

Growth in teacher knowledge: individual reflection and community participation

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Barbara Jaworski (2001) posed the question “In terms of teacher education, do we see a teacher’s growth of knowledge as a personal synthesis from experience or as deriving from interactions within social settings in which teachers work?” (p. 298) Evidence from my four year study suggests that participants’ growth of knowledge for mathematics teaching has been influenced by individual reflection as well as by participation in communities of practice, with the interaction between the two being dependent on individual contexts. In this paper I present some findings from the case studies of Amy and Kate.

Key words: knowledge, growth, elementary, reflection, communities of practice

Introduction

My study is predicated on the view that well developed content knowledge, both subject matter knowledge and pedagogical content knowledge (Shulman 1986), are necessary for mathematics teaching (Ball 1998). The view was also taken that such knowledge might be developed through reflection *in* and *on* practice (Schön 1983). A framework for lesson analysis - the ‘*knowledge quartet*’ - has been used to support the participating teachers in reflecting on their mathematics teaching with a focus on mathematical content knowledge. The framework offers four dimensions as lenses through which to view teaching; *foundation, transformation, connection* and *contingency*. For details of these dimensions and the development of the framework see Rowland, Huckstep and Thwaites (2004).

Reflection may be seen as an individual activity, however this is not necessarily the case and it can be argued that reflection is more effective in developing practice when carried out within a ‘community of practice’. Lave and Wenger (1991) described the learning of professionals as ‘enculturation’. Those new to the profession begin as ‘peripheral participants’ and grow into ‘old stagers’ as they absorb and are absorbed in the ‘culture of practice’. Knowledge to be gained is situated in the practice of the community and can only be gained through participation.

Cobb and McClain (2001) see learning as happening not in isolated classrooms but within a professional teaching community. Jaworski (2001) emphasised the importance of communities of practice in development as they “provide opportunities for sharing experiences, synthesising from and explaining outcomes of research and developing critical frameworks related to practice.” (p. 298). Lerman (2001) contended that reflection alone does not lead to learning but must involve others.

“Reflection” per se, does not give us enough to serve as a process of learning. This is not to say that we don’t reflect, only that for reflection to say something about how people learn involves others in one way or another. Reflective practice

takes place in communities of practice, as groups of teachers in a school, teachers attending in-service courses, or other situations, and learning can be seen as increasing participation in that practice. (p. 41)

It is the interrelationship between individual reflection and participation in communities of practice that I examine here in relation to the development of two of the beginning teachers in my study.

The study

In this study I have been working with a group of beginning elementary teachers over four years, using the Knowledge Quartet framework to focus their reflections on the content knowledge underpinning their mathematics teaching. My research aims were concerned with assessing the effectiveness of the Knowledge Quartet framework in developing mathematics content knowledge, and with identifying other factors that might affect such development. The two teachers, from whose case studies I draw here, began the study as student teachers in the 2004-5 cohort of the early years (3-7 years) and primary (5-11 years) postgraduate pre-service teacher education course at the University of Cambridge.

Participants were observed teaching during the final placement of their training year, twice during their first year of teaching, three times during their second year of teaching and a final time in their third year of teaching. These lessons were all videotaped. The Knowledge Quartet provided a framework for discussion in the reflective interviews following the lessons. These were audiotaped and transcribed. In years two and three of the study the participants were sent DVDs of their lessons and wrote reflections on these under the four dimensions of the Knowledge Quartet. Additional data relating to developing mathematical content knowledge and mathematics teaching came from participants' written reflective accounts. Group interviews were held seven times over the four years of the study and provided rich data in relation to the participants' perceptions of their own development.

Case studies were built from all of these sources of data. This paper draws chiefly on transcripts of reflective interviews following observed lessons and group interviews as well as on written reflections. This data has all been coded using the qualitative data analysis software NVivo. I examined the data through a pre-determined 'theoretical lens', though I was also open to emergent themes (Glaser and Strauss 1967) in order to take account of factors I had not foreseen. This led to a hierarchical organisation of codes under a number of themes. The themes on which I draw here include '*working with others*', '*reflection*' and '*experience*'.

Findings

All of the teachers in the project have claimed to find using the *knowledge quartet* useful in focusing their reflections. Their comments over the three years of the project suggest that they have learned through individual reflections '*on practice*' (Schön 1983). Amy has shown herself to be a particularly reflective teacher. She teaches a reception class (4-5 years) and though she lacks confidence in her own mathematical subject knowledge, she is confident in her pedagogical knowledge and attributes this to some degree to using the *knowledge quartet* framework.

You don't take your teaching for granted. You think about all the images, prompts or examples you'll need. You think as you are teaching of extra aids, how you are phrasing explanations. I think the Knowledge Quartet has pushed

me to think from the other side and see more clearly how the children see and what they need. *(From written reflection at the end of Amy's second year in post)*

Kate teaches a Year 1/2 class (5-7 years) and is also a very reflective teacher. Though less confident in her pedagogical content knowledge than Amy, Kate is confident in her own mathematics subject knowledge having gained an advanced qualification in school mathematics.

I think the categories are very useful ... they kind of give you a way of thinking about what would be a kind of sensible remark to make about your maths lesson, and they evaluate it against certain things. *(From group meeting at the end of the first term of Kate's second year of teaching)*

There is much further evidence from the study that Amy and Kate have both made use of the *knowledge quartet* to reflect on the content of their mathematics teaching. However, these reflections were not made in a vacuum and should therefore be considered in relation to the communities of practice in which these teachers worked. Amy had a close professional relationship with the other reception class teacher, who was also her mentor during her first year of teaching. They plan together, share ideas and discuss the effectiveness of their teaching.

The other teacher in reception is totally like-minded with me, we use lots of practical objects and it is more like how I want to teach [than her mentor in her final teaching placement]... We have a good dialogue about how we want to teach and how we want to change things. *(From group meeting at the end of Amy's first year in post)*

I have developed, especially through working with an excellent early years teacher, a good feel for the ways young children learn effectively. *(From Amy's written reflection half way through her second year in post)*

Interactions with other professionals seem to have contributed to Amy's learning, as predicted by Cobb and McClain (2001). Amy has a great deal of respect for her colleague, though her strong views on effective pedagogy in the early years means she can be critical of other teachers whose approach does not align with her own.

I teach the same as Daphne but I am in agreement with her and I share the planning and contribute my own ideas... I am critical when I hear of teachers using worksheets with young children. I am critical of maths teaching which is too much about abstract procedures and doesn't address what children can already do mathematically *(From written reflections at the end of Amy's second year in post)*

By her third year of teaching Amy appeared convinced of the importance of discussion with colleagues for her professional development. She is equally certain that reading books and going on courses has had little impact.

And a lot of it is from talking to colleagues as well. You do learn from discussions, you're having constant discussions and you learn that way as well but I can't say I've read a lot of Maths books... I can't say I've learnt more from that and you never get time out to go on courses so it is all from in the classroom. *(From the interview with Amy at the beginning of her third year of teaching)*

Amy's development seems to be influenced by both individual reflections on her own practice and her participation within communities of practice, particularly her relationship with the other reception teacher. However these two influences are not separate, Amy's confidence in her own pedagogical knowledge and her positive relationships with colleagues have enabled her to share her reflections and her participation in the project with her colleagues.

I have found talking the feedback (from me) over with my colleagues, means we have had more of a dialogue about maths and our teaching of maths in school, well in the lower school, with my colleagues and that seems really interesting and useful and it is always good to talk about other people's ... about how you are teaching or about how you can move forwards. *(From group meeting at the end of Amy's first year in post)*

Kate has had a less constructive relationship with colleagues. In her school, planning for the three year 1/2 classes was done by three teachers in rotation. This means that sometimes Kate teaches from the mathematics planning of another teacher and at other times she will plan for the team. Such planning presents little opportunity for the type of professional interaction seen as leading to teacher learning by Cobb and McClain (2001). In her first year of teaching Kate tried amending the planning in order to focus on what she considered to be the needs of her class. She was told that this was not acceptable because it meant she became 'out of step' with the other classes.

I kept finding that I had taught things differently to my colleagues who were supposed to be teaching the same lessons as me. And I was thinking "Oh no I am getting left behind, I always do it wrong". *(From group meeting in the middle of Kate's second year of teaching)*

Kate tended to accept the advice of her more experienced colleagues in a way that might be expected of a *peripheral participant* in the *community of practice* as they become 'enculturated' (Lave and Wenger, 1991).

My colleague who previously taught year 3/4 at our school believes that we should only be teaching 'counting on' along the empty number line for subtraction because that is what the children will be taught in year three. *(From Kate's written reflections in the middle of her second year in post)*

One of the teachers I am working with this year particularly hates it when there are lots of things going on at the same time and she has had a lot of input and sort of synthesised the plans. I think in some ways it is possibly a good thing ... it has been a lot more easy to manage. I don't know whether it is good for the children. *(From group meeting at the end of Kate's second year in post)*

Kate's final sentence here suggests she does not simply take on knowledge situated in this community of practice, without critical reflection and adaptation. This is a recurring theme in Kate's reflections.

As mentioned under *foundation*, I changed the plans for one day as I didn't agree with the idea behind our investigation. I haven't discussed this with my colleagues as I didn't want to be awkward. *(From written reflections at the beginning of Kate's second year of teaching)*

Not very often (have deep conversations about the use of representations), no, not as often as we should because nobody wants to do the planning again. Um, I guess I would just use the other representation rather than discussing it with anybody. *(From interview with Kate at the beginning of her third year of teaching)*

At the beginning of her third year of teaching Kate appeared to lack the confidence to have discussions that might take her learning forward through the kind of critical dialogue described by Jaworski (2001). This may develop as she becomes an 'old timer'. When asked directly if she felt she had learned from other colleagues in school, Kate's response suggested that although she recognised the situated nature of her learning she felt any learning from colleagues has been incidental or even subversive.

I am sure that I have learned from other people's ideas and things other people have planned and also things I have seen the reception teachers do as well ... Not really (get a chance to observe other teachers) I did a few times in my first year, I walked through their classrooms and see what they have put out ... I don't know a lot about what they have done, I look through their books to see what they have done and go and look at the things they have got out on their tables. (*From interview with Kate at the beginning of her third year of teaching*)

Kate's experience of learning within a community of practice appears very different to that of Amy. Both teachers have demonstrated a propensity to reflect critically on their practice and the practice of others. Amy's individual reflections have confirmed and progressed her thinking about effective mathematical pedagogy for young children and she feels able to share her reflections with colleagues. Amy is able to organise the teaching and learning in her classroom in a way that is consistent with her thinking and to share this thinking with her colleagues whom she respects. Planning for Amy is a collaborative process in which she feels her ideas are as valid as those of her colleagues. Her 'enculturation' is facilitated by the compatibility of her beliefs about teaching with those of her colleagues.

Kate however seems to feel insecure in relation to her colleagues. In the face of disparity of ideas, she tends to give way to what she sees as the greater expertise and experience of her colleagues. Planning for Kate is shared but not collaborative. She feels constrained to work from the plans and resources produced by other teachers even when not entirely comfortable with them. Kate has few opportunities in the school community to rehearse her reflections with others and to try out ideas resulting from them. Her 'enculturation' is hindered by unresolved disparity between her thinking and that of her colleagues. However, Kate does reflect critically on the planning and on her own teaching and within the confines of her own classroom acts on these reflections.

Summary

Jaworski (2001) and Lerman (2001) suggested that reflection is most effective when shared with others. Amy has more opportunity than Kate for such sharing in her school community of practice. However, I would contend that reflective individuals, such as Amy and Kate, will learn and develop whatever the nature of the communities of practice they find themselves in. The ability to be critically reflective may be especially beneficial where communities of practice do not support learning in what might be considered a positive direction.

Giving the teachers in my study a framework to focus and deepen their reflections has positively affected the way in which they have engaged with learning situations in their own contexts. In Barbara Jaworski's (2006) terms, it has facilitated *critical alignment* with their communities of practice. Teacher educators have limited opportunities to influence the learning situations of beginning teachers in their schools. It is however possible to help teachers become reflective practitioners who are able to engage more effectively in critical discussion within communities of practice in their schools and within the wider profession.

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