HOW DO PUPILS EXPERIENCE SETTING IN PRIMARY MATHEMATICS?

Rachel Marks explores the 'cultures' in learning groups

Many primary schools set pupils for mathematics, but how aware are we of the impacts of these practices? This article reports on some findings from my study into ability in primary mathematics. In the study I examined how ability is understood – both by pupils and teachers – and what impacts these understandings and ability-grouping practices have on pupils' engagement with mathematics. A finding from this study was that the impacts of setting are far-reaching, may not be fully realised, and may have quite fundamental impacts on learning and engagement. Pressures on teachers to use particular grouping practices perpetuate these impacts whilst restricting teachers' opportunities to notice what is happening within their classrooms.

As teachers we often believe that we understand pupils' experiences within the classroom, interpreting their outward actions and reactions through our belief systems. However, it may be that we are only giving them pseudo-voices rather than getting to the core of their experiences. It was my privilege to have the opportunity to gain deeper access to pupils' voices, examining alternative interpretations for pupils' classroom behaviours through their words and pictures; interpretations that may go unnoticed during the usual day-to-day activity of the mathematics classroom.

Within this article I present the cases of two Year 6 (ages 10 - 11) pupils, Megan and Samuel, exploring their broader experiences during mathematics lessons that impacted significantly on their mathematical opportunities to learn. Megan was in the top set and considered generally able by her teachers. Samuel was in the bottom set and considered one of the least able pupils in Year 6. Comparing their cases I argue that both pupils, despite having very different experiences of setting, experienced many of the same limits on their learning, albeit stemming from different sources. Whilst these are the stories of just two pupils in one school, their experiences are representative of many of the pupils across my study and my discussion with teachers and others suggest that these impacts can be generalised to many setted primary mathematics classrooms.

Top set experiences: Megan's story

During the year I worked with her, Megan was in the top set of four at a high-achieving 3-11 primary school in Greater London. Just under a third of the top set pupils were girls. Megan was expected to attain a level 5 without difficulty in all subjects in her Year 6 SATs and to secure a coveted place at a local highly selective and over-subscribed grammar school.

Despite being in the top set, Megan was a bit of an enigma both to her teachers and peers. At times they would describe her as a gifted mathematician, and this fitted her academic outcomes. However, they felt there was something about her classroom behaviour that set her apart from the top set, as Natalie, another pupil in the top set, explained:

Natalie: *I think Megan is quite strange because most of the people who are really good in our group, they're always making sure that they get noticed and everything, but Megan keeps it to herself a bit more.*

Other peers, whilst referring to Megan academically in other worldly terms such as being *"freakily good"* and *"too clever"*, also felt her classroom behaviours set her outside of the most able mathematicians in the top set, a group consisting, in this case, predominantly of boisterous boys. Whilst this able group of boys did everything to ensure they were noticed, Megan appeared introverted and cautious. She rarely volunteered answers in class, was never observed asking the teacher questions or challenging comments made by others and appeared to withdraw from lessons. The outward behaviours accompanying Megan's apparent reluctance to participate in mathematics lessons were evidence used by her teachers in their labelling of her as not being one of the most able mathematicians of the top set, describing her approach as *"hesitant"*. Quite logically, they formed the opinion from her actions, or lack of, that she both was not as quick as other pupils in obtaining the answers and that in some cases she was unable to obtain the answers that other pupils achieved with ease.

But what was actually happening for Megan during her mathematics lessons? In the year I conducted my fieldwork, I was able to closely observe and interview her on multiple occasions. This gave me access to an understanding of her behaviours not readily accessible to her teachers. Observing Megan in class revealed

that, far from not getting the answers quickly as her teachers assumed, she consistently produced fast correct answers, often as quickly as, and sometimes more quickly than, those believed to be the highest attainers of the set. However, unlike the pupils considered most able who shouted out and drew attention to themselves, Megan discretely wrote these down on her paper or whiteboard, keeping them to herself. Extracts from her individual and group interviews expose the chasm between Megan's outward behaviours, as observed by her teachers, and the feelings she was experiencing and struggling to manage in the mathematics classroom:

Megan: *If you are quite clever in some way, sometimes you don't want to get something wrong because other people might say something about that, so I would rather not say anything.*

Megan: *I think it's more embarrassing for the people who are, who know, who are good at maths and they get something wrong, like today because Martha was doing the maths the other way she got the answer wrong and because she's quite good at maths the class were going ooohhh and boooo.*

Olivia: *Yeah and like, especially if you get an answer wrong then everyone shouts no, no, no and they go yes, yes, yes. It's quite like, it's like a zoo in the classroom it's terrible.*

Megan: *Yeah if you get an answer wrong everyone goes nooooo, it's this, and everyone goes, yeahhhhh.*

My observations, and Megan's discussion in her interviews, revealed a very different reason for her behaviours than the interpretation made by her teachers and some peers. Megan was obtaining accurate answers quickly, but the top set culture of speed and correctness brought about a high level of anxiety for Megan. This led to her being fearful of making mistakes in front of others, and as a result she made an active decision not to participate in lessons, for as she says, she *"would rather not say anything"* than risk making a mistake and face humiliation from her peers in the top set mathematics classroom, an environment that Olivia likened to a zoo.

Megan's strategy had serious implications for her learning of mathematics and her attitude towards the subject. By being fearful of making mistakes, she rarely took a risk in public and as such had limited opportunity to learn through her errors. Importantly, her teachers' interpretation of her behaviours impacted on the learning opportunities they made available to her; through the work offered and through allowing her disengagement in attributing this to something internal to Megan rather than a product of the top set culture, further limiting opportunities for peer discussion and collaborative learning. Whilst Megan started from a high academic position at the beginning of Year 6 and hence, along with the majority of her set, achieved level 5 in the KS2 National Tests, assessments I conducted showed that over the course of the academic year Megan made a gain of just 6 months, placing her in the bottom third of her set in terms of gains. Her written, often hidden, responses in class and her high starting position suggested that she should have achieved more than this. However, Megan's behaviours, stemming, I suggest, from heightened levels of anxiety, limited her in terms of the forms of participation required for success in a top set environment.

Megan's experiences, and the wider findings from my study concerning the impacts of ability-grouping in primary mathematics strongly reflect similar studies in secondary mathematics (see Marks, 2011). Megan's top set classroom was characterised by a competitive and fast paced approach strongly reminiscent of the literature on top sets in secondary mathematics whilst her experiences mirror those of many top set girls in Boaler's (1997) secondary mathematics study. Boaler found that whilst many boys in top sets were able to form goals related to speed, girls, valuing understanding, struggled to align with the top set culture. Much like Megan and other top set girls I interviewed, Boaler found that the girls in her study cited the teaching approach, pace and pressure of the top set as reasons for their disaffection. Boaler also highlighted the anxiety felt by top set girls, importantly locating this within the school system and not as a deficit within particular pupils:

'The girls at Amber Hill talked openly about their mathematical anxiety, but they did not attribute this anxiety to any deficiencies of their own. They were quite clear about the reason for their anxiety which was the system of school mathematics that they had experienced.'
(Boaler, 1997: 119)

It is clear to me that the same was happening for Megan; the anxiety she experienced which severely limited her participation in class was a product of the top set culture and approach, and not a deficit internal to Megan. In a different environment she might have behaved in very different ways. However, this is not how her teachers interpreted Megan's behaviours. They did not have access to her thoughts and anxieties and did not notice her quiet disaffection. Just as Boaler's girls experienced heightened anxiety and were unable to align with the top set culture, accessing learning

opportunities in their secondary mathematics classrooms, so too did Megan in her primary mathematics classroom. This is of concern, given that I found evidence of similar anxieties expressed by pupils from Year 3 (ages 7 - 8). We should be asking what the long-term impacts, particularly in terms of attitude towards and continued participation in mathematics, are of such experiences for pupils like Megan who are likely to experience a similar top set culture as they move into secondary mathematics.

Bottom set experiences: Samuel's story

Samuel attended the same school as Megan, but was in the bottom set in Year 6 for mathematics. Like the top set, boys were over-represented in this set, forming approximately two-thirds of the group. Samuel had been in the bottom set since he started at the school and was considered to be the lowest achiever within the set. He was not expected to be successful in the SATs and was dis-applied from these at the end of primary school. Samuel's behaviour in class could be very challenging; he did not have special needs support yet his teachers felt the bottom set was not appropriate for him; they believed he would have been better working on a one-to-one basis away from the rest of the class.

I found the culture of bottom sets in my study to strongly reflect findings from secondary mathematics with concrete, kinaesthetic approaches, unchallenging tasks and a slow pace of work. Samuel's experiences were reflective of this. The majority of tasks in Samuel's mathematics lessons consisted of the pupils being given individualised worksheets to work through alone, often with little input from the teacher. Worksheets were photocopied from a variety of commercial resource books, which for Samuel were usually KS1 books (for pupils aged 5 - 7), with this intended age-group clearly indicated on the bottom of the sheets. The rationale given by the set teacher for this approach was two-fold. Firstly, he was concerned that Samuel should experience success. He felt that by giving Samuel low-level work he would be able to attain the correct answers, which in turn would improve his self-esteem. Whilst there may be some logic in this, having Year 1 and Year 2 labelled sheets only served to antagonise Samuel, having the opposite effect to that intended on his self-esteem.

The second reason for the set teacher's approach was behavioural. It has been repeatedly reported in the literature that in low sets teachers spend most time in behavioural interactions with pupils (Oakes, 1982). Like many low set teachers, Samuel's teacher felt that his bottom set pupils would struggle to work cooperatively together. By having pupils working individually and limiting opportunities to talk, the teacher felt he was able to maintain better behavioural control. However, this had two unintended consequences: it appeared to increase the likelihood of any talk, even overtly mathematical talk, being interpreted through a behavioural lens, and secondly, it meant the pupils had very few opportunities to practise mathematical discussion.

An example of this was observed in one lesson where Samuel and the boy he was sitting next to, Saul, were heavily chastised for talking, despite their talk being mathematical and interesting in nature. This talk related to an important idea, grouping versus sharing models of division, in school mathematics. The pupils, working on worksheets, were using counters to divide by two. Samuel asked Saul if dividing by two meant he was supposed to put the counters into two groups, or into groups of two. Saul had, to this point, been putting counters into two groups but was now trying out both ways. This seemed to cause some confusion to the boys who were discussing which method they should be using. This was quite an animated discussion and the noise created was interpreted by the teacher as non-mathematical with both boys disciplined for talking in class. It appears that the behavioural focus of the bottom set led the teacher to immediately respond in behavioural terms rather than consider that there may be a mathematical basis to the discussion. When I interviewed Samuel after this lesson, he brought up the incident and, very astutely, highlighted the impact a lack of opportunity for discussion had on his mathematics learning:

Samuel:
That affects my maths, because if I was going to ask a question, he [the teacher] wouldn't allow it, if the question is part of my work then he still won't allow it.

Samuel's low-level work, and limited spaces for mathematical discussion, were both enacted by the teacher as supportive measures yet brought with them unnoticed implications in terms of spaces for Samuel's mathematical progression. Without being given access to higher-level work, without being given the opportunity to engage in mathematical discussion, and being dis-applied from standardised testing, Samuel was never given the opportunity to make or show any improvement, something he was very aware of:

Samuel: *My friend thinks I'm dumb and so dumb that when it comes to the tests they think, they don't even give me the test, the teachers say I can't do the test and my friends think I'm dumb for not being allowed to do the test. That's how it*

works, I won't do the test, it makes me unhappy and I can't get better to get the tests to go up.

Samuel often talked about wanting to be in a higher set. Whilst it could be argued that this was unrealistic, his assessment that, under present conditions, he *"can't get better"* seems accurate. In the assessments I conducted, Samuel made no gain in his mathematics age over the course of the year. As with the congruence between my top set findings and Boaler's findings in secondary mathematics, Samuel's experiences and beliefs also mirror the findings of pupils in her lower sets who reported that it was restrictions arising as a result of set placement and teacher belief, such as access to particular levels of tests and examinations, which led to disaffection and underachievement. Much like Samuel reports, secondary mathematics *'students believed that they had been restricted, unfairly and harmfully, by their placement into sets'* (Boaler, 1997: 134). Other pupils across bottom sets in KS2 reported similar restrictions to their learning and whilst many of these experiences arose from the teacher attempting to act in a supportive role, many consequences for pupils' opportunities to learn, and subsequently their levels of disaffection within mathematics, went unnoticed or misinterpreted as an aspect of their character rather than a reaction to the restrictions of their set placement.

Discussion

Megan and Samuel's experiences of mathematics lessons and setting are, on the surface, very different. Yet there are similarities in their stories. Both pupils are being held back, experiencing restrictions on the mathematical learning opportunities open to them. Megan and Samuel are both subjected to limits on mathematical discussion and collaborative work with peers. For Megan and other top set pupils, potentially more acutely for girls, this arises from the competitive, self-absorbed culture of the top set where making mistakes is not allowed. This led to Megan experiencing high levels of anxiety and being too fearful of peer reactions to regularly join in with classroom discussion. For Samuel, restrictions on discussion were imposed by the teacher with the assumption that bottom set pupils did not possess the behavioural control necessary to engage in collaborative work.

Both pupils also lost the opportunity to learn from their mistakes as a result of the cultures and practices of their sets. For Megan, her fear to participate resulted in her teacher misjudging her academic performance and lowering the level of questioning and work offered accordingly. For Samuel, in an attempt to improve his self-esteem and engagement with mathematics, he was offered low-level work he could already complete successfully, taking away opportunities for him to progress mathematically and keeping him at his current level of attainment. Rather than a culture where teachers are fearful of placing pupils in a position where they may make mistakes, or where pupils themselves are fearful of making mistakes, we ought to be finding ways of valuing risk-taking and exploration in mathematics classrooms. Pupils need to be free to make, and learn from, their mistakes and the mistakes of others.

These two pupil stories suggest that more may be going on for pupils in the mathematics classroom than is immediately obvious. Pupils are reacting to the cultures and expectations of their sets in ways that may not always be expected. The outward behavioural manifestations of these reactions are being misinterpreted with the potential for them to be, wrongly, ascribed to some internal quality of the pupil. Ability-grouping practices currently appear to be increasing in primary schools (Hallam, 2011). It is necesssary that we address the implications of this in order to provide all pupils with the best possible opportunities to learn. Older students in the US have been found to benefit significantly from access to higher-level college track courses (White et al, 1996). We need to find ways of providing all pupils – including at the primary level – with opportunities to engage with rich mathematical learning experiences where pupil discussion about more than mathematics is valued.

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