

## **‘Ability’ in primary mathematics education: patterns and implications**

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Ability is a powerful ideology in the UK, underscoring many educational practices. We have extensive evidence pertaining to the impacts of these, particularly setting, in secondary mathematics, but there is relatively little research into the impacts in primary schools, despite an increase in ability-grouping practices at this level. This paper begins to address this gap, discussing some of the results from my doctoral study. It explores the pervasive nature of ability and the strength of young children’s convictions in innate ability. It also examines the role of assessment in perpetuating an ability ideology, suggesting that many of the implications seen in secondary education are also issues for primary mathematics.

**Keywords: Ability, Primary Mathematics, Setting, Grouping**

### **Introduction**

The research reported here presents results from my doctoral study into ability in primary mathematics education. It extends our understanding of the implications of ability in mathematics, considering the transferability of the secondary literature into the primary context. The UK has a long history of segregated education built on a strong ideology of ability. Until the 1960s, almost all pupils were educated within a tripartite system, assigned to schools on the basis of 11+ results. Whilst subsequent comprehensivisation brought a greater degree of mixed-ability teaching, mathematics has always retained a belief in the need for ability-grouping. Setting has increased in recent years, being an organisational method promoted by the Government (e.g. Gove 2007).

The impacts of ability-grouping are often considered in terms of attainment and attitude. Whilst the studies are not fully in agreement, the overall picture is of negligible overall effect (Hallam 2002). However, ability-grouping has the potential to create and extend existing achievement gaps and a number of studies have found that it is assignment to higher sets and / or enriched curricular that makes the difference in terms of attainment gains (e.g. Wiliam and Bartholomew 2004). These differences may be the result of different expectations and pedagogy in higher sets. This underscores Boaler’s assertion that “the set or stream that students are placed into, at a very young age, will almost certainly dictate the opportunities they receive for the rest of their lives” (1997, 142).

As with attainment, the impact of ability-grouping on pupils’ attitudes is also contested. Studies (e.g. Ball 1981) have shown the potential of grouping practices to polarise attitudes, although Boaler’s (1997) study suggests this to be more complex. Despite these known impacts, the use of ability-grouping continues to grow. 52% of primary schools began ability-grouping in the first year of the National Numeracy Strategy (Hallam, Ireson, and Davies 2004) and this appears to be increasing, hence the need to develop our understanding of the impacts of this on primary pupils.

## **‘Ability’ in UK education**

Ability is a contentious notion in educational research, yet is a powerful ideology in the UK. Within UK society, ability, segued with intelligence, is seen as a fixed, hereditary quality, genetically determined and characterised by upper limits and a sense of inevitability (Howe 1997). The historical underpinnings of this ideology are long and complex. We have reached a stage, White (2006) argues, where accounts of intelligence arising from the work of Galton have so influenced everyday understandings, that we no longer have the capacity to see them as in any way peculiar. Ability is “one of the dominant discourses in schools and policy” (Stobart 2008, 32) and the foundation of many forms of UK classroom organisation. Adey et al. (2007) argue that teachers lack any model of cognition containing plasticity, evidenced by Kovas et al.’s (2007) finding that over 90% of teachers believe that genetic influences on ability are more, or at least as, important as environmental ones. This is important, for whilst such beliefs pervade, associated practices and their implications will continue to be legitimised.

### **Research design**

This mixed-methods research took the form of a multiple case study. To explore the impact of different discourses and practices of ability, the research included two diverse school environments, one teaching mathematics through a strong philosophy of setting and the other employing mixed-ability teaching. Within each school, focal sets, classes, teachers and pupils were followed over the course of one academic year to explore their experiences with respect to ability.

#### *Sample*

Avenue Primary and Parkview Primary (both pseudonyms, as are all names in this report) were both 3 - 11 schools in Greater London local authorities. The schools were matched by Contextual Value Added scores. Avenue Primary was a three-form entry school. They set pupils in mathematics into four sets in each year group from Year 2 (ages 6-7). Movement between sets was very limited. Parkview Primary was a two-form entry school. This school had a strong inclusive history, having provision for pupils with Special Educational Needs, with mainstream integration. Pupils were taught in mixed-ability classes except in Year 6 where they were set for mathematics.

Within each school, all classes / sets in years 4 and 6 were included in all quantitative elements of the study, totalling 284 pupils. For the qualitative elements, top and bottom sets at Avenue and all classes at Parkview were used as focal classes. Within each focal class / set, three focal pupils were chosen by the teacher to reflect the range of attainment within the class, totalling 24 focal pupils.

#### *Research methods*

A variety of research methods were employed to gather data at different levels. Quantitative methods included attainment testing and attitudinal questionnaires, whilst qualitative methods involved classroom observation, group and individual interviews and data gathered through day-to-day observation in the schools. This approach brought with it many benefits, using many types and sources of evidence to give a rich account of events as experienced by the research subjects whilst at the same time allowing for analytic theory and generalisations to be drawn from the data. The data presented in this report all arise from the qualitative elements of the study.

## Findings

The findings presented in this report represent a small selection of those discussed in the full study. The themes have been selected to provide an overview of the key issues arising across the research, but also to tell a coherent story. Data extracts are used to illustrate the findings discussed; these are selected as typical rather than extreme examples and are generalisable across both schools and year groups.

### *Pervasiveness of 'ability'*

One rationale for including a school using a mixed-ability organisation was to give access to an understanding of the impacts of ability beyond the obvious practice of setting. A key issue to emerge early on in my school visits was that ability impacted on practices across the schools in explicit and implicit ways. In many cases, in the same ways it is argued we have lost the capacity to see our everyday use of intelligence as in any way peculiar, there seemed to be a lack of awareness of just how pervasive ability is and just how much it invades the everyday issues of teaching and learning.

My first confrontation with the pervasiveness of ability came prior to the main research during the process of school recruitment. Parkview primary had been recommended as having a very strong mixed-ability ethos. I was told the school was mixed-ability throughout with no use of between or within class grouping with the exception of Year 6. During my first meeting with the head-teacher she emphasised her position, that no ability grouping was used, and to solidify this, asked a 6-year old pupil in the room with us to confirm that there was no movement into groups for mathematics. Unfortunately, the pupil's response did not confirm this, but instead came as a shock to the head-teacher:

No Miss, Miss Mason makes us go and sit in our maths groups, there's the green table, the purple table, the blue table, the yellow table and the red table. The green table are the best at doing maths; I'm on the red table. (Adina, Year 2, Parkview Primary)

Whilst this suggested that classroom organisation at Parkview was not as mixed-ability as first assumed, I included the school within the study as it demonstrated firstly the extent to which ability grouping practices are part of UK primary education and, secondly, how these may have become so normalised that we do not notice them. Across the study many focal pupils spoke in similar ways to Adina, demarcating tables and groups by their names, labels and / or National Curriculum levels with a full awareness of the meanings and implications of these groups.

Within the study I interviewed the teachers individually. This was very revealing, not just for the study, but also for many of the teachers who, for the first time, were given the space to think through and question the ability predicated practices they were engaged in. These teachers talked about practices which, when asked to discuss further, they could not logically defend and in many cases talked about doing things in a particular way because that was how it had always been done. Within these interviews, comments were made such as: "I don't know ... it's odd, isn't it?" (Mrs Jerrett, Avenue Primary) when asked why they set pupils for mathematics and not for other subjects, whilst another teacher concluded her interview by saying: "It's freaked me out now" (Miss Barton, Parkview Primary). These teachers, involved in reproducing many of the same experiences they had as pupils (Hodgen and Marks 2009), had never been given the space, time or resources

to think through the pervasive ability-predicated practices they were engaged in or the implications of these for their pupils.

### *Children's beliefs about 'ability'*

There is much in the literature to highlight the erroneous beliefs that underscore the ideology of ability dominant in UK society and in education. Within this study I was interested in exploring the extent to which primary pupils held these beliefs and the potential impact of any beliefs they held on their learning in mathematics.

The beliefs pupils conveyed in their individual interviews were virtually unanimous with all pupils making some reference to the dominant beliefs. Pupils expressed the same views during group interviews suggesting a perceived shared understanding and a willingness to be seen to hold such views. The predominant views centred on ideas of heritability and genetics. Pupils expressed beliefs that only some individuals could be good at mathematics and that this was dictated by being born to be good at mathematics or not:

Rachel: So what makes someone good at maths?

Wynne: Their brain's bigger. And they're cleverer and better ... it just happens. They were born like that. They were born clever.

Rachel: And what might make someone not good at maths?

Zackary: Some people are just not born clever.

(Wynne and Zackary, Year 4, Avenue Primary)

In holding a belief that mathematical ability was something individuals were born with, pupils also expressed a conviction that any individual, including themselves, would not be able to improve on their attainment in mathematics. As one pupil put it, "you can only do so much can't you?" (Peter, Year 6, Avenue Primary). Pupils at Avenue Primary tended to stay in the same sets throughout their primary careers. A number of pupils appeared to use this as evidence of the 'fact' that individuals could not improve, talking as if such practices were legitimate given their understanding that individuals only possess a certain quantity of mathematical ability:

I know I am worst out of everyone ... I'll just be low now in my next school too.  
(Samuel, Year 6, Avenue Primary)

I think I would not move. I think I would normally stay in the same place. I don't think there's anything I could do to make myself better. (Zackary, Year 4, Avenue Primary)

Sam and Zackary were both bottom set pupils. They had always been in the bottom set and both expressed the view that they felt this would not change. The implications of this are important. Zackary was eight years old at the time of this interview and so had at least another eight years of fulltime education ahead of him. However, in holding the view that he was powerless to effect group movement, one outcome may be that any effort he puts into change is limited, with his set placement effectively being self-fulfilling.

### *'Ability', assessment and selection*

Whilst setting is a clear explicit practice of a dominant ability discourse, many other practices are tied to ability in complex ways. These both rely on the existence of a stratifying discourse, but in turn also feed into it. A number of these practices revolve around issues of assessment and selection. Both Parkview and Avenue Primary were

in the catchment areas of academically selective secondary schools. The impacts of this on the pupils, even at Year 4, were high and, as with the lack of movement between sets, legitimised their beliefs about ability. Pupils talked about grammar schools with a sense of awe, citing them as where “everyone who is really really clever goes” (Thomas, Year 4, Avenue Primary) and perpetuating the belief that selective processes, such as verbal and non-verbal reasoning tests, give a reliable indication of what someone is able to do now and in the future. Further, local authority allocation procedures for secondary education served to strengthen pupils’ beliefs about innate individual differences and a lack of opportunity for change:

SATs are more like year 6 exams, and in year 5 they’re like banding exams, that bands you like, some people are 1A and 1B and to get to, well some state schools, they get a certain amount from 1A, a certain amount from 2A, some from 1B, and the others. (Abbie, Year 6, Parkview Primary)

Here, Abbie was talking about the different assessments she had undertaken in mathematics. She reproduced the language of banding, understanding this, as many do, as an assessment of innate ability. Believing that each pupil fits a particular category and can be labeled thus – it was not uncommon to hear pupils referring to themselves by their National Curriculum level or band identifier – intensifies a belief that mathematical ability is a fixed given quantity that cannot be changed.

In addition to maintaining beliefs, assessments could act as a gatekeeper, ensuring the perpetuation of practices and keeping individuals where they had been placed. This was particularly the case for one pupil at Avenue Primary who was disappplied from the SATs at the end of Key Stage Two due to his attainment level:

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, Year 6, Avenue Primary)

Samuel understood the importance of the tests in having the potential for allowing him to demonstrate his attainment and hence move up through the sets. Without access to the tests, Samuel had always been, and as he saw it, would always be, placed in the bottom set. He talked vividly during our interviews about his lessons and understood the limitations that were being placed on him through the teaching and learning in the bottom set. Dominant beliefs about ability led the teachers to believe that they were doing the best thing for Samuel in protecting him from the SATs, but as Samuel identifies, this becomes reproductive, with ability beliefs serving to limit mathematical experience.

## Discussion

The findings presented in this report represent only a small part of my study, yet they highlight a number of important issues arising from this research. Despite the different cultures of primary and secondary mathematics education, many of the issues we are aware of in the secondary mathematics education literature on ability appear also to be issues for primary mathematics. This is an important finding given the rise of ability-grouping in primary mathematics and may suggest that Boaler’s quote concerning the early stratification of life-opportunities can be brought down and applied from a much earlier age.

Children as young as eight years old demonstrated a strong acceptance of and belief in the mathematical ability myths that pervade education, legitimising resultant

practices in the same ways teachers, policy-makers and wider society do. Given the strength of these beliefs it seems likely that even younger children may be holding and forming similar views. It is important that we understand the views pupils are holding as they may lead to many pupils feeling that mathematics is something they cannot, and never will be, able to do, with potential impacts for their attitudes towards and application in, mathematics lessons.

There is some hope for change. Although many of these practices take place with very little awareness, hence the pervasiveness of ability, teachers, when given the space to think, were genuinely interested in questioning these practices. It seems feasible to suggest that practitioner reflection may be one way into addressing the inequity that is currently legitimised through our discourse of ability. However, whilst ability truths continue to dominate education, change will be very difficult. This research is part of my doctoral study entitled “Discourses of Ability in Primary Mathematics: Production, Reproduction and Transformation” and is funded by a studentship from the Economic and Social Research Council (award number: PTA-031-2006-00387).

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