‘Ability’ ideology and its consequential practices in primary mathematics

Rachel Marks

Department of Education and Professional Studies, King’s College London

‘Ability’ is a powerful ideology in UK education, underscoring common practices such as setting. These have well documented impacts on pupils’ attainment and attitude in mathematics, particularly at the secondary school level. Less well understood are the impacts in primary mathematics. Further, there are a number of consequential practices of an ability ideology which may inhibit pupils’ learning. This paper uses data from one UK primary school drawn from my wider doctoral study to elucidate three such consequential practices. It examines why these issues arise and the impacts on pupils. The paper suggests that external pressures may bring practices previously seen in secondary mathematics into primary schools, where the environment intensifies the impacts on pupils.

Keywords: Ability, Primary Mathematics, Setting, Educational Triage

Introduction

This research, from my doctoral study, examines the unexpected and sometimes unnoticed consequences of ability-predicated practices such as setting. Three issues representing different ways unintended consequences may be enacted are discussed.

Ability predicated practices have increased in primary schools, particularly in mathematics, following the implementation of the National Strategies (Hallam, Ireson, and Davies 2004). Successive governments have repeatedly called for an increase in ability-based grouping at both secondary and primary levels. These changes come despite our lack of understanding of the impacts of ability practices at the primary level. Our understanding of the impacts comes predominantly from the secondary mathematics literature. This was explicated in earlier work (Hodgen and Marks 2009, Marks 2011) and for brevity is not rehearsed here. Instead, findings within the three themes are discussed with respect to the key literature.

Research design

The wider doctoral research of which this paper is a part was a mixed-methods study taking the form of a multiple case study. Two diverse school environments were included, although only data from one school – Avenue Primary (a pseudonym, as are all names), with a strong philosophy of setting – are discussed.

Sample

The wider project involved 284 Key Stage Two (ages 7-11) pupils in two UK primary schools, one using a high-degree of setting for mathematics and one using limited setting. Avenue was a three-form entry primary school in Greater London. Pupils were set for mathematics into four sets in each year group from Year 2 (ages 6-7). Movement between sets was very limited.

The study involved Year 4 (ages 8-9) and Year 6 (ages 10-11) pupils. This gave access to a range of experiences, additionally allowing a focus on the impacts of the mathematics Standard Assessment Tests (SATs – the tests taken by pupils in Year 6 at the end of primary school) on ability practices. All pupils were involved in the quantitative elements of the study. For the qualitative elements, top and bottom sets in each year were selected as focal sets. Within each focal set, three focal pupils were chosen by the teacher to reflect the range of attainment within the set, totalling 12 focal pupils at each school. The focal set teachers were also included within the study.

Research methods

A variety of research methods were employed to gather data at different levels and to allow for data triangulation (Denzin 1997). Attainment tests developed at King's College London (Brown et al. 2008) were conducted with the full cohort in October 2007 and July 2008. These allowed the measurement, as maths ages, of the attainment gains made by each pupil over the academic year. Additionally, Nicholls et al.'s (1990) attitudinal questionnaire was conducted as pre- and post-tests. Quantitative data were collated in SPSS and descriptive and inferential statistics applied.

Over this same time period, 48 mathematics lessons involving 13 sets/classes were observed, and 48 interviews were conducted with the 24 focal pupils and 8 teachers to explore their experiences. The qualitative data were collated in NVivo and analysed using constructivist grounded theory (Charmaz 2006). Both quantitative and qualitative data are presented in this report, allowing for the elucidation of key data trends alongside rich accounts of events as experienced by the research subjects. Together these provide a fuller picture of the issues discussed, allowing for analytic theory and generalisations to be drawn from the data

Findings

Three key themes giving an overview of the issues arising from consequential practices are presented below. With each, data extracts are used to illustrate the findings discussed; these are selected as typical rather than extreme examples.

Educational triage

The notion of educational triage originates in Gillborn and Youdell's (2000) study into the allocation of educational resources. They describe it thus:

> In a medical emergency triage is the name used to describe attempts to direct attention to those people who might survive (with help), leaving other (less hopeful) cases to die. In school, educational triage is acting systematically to neglect certain pupils while directing additional resources to those deemed most likely to benefit (in terms of the externally judged standards). (134)

Their study referred to the practice of targeting resources at pupils attaining at the grade C/D borderline in the General Certificate of Secondary Education (GCSE) examinations taken at the end of compulsory schooling. The aim of such an intervention was to ensure these pupils attained a minimum of grade C, the benchmark used to construct school league tables and externally measure school effectiveness. A result of this was that pupils deemed unlikely to attain a C grade, even with intervention, were given the lowest priority and least support. A similar study was conducted by Booher-Jennings (2005) examining the impact of reading tests as gatekeepers to Grade 4 entry in Texas elementary schools. Her study showed

teachers redirected resources to those pupils who would succeed with intervention whilst taking away support from those pupils unlikely to pass the reading test.

Educational triage was applied, knowingly, at Avenue Primary. Set 3 pupils were referred to by teachers as the Cusp Group. These pupils were identified as likely, with support, to achieve a Level 4 in the mathematics SATs at the end of Year 6 (the Government target and a measure of school success). The Cusp Group was allocated the "strongest teacher" (Mr Iverson, Year 4) and the teachers talked about using a different approach with these pupils:

> With the Cusp Group you have to, sort of, you know, push open those doors a bit and not be frightened and say right, what about these numbers … the idea is to push them up and get them moving. (Mrs Jerrett, Year 4)

Whilst the teachers saw this additional input as supportive of Cusp Group pupils, they seemed unaware of the consequential impacts on Set 4 pupils who were deemed unlikely to attain a Level 4. With the strongest teacher placed into the Cusp Group and the subsequent priority being Sets 1 and 2, Set 4 pupils in Year 6 were taught by supply teachers or Teaching Assistants. Additionally, lesson observations supported by teacher interviews suggested the Set 4 curriculum was bland in comparison to the Cusp Group. The impact of Cusp Group practices on attainment can be seen by comparing the pre- and post- attainment test scores for each set in Year 6 (Figure 1):

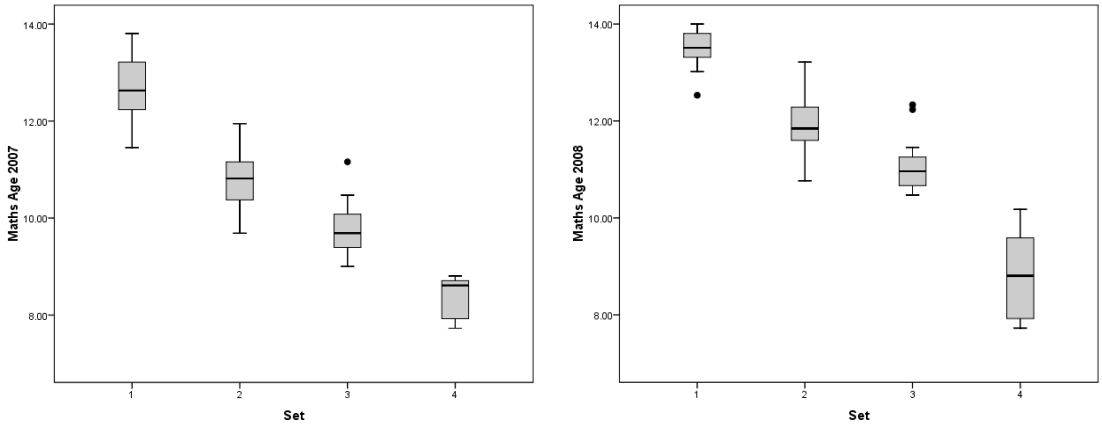

Figure 1: Boxplots showing maths ages for Year 6 pupils in each set as assessed in October 2007 and July 2008.

The first boxplot shows that in October 2007, towards the beginning of Year 6, there was a difference of approximately one year between the median maths ages of pupils in Sets 2 and 3 (Cusp Group) and between pupils in Sets 3 and 4. The difference in the maths ages between Sets 1 and 2 was slightly larger. If all pupils had received a similar educational input over the academic year, the between set differences would be expected to remain similar. However, as the second boxplot, showing maths ages at the end of Year 6 in July 2008, shows, Set 3 – the Cusp Group – has moved away from Set 4. Set 3 have made a median maths age gain of one year and 4 months, a gain of over a year more than pupils in Set 4 who made a gain of 3 months.

The gains difference between Set 3/Cusp Group and Set 4 pupils seems to suggest that the teachers' differential practices do have the intended impact of increasing Set 3 attainment, with these pupils on target to achieve the coveted Level 4 in the Year 6 SATs. However, this neglects to address the impact, both in terms of attainment and attitude, on Set 4 pupils. In their interviews, the pupils demonstrated an awareness of these differential practices:

> Samuel: The different groups get different things, I want Mr Quinton [Cusp Group], they have fun.
>
> Peter: He actually makes learning maths fun.
>
> Samuel: I would literally love to move to Mr Quinton's group. He's really really nice but I have Mr Leverton, in class he tells us to talk and then comes over and whacks the table and goes what are you doing?

Samuel, who was in Set 4, was aware he received a very different mathematical learning experience to Peter, who was in the Cusp Group. Data from further interviews with Samuel and other Set 4 pupils suggests they hold fairly negative attitudes towards mathematics and that these can be, in part, attributed to their experiences in Set 4. Whilst it is not possible to ascertain whether the Set 4 pupils would make more substantial gains if given the Set 3 experience it does appear that an ability ideology and associated beliefs allow teachers to justify such differential treatment. An unintended consequence of this is the development of self-perpetuating practices which trap Set 4 pupils into limited gains and hence a belief they have been correctly placed, resulting in the continuation of a remedial curriculum.

Restricted mathematical access

One of the commonly held ability beliefs which teachers use to justify practices such as educational triage is the association of learning styles with ability levels. Many teachers hold a view that pupils in the highest sets are auditory learners whilst those in the lowest sets are kinaesthetic learners requiring a more concrete approach. This view underlies some of the differential practices seen between sets, reflecting those in the secondary mathematics literature.

Within top sets, characterised by a fast-paced competitive environment and procedural learning, pupils are restricted in their mathematics learning due to the pupils' perceived need to strictly adhere to the taught algorithms rather than consider or develop an understanding of the underlying mathematics. Additionally, competitive practices have the potential to enhance pupils' self-interest, reducing peer support and discussion and hence restricting the pupils' mathematical experience.

In bottom sets, different practices apply, but the potential again exists for restricted mathematical experiences. Set 4 teachers at Avenue talked about caring for their pupils and wanting to ensure they were not frightened by the mathematics:

> We'll only go with numbers up to 500, we won't be going up to 5000, or 500000 … I think I'm a little bit sort of, oh, don't want to make it too hard, don't want to scare them off, keep it small … for fear of them all sort of panicking and freaking out. (Mrs Jerrett, Year 4)

With the intention of reducing pupils' fear, and drawing on beliefs that Set 4 pupils are kinaesthetic learners, Mrs Jerrett compelled the pupils in her set to use cubes for all calculations. This led to these pupils not being required to learn number bonds and relationships, and not having the opportunity to explore and use derived facts. This, as Gray and Tall (1994) assert, resulted in having to do more mathematics and at the same time restricted the possibility of richer mathematical experiences.

Educational spaces

A further consequential impact of ability practices in primary school mathematics concerns the allocation of learning spaces. Avenue Primary created more sets than classes (four sets in each year group from three classes), the rationale being that

smaller set sizes particularly in the lower sets would be beneficial to pupils' learning. However, Avenue did not have the physical space in terms of empty classrooms to accommodate the extra sets, leaving Set 4 pupils without a stable base. This represents an area with limited coverage in the literature with Fisher (2004) noting very limited consideration of the impact of physical space on pupils' learning.

Set 4 pupils at Avenue were taught in a variety of areas including infant classrooms, computer rooms and corridor spaces. At the beginning of every session there was uncertainty over where the lesson would be conducted and pupils sometimes had to move during lessons. Not having a base meant limited access to mathematical equipment. In both years 4 and 6 at Avenue, pupils in Sets 1 – 3 were taught in classrooms where they had access to supporting equipment, mathematical displays and aids such as number lines on the walls. Conversely, Set 4 pupils only had what they or the set teacher could carry, reducing the opportunity for spontaneous exploration of concepts not planned for. Additionally they were taught in areas where the displays related to other subjects, serving only as a distraction rather than a potential support for learning. As a result, Set 4 pupils were more limited in their mathematical learning opportunities due to the physical constraints imposed by setting, potentially increasing the attainment gap between them and other pupils. This limitation was raised by their set teacher during her interview:

> In our group we could have done more get up and do except in that computer room there isn't a lot of space and you know in the corridor you're a bit constrained and a bit public as well because everyone is walking through. (Mrs Jerrett, Year 4)

The issues created by a lack of physical space to meet the perceived need for practices predicated by an ability ideology suggest how widespread impacts of ability constructions are. Further, they suggest how many elements of the school day, beyond the mathematics teaching, are implicated in the reproducing ability discourses.

Discussion

This paper suggests how an ideology of 'ability', prevalent in UK mathematics education, may impact on primary school mathematics learning in many ways, some of which go unnoticed or with the impacts not fully considered. This paper has only considered three consequential practices, but with the finding of the wider study that an ideology of ability is pervasive in primary mathematics, is seems likely that there are further consequential practices. These practices, alongside more explicit ability practices, impact on very young pupils who are potentially being turned off mathematics at an increasingly young age.

It is important to stress that this paper does not blame the teachers concerned for engaging in these consequential practices. Some practices go unnoticed, yet many others are enacted from the position of care, for instance in protecting pupils from what is considered to be hard mathematics or in providing them with smaller classes and therefore, it is argued, greater teacher input. Other practices arise from external pressures which teachers feel trapped within. In order for this situation to change, teachers need the opportunity to engage with and understand these practices.

As things are currently, many of the issues arising in secondary mathematics are being seen in the primary mathematics classroom. In some ways these may be more detrimental in the primary context where the pupils' main classroom is not just a base as in secondary schools, but the centre of much of their education and their relationships with others for an entire year. This context may intensify the detrimental

impacts of ability practices, affecting the mathematics learning of all pupils. As such, we need to look beyond the most explicit practices to more fully understand the impacts of ability in primary mathematics.

Acknowledgement

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).

References

Booher-Jennings, J. 2005. Below the bubble: "Educational triage" and the Texas accountability system. *American Educational Research Journal* 42: 231-68.

Brown, M., M. Askew, J. Hodgen, V. Rhodes, A. Millett, H. Denvir, and D. Wiliam. 2008. Progression in numeracy ages 5-11: Results from the Leverhulme longitudinal study. In *Mathematical Difficulties: Psychology and intervention*, ed. A. Dowker, 85-108. Oxford: Elsevier.

Charmaz, K. 2006. *Constructing grounded theory: A practical guide through qualitative analysis*. London: SAGE.

Denzin, N. K. 1997. Triangulation in educational research. In *Educational research, methodology, and measurement: An international handbook*, ed J. Keeves, 318-22. Oxford: Elsevier Science.

Fisher, K. 2004. Revoicing classrooms: A spatial manifesto. *Forum* 46: 36-8.

Gillborn, D., and D. Youdell. 2000. *Rationing education: Policy, practice, reform and equality*. Buckingham: Open University Press.

Gray, E., and D. Tall. 1994. Duality, ambiguity, and flexibility: A "proceptual" view of simple arithmetic. *Journal for Research in Mathematics Education* 25: 116-40.

Hallam, S., J. Ireson, and J. Davies. 2004. Grouping practices in the primary school: what influences change? *British Educational Research Journal* 30: 117-40.

Hodgen, J., and R. Marks. 2009. Mathematical 'ability' and identity: A sociocultural perspective on assessment and selection. In *Mathematical relationships in education: Identities and participation*, ed. L. Black, H. Mendick and Y. Solomon, 31-42. Abingdon: Routledge.

Marks, R. 2011. 'Ability' in primary mathematics education: Patterns and implications. *Proceedings of the British Society for Research into Learning Mathematics* 31: 91-6.

Nicholls, J., P. Cobb, T. Wood, E. Yackel, and M. Patashnick. 1990. Assessing students' theories of success in mathematics: Individual and classroom differences. *Journal for Research in Mathematics Education* 21: 109-122.