

“I WOULDN’T DO IT THAT WAY”: TRAINEE TEACHERS’ REACTION TO OBSERVATIONS OF THEIR OWN TEACHING

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This paper describes some initial findings of a study focusing on the way in which teachers draw on their knowledge of mathematics and mathematics pedagogy in their planning and teaching. The first year, of this four year study, entailed the observation and discussion of mathematics lessons taught by trainees during their final placement. Lessons were analysed in terms of the ‘Knowledge Quartet’. One theme that arose from these discussions was, that when questioned about why they taught in certain ways, trainees responded that if they had no restrictions they would have done things differently. Teachers observed in this study seemed to hold firm to their beliefs about good practice but felt they had to conform to the curriculum and teaching methods they thought to be the policy of the mentor, school or government.

This paper reports one finding from the first year of a longitudinal study into the ways in which teachers knowledge of mathematics and mathematics pedagogy, as revealed in their planning and teaching, may be developed through reflection and the use of a particular framework for observation and analysis.

THE KNOWLEDGE QUARTET

The ‘Knowledge Quartet’ offers a framework for the observation of mathematics teaching with a focus on identification of ways in which mathematics content knowledge impacts on teaching. Mathematics content knowledge is taken here to include both Subject Matter Knowledge (SMK) and Pedagogical Content Knowledge (PCK) (Shulman, 1986). This framework was developed by colleagues at the Faculty of Education in Cambridge (Rowland, Huckstep and Thwaites, 2003) using a grounded approach which identified four superordinate categories of issues to look out for. The first of these categories is termed *Foundation*: it includes the ‘theoretical’ knowledge of both SMK and PCK as well as beliefs about mathematics and mathematics teaching. *Transformation* is the second category, and this encompasses the ways in which the teacher’s own knowledge is transformed to make it accessible to the learner. The third category includes issues of sequencing and connectivity as well as complexity and conceptual appropriateness, this is termed *Connection*. The final category is termed *Contingency* and could be described as ‘thinking on your feet’. Further detail of the process by which the four dimensions were identified can be found in Rowland *et al* (2003).

This longitudinal study developed out of my role as a PGCE mathematics tutor and my earlier involvement as a researcher in the development of the Knowledge Quartet. The research questions for the study relate to investigating whether the framework is a useful tool in helping beginning teachers reflect on and develop their mathematics teaching; discovering what areas of mathematics teaching it identifies

as in need of consideration; what support would be needed to address these areas; and how the framework might be modified to make it a more useful tool.

THE FIRST YEAR OF THE STUDY

Participants

A session outlining the research that has led to the development of the Knowledge Quartet was given to all Early years and Primary PGCE trainees in the 2004-5 cohort. An outline of this proposed study was given and trainees were invited to take part. Around thirty six people volunteered, from whom twelve participants were selected. Selection involved securing a balance of people expecting to teach across the primary school age range and included only those who intended to teach within a distance from Cambridge, such that they could be visited in school within a day.

Methodology

Participants' familiarity with the Knowledge Quartet framework was enhanced by giving them copies of the 'Guidelines for Mentoring Mathematics Teaching'. These were developed to be used by Mentors and Partnership Tutors, and give an outline of each of the four dimensions with a number of questions to ask about planning and teaching related to each dimension. One mathematics lesson of each participant was observed and video-taped during their final school-based placement. This was subsequently analysed in terms of the four dimensions of the Knowledge Quartet (see e.g. Rowland, Huckstep and Thwaites 2004) and relevant issues were identified for discussion with the trainee. Within the same day, the trainee viewed the video-tape with myself, either in school or at the Faculty of Education, and was invited to comment on the lesson, with a focus on the mathematical content. Issues identified in the analysis of the lesson were also raised by myself, and the participant was encouraged to discuss these issues. These discussions were audio-taped for later transcription and scrutiny. At the end of the placement the participants came together at a meeting with myself to discuss their feelings about the study so far and the way in which they would like it to continue. The suggestions discussed in this paper come from comments made during the video-stimulated discussions and the whole group meeting.

AN EMERGING THEME: "I WOULDN'T DO IT THAT WAY"

When reflecting on their video-taped lessons, several of the trainees recognised that some of their teaching strategies were inappropriate, and suggested that they had adopted these strategies because of various perceptions of constraint. There were three types of constraint identified by trainees: published schemes, the National Numeracy Strategy (NNS) teaching programmes or unit plans, and the teaching style of their mentors.

Trainee perceptions

Laura was teaching a Year 2/3 class: in the video-taped lesson she was addressing the topic of position, movement and direction using a controllable toy. Laura recognised

that she had not clearly demonstrated the need for giving instructions for movement in terms of both turn and distance. She seemed to attribute her lack of clarity to a dissonance between what the published scheme she was using suggested, and the way in which she was thinking about the lesson herself.

I mean its with the scheme I find it hard because its not, its not my way of teaching. Sometimes I do find it hard to make it fit completely with my mind and I think that's sometimes why I get confused because its not what I completely, it doesn't follow my train of thought and I do find that quite hard.

The ideas of position, movement and direction were all included in the lesson suggested by the scheme. Laura commented that she found it difficult to include all the elements coherently in her planning.

Another trainee, John, seemed to attribute the difficulties he recognised in his teaching to following the NNS teaching programme. The task he had set for the year six pupils was to construct bar charts showing how many children have different numbers of letters in their names. During the lesson John realised that having numbers on both axes made the task more complex than he had originally thought, and when watching the video he commented on its inappropriateness. I suggested that it might have been helpful to give children a purpose for the task, perhaps trying to work out how much 'ticker-tape' would be needed to make names for all the children's drawers. His response suggests that he now recognised that he had made decisions about what to teach based on the programmes of study of the NNS rather than on what he believed the children needed to be learning.

That would have been much better because these lessons I felt were maths for the sake of maths. I did look at the plans for bar charts, and I did go 'What am I doing three days on bar charts for?' I don't understand why, they obviously can do bar charts you can see them on the board there, I don't really know why I am doing this or where I am going to go with it ... taken from what's there in the National Numeracy Strategy ... Yes I think I agree ... I think the problem is what came from me and I passed on to them. We're doing this - I don't really understand why, but we need to do it. I don't know if it came across in my teaching, but "I am showing you how to do it and we are going to learn how to do it because we need to know how to do this".

In reviewing her lesson, Jenny also attributes her teaching strategy to recommendations from the NNS unit plans. Her oral and mental starter with this Year 4 class involved finding the complements of two-digit numbers in one hundred. She modelled this on the whiteboard in two neat columns, in a way that reflected the column method of addition. On reflection she recognises that the use of an empty number line might have been more appropriate, especially since the children were used to working with these.

It [the NNS] tells you specifically in steps, so it says 'remind the class that when numbers total a hundred the units total ten' ... I think if it had just said the first bit so 'ask the child to show the number which makes a total of a hundred' I would probably have thought,

‘Well what way would they do that?’ and then, you know, possibly have introduced a number line, so its good learning for me to just think things through, how would they best be able to do that?

Jenny’s own experience of ‘school mathematics’ would seem to have influenced the way in which she interpreted the recommendations of the NNS unit plan. However when reflecting on the mathematical content of her lesson, using the Knowledge Quartet framework, she was able to integrate an aspect of the pedagogy that she had come across in the university – her as-yet inert ‘Foundation’ knowledge - to her understanding of mathematics teaching.

Another trainee, Liz, suggested that the difficulties she recognised in her lesson arose from picking up the previous teaching of her mentor. She explained that she was doing some work on place value because she had found that some of her children were having difficulty with column addition of two-digit numbers that they had been doing earlier in the week.

I know yer, I just found it all quite hard 'cus I wouldn't necessarily set this addition at the start of the week to be honest.

Liz decided that a lack of understanding about place value was underlying the problems children were having with two-digit addition. The teaching strategy and learning activities which she chose to address this focused on column recording. This focus was a development of the previous work the mentor had been doing with the children. In reflecting on the lesson Liz decided this was not appropriate.

Amy was another trainee who, when reflecting on her lesson in a reception class, suggested that she had felt constrained by the NNS. She also became quite passionate about the disparity between the way she was teaching in the video-taped lesson and her own beliefs about the teaching of mathematics.

I don't know, this is what I was thinking about when I was planning it and today as well 'cus I felt really frustrated that I had taken this objective from the Strategy but I was thinking it's not really what I agree with, in a way ... it's not how I normally teach either, I normally teach in a much more playful way with real context and a shop out and everything”

Amy held a strong belief in the importance of the affective dimension in the teaching of mathematics and saw a disparity between this belief and the transmission model she had adopted. She reflected further on the disparity between her beliefs and her practice during the whole group discussion at the end of the year.

It [reflecting on her lesson using the KQ framework] made me think more conceptually about what I was teaching, I suppose, yes like not focusing on resources but it made me think about, I’ve got certain priorities about early education, children’s mathematical development maybe conceptually, but that wasn’t coming through in the actual, lots of the lesson I was teaching, it was a kind of disparity between what I actually believe and what I was teaching in a way.

During the whole group meeting, Liz also suggested that focused reflections on her teaching, as part of this study, had encouraged her to consider the match between beliefs and practice.

It's useful to just come away from the placement as well and come away from your mentor, not that I, I love my mentor, she's lovely but, you can get so influenced by your mentor's ideas and their approach, it was just good to watch the video and talk about it in depth and think 'right what are my feelings about how children are taught?' she's much more formal than I am and I could really see I was being influenced quite a lot by that.

For Liz the constraints came from the teaching style of her mentor whereas Amy saw them as originating in the NNS, however both of them recognised these constraints had led them to teach in a way that was at odds with their beliefs.

DISCUSSION

Brown, McNamara, Jones and Hanley (1999) wrote about this phenomenon of trainees not teaching in a way they would wish, due to constraints of their placements:

In later stages of training however, their conceptions of mathematics and its teaching are subsumed within the organisational concerns of placement schools and school experience tutors, and shaped by commercial schemes. (p. 299)

Though this seemed true of my participants, it also seemed to be the case that when given the chance to reflect on their teaching, the trainees themselves recognised the disparity between practice on placement and the beliefs about teaching mathematics that they held. Their conceptions of mathematics and its teaching have not been subsumed by the concerns of their placements. Rather the trainees saw themselves as being at odds with recommendations from published schemes, NNS programmes of study or the previous teaching of their mentors.

McNamara, Roberts, Basit and Brown (2002) suggested that trainees do not move from being students to being teachers through a 'rite of passage' that is smooth and uni-directional. Rather, they found that the different agendas of the university, the placement school and the trainees' own experience of mathematics teaching are predominant in their thinking at various times as they move back and forth from one environment to another. By encouraging trainees to reflect on the mathematical content of their lessons, it seems that they were able to see beyond the agenda of the schools or the government, termed 'official accounts of mathematics' by Brown et al (1999). Thus they were facilitated in continuing to move forward in their mathematics teaching in a way more consistent with their own beliefs and their university experiences.

SUMMARY AND QUESTIONS FOR FURTHER INVESTIGATION

Focusing on mathematical content, while reflecting on their teaching, would seem to have encouraged these trainee teachers to recognise disparities between their beliefs

about mathematics and its teaching, and their own practice. They were able to recognise inappropriate teaching strategies and identify constraints that had led them to use these strategies. They had also begun to think about ways in which they might make their teaching more consistent with their beliefs.

Burton and Povey (1996) investigated factors that lead to increasing competency in the teaching of mathematics. They identified three key factors of which “the recognition of the interdependence of epistemology and pedagogy” was the first. The reflections of these trainees seem to suggest that they do indeed recognise this interdependence, and wish to reach an authentic position with regard to their beliefs and practice. As the study continues it will be interesting to observe whether using the Knowledge Quartet framework to focus on content knowledge continue to facilitate such reflections and aid the development of competency in these beginning teachers.

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