the second year of the Primary CAME Project, she became a Numeracy Consultant. In many respects, Ursula's professional development in mathematics was somewhat unusual for a primary teacher. Primary CAME was exceptionally extended and intense, involving one day release every fortnight for three years. Moreover, as part of the project, she co-wrote curriculum materials and gave research presentations to teachers and academics. She was also unusual in that she moved from a position of fear and distrust in mathematics to one in which she identified herself positively as a teacher of mathematics:

> I like being a specialist. I like having one subject. I like being a maths teacher.

Our analysis suggests, however, that this shift was due to a combination of factors not simply (or even mainly) to Primary CAME despite its intensity. Ursula herself identified three key moments in her own professional development as a mathematics teacher: a classroom incident in her first year of teaching when "something clicked" and she realised that she "might actually like teaching maths", the 20 days course and Primary CAME.

IDENTITY AND PROFESSIONAL CHANGE

Central to our analysis is the concept of identity. Becoming a teacher is a process in which identity is both the product and the instrument of change:

> identity … [is a] … culturally and personally located social schema that has the potential to be transacted, redefined and resisted and, like discourse, called upon when the moment is - to the learner - opportune. (Carr, 2001p.527).

But identity can be (and often is) a barrier to change. Bartholomew (2006) argues that identity is both a meaning making and a *defended* subject drawing on Hollway and Jefferson's (2000) conception of the "defended self", itself a development of Klein's work about "how the self is forged out of unconscious defences against anxiety" (p. 19). In her four-year study of involving 8 schools, Bartholomew argues that many of the teachers had forged an identity in terms of their ability to cope in a "difficult school" with "difficult students". This identification with "difficulty" meant that there were risks attached to success as well as failure. A successful school could no longer be a difficult school. Hence, these teachers had a very significant investment in the status quo. She uses the metaphor of the "dragon" to emphasise the power of these teachers' fear of change and argues that this fear of change cannot be removed, but rather needs to be transformed into a source of strength. As we have argued previously, this notion of the transformation of fear and anxiety into desire, or the attraction for something which "simultaneously attracts and repels", was key to Ursula's professional change (Hodgen, 2004). For Ursula, the dragon was strongly associated with her experiences of school mathematics and one particular secondary school teacher, Miss Briggs.

URSULA'S STORY

Ursula had what she described as a fear of equations, which she described as follows:

> I have a fear of algebra. […] No, I don't, I have a fear of anything that looks like an equation. And when people use the phrase simultaneous equations I could pass out quite happily. […] As, Bs, Xs and Ys, all mixed together, put in a few brackets and I'm gone, I'm away with the fairies.

Ursula had, however, been identified as mathematically able at school. She was in a small top set group who took an O/A in mathematics at the same time as GCSE. The O/A was taught in after school sessions by Miss Briggs (a pseudonym):

> that [the O/A] was after school, and that was with Miss Briggs. And Miss Briggs was actually, in retrospect, I think she was probably a very good teacher, because she did try

> to stand at the front and teach us. But I remember going from what I considered to be things that were really easy, drill and practice things, to this lesson where there was just this enormous algebraic equation going across the board. Absolutely enormous, and I'd walked in late because it was after school and I wasn't really over-keen on this, and I'd missed the first lesson, and I couldn't come to grips with this at all. And that was that. Walked out the classroom and didn't go back again. […] Supposed to work something out from it and everybody else in the room seemed to be able to do it except me. Because I'd kind of missed out on what I was meant to be doing with it. […] In fact, I could quite happily probably tell you for the last two years I probably didn't go to any maths lessons because I can't remember them at all, apart from the after school one. […] The only good thing about it was I kind of looked around the room and thought - mm, this is an interesting group to be in. But that's it. […] Yeah, there were some exceptional high fliers in that. It was a very small group. There must have only been about six of us. But most of them were the exceptional high fliers that just don't bear thinking about, you know, in your school year, they don't exist. They just get everything right, and you assume they do, and they don't exist as people. [LAUGHS.] But, only two girls and one of them was Susan. […] But I can remember the room as well. I can remember the room in minute detail. It obviously had huge impact because I could remember everything about it. […] And knowing how well I didn't get on with Miss Briggs it's quite likely that she made some derogatory comment that I didn't understand. Although I don't remember her doing it. It wouldn't have surprised me if she did.

There are a range of fascinating and important issues in this account that resonate with the literature - not least the construction of mathematical ability and failure (Boaler, Wiliam, & Brown, 2000). For our current purposes, and given space constraints, we simply highlight Ursula's sudden incomprehension of mathematics in the form of the "enormous algebraic equation" and the personalisation of this with Miss Briggs. This was a story Ursula told several times and on each occasion she immediately went on to relate an incident on the 20 days course in which she got frustrated with Mike about doing "maths for maths sake":

> The other person who got me very frustrated because I didn't understand was Mike. […] I obviously hadn't been listening and didn't know where it came from, and he was asking people to work out … about tangents … and there was something about it. But again it was using the vocabulary that I couldn't remember quite. And I got really cross with him and I kept saying - why do you want to put a line on a circle? For God's sake, why does anybody want to work this out with a line on a circle? I couldn't understand why anybody wanted to do it. […] You had to work something out around this, but I don't know what you had to work out because I'd given up by that point. And I just got cross with him. But again, I think it was into the realms of maths for maths sake. […] I just remember being very frustrated and feeling like I could have quite happily just sat there and cried, or screamed at him, one or the other. So I shouted at him instead.

MIKE'S STORY

Mike remembers the incident differently but equally clearly. In his recollection, the incident was concerned with negative integer powers and Ursula challenged rather than shouted at him. But, like Ursula, the focus is on the motivation for doing mathematics:

> Ursula, called me over.
>
> "My 5 quid calculator has got a 1/x button on, so why doesn't this expensive one?"
>
> "Well, it does," I replied " it's that x^{-1} button."
>
> This seemed an opportunity to explore powers and so I stopped everyone to go through the argument as to why, for consistency, mathematicians had decided to define x^{-1} as 1/x.
>
> While the teachers' nods during my explanation suggested that they were following me in the logic, afterwards there was quite a lot of muttering going on at Ursula's table.
>
> "Is there anything you are not clear about?' I enquired.
>
> "No, we follow your argument," Ursula replied. "But we were just saying to each other, 'why would anyone ever want to do that in the first place?'"

DISCUSSION

We emphasise that the 20 days course was a critical moment in Ursula's professional development. She described it as follows:

> it was just a good, a good course. It was a very inspirational. […] this is good maths practice, here some ideas you can go back and try. […] But it was all about, it was maths at adult level, I suppose, and maths at children level, […] He [Mike] did it well, 'cos we, we went back and we tried things but we also wanted to do things. So we were doing things on the train on the way home and we were phoning each other up and comparing how things had gone

Yet, one key incident for her - perhaps the key incident - was her frustration with Mike. Moreover, this incident seemed to be associated with her school experience with Miss Briggs. We suggest that, unwittingly, Mike provided a space within which Ursula could challenge the dragon of Miss Briggs and raise issues of purpose and motivation for doing mathematics. [4] We further suggest that this in turn enabled Ursula to begin to understand the attraction of mathematics (Hodgen, 2004).

Ursula's negative experience of secondary school mathematics is commonplace amongst primary teachers (Bibby, 1999). Indeed, we suggest that many primary teachers, like Ursula, have a dragon such as Miss Briggs. This we contend can lead to teachers protecting pupils from - or *defending* them against - mathematics. Such a position is likely to reproduce negative attitudes to mathematics.

It is commonly assumed that individuals are either drawn to or avoid mathematics. This pleasure/pain dimension is documented by Buxton (1981) amongst others:

> There seem to be two different states that one might properly call panic, yet they are *very* different. One is a sort of turbulence in the mind, a type of frenzy … 'mind chaos'…. More common in the maths classroom is a sense of paralysis, a freezing of the mind…. People may pass through the chaotic to the frozen stage or may simply enter paralysis directly. (p. 5)

More recently attention has been turned to the social dimension of learning mathematics. Bibby (2002), for example, describes how many primary teachers' relationships with mathematics are characterised by shame. Scheff (1994) describes shame as follows:

> Shame seems to arise from our need to feel the right degree of *connectedness* with others. Shame is the emotion that occurs when we feel too close or too far from others. When too close we feel exposed or violated; when too far, we feel invisible or rejected. Pride is the signal of being at the right distance: close enough to feel noticed but not so close as to feel threatened. (p. 40).

In our view, these emotional dimensions are dialectically inter-connected. As in Ursula's case, the motivation to do mathematics – or to teach mathematics – is both individual and social. Professional development in primary mathematics in the UK has generally focused on cognitive and pedagogic issues: teachers' mathematics subject knowledge, how children learn and teaching approaches. These issues are, of course, important. Indeed, our own professional development initiatives have focused on these issues. But, such an approach is, in our view, doomed to failure unless placed within an affective frame in which teachers have space to question mathematics and mathematics teaching. Central to such an approach is Noddings' (1992) notion of care – care for the learner and for the discipline. To paraphrase Noddings:

> Education […] has one main goal, a goal that guides the establishment and priority of all others, it should be to promote the growth of students [and teachers] as healthy, competent, moral people. […] We cannot ignore our children [and our teachers] – their purposes, anxieties, and relationships – in the service of making them more competent in academic skills.

NOTES

1. The Primary CAME Project was funded by The Leverhulme Trust as part of the 5 year Leverhulme Numeracy Research Programme (LNRP) at King's College London.

2. Ursula is a pseudonym. She gave permission for this data to be shared with Mike.

3. The methodology is described in detail in Hodgen (2003). The data is taken from interviews conducted on 4/3/99 and 19/7/00.

4. We emphasise that this was unplanned. Whilst we have thought for some time that emotion is an important aspect in primary teachers' mathematics learning, Ursula's case has caused us to radically re-think the nature of this.

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