# AN EXAMINATION OF THE DEVELOPING MATHEMATICS TEACHING PRACTICES OF PRIMARY TEACHERS FROM ITE INTO FIRST TEACHING POSTS

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*This is an exploratory paper looking at some early evidence from data which is part of a study following the progress of four primary teachers as they move from a university based Post Graduate Certificate in Education (PGCE) course until the end of their Newly Qualified Teaching (NQT) year. The study looks at how we might theorise the transition of mathematics teaching practices from university course into school. The data in this paper focuses on one participant's ideas about problem solving. The paper also looks at two publications offering sociological perspectives on ITE and classroom teaching to consider possible readings of the data. One possible area to be developed from the ideas in the publications is that of teacher agency and the role it plays in the process of becoming a teacher of primary mathematics.*

## A BRIEF OVERVIEW OF THE FIELD OF STUDY

The study of primary ITE in England has focused to a large extent on the knowledge needed to teach effectively and the concerns widely expressed about weaknesses in what mathematics primary teachers know. Discussions about appropriate knowledge frequently draw on Shulman's (1986) ideas of knowledge in teaching and develop in various ways from them. The affective or emotional attitudes around having to know and to teach mathematics have also been recognised (Bibby 2002). At the same time, as mathematics education research has developed a more overtly sociological strand, interest in teacher knowledge has moved to considering the contexts and interactions within which knowledge is developed (for example Ball and Bass, 2000; Rowland et al, 2005; Hodgen, 2007). In addition to examining knowledge as culturally and socially embedded, post-structuralist theories have been used to explore the regulation of the practices of individuals in the discourses of mathematics teaching and the possibility for individual agency, adding a political dimension.

The two perspectives (psychological and sociological) may be brought together in an attempt to describe and explain the early stages in the process of learning to teach primary mathematics through considering the ways in which individuals have to construct new ways of regarding mathematics and the teaching of it as they progress from learning mathematics as school pupils to learning mathematics for teaching on teacher education courses and in classrooms.

## MY STUDY

My work is focused on the early stages in the developing practices of new teachers teaching mathematics, as student teachers and in first posts. My aim is to examine the

issues surrounding the transition between training and teaching, in the first instance looking at the move into school placement from the university based course in mathematics education and, later, the move into first teaching posts.

This paper is intended as an initial exploration of those issues, from my continuing study and from two publications which appear to offer possible insights. Firstly, Ensor's (2001) work, drawing on Bernstein and Dowling, examines what happens when teaching practices encountered in ITE are transferred into classrooms. This is described as a 'recontextualisation' and Ensor's interest is in how practices are transformed in the process and in the implications of this for mathematics ITE courses. Secondly, Walshaw's (2004) paper is concerned with the ways in student teachers' teaching is regulated by the explicitly stated and implicitly accepted ways of teaching mathematics in university ITE, schools and the wider educational context. I have selected these two as representing two perspectives offering potential readings of the discontinuities between ITE and school practice, a continuing concern in my field of work. My aim here is to begin to examine a small selection of data from the account of one student teacher, as well as the perspectives these authors present with the longer term intention to develop such perspectives through studying the process of learning to teach in the transition from ITE into first teaching posts. Looking at what happens as the research participants move from students to teachers in their own classes will allow the analysis of the possibilities open to them in this process and, from such analysis, the potential for adding to the kind of theoretical perspectives offered by the two publications focused on here.

## GEOFF

My study is focused on PGCE students and I am drawing on the data collected so far for Geoff (a pseudonym), a mature student, whom I chose as a 'telling case' from the original group. He communicated a strong sense of confidence in mathematics yet reported some difficulty in teaching mathematics. In the first interview it was clear that he had had extensive and very successful mathematical experience as reflected in his school qualifications in mathematics, his degree and subsequent profession prior to the PGCE yet later he stated that mathematics was 'the hardest to teach'. The data is taken from interviews and a classroom observation from ongoing research.

## Problem Solving – Aims and Practice

I will present the data and analyse it with reference to Ensor (2001) and Walshaw (2004) and identify how my study can draw on their perspectives but also contribute to understanding the conditions for the development of the mathematics teaching of new primary teachers.

I have selected Geoff's comments on 'problem solving' as this appeared to be a particular issue in his reflections on school placements. In our first interview just

prior to his final school placement, problem solving seemed an important aspect of his aims for teaching mathematics.

Sandy: What is your aim for teaching mathematics?

Geoff: …trying to involve a lot of problem solving so actually moving it from the sort of algorithm type approach and you can …[inaudible] to actually demonstrating a real understanding by problem solving but also problem solving is the fun bit as well.

He was also asked about successful and less successful experiences of teaching.

Sandy: Can you tell me, now, about a less successful lesson you taught?

Geoff: [A] problem solving question that we were doing. It was some work on shapes. It was a second lesson following on from the previous one, which I though they understood. Well, they did, but I think it was similar to the point I made earlier about doing it in practice. Also doing it a different way that you think they understand it and then you put it in a different context and they don't.

…so it was coming at it from teaching them how to work out perimeter from either measuring the sides or having the measurements there and area to then say 'Well if you've got the perimeter or area, work out the length of the sides' but it was just because there were two stages to the calculation they just didn't get it at all.

At the end of the school placement I asked about how he felt he had progressed. Problem solving was mentioned first in this context.

Sandy: How do you think your maths teaching progressed in the second placement?

Geoff: Problem solving was very problematic. That was a problem with Y5 [first placement] but also a problem with Y1 [final placement] and I came unstuck on that a couple of times. You gave them tasks to do and perhaps it was the Friday session or whatever but the rest of the week went well. 'Oh, look they can do this. They're doing really well'. Then Friday you change it round because the planning was some problems on the Friday to do with that and somehow they just could not do it at all. You think they understood it but what they're actually doing was just doing the algorithm … without the understanding behind that and trying to get their head round problem solving is a real problem.

Sandy: Can you give me an example of what you mean by problem solving?

Geoff: Perhaps it's like when I set some homework in Y5 that was about division and rather than getting them to 'how many' or '100 divided by 6 equals what' with having a remainder, …. is to say right if we're going on a bus, and also putting in spurious information which they don't need to answer it as well. So they've got to try and work out what if you go on a bus and they all bring two oranges and there were 300 children, how many buses do you

> need to get there and try to, then write down the sum and then work it out. With the problem solving you have to have an understanding of what you are doing so it all goes hand in hand rather than just say 'follow that, the standard algorithm' with no understanding.

Finally, I observed a lesson on formal written algorithms for addition and subtraction in Geoff's first term as an NQT with a Y5 class. At the end of the lesson Geoff asked the children to make a question into a 'sum' e.g. 2006 – 1666 and then he set it out vertically for them to work out how long ago the Great Fire of London was. When the class could not decompose 2006 to carry out the algorithm Geoff wanted he told the children he was "disappointed' with them as they had "been doing these all along". In discussion after the session, however, he reflected that they had not been working on this kind of example before (with zero placeholders).

## ANALYSIS

The discontinuity between what is presented as problem solving on the PGCE course and Geoff's accounts of it in his teaching could possibly be explained by Ensor's (2001) use of 'recontextualisation' which "points to the transformation of discourses as they are disembedded from one social context and inserted into others" (p. 297). One manifestation of this is the use of 'professional argot' (ways of talking about practices from professional training) The contribution of ITE to his thinking is possibly here represented by 'problem solving' and its opposite - for him - 'algorithm'. New teachers use the *language* of the practices privileged in ITE but do not reproduce the concomitant practice promoted and meaning is reshaped to fit what they actually do in school, because the two sites for the production of mathematics pedagogic practices are distinct social contexts and experiencing a practice in ITE is no guarantee of its realisation in classrooms, according to Ensor. While this provides one reading of this move from course into school, acknowledging the contextualisation of practice, a more explicit focus on the political dimension and the role of agency in looking at possibilities for developing teaching practices opens up the possibility for examining the tensions between constraints acting upon and choices available to these new teachers. I have selected Walshaw (2004) to consider in this respect.

Walshaw looked at student teachers' accounts of school practice using a Foucauldian perspective to see teaching practices as regulated in various explicit and implicit ways. This, she argues, shifts the focus to the conditions in which beginning teachers operate rather than on autonomous individuals. As with Ensor, Walshaw suggests schools and universities (and curricula) may present common or conflicting assumptions about mathematics teaching which bound professional choices. Learning to teach involves a '(micro)political engagement' with accepted practices. Individuals must negotiate their position in developing their teaching. Walshaw uses the term 'normalisation' to refer to the ways in which various constituencies legitimate "what can pass as teaching mathematics" (p. 76). Like Ensor, Walshaw describes how student teachers move between social contexts but her view emphasises the political

dimension of moving between sometimes competing versions of what it is to teach mathematics. Her observation that "Developing a sense of the pedagogical grows out of a history of response to local discursive classroom codes and wider educational discourses and practices, all of which interrupt, derail and elide the best intentions of the pre-service teacher." (2004, p. 80) seems to provide another way of explaining Geoff's account of his teaching. The National Numeracy Strategy's (NNS) Unit Plans guide and structure Geoff's planning and his problem solving tasks are closer to those presented as worded problems in the NNS than to ideas from the PGCE. While he clearly finds the Units of work for his year group helpful in planning, his stated intention for children to understand rather than simply reproduce algorithms has been compromised ('derailed?') by the need to press on through the Y5 learning objectives in the NNS. This appears to have resulted in a possible tension for him between promoting understanding and mastery of the algorithms and this appears to be reflected in apparently contradictory comments he has made over time about his own mathematics learning in school. In the first interview Geoff talked about having had difficulty as a pupil in primary school in understanding place value, when calculating, and expressed a desire for this not to be the case for children he taught. However, reflecting on the difficulties some of the children encountered in his own class, he again referred back to his own learning, perhaps as a justification, to say that lack of understanding had not always come to him as a child in the first instance.

Both Ensor and Walshaw thus offer ways to theorise the transition from mathematics course to school contexts and offer possible readings of new teachers accounts which may be helpful in the analysis of data from my research. However, although there is a recognition of individuals having agency, in Walshaw's work in particular, there is more of an emphasis on constraint, regulation and 'fitting in', not surprising perhaps given her focus on ITE school placements. The idea of teacher agency is one I am interested in developing through analyzing what happens as the new teachers in the study develop their mathematics teaching. As they move into teaching their own classes is there more opportunity to make independent choices, what opens up or constrains aims and choices and the possibility to enact mathematics teaching in particular ways? What factors affect choices teachers make about how they teach mathematics? What is the kind of control or support in the school context which limits or encourages agency? Returning to my starting point on the debates about appropriate mathematical subject knowledge and concerns about the weaknesses in the knowledge of primary teachers, a focus on individual agency and its interplay with context offers the possibility of moving away from seeing discontinuity between ITE and teaching as individual weakness or willful rejection of 'theory' in favour of practice.

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