RESEARCH AGENDA ON MATHEMATICAL KNOWLEDGE IN TEACHING

Teachers' Stories of Mathematical Knowledge: Accounting for the Unexpected

Julie Ryan and Julian Williams

Manchester Metropolitan University and University of Manchester

The paper we presented at the *Nuffield Seminar Series* in September 2007 (Ryan & Williams, 2007) detailed an innovative assessment feedback tool – we called it a mathsmap – which provided a profile for pre-service primary teachers of their attainment and errors across the mathematics curriculum used for teacher training. The use of the mathsmap to reflect learning on a personal level was seen to also provoke 'accounts' or 'stories' that might inform pedagogical content knowledge.

We offered one method for encouraging teacher reflection by having pre-service teachers personally confront their responses, errors and misconceptions as indicated on the mathsmap. We reported our one-to-one interviews with two pre-service teachers. This tool is different from other feedback devices in drawing attention to non-normative responses of two kinds: unexpected correct and unexpected incorrect responses. Being told that responses are not 'expected' causes dissonance, or 'trouble' *to be explained*; such troubles generate 'accounts' or stories to be narrated to account for them (Bruner, 1996). These accounts – it seems to us – also provide the researcher or teacher educator with some insight into the students' self-knowledge, indeed their metacognitive knowledge, and even the students' sense of self-efficacy or agency in their own learning.

Thus, one of our pre-service teachers Lorna narrated her unexpectedly correct responses with a story of her growth in competence and confidence in her capacity to learn. It is difficult not to interpret this as a very positive indicator. On the other hand, although (or just possibly because) Charlene was a higher scorer, her accounts for her unexpected errors told a story of 'slips', and tended to marginalise explanations that might invoke her need to learn or fill knowledge gaps.

We indicated that we only had these two limited cases at the time, but pointed to the way 'accounting for the unexpected' in both cases impelled a story of themselves as learners or mathematicians. The resources the pre-service teachers used – for example, whether they invoked 'misconceptions' or not – reflected their metacognitive knowledge of learning and hence tapped their pedagogical content knowledge. Interestingly, recent work asking Primary teachers to account for the unexpected errors of their children (as produced on the children's mathsmaps) have similarly provoked accounts from their teachers, which draw on explanations such as 'slips' or 'we've done a lot of that recently' (Petridou & Williams, 2007). This leads us to propose that the mathsmap is a tool for provoking students to 'story' their own learning and knowledge, and hence becomes a diagnostic of their cultural models for narrating stories of 'learning' in general.

We suggest there is further work to do here. We intend to collect further stories from pre-service teachers. We will also extend the research base to teachers and analyse how any cultural models are reflected in their professional practice.

The research question/hypothesis is that teachers' dispositions towards learning and teaching may develop from reflections on their own experiences of learning and their own learning approach: 'surface' learners may tend to become transmissionist teachers, but 'deep' learners might tend to, under certain circumstances, become connectionist teachers. The task is to study such constructions of professional identities though narratives of learners-becoming-teachers longitudinally, and to understand the critical events that mediate this long term professional work.

References

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