I can be quite intuitive": Teaching Assistants on how they support primary mathematics

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This paper reports on initial work on Teaching Assistants' (TAs) perceived contribution to Mathematics teaching in primary schools. Extracts are presented from interviews with three TAs who provide support to individuals with particular needs. The focus is on what interviewees say about the knowledge and understanding they bring to their work. The paper also identifies how they feel they acquired this knowledge. I show that they draw on pedagogic content knowledge and subject specific knowledge of individuals. In discussing the source of this knowledge, interviewees value experience and use of initiative.

Keywords: primary mathematics, special needs, Teaching Assistants

Introduction

It is now common practice in many primary schools for TAs to be present in mathematics lessons and recent research suggests that in many cases they work directly with pupils considered to have greatest difficulty (Blatchford et al 2009a, 2009b). This research points to the many positive benefits of TA presence, but questions whether they have any positive effect on children's attainment in Mathematics and English, a finding which is not dissimilar to earlier research focussing on numeracy (Muijs and Reynolds 2003).

This paper draws from on-going research investigating TAs own views on how they impact on pupils' progress, focusing particularly on how they work with pupils in Mathematics and English. A key follow up question is about the type of knowledge and understanding they feel they bring to their work and how they acquired this. TAs work with pupils in a range of different ways, but for current purposes, extracts have been taken from interviews with three TAs who are all employed mainly to give support to a specific named pupil with a statement of special educational needs. Extracts concerning mathematics have been selected from these interviews.

As well as presenting early findings, this paper explores whether frameworks used to represent the knowledge that primary teachers draw on might also be appropriate when considering TAs' knowledge. Such frameworks commonly draw on Shulman, including his use of the phrase 'Pedagogical content knowledge' (Shulman 1986) and his identification of seven categories of knowledge required for teaching (Shulman 1987). Three of these, content knowledge, curriculum knowledge and pedagogical content knowledge, are usually regarded as subject specific. The other four are general pedagogical knowledge, knowledge of learners and their characteristics, knowledge of educational contexts and knowledge of educational ends, purposes and values. Pedagogical content knowledge includes knowledge of ways of presenting key ideas in one's subject, an understanding of difficulties students are likely to experience and strategies for addressing these (Shulman 1986).

Researchers in primary mathematics education have shown a particular interest in Shulman's subject specific categories and the relationship between them. Ma (1999) investigated primary teachers' depth of understanding of basic mathematics, Ball and her colleagues closely examined the mathematical knowledge drawn on in teaching situations (e.g. Ball and Bass 2000) and Rowland and his colleagues (2009) offered a categorisation of the knowledge drawn on by trainee and newly qualified primary teachers when teaching mathematics. There has also been consideration of whether teachers might have knowledge of individuals which is specific to mathematics, for example by Aubrey (1997) in work with teachers of reception children and by Ball, Hill and Bass (2005). An early question considered when analysing the data which follows, concerns whether this body of research might also shed light on the knowledge TAs draw on when working with primary age children on mathematics.

Interviews

Sample and method

Those interviewed have undertaken some study at Foundation degree level including a short module on supporting pupils' mathematical learning. This is common, given the number of TAs on such courses, but the sample is clearly not representative of all TAs. Semi structured interviews were used, with TAs asked to talk about their work particularly in relation to supporting Mathematics and English, then about the knowledge that helps them and how they acquired it. Extracts are considered below that reflect these broad questions.

Supporting individuals

The three TAs all gave examples of how they worked with their individual learners in mathematics lessons. The three situations differed in many ways, though they had in common fairly longstanding partnerships between the TAs and pupils. In the first example below, Salma, a TA in a mainstream primary school, discusses her work with Harry diagnosed with Asperger's syndrome at eight years old. Salma started working with him soon afterwards, continuing until he moved to secondary school at age eleven.

> I would find that quite often the teacher would not differentiate the work and it would really be too hard for him. Because I find that if you can't do the basics, there's no point in trying to understand something, you know. So I would find that often I would have to differentiate, which would mean using visual aids like cubes and umber lines and things. Quite basic stuff, because he wasn't even able to do his times tables and things, but it just meant that I would differentiate and make sure the visual aid was there.

It was clear from Salma's interview that her preferred way of working with Harry was one to one, outside the classroom partly because of Harry's difficulty in coping with classroom noise and distractions. Because Salma worked with Harry across three academic years, he had three teachers in this time who all appeared to have slightly different ways of working with TAs. It appeared that, if necessary the SENCO would also help with negotiating what was best for Harry. Salma talked enthusiastically about one of the teachers who was happy for her to make decisions about how best to support Harry.

> ...the teacher was lovely, he was really understanding and he just kind of said, "Yeah, you can do what you want." I like it when the teachers do that, when they give you some sort of power as well, because I obviously know what I'm doing with him. So he says "Use your initiative, whatever you want to do. If you want to take him out, take him out"... a really positive year.

The next TA considered, Joyce, also preferred to work in this way. Joyce works in a mainstream school and has supported Gordon, who has a hearing impairment, for two and a half years. Joyce worked individually with Gordon for Mathematics, using specialised plans devised by a teacher with a specialism in Hearing Impairment, not the class teacher. Like Salma, Joyce used practical resources for teaching mathematics. In this case, she also talked about language issues in mathematics.

> The language in maths papers for example, 'James has got six pencils, Becky has got four more pencils than James. How many pencils has Becky got? The problem's not with the maths, because you ask him five and four and he'd do it instantly, so we quite often use that little whiteboard and draw him pictures. Or you go and get the physical resources I mean, if they're ever talking about buttons, we have a number of buttons or counters. They don't know what a counter is, then you go out and get a counter and you go, 'Look, he's got six of these'.

A slightly different type of support was mentioned by Pauline, the third TA, who discussed how she encouraged Aden to focus on his work. Aden was a Year 5 pupil diagnosed as Autistic and Pauline had worked with him for just over a year at the time she was interviewed.

> I'm actually quite strict. He could easily look out of the window and admire himself and I go, 'Right, name, date' and he'll sometimes go, 'What's the date?' I'm almost like the starter button, I say, 'Name, date, I want them down.' Sometimes, I'll count him down if he doesn't do it and he doesn't like that. He thinks, 'Oh my gosh, countdown starts.' So I start him off and once he's started and he sees other children ... and we've instigated now something called Musts, Coulds and Shoulds. So must is, he must do five, he could do eight...

Salma also had strategies for encouraging the child she worked with to engage with Mathematics. One strategy, outlined below, involved allowing Harry to write on a white board rather than in his book. Salma went on to explain that this idea of hers was now used by others in her school.

> Because he associates his maths book, I mean he scribbled all over his maths book and eventually there was nothing in there. So I said, "Okay, we'll get you a new maths book, you don't have to write in it." Because he just didn't like the squares in the book. You know, he's just got some phobia with maths. So I said, "Okay, we can do it on the whiteboard", and he just seemed to like it. So we used to photocopy all these sheets and things and date them and stick them into his maths book.
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> When I was taking the whiteboard to the photocopier I was getting some really funny looks. They were like, "The skin will rub off." I thought, "Let's just give it a go." Now everyone does it in the school.

Knowledge used to support individuals

These TAs all demonstrated some Mathematics 'pedagogic content knowledge' (Shulman 1986). In particular they talked confidently about use of equipment and demonstrated some awareness of how to present ideas and what difficulty learners might experience with particular aspects of mathematics. The evidence is not

conclusive here, as the interviews do not enable us to judge their skill at selecting appropriate equipment or representations, though they appear to do so with some confidence and success. Mathematical content knowledge is even harder to judge, partly because it appears much initial planning is done by teachers then adapted by TAs, but also because the TAs do not talk about the mathematics in detail and they do not tend to see mathematics at this level as problematic.

There is some evidence of general pedagogic knowledge, but more evidence of knowledge of individuals. This latter knowledge can be subject specific. They also have knowledge of named special needs, such as Autism or Hearing Impairment, but still distinguish between individuals with these needs. Given the time these TAs had spent with the individuals in question, it is unsurprising that they demonstrated knowledge of them. Interestingly, there was a subject specific element of the way they discussed this, with distinctions drawn between the way pupils coped with mathematical tasks, in contrast to literacy. For example, Salma considered Harry to have more difficulty with mathematics than with literacy, as explained below.

> It would depend on the lesson. With literacy he was very able ... and I used to let him ... I'd just sit back. Whereas with numeracy, numbers were very difficult for him and he really struggled with that, so I'd pull him out and I used to teach him one-to-one with numeracy ... I think it was just numbers he honestly has not grasped and he kind of gets very confused ... with everything else he's very articulate ... but he would look at numbers and he would honestly kind of panic ... He honestly, genuinely could not do them and he would really, you know, struggle.

When Pauline talked about Aden, she also contrasted his performance in Mathematics and English; in his case he found Mathematics easier.

> He's a very intellectual young man ... he likes maths, because there is an answer ... He's a very able child. The problem comes when, for instance, he's given an alternative strategy to deal with something....
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> Probably most of the Autistic children I've had find literacy more difficult to deal with than maths ... if he's asked to use several devices within a story ... He finds that much more difficult ... whereas maths feels safe to them.

In the quotation above, Pauline started to generalise about Autistic children. Joyce talked in a similar way about children with hearing impairments, but also pointed out that she considers there to be considerable difference between individuals.

> Quite often we actually physically go and do it. Quite often you'll see a TA walking around the school with a deaf child in front of them, saying, "Walk six paces ..." You know, you actually physically do it with them.
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> I do know this particular child very well, but he's not special. It's not special to him. Most HI kids have got this language problem. ...
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> But everyone's got different ... everyone's got a slightly different perception of the deaf child and how they learn best.

These TAs considered themselves very knowledgeable about the children they worked alongside and felt they were in a stronger position than teachers to develop such knowledge.

> Quite often TAs are the experts on the SEN children, because they do spend more time, quite a lot of time.
>
> (Jovce)

All three TAs provide evidence that their knowledge of the children they worked alongside assisted them in trying to meet the child's needs. There was also

some sense of the TA becoming an advocate for the child, as explained by Pauline below.

> I'm very concerned about that child, because I do feel they sometimes get a little bit sidetracked as Autistic children. So I want to make sure that he has as much say, he has as much voice, but also that if he's treated that way, usually that system works with all the other children too. And yeah, he does like to see justice being done.
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> ... I just feel that I'm a voice for these children and I also would like them to have their own voice. And as a result, most of the children who work with me do tend to become more confident and do have a voice.

Sources of knowledge

When asked how they gained the knowledge to assist them in their work, all three TAs talked at some point about how they worked things out for themselves and how they used commonsense or intuition. Salma gave examples of activities she used with Harry and talked about how she had come up with these ideas herself, or spent the weekend trawling the internet for information or even bought resources such as a tables tape out of her own money.

> I used my initiative a lot and said, "I think this will work best" and after a while, they're just like. "Let's just shut her up. Let's just give her some money so she can go and get her resources and things." And it worked, he did actually start eventually learning his tables.

Salma returned to the theme of working ideas out for herself at the end of her interview when asked if there was anything she would like to add.

> I'd just like to say that I really enjoyed being plunged in the deep end of things, because I don't think I'd have it any other way. I think that's how I learn as well, by trial and error and by reading up on things. You know, especially with Harry, nobody told me "These are a set of rules and you've got to do it like this and you can't do it like this."

These three TAs had all completed a foundation degree and were continuing to study. This was usually mentioned at some point as being helpful, though more in terms of the reading they did themselves than the direct teaching. But mentions of the course still tended to follow answers about experience, as in the quotations from Joyce below.

> Most of it is experience. Yeah, most of it is experience.
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> ... no, not training, experience. And of course, I've done a lot of reading since I've been doing this course. I know why the gaps are there now, whereas before, I knew the gaps were there, but not necessarily why.

Pauline also talked about what she had learned from her experience of working with children who need support and from her experience as a parent. She also described herself as intuitive, reflected in the title of this paper.

> Yeah, I can be quite intuitive. I feel that the more I've worked with children of this type, the more you understand.
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> Because I've worked with those children, you get a real feel for the way that they behave. Yeah, I think it is very intuitive and actually also because I'm a parent.

The discourse of experience and intuition was strong for all three TAs, although it co-existed with their acknowledgement of academic study which they knew the interviewer was aware of. In response to follow-up questions about where

they found particular ideas, they spoke of many other sources of knowledge. For example, Pauline got the idea of 'musts, coulds and shoulds', from a new teacher at the school. Ideas also came from staff meetings and short courses. A range of knowledge sources were therefore identified in response to questions about particular ideas, but the general discourse was about experience and generating their own ideas.

Summary and next steps

These three TAs demonstrate use of pedagogic content knowledge and subject specific knowledge of individuals, though there is little evidence of drawing on mathematical content knowledge. A next step might be to examine these two forms of knowledge more closely, perhaps considering whether beliefs are also relevant, for example in relation to use of materials and practical activities. For these TAs who work closely with individuals, subject specific knowledge of individuals is also important. Finally, the issue of the importance TAs attach to experience and intuition merits further consideration.

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