

The impact of Masters level study on teachers' professional development

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This on-going NCETM-funded^[1] longitudinal study is exploring the impact of studying for an MSc in Mathematics Education on the professional life of a group of teachers. Whilst the findings from this research are already anecdotally known, there has been little systematic research in the UK on which to ground these 'teacher stories' of the impact of study at Masters level. We report on the impact on teachers' individual professional development, the impact on their classrooms, their respective pedagogies and on consequent pupil learning, and the impact on the wider life of the school and the local authorities within which they teach.

Keywords: professional development of teachers, mathematics, impact, Masters.

Background

There is an abundance of anecdotal evidence that undertaking postgraduate research and study at Masters level significantly changes how teachers view aspects of teaching and learning in their classrooms. In respect of mathematics teachers, the recent (December, 2008) conference of the UK National Centre for Excellence in the Teaching of Mathematics, which had as its theme 'Adding Value in Mathematics CPD Partnerships between Schools, Colleges and HEIs', contributed significantly to this anecdotal evidence. However, there is little systematic research in the UK about the impact that this sustained professional development has on wider professional development. In a systematic review of CPD in relation to teacher impact (Cordingley 2003), only two UK research papers on sustained collaboration between teachers were identified and neither of these related to mathematics teaching and learning.

Research on the in-service professional development of teachers, either *in situ* within their practitioner contexts or through particularly designed programmes, is widely reported internationally (see, for example, Ellerton 1999, Jaworski, Wood & Dawson 1999, Lin & Cooney 2001, Ponte, Ax, Beijaard & Wubbels 2004). In all these contexts, teachers are associated with Higher Education Institutions (HEIs), though not undertaking accredited postgraduate study. In the breadth of research from the US on in-service teacher development (for example, Lampert & Ball 1999, Ball 2000, Steinberg, Emson & Carpenter 2004), almost all is on aspects of mathematics education reforms, such as research on curriculum and teaching methods, and teacher knowledge and student learning, and the culture of the classroom.

By contrast, this research project provides an evidence base which addresses the lack of research about teachers' professional and personal development while undertaking postgraduate research study. The project focuses on a group of seven teachers, who are mathematics initial teacher education (ITE) mentors, during their

study for an MSc in mathematics education part-time over two years from October, 2007. It is examining:

- a) the personal and professional impact of research and study on these mentors throughout their Masters course;
- b) the impact this learning and research has on the curriculum and pedagogical development in their respective classrooms and mathematics departments; and
- c) the impact these developments might have on schools, in particular on cross-school liaison, given the close proximity of some of the participating schools to each other.

The Teachers

Paul is the longest serving teacher in the study, with 15 years teaching experience including a responsibility post as a deputy head of the mathematics department, as he started postgraduate study. Rachel had 12 years teaching experience at the beginning of her Masters level study, similarly with a post as deputy head of the mathematics department. She, similarly, has been a long-term curriculum mentor, particularly working with paired student placements. Additionally, Rachel has responsibility beyond the school environment as a 'Leading Mathematics Teacher', a post that involves her in out-reach work with other mathematics teachers.

Liz had eight years experience in the classroom at the outset of postgraduate study, is also a deputy head of the mathematics department and involved in a range of mathematics initiatives external to the school, such as the trialling of the government-initiated 'Functional Mathematics' pilot, the Go4SET project and a TDA-funded Partnership Development School network. Jonathan and Claire both entered their fourth year teaching as they embarked on their Masters degree. Each has a similar responsibility in their departments to others in the study. Neil and Nicola began their postgraduate study as they entered their second year teaching, though Neil brought 16 years experience in industry, as an electrical engineer, to his classroom role. As they begin their third year teaching, both have since secured appointments as a deputy head of a mathematics department, Nicola as an internal school appointment and Neil in a different school.

Data Collection

The research uses a case study approach with mixed methods of data collection. There was an initial semi-structured focus group interview to ascertain the reasons each had for undertaking a Masters degree. Each teacher is since keeping a reflective log (Merritt and Edwards 2005) about the impact of their Masters level study, recording moments when 'shifts' in thinking occur in relation to mathematics, curriculum, pedagogy, or shared practice in schools. This reflective log takes a variety of forms – two as a trajectory of experience on the Masters course with impact labelled clearly, one as a separate record of impact, two others as an edited audio version, and one as a blog on the NCETM portal. Some teaching sessions were audio-recorded, as a means of enabling the researcher to both teach the session and record field notes. Some field notes were written after the finish of the taught session. Audio-recorded, semi-structured focus group interviews, based at the University, supplement the reflective logs. These focus groups are designed to elicit collaborative impacts or developing communities of practice between the teachers involved. Individual semi-structured interviews with the teachers, within their school environment, to elicit further evidence of impact *in situ* are also audio-recorded. Other, more formal, means of

seeking evidence of impact include accredited assignments for the Masters degree. Similarly, more informal contacts, such as emails and phone conversations formed part of the field notes feeding into the analysis. On-going analysis of this data is exploring impact in five categorisations: personal impact; professional impact; impact on classroom; impact on department/school; impact beyond the school. It is not possible, in the length of this paper, to examine teacher experiences as case studies in themselves, so I present some of the data within these categories.

The Evidence

The initial focus group interview, which took place in November, 2007, provided baseline evidence about the teachers' motivations to undertake postgraduate study in the form of a Masters degree. These early motivations will be revisited in January, 2009, as part of a different study. The main reasons for creating the time and space to undertake a taught Masters course included:

- wanting to see progress in my classroom;
- being able to question the curriculum;
- allowing me the space to engage pupils with mathematics outside the classroom;
- developing ideas about transferability of skills;
- keeping the classroom interest alive throughout all the management demands;
- maintaining my love of mathematics and keeping it alive in the classroom and in my teaching;
- a sense of 'pulling things together' in terms of teaching, learning, and personal development;
- putting my current bits of research to good use as a qualification;
- previous experience of action research engendered a love for the model of classroom development;
- knowing and partially reading research evidence for my classroom – but now, more formally, setting aside the time to do this;
- giving me an opportunity to talk to other teachers about practice.

In setting up this study, I envisaged three broad categories, within which I could place teachers' recorded experiences. There is evidence of each of these three categories in these initial motives for postgraduate study. The first five represent the curriculum and pedagogical development impetus, as does the sixth. The sixth also, along with the seventh to tenth, is evidence of motives for personal and professional development. The final statement indicates an understanding that the Masters level study will provide opportunities for cross-school collaboration.

Although these three categories were sufficient for this initial data, subsequent data is proving 'richer' than these categories justify, so the three original categories have expanded to five (listed in the previous section). Initially, the reflective logs did not appear to provide a great deal of evidence, but this was just slow to develop – perhaps an expected outcome of the growing engagement with a Masters course which sits easily with anecdotal evidence of teachers' development.

Personal Impact

The distinction between personal and professional impacts remains somewhat ill-defined at present, but this is becoming clearer with a growing data set. At present (at the mid-point of the project), this delineation is made through whether the statement

indicates development of self-knowledge (personal) or development of knowledge which has an overt impact on aspects of professional life (though I acknowledge that the former could also impact on the latter). Two examples of quotes which I define as personal impact are:

Group work is messy and I'm quite tidy so I was definitely out of my comfort zone to have children not facing me. I was surprised about how insecure it made me feel and I realised how much I needed to be in control in my classroom. After all these years teaching, I'm learning new things about myself.

I think "it doesn't matter what their books look like as long as they're thinking" until I realise I'm thinking "what do their books look like?" I think I say I believe all these things but I've found I don't actually do this in practice. I was reading something about the relationship between beliefs and practice and I thought "Oooh, that's me".

Professional Impact

Along with classroom impact, this is the most frequently identified impact recorded. The following are direct quotes from the teachers, either from their reflective logs, from the interviews, or from field notes:

Reading Geoff Wake's [2005] article prompted me to think about the way that I approach topics. I plan to think more carefully about beginning a topic with a problem and asking 'what do we need to know/learn to solve this?'

Problem-solving ideas are much more in my thoughts when lesson planning now – I'm aware of a shift in my previous thinking – *Bertie Bassett* was successful!!

Am rethinking whether 'Functional Maths' is a form of qualification or a way to teach all students

I now like the phrase "creating a need". The need to solve a problem may be created from real life problems or interesting puzzles.

I used to read articles in *Maths Teaching* and think "That's a good idea, I'll do that". Now I think "That's a good idea, I wonder if the research evidence backs that up". (FN)

Assignments feed into everything I do. Its interesting to reflect – we don't get enough time to reflect – but reading and doing assignments forces me to reflect more.

Impact on Classroom

Evidence of impact on the classroom is provided by the greatest variety of forms of data, including field notes and recordings of discussion in taught sessions, reflective log notes, written assignments, the NCETM blog and recorded interviews. This appears to be, one-year into data collection, the impact of which the teachers are most personally aware. Evidence includes:

I have downloaded the MiC problem-solving activities for year 7 & 8 and have made Smart Notebook files of these to use with 7R1 and 8A2 this term.

Ideas from the UKMT challenges (without the multiple choice answers) may make good lesson starter problems – written up one on Smart Notebook to use as a starter.

Read *Mathematics Teaching* 194 p3-5 – will make the algebra cards and use them.

I have begun starting all topics with problems. A good introduction to 10M1, linking Pythagorean triples with the radius of a circle, means they are now all well acquainted with Pythagoras.

With 9M4 and 9N2, I posed a problem which forced them to derive informal formulae. I have found this a useful starting point to find a problem that needs solving.

It [NCETM conference] has had a positive effect on my teaching. I found the deconstruction of what $12/n$ means using $\frac{1}{2}$ meaning 1 shared between 2 received a promising “Oh, that makes sense” from E and B in 7M3.

Began groupwork with 8M2. The impact of the change [of arrangement of desks] was a pleasant atmosphere in the tutor group with 3 groups in 8M2 making better progress.

I never believed in using friendship groups in the classroom because I thought they'd [the pupils] just chat, but when I listened to the audio tapes I was really surprised at the level of on-task talk for an hour – 93%.

Impact on Department/School

All the teachers in the study currently have posts of responsibility within their mathematics departments. The impact on the wider mathematical (and other) life of the school was a feature of this study, particularly for this reason, though it has been interesting to see how the foci of assignments (such as APP and ‘student voice’ have changed some of the teachers’ responsibilities in the school):

Will get a copy of Prestage and Perks (2001). Found a copy in the Library. Very interesting reading – have made a list of suggested approaches and good ideas to add to our schemes of work.

Have looked at Nrich website and curriculum mapping section to map puzzles to schemes of work.

Borrowed the DIME Build-ups and used some department time on our INSET day to introduce them to the staff. We really enjoyed them!!

My Head and DH asked to read my assignment on APP in maths. As a result, I was asked to do an analysis of the SATs results for the school to check whether they were comparable to the evidence we had in school – they were. I am now responsible for APP across the school!!

I was asked yesterday to join a team/committee in school being set up to look at continued professional development.

Impact Beyond the School

Some of the teachers have significant roles and involvement in groups related to the teaching and learning of mathematics outside of their immediate school sphere. It seemed important that impact in these spheres was recognised. Additionally, the study aimed to examine collaborative activity between the teachers/schools. At present, this has been on a one-to-one basis for emotional support. Attendance at both NCETM and BSRLM conferences have had impact (see above [impact on classroom] and below):

I now go to meetings and think “I’ve done some reading about that” – different groups like the LMTs and the Hampshire AfL group. Sometimes I’ve actually brought up the reading I’ve done in our LMT meeting. We got into a really interesting discussion about exploratory talk and J told us about some work they’d been doing at W School.

One of the sessions at BSRLM prompted me to contribute to the discussion which I didn’t think I ever would.

As with the initial slow beginning to providing significant evidence of impact on various aspects of professional life, what is just emerging in the data is evidence of

the teachers' development in thinking about how theoretical models and research impact on professional life. Further analysis against all these criteria is on-going, with the intended outcome of case studies of teachers' 'narratives' of professional development. This model is employed with the aim of engaging the teachers in meta-reflection on their development over the period of two years, using ideas from Schön's model of *reflection on reflection-in-action* (Schön 1983). Such an approach, it is hoped, will shift the emphasis from research on teachers' professional development, as described earlier, to a model in which teachers' are actively examining, and influencing, their own professional development.

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