Beginning Mathematics Teachers' Professional Learning

Glenda Anthony
Massey University g.j.anthony@massey.ac.nz

Introduction

The professional formation of mathematics teachers evolves over a continuum involving initial teacher education (ITE) and the induction period (Feiman-Nemser, 2001; Peressini, Borko, Romognano, Knuth, & Willis, 2004). For beginning teachers the quality of their professional learning experiences is a crucial influence on the sort of teacher they become (Ingersoll & Kralik, 2004). In addition to providing the beginning teacher with the benefit of expertise associated with experience, the professional community is charged with providing learning spaces and opportunities for the newly qualified teacher to engage in "serious and sustained professional learning" (Feiman-Nemser, 2001). These opportunities can occur both within a formal induction programme, and within informal arrangements in schools (Little, 2003) or external to a teacher's immediate workplace (Hansen, Haigh, & Ashman, 2003).

Currently, there is considerable variation—both within and between countries—in the professional learning induction programmes and opportunities for beginning teachers. Kardos and Johnson's (2007) recent study of 486 beginning teachers in the U.S. reported that large numbers of teachers work as solo practitioners, and are expected to be prematurely expert and able to work without the support of school-based professional networks. In contrast, beginning secondary teachers in New Zealand move into a mandated induction programme. A funded 0.2 time allowance in the first year, and 0.1 for the second year, is used to facilitate beginning teachers' professional learning, provide mentorship, and support their planning and preparation. Suggested elements of the programme (Ministry of Education & New Zealand Council of Teachers, 2006) include: professional discussions, systematic goal setting for teaching and student learning, professional reading time, planning and resource appraisal and development, evaluating student work, professional learning and development activities (e.g., classroom observations of colleagues), and self reflection.

Based on a subset of interviews from a longitudinal national project *Making a Difference* that explores graduating secondary teachers' experiences of their ITE and their induction, this paper examines the learning experiences and opportunities afforded 15 mathematics teachers[1] within their first year of teaching. The first interview, conducted 6 months into their first year, focused on teachers' views of ITE preparation, their experiences as a beginning teacher, and their induction experiences. At the end of their first year of teaching, the second interview focused on their continuing experiences as a teacher, their induction and professional learning experiences, and their career plans.

The Theoretical Framework

Findings are framed in relation to the sociocultural literature, with its orientation toward joint enterprise, the centrality of participation and resources, and the notion of trajectories of learning (Wenger, 1998). From a sociocultural perspective, the specific interactions and dynamics of the professional community of the school constitutes an important contributor to a beginning teacher's development (Wilson & Berne, 1999). Kardos and Johnson (2007) note the importance of the professional culture—"the established modes of professional practice among teachers; their norms of behavior and interactions; and the prevailing

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[1] Eleven teachers teach only mathematics, and four teach mathematics at the junior level only with responsibility for another subject area.

institutional and individual values that determine what teachers do and how they do it." From their research studies they found that beginning teachers are more likely to stay in teaching when they perceive their schools to be places that promote frequent and reciprocal interactions among staff across experience levels, recognise new teachers' needs as beginners, and develop shared responsibility among teachers for the school and its students.

The initial year of teaching is an important phase in any teacher's professional growth. When a beginning teacher enters their own classroom they experience and learn about the complexity of being a teacher—and they find a professional place within the school culture (McCormack, Gore, & Thomas, 2006). In addition to developing a professional identity, Feiman-Nemser's (2001) Central Tasks in Learning to Teach (CTLT) for the induction period include: learning the context, designing responsive instructional programmes, creating a classroom learning community, and enacting a beginning repertoire. These CTLT tasks frame the specific interactions and dynamics that provided a resource for learning for the beginning mathematics teachers in this study.

Teacher Learning

Despite national implementation guidelines (see MoE & NZTC, 2006) and the provision of a beginning teacher time allowance, the teachers in this study experienced variable induction experiences and support for their professional learning (Anthony et al., 2007).

In the first 6 months beginning teachers' time allowance was largely used for **learning about the context**—students, curriculum, and school community. Initially, the extent of this new knowledge seemed, for some, quite overwhelming:

> You don't know the names of any staff, you don't know any of students, you don't the background of any of your students, you don't know what sort of behaviour to expect from them, you don't anything about their ability, you don't know anything about their disabilities, that's the big one. (T204#1)

Information about school policies and procedures, reporting to parents, and information related to students was frequently shared in scheduled meetings with other beginning teachers led by a senior teacher. By the end of the year, the teachers reported a certain familiarity with procedures, and many noted that they had learned to be more patient and tolerant, and sort the 'big stuff' from the 'little stuff':

> I have had to learn about a boundary of reasonableness like I'm a structured person and I like the rules to be consistent and if you are late you are late…I like things to be quite black and white and it have had to learn that I cant be so I have to work out is late enough to give the home detention and how late is late enough to say you are late. So that is something that I have had to learn throughout the year. (T790#2)

Designing responsive instructional programmes Feiman-Nemser (2001) explains as "the ability to bring together knowledge of content and knowledge of students in making decision about what to teach and how to teach over time and make adjustments in response to what happens" (p. 1028). Addressing diversity and setting realistic expectations based on their developing knowledge of students proved an ongoing challenge for many teachers, with several referring to the need to provided a more structured experience for students.

> …making the work accessible to them. I've had to re-think and probably go back to quite tradition ways of teaching because they find that more accessible, sort of quite processed-based learning. Almost like a formula you can follow to get success seems to be the way they absorb things easier. (T202#1)

However, by the end of their first year most teachers indicated an increased confidence in their ability to recognise and meet the diverse needs of their students in their programmes and through their teaching strategies.

> I feel that I am making a difference with my year 10s. They are a top band group and I really feel like I am extending them…I really like playing with them—'why does this work'—not just this is what we do, but the idea behind it, and their eyes light up and they think through it. (T790#2)

Comments indicated that as the teachers spent time with their students and watched and listened to their responses to their teaching, they continued to make adjustments to their programmes and tailor their teaching strategies to maximise learning.

> One of the biggest things I have had trouble with getting to grips with particularly is the way in which they learn mathematics and the level; what students are capable of at different levels. That's something to some extent textbooks and prepared material helps with because you can see the way other authors have organized the work. But until you start teaching the classes and seeing where comprehension is and what proportion of the class is comprehending and what's not, you don't really realize how much of a problem it is. I think that's going to be a big difference [next year] having that experience and knowing how to set work for different levels. (T69#2)

This teacher, with limited ITE mathematics education experiences to draw on, remarked that the classroom observations prompted her to "bring in those things I had applied to science, into the maths teaching".

Day-to-day planning was a challenge for some, especially if preparation also involved learning subject content knowledge; learning that many hoped would pay off in terms of preparation for future years. Several teachers commented that they needed to be realistic about how much time to spend planning:

> So there is a standard that you are expected to produce at Teachers College and then there is what is actually achievable in the real world…what we need more of is what you need to do to get through the week. (T204#2)

Information about resources and mathematics assessment requirements was shared within department meetings and one-on-one meetings with their assigned mathematics mentor. Whilst a few teachers reported that these meetings were based on planned agendas, most reported that mentor meetings were largely responsive to day-to-day needs, for example:

> They've [meetings] helped quite a lot really particularly meeting with my supervisor because that is not particularly structured. If there is nothing else going on we'll go through each of my classes and talk about how they are going. But that is an opportunity to bring up any issues that I have been having during the week or ask questions. Some of them are quite a practical nature, like do you have any good resources for this topic? (T191#1)

However, as the year progressed, several of the teachers expressed an awareness that access to colleagues' time was not to be taken for granted. Those who had regular, as opposed to 'needs-based' meetings, appeared more likely to continue productive mentoring arrangements despite the prevailing culture of 'busyness'

> Mostly the mentoring I have got from people has been really specific because I guess everybody is busy and you need to have an agenda on something specific that you are talking about and achieving through that time. I have really appreciated the fact that my supervisor has time-tabled a regular time to meet and that is our time. (T790#2)

Creating a classroom learning community involves teachers maintaining a classroom which is not only productive of students' learning but is also safe and respectful. In accord with the literature (e.g., Johnson, Berg, & Donaldson, 2005) the beginning teachers collectively reported struggles to motivate students to learn, to implement effective classroom management, and to work in partnership with parents.

> I can't motivate the children and I'm finding that very frustrating. I talk to the other teachers who have got more experience than me.…My HoD doesn't take it personally, he says they have to take responsibility but … I get upset really quickly about students who just don't want to do any work. I just have to accept the fact that kids who are there, 15 of them are not motivated towards maths at least, I just have to accept it. (T417#1)

At 6 months into their teaching, many of the teachers reported grappling with management issues, with the need to establish rules and routines, and manage disruption whilst attempting to undertake quality teaching and learning. The majority of the teachers sought and had been provided with assistance from their more experiences colleagues in tackling issues of classroom behaviour and student motivation.

There was a marked change in focus in the interviews at the end of year, with most teachers reporting that classroom management issues were largely resolved; they finished the year with a sense of order and confidence in the classroom community they had established. Recalling their most enjoyable experience often related to a 'breakthrough' with their 'nemesis' class:

> [At first] I was just really struggling with them and I would go home and I couldn't stop thinking about them and I would be worried about them and thinking how are we going to get through the year … I got through it and the support was really good then and that was a time when [beginning teacher meetings] were really valuable because several times as a group we would just talk about it and people would have different ideas. I had a kid with ADHD in my class and they suggested different strategies which has helped a lot. So I have learnt heaps through that, so although it was a horrible experience I am not sorry I had that class at all. (T790#2)

A few teachers, however, were still focused on creating the positive learning environment, suggesting that work on mathematics teaching per se was on the 'to do' agenda for next year.

> My angry voice I think, I have to get one I think. I find it easier to get to know my students but it's finding that line where I know them as students but they know still know me as 'teacher' and not just friend. So then when it comes to discipline issues and yeah that's sort of the main thing I want to pick up next year. (T6#2)

Enacting a beginning repertoire involves attending "to the purposes not just the management of learning activities and their meaning for students" (Feiman-Nemser, 2001, p. 1029). This requires pedagogical practices which encompass curriculum design, classroom instruction and assessment. A major role of any induction programme is to assist beginning teacher to enact and broaden their repertoire of teaching skills by developing and extending these skills with an understanding of their new environment and context. However, professional learning in this area appeared to be closely linked with both the beginning teacher's initial capability in terms of confidence and experience of pedagogical practices, and with the school culture.

Some teachers found themselves in schools with a strong 'craft knowledge' culture where more ambitious pedagogies were discouraged in favour of traditional safe approaches to teaching. Several teachers reported explicit awareness of the pull (and sometimes push) to abandon their initially desired practices for safer, less complex activities or actions:

> I find myself actually moving away from what I've been taught. I love the idea of student centred learning, I love the idea of group work. But what tends to be the most effective is actually having a very tight lesson with lots of where students are kept very busy doing work out of a textbook and textbook teaching if you like. So that's not something that I'm entirely comfortable with … (T204#1)

The teacher in this case experienced pressure from both more experienced colleagues and from the community: "That's the advice that I've been given—keep it simple and keep them moving through the work" and "Parents want to see a lot of homework….Parents will be more focused on the amount of homework than the learning that is taking place".

Consistently, those beginning teachers that had been encouraged and supported to observe experienced teachers reported this as a significant source of professional learning, especially when these experiences confirmed the "privileged teaching repertoire" (Ensor, 2001) promoted within their ITE experience:

> I said [to the mentor] I am having real trouble making this interesting. You know, getting outside the book. She suggested go and watch this other teacher. So I did, and I got some good ideas from it that relates right back to that ITE training, because I found that when I got into the classroom, she was

applying some of those outside the square ideas.…Whereas for me, I had reverted back to the way I was taught maths, which was from the book, pen and paper, in the exercise book and had no variety. (T343#1)

The opportunity to watch in other subject areas and interact with teachers outside of their department was also reported as a useful activity by a few teachers. Others reported the process of reflecting back or referring to ITE notes and resources during personal reflection time, to be a valuable source of learning:

> I guess there are big principles that I have really internalised from that [theory], it's not all of the details of who thought of this version of the theory versus this version.…Bigger issues around motivation and what makes them succeed and how they learn—it's definitely all going on in the back of my mind. Often having taught something I will sit back and I will think how I might do it better next year for one of those reasons. (T790#2)

Implications and Conclusions

The interviews affirmed Feiman-Nemser's (2003) conclusion that new teachers "long for opportunities to learn from their experienced colleagues and want more than social support and instructions for using the copying machine" (p. 28). Focusing closely on the induction programme embedded in particular school settings revealed complex learning systems that had to be negotiated by beginning teachers. All teachers sought advice on curriculum implementation, assessment, teaching strategies for specific students' needs, behaviour management and working effectively with parents. They expected and sought to gain insight from colleagues with experience in their subject areas, through regular meetings and classroom observations.

The findings also remind us that a beginning teacher's repertoire of practice is fragile; it needs to be trialled, reflected upon, strengthen and challenged, but challenged in a positive way with guidance within a supportive professional learning community. The push of some colleagues towards structured teacher directed lessons was frequently associated with classroom management issues and 'coping' with low-achieving students. Most of the beginning teachers discussed differential practices, expectations, and satisfaction with their teaching of senior students compared with junior students:

> I have some students particularly in Year 9 who their way of trying is just trying to keep their behaviour within acceptable bounds and that's sort of where their priority is rather than their academic work at the moment. (T69#1)

While beginning teachers reported varied experiences and satisfactions with the formal support programmes, the level of informal support was always highly valued and for the majority of teachers highly accessible. Informal support, in particular, reinforced the role of the 'ethic of care'. The following response indicates a teacher's delight with the school principal's informal observation of her teaching:

> So he comes in and the kids are used to it…He's a Maths person and last time I got him to do an example on the board and the kids just thought it was fantastic, so he has seen me teaching in an informal way which I really appreciate because it makes me feel that he cares about what kind of job I am doing and he doesn't just go on hearsay, he actually takes the time to get out of his office to come and see. (T790#1)

It was clear that despite clear national guidelines for induction not all teachers in this study were necessarily receiving *sufficient* or *appropriate* support and guidance that challenged and furthered their capacity to become more effective in their teaching. Issues of access, focus and quality, with regard to guidance and support, resulted in differential spaces and opportunities for teacher learning. Moreover, faced with multiple options for support and considerable freedom to plan their non-contact time, the beginning teachers exercised varied

expectations of continued learning, and exhibited varied levels of agency in their participation in the induction programme

Beginning teachers have legitimate learning needs that cannot be properly assessed in advance or outside the contexts of their teaching. Schools need to adapt their advice and guidance programme to suit their situationally relevant context, and to match an individual teacher's levels of experience and preparedness. Equally, beginning teachers need to be aware of both their non-formal and formal learning needs and be equipped and prepared to take more responsibility for their own professional growth.

For those who rated their induction experiences highly, there was clear evidence that they were involved in relationships with colleagues that both valued them and recognised their special needs as beginning teachers. There were frequent planned and informal interactions about teaching and learning with more experienced teachers. The school induction programme was organised and explicit about the available guidance, and beginning teachers were encouraged to seek help and expected to be learning and improving their teaching practice. The provision of time and sustained learning opportunities enabled them to build upon their initial teacher education experience, to teach in ways that met demanding new standards for student learning and to participate in the solution of educational problems. As their mentor teachers remarked, beginning teachers bring enthusiasm and renewal to our schools—to a point where they may begin to develop a new cultural dynamic.

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