

Low attainment in mathematics:

An analysis of 60 years of policy discourse in England

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Abstract

The problem of low attainment in mathematics has been an increasingly prominent feature of the policy discourse in England over the last 60 years; however, evidence from comparative studies indicates that little progress has been made in finding a solution. In this paper, we analyse the changing policy discourse of low attainment in mathematics through the main reports and speeches published in England, beginning with the Newsom Report, *Half Our Future*, in 1963, and continuing to the present day. We chart the evolving perspectives on the nature of ability, expectations, curriculum ideology and frame of reference through the changing language used in these documents, noting tensions and inconsistencies which arise through continuing lack of clarity about definitions and assumptions.

Keywords: Low attainment; mathematics; policy; educational equality

Introduction

Low attainment in mathematics is widely acknowledged to be one of the most serious problems in British education (Hodgen, et al. 2020; Marshall, 2013). Low attainment in mathematics matters to individuals in terms of future employment, earnings and life chances (e.g., Dearden et al., 2002) and thus to educational equity. It also matters to the economy and the nation more generally (e.g., The Royal Society, 2011). England has for some time been perceived by politicians and policy-makers to have performed poorly in mathematics, based on evidence from international surveys, such as the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA). Following the publication of the *Worlds Apart* review (Reynolds & Farrell, 1996) and England's 'low' rankings in TIMSS 1995, politicians, including the then future UK Prime Minister, Tony Blair, began to take a keen interest in what he described as "mass underperformance" (Blair, 1996). The 1997 White paper *Excellence in Schools* (DfEE, 1997) noted "that too many of our children are failing to realise their potential" (p. 10), described pupils as being "particularly weak in basic number and fractions and also in algebra" (p. 82) and set "challenging national targets" (p. 19) for mathematics. In the intervening period, there have been five major reports on mathematics education (see Table 1). Political interest in the level of England's mathematical attainment reached a recent peak during the Coalition Government (2010-2015), a period of intense political and policy interest in the importance and reform of mathematics education (Noyes & Adkins, 2016).

Evidence from comparative and longitudinal studies indicates that, although such perceptions are often based on partial interpretations of the evidence (Brown, 1998), these

perceptions of poor performance relative to other systems are justified (Askew et al., 2010; Leung, 2014). A particular concern is that the gap in performance between the highest and lowest attaining pupils in TIMSS 2019 was relatively large compared to most other countries (Richardson et al., 2020). Moreover, the mathematics performance of the lowest-attaining students in England has worsened, rather than improved, over time (Hodgen et al., 2011; Shayer & Ginsberg, 2009), whereas this has not been the case in other systems (OECD, 2013). Further, low attainment is correlated with students' socioeconomic status, such as eligibility for free school meals (Richardson et al., 2020; see also OECD, 2018). This is despite a plethora of policy initiatives addressing the issues of low attainment and disadvantage in education more generally (see Figure 1).

In this paper, we analyse the main policy documents and speeches from over the last 60 years in England to examine the nature and content of policy discourses about low attainment in mathematics and how these have changed over time. Lerman and Adler's (2016) analysis shows how these policy discourses exert a significant influence on the educational opportunities and outcomes for low-attaining students. This influence is not simply in the choice and design of policy initiatives that affect low attainers, but also in how resources are allocated and what outcomes are prioritised and, thus, how policy is enacted in schools. However, despite frequent expressions of intent by politicians and policymakers, the problem of low attainment has proved resistant to change. Our analysis aims to contextualise and understand current attempts to address low attainment in mathematics and, thus, to help formulate better ways to support low-attaining students in mathematics in order to improve equity in mathematics education.

Previous analyses (e.g., Ball, 1990) have started later, seeing James Callaghan's (1976) Ruskin speech as a key moment in educational policy. Our analysis begins earlier, in 1963, with the publication of the Newsom Report, *Half Our Future*, in order to trace more fully the emergence of discourses regarding low-attaining students. While earlier reports had addressed the issue of education for all (e.g., Board of Education, 1926), Newsom (1963) was the first major policy report to focus on the needs of low-attaining students (Education in England, 2017).

Although our focus in this paper is on the case of low attainment in England, we have a specific interest in mathematics education policy more generally. This national case study has wider relevance for two reasons. First, many countries have similar concerns about attainment in mathematics and mathematically low-attaining students (Hanushek et al., 2015). Second, educational reforms in England, have been widely influential across the world (e.g., Fullan, 2000), with a widespread and enduring international interest in the UK's first major report specifically into mathematics education, the Cockcroft Report (1982).

Previous research on policy and low attainment in mathematics

Although some research has used statistical data to examine the effects of policy (e.g., Parsons, 2016), or, at a small scale, case studies of low-attaining students (e.g., Alderton & Gifford, 2018), or teachers' beliefs about low-attaining students (e.g., Beswick, 2017), we could not identify any systematic analyses of policy in relation to low attainment and mathematics and its development over time. There has also been no policy analysis specifically about low attainment, although there have been analyses of education policies and disadvantage (e.g., Francis et al., 2017).

Further, since Ernest's (1991) seminal analysis of educational ideologies, building on a framework used by Ball (1990), drawn from Williams (1961), there have been few examinations of mathematics education policy in England. Those that have been published have been analyses of specific policies (e.g., Lerman, 2014; Lerman & Adler, 2016; Morgan et al., 2002; Noyes & Adkins, 2016) or micro-level analyses of schools' and teachers' enactment of policy (e.g., Golding, 2017; Perryman et al., 2011). For example, in an analysis of the impact of a specific research finding on policy, Noyes and Adkins (2016) highlighted the key role of a 'policy interlocker' (Ball & Exley, 2010), who is a key intermediary that "straddle[s] sectors and policy fields and settings" (p. 152). However, Brown, over four papers (Brown, 1996, 2011; Brown et al., 2000, 2001), examined policy tensions surrounding the development of three key innovations in mathematics education: the first National Curriculum in mathematics, the National Numeracy Strategy, and the 2010 revision to the National Curriculum.

Connelly et al. (2014) briefly outlined the evidence for the effectiveness of interventions from 1980 to 2006, and Heath et al. (2013) reviewed the evidence on New Labour's education policies and achievements between 1997 and 2010, finding some evidence for modest successes. Both highlighted very significant overclaiming of success from Labour, and a failure of the Conservative opposition; they also noted that the poor quality of statistical data seriously limits the extent to which robust analyses can be carried out.

The terminology of 'attainment' and 'ability'

In this paper, we use the term 'attainment' in preference to the term 'ability', although these terms are often used interchangeably in policy and professional discourse. By

attainment, we refer to current performance, whereas ability often has connotations of future, often ‘fixed’ performance (Francis et al., 2017).

Terms such as ‘low attainment’, ‘low attainers’ and ‘low ability’ are ubiquitous in policy discourse, although they are rarely carefully defined (Scherer et al., 2016). It is common practice now to understand low attainers as students achieving lower scores than their peers on high-stakes national assessments, such as GCSE (General Certificate of Secondary Education – the main public examination at age 16 in England). However, among researchers, multiple, and somewhat contradictory definitions are in common use, based on different norm references. For example, Geary (2011) regarded around 7% of children as having mathematical learning difficulties and a further 10% as showing “persistent low attainment” in mathematics. In this paper, our concern is with a broader group of low-attaining students, who do not go on to achieve a Level 2 mathematics qualification by the end of formal schooling, and who are, as a result, very likely to be socioeconomically disadvantaged in their lives beyond school (Dearden et al., 2002).¹ In England, this group constitutes around 35% of the age cohort (DfE, 2017) and has been referred to as “the forgotten third” (Association of School and College Leaders [ASCL], 2019).

Throughout the period, different notions of ‘ability’ have been common, and these persist to some degree. The term ‘ability’ is often used to indicate a relatively fixed, perhaps innate, level of capability. To a modern eye, this might be categorised as a *deficit discourse*; namely, “an endogenous theory – positing that the student who fails in school does so because of internal deficits or deficiencies” (Valencia, 2012, p. 2). Alternatives to this ‘blame’ model

¹ Level 2 is the terminology used in England to refer to a set of qualifications that are judged as equivalent to grade 4 or above at GCSE. Level 2 in England is equivalent to the International Standard Classification of Education Level 2.

exist, and instead stress systemic social disadvantage and the role of the educational system and society in reinforcing and reproducing mathematical low attainment among certain groups of students (e.g., Cooper & Dunne, 2000; Baker et al., 2003), including defining certain levels of achievement as failure (or success) (e.g., ASCL, 2019).

Method

We identified a sample of policy documents published between 1963 and 2020. The 1960s marked the beginning of an intense period of reform of education in England that has continued to the present day. The school leaving age was raised to 16 in 1973, which took place alongside a move away from selection and towards comprehensive schooling (Woodin et al., 2013). Following this, there was the introduction of the General Certificate of Secondary Education (GCSE), a 'universal' public examination at age 16 (1988), the introduction of a National Curriculum (1989), followed by frequent reviews (Oates, 2011), the introduction of National Testing at ages 7, 11 and 14 (from 1991), the National Numeracy Strategy at primary (1999) and subsequently the associated Secondary Strategy (2001), and an extension of education to age 18 (2008). In the period since 2010, there have been important changes to the organisation and management of schools, and to curriculum and qualifications, as well as initiatives to increase mathematics attainment and participation beyond age 16 (Noyes & Adkins, 2016).

Since 1963, numerous policy documents and reports have been published and ministerial speeches made (Education in England, 2017). For this study, our sample for analysis consisted of 42 documents, as detailed in Table 1 and explained below. These were

principally identified using the *Education in England* website,² together with two overviews of the development of mathematics education across the period (Brown, 1998; 2011).³

Finally, in order to validate this sample as representative of the policy discourse, we consulted nine expert mathematics education researchers from England, all with extensive knowledge of policy, low attainment, the history of mathematics and social justice, and through which we reviewed omissions and, where necessary, included these in our sample.

The changes in government and the key reports and speeches in our dataset are summarised on the timeline shown in Figure 1 and below:

- Eight general reports on education, which we judged to have particular relevance to low-attaining students and mathematics.
- All six major reports into mathematics education during the period. We note that one of these, Moser (1999), is primarily concerned with adult numeracy (and literacy), but we included it because we judged its central concern with low levels of numeracy to be relevant to our focus on discourses of low attainment in mathematics.
- At least one political speech on educational policy from each of the five major administrations from the mid-1970s to the present. The availability of political speeches has significantly increased over time, and it was not possible to obtain relevant political speeches prior to 1976 (and only some speeches were available prior to 2010). Our selection includes two speeches from both the 2010-2015 Coalition government and the

² The *Education in England* website provides a comprehensive list of major reports and official documents (Green Papers and White Papers), together with a selection of other policy-related documents and curricular guidance: <http://www.educationengland.org.uk>

³ We were unable to locate any other sufficiently detailed overviews of mathematics education in England, despite searching the *BSHM Bulletin: Journal of the British Society for the History of Mathematics*. We were able to locate one book chapter (Howson & Rogers, 2014) on the history of mathematics education in England, but its focus was over a period of several hundred years and gave limited information on the period from 1960 onwards.

first term of the 1997-2010 Labour administration, because of the intense political interest in mathematics and numeracy, respectively, during these periods.

- A selection of official guidance documents on school mathematics teaching over time, particularly guidance specific to the teaching of low-attaining students.
- Eight additional documents: The Ofsted review of research, *Worlds Apart* (Reynolds & Farrell, 1996), is included because of its importance in shifting the political debate towards a focus on England's comparative performance on international surveys (Brown, 1998) and its identification of what has come to be termed England's "long tail of underachievement" (House of Commons Select Committee on Education, 2015). The recent years of the Coalition government (2010-2015) were a period of contested debate and political interest in mathematics education (Noyes & Adkins, 2016). In order to capture this, we included two reports representing the positions of the two main political parties, Conservative (Vorderman et al., 2011) and Labour (Labour Party, 2014), although only the former has a specific focus on mathematics education. Finally, in order to reflect competing, less "progressive", discourses than those represented by Newsom (1963) and Plowden (1967) from the 1960s debates, we included the *Black Papers*, a set of five reports from a loose group of right-wing educationalists and others opposed to comprehensivisation, egalitarianism and progressive methods (Gillard, 2011). Only one brief document from this set of papers addressed mathematics specifically (Froome, 1969), and we analysed this, along with the overarching commentaries (Cox & Dyson, 1969a, 1969b, 1970).

Our analysis of these documents combined detailed coding with more holistic reading, following what Braun & Clarke (2006) refer to as a *semantic* approach to thematic analysis,

which aims to reflect the explicit content of the data. We adopted Braun & Clarke's six-phase process for analysis, operationalised sequentially as follows:

1. **Familiarisation:** The first two authors read all the documents in their entirety, summarised the documents and identified sections relevant to low attainment and mathematics for all (henceforth, the 'core dataset'). This process generated an initial set of codes to be used in Phase 2, together with a set of emergent themes.
2. **Coding:** The core dataset was coded by the first two authors. Initially, a subset of the core dataset was coded independently by both. Following comparison and discussion, the set of codes was revised. Based on this coding, a systematic text search was conducted to identify any additional sections relevant to low attainment and mathematics. As a result, the core dataset from Phase 1 was extended. The entire core dataset was then coded by at least one author.
3. **Generating initial themes:** Excerpts of data for each code were collated and five initial themes (*ability, language/terminology, importance of mathematics, inclusion, international comparisons*) were developed by the first two authors through discussion. Initial brief memos were written summarising each theme.
4. **Reviewing themes:** The themes were discussed first with the third author and subsequently with the project advisory group. As a result, two candidate themes (*ability* and *language*) were combined. At this stage, the first two authors reviewed the entire dataset to validate the themes.
5. **Defining and naming themes:** Extended memos were developed for each of the four themes by the first two authors, together with a narrative drawing together the four themes, contextualising the themes in relation to the existing literature and producing informative names. These were discussed with the third author and with a

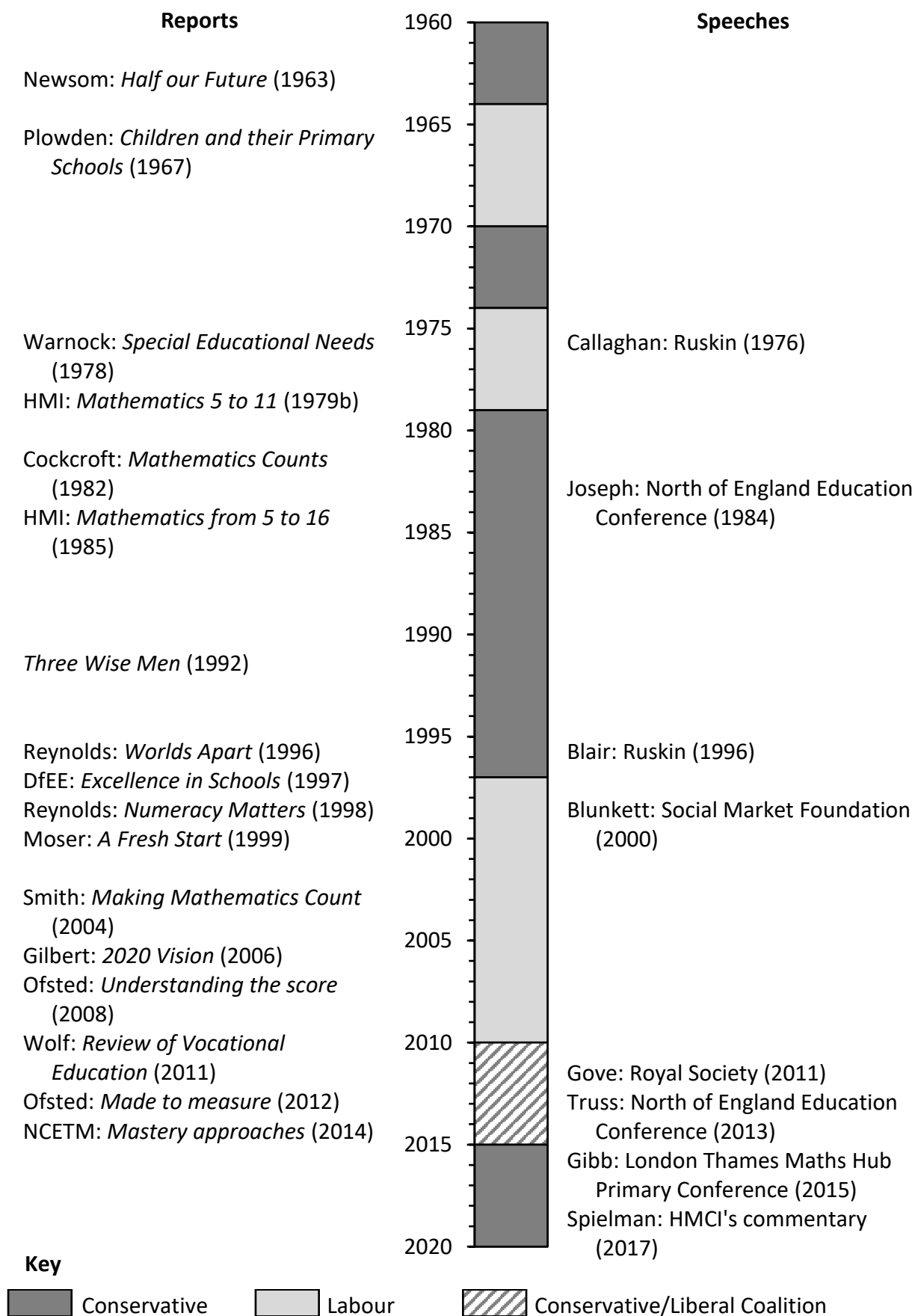
mathematics education research expert. As a result, the theme of international comparisons was renamed: *Broadening of scope in the target group and the search for solutions*.

6. **Writing up:** A full narrative was produced by all three authors.

Table 1. Documents included in the dataset

General Reports	Mathematics Reports	Speeches	Guidance	Other
Newsom: <i>Half our Future</i> (1963)	Cockcroft: <i>Mathematics Counts</i> (1982)	Callaghan: Ruskin (1976)	HMI: <i>Mathematics 5 to 11</i> (1979b)	Black Papers (1969-1977)
Plowden: <i>Children and their Primary Schools</i> (1967)	Reynolds: <i>Numeracy Matters</i> (1998)	Joseph: North of England Education Conference (1984)	HMI: <i>Mathematics from 5 to 16</i> (1985)	DES: <i>Education in Schools</i> (1977)
Warnock: <i>Special Educational Needs</i> (1978)	Moser: <i>A Fresh Start</i> (1999)	Blair: Ruskin (1996)	DfEE: <i>The National Numeracy Strategy</i> (1999)	Reynolds: <i>Worlds Apart</i> (1996)
Wadell: <i>School Examinations</i> (1978)	Smith: <i>Making Mathematics Count</i> (2004)	Blunkett: Social Market Foundation (2000)	DfEE: <i>Framework for teaching mathematics</i> (2001)	DfEE: <i>Excellence in Schools</i> (1997)
HMI: <i>Aspects of secondary Education</i> (1979a)	Williams: <i>Maths in Early Years</i> (2008)	Gove: Royal Society (2011)	DfES: <i>Keeping up</i> (2007)	DfEE: <i>The implementation of the National Numeracy Strategy</i> (1998)
Three Wise Men (Alexander, Rose, & Woodhead) (1992)	Smith: <i>Review of post-16 mathematics</i> (2017)	Truss: North of England Education conference (2013)	Ofsted: <i>Understanding the score</i> (2008)	HoC Education Select Committee: <i>Higher Standards, Better Schools for All</i> (2005)
Gilbert: <i>2020 Vision</i> (2006)		Gibb: London Thames Maths Hub Primary Conference (2015)	Ofsted: <i>Made to measure</i> (2012)	Vorderman: <i>A world-class mathematics education for all our young people</i> (2011)
DfE: <i>Framework for the National Curriculum</i> (2011)		Spielman: HMCI's Commentary (2017)	NCETM: <i>Mastery approaches</i> (2014)	Labour Party: <i>Review of Education Structures, Functions and the Raising of Standards for All</i> (2014)
Wolf: <i>Review of Vocational Education</i> (2011)				
Academies Commission: <i>Unleashing Greatness</i> (2013)				
HoC Education Select Committee: <i>Underachievement by White Working Class Children</i> (2014)				
HoC Education Select Committee: <i>Closing the Gap</i> (2015)				

Figure 1: Key reports and speeches from 1960 until the present



Themes within the policy discourse

We now discuss in turn the four themes that emerged from our analysis: changing perspectives on ‘ability’; raising increasingly inclusive expectations; growing emphases on numeracy for all and mathematics for some; and, broadening scope in the target group and the search for solutions.

Changing perspectives on ‘ability’

The language used throughout this dataset to refer to low-attaining students is frequently infused with terms relating to ‘ability’, and, from a modern standpoint, in many places might be categorised as invoking a *deficit discourse*, as we outlined in section 2 (Valencia, 2012). For example, in 1963, the Newsom Report, *Half Our Future*, examined education between the ages of 13 and 16 of pupils of what it termed “average or less than average ability” (p. xv). This usage was perhaps not surprising in a context where such pupils were in most areas of the UK separated from the ‘above average ability’ pupils at age 11+ into secondary modern schools, on the basis of psychometric tests of ‘ability’, and where the validity of the tests and the appropriateness of such radical educational separation were only recently being seriously questioned.

Furthermore, the report made the following suggestion:

Pupils who are backward in mathematics need not necessarily be excluded from assisting classmates in some of the practical mathematics work undertaken - they can gain something by noticing how others set about a job and even by holding the end of a measuring tape if this contributes to an understood purpose. (p. 151)

Viewed today, the language referring to “backward” students would be deemed unacceptable, and the suggestion that they hold the end of a measuring tape seems to imply very low expectations of students’ capabilities. However, it is noteworthy that the aim here is at least to encourage inclusion of very low-attaining students in a more able group rather than their isolation; the goal of “an understood purpose” may suggest an expectation of broader understanding.

The categories used here are interesting: in addition to the standard three-way categorisation of students by ability into ‘average’, ‘below average’ and, by implication, ‘above average’, we also have a subdivision of the ‘below average’, termed ‘backward’. At other times the categorisation is binary, as in the following quotation; yet here there is also a hint of the *progressive educator* in the recognition that what is under consideration may be the more variable notion of relative attainment, which can be affected by prior schooling, rather than some fixed intelligence trait:

when we refer to pupils in this report as 'more able' or 'less able' we are conscious that the terms are descriptive rather than diagnostic; they indicate the facts about the pupils' relative performance in school, but not whether that performance could be modified given different educational approaches. (p. 6)

Anticipating later debates, Newsom also warned against the labelling of some children as inferior or less worthy:

We had difficulty with our terms of reference. 'Average' and 'below average' are full of pitfalls. The words themselves are useful enough, as ways of trying to identify in broad terms two large groups of pupils; but unluckily they often carry emotional overtones: the idea of 'below-average ability' easily suggests 'below-average people',

as though the boys and girls so described were being regarded as generally inferior and in some way less worth educating than their 'above-average' brothers and sisters. (p.4)

In the Warnock Report, *Special Educational Needs*, published 15 years later, the negative labelling of particular students as 'deficient' is still present, yet the language used refers now to achievement rather than ability. This report concerned "school leavers of low educational achievement and social competence, many of them deficient in the basic skills of literacy and numeracy" (p. 173).

The publication of the Cockcroft Report, *Mathematics Counts*, in 1982, marked the beginning of a shift away from a deficit discourse, and firmly avoided the use of the term 'ability' altogether, referring instead to attainment, as is common practice today. Indeed, Cockcroft appears to prefer the relative term 'lower-attaining' to the more absolute 'low-attaining', with 'lower' perhaps being more suggestive of a continuous range of attainment, rather than a binary partitioning into 'high' and 'low'. Warnings against treating ability as fixed become more explicit from the 1980s onwards, and recognition starts to be given to the role of teacher expectations. For example, Alexander et al. (1992):

The mounting evidence about teacher under-expectation and pupil under-achievement means, however, that teachers must avoid the pitfall of assuming that pupils' ability is fixed. Assumptions about pupils' ability should be no more than working hypotheses to be modified as and when new evidence emerges. (p. 27)

Note that this paragraph, including the then fashionable use of the term 'under-achievement' seems ambiguous, both denying and assuming the existence of fundamental differences in ability; the caution was that potential might lie unfulfilled due to low

expectations, and thus 'ability' might not be accurately demonstrated or determined. This caution, like that of Callaghan quoted in the next section, resonates with more recent criticism of the use of levels to label students (e.g., Marks, 2014).

In the 1990s, with the exception of the *Worlds Apart* Review of international surveys of educational achievement where Reynolds and Farrell (1996) referred to "slow learners" (p. 50), reports generally seemed careful to avoid language implying fixed underlying abilities. Admittedly, as recently as 2004, the Smith Report, *Making Mathematics Count*, argued for "motivation, challenge and worthwhile attainment across the whole spectrum of abilities and motivations", which at least provides an inclusive aim and endorses high expectations, and then warns specifically of the danger of a "sheep and goats" divide (p. 8), but still seems to imply that attainment is a variable determined only by fixed characteristics of ability and motivation, although these traits are now accepted as varying on a continuous scale.

The focus on attainment rather than ability was sustained in later reports by Gilbert (2006), Williams (2008) and Vorderman (2011), until, in the 2014 Blunkett review (Labour Party, 2014), we read of the necessity for a "relentless drive to raise standards and offer equal opportunity from the moment a child is born, to all children" (Labour Party, 2014, p. 5).

Here we have reached the rhetoric of equality of opportunity (*equity*), but it does not clearly express a desire for *equality of outcome* (by giving additional support in order to remove the gap in attainment) (Askew et al, 2001).

What Francis et al. (2017, p. 7) referred to as a discourse of the "natural order" is a recurrent theme throughout these documents, particularly in the speeches of politicians of both main parties.

Raising increasingly inclusive expectations

In parallel with the changing discourse of 'ability' language, we also observed a trend towards a rhetoric of increasingly inclusive ambitious aims for all. This has already been noted in the quotation from the 2004 Smith Report. Following Newsom's warning against the labelling of children, and by implication educational triage (Gillborn, & Youdell, 2000), in his 1976 Ruskin College speech, James Callaghan, then Prime Minister, argued that:

The goals of our education, from nursery school through to adult education, are clear enough. They are to equip children to the best of their ability for a lively, constructive, place in society, and also to fit them to do a job of work. Not one or the other but both. For many years the accent was simply on fitting a so-called inferior group of children with just enough learning to earn their living in the factory.

(Callaghan, 1976, np)

It is perhaps unsurprising that a Labour politician should challenge the labelling of some sections of society as "inferior", while nevertheless implying children are endowed with fixed abilities. But apart from the differing emphasis on economic and social aims for education, there is otherwise little clear distinction between this and the 1984 statement by Sir Keith Joseph, then Secretary of State for Education, and a proponent of right-wing ideology within the Conservative Party:

Achieving our aims – to develop the potential for every child and, as a nation, to prosper in a free and fully employed society – depends much on the effectiveness of our schools. Our schools should equip with versatile competence, not just the able, or the quick learners, but everyone. (pp. 138-139)

Here, while specifying ambitious and universal aims, and acknowledging the unfulfilled potential of every child, like Callaghan he implies that such potential is limited according to

their membership of “the able”, “quick learners”, or, by implication, “the less able or “slow learners”. Hence, both Joseph and Callaghan judged low attainment to be acceptable, provided all learners had the opportunity to “prosper”.

The focus on high expectations and inclusive aims, while failing to move away from a fixed ability assumption, was also a key feature of New Labour’s education strategy. For example, David Blunkett, then Secretary of State for Education, argued:

Firstly - and most importantly - we must have high expectations of every individual pupil and we must ensure that all young people have high expectations of themselves. This is an essential prerequisite for success and underpins our entire approach. Where there are barriers to individuals learning whether inside schools or outside we must systematically remove them. We must ensure that schools individually and collectively are equipped to support and challenge pupils of all abilities and from all backgrounds.

Secondly we need to increase the diversity of provision in secondary schools, both within schools and between them. But diversity is not an end in itself. All schools need to provide a good all round education for all their pupils. (Blunkett, 2000, np)

Both these paragraphs embody underlying tensions; the first appears to unusually recognise the role of educational as well as social factors in inhibiting learning, but goes on to nevertheless uphold the principle of fixed underlying ability. The second seems to simultaneously endorse diversity and uniformity in provision, perhaps to reflect the failure to resolve the earlier tension.

This corresponds to the observation noted by Francis et al. (2017) that since the 1990s, while demanding inclusive and ambitious aims, politicians have simultaneously made

frequent calls for more grouping by ability, seemingly unaware of the already extensive practice of this in England (Taylor et al., 2020). These calls have been made in spite of empirical evidence (e.g., Higgins et al., 2018) and of international practice in high-attaining countries (Hanushek et al., 2015).

Growing emphases on numeracy for all and mathematics for some

At the beginning of the period under study, aside from the mathematics-specific reports, there were relatively few references to mathematics or numeracy in political discourse, and very few references to mathematically low-attaining students. In part, this reflected overarching concerns, and political contestation, at the time over more general and systemic reforms to education, such as comprehensivisation (Crook, 2013) or parental choice (Ball, 1990). However, during the period of study, this generic concern with education gave way to an increasing focus on the importance of mathematics and, in particular, numeracy.

In the 1960s and 1970s, the focus was on the curriculum as a whole, in which mathematics was just one element. For example, the Newsom report devoted 18 pages to the humanities (including English, 9 pages), 13 pages to “practical subjects (including the Arts)” and 10 pages to science and mathematics (mathematics, 4 pages). This broad perspective was also apparent in the HMI focus on all subjects across the curriculum (HMI, 1979a, 1985). Indeed, the *Black Papers* barely mentioned mathematics at all (Cox & Dyson, 1969a, 1969b, 1970). In the National Curriculum from 1988 onwards, mathematics became, along with English and science, a ‘core subject’ but in terms of its specification was one compulsory subject among many.

However, by the 1990s, the focus had shifted to the ‘basics’ of numeracy and literacy, due to concerns that England was being left behind by higher-performing nations (e.g., Prais, 1987). As Brown et al. (2000) explained, the response from the 1997 Labour government was shaped by tension between Blair’s modernism and Blunkett’s traditionalism. The outcome was greater emphasis on number and calculation (DfEE, 1999), alongside the promotion of ‘ability’ grouping (see, e.g., Francis et al., 2017). However, the notion of the ‘basics’ can be expanded; for example, Moser (1999) conceived of these “basic building blocks” (p.13) as enabling learners to cope with change and thus, at least to an extent, empowering:

[E]mployees and job applicants need good basic skills, not just for the current job, but for changing demands of employment. Many adults will need help to improve their skills in order to reach a level where they can not only attain employment, but are also well placed to adapt and improve their skills as the demands of the economy change. (Moser, 1999, p. 23)

By 2011, mathematics took a prominent place in educational debates, with politicians adopting various of Ernest’s (1991) characterisations. Firstly, a *technological pragmatist* position, arguing for mathematics as a basis for individual and national success in the modern world, was expressed by Truss (2013) and by those who focused on technical and vocational routes (e.g., Smith, 2017; Wolf, 2011). Second, an *industrial trainer* position, arguing for more emphasis on pencil and paper calculation, with the long division algorithm and the ‘instant recall’ of times tables in particular, was held by Gibb (2016). Third, an *old humanist* position, arguing for transmitting a body of knowledge representing the best of human achievement, was voiced by Gove (2011, np); for example: “it seems to me

genuinely bizarre that in the 21st Century so many children leave school essentially trapped in a mathematical world predating Newton and Leibniz, essentially unaware of the development of calculus". In total, this phase led to increases in the accountability of schools and colleges for mathematics performance specifically, including the reporting of mathematics (and English) performance in school league tables (Leckie & Goldstein, 2017) and a requirement for students to continue studying mathematics post-16 until they achieved a Grade 4 at GCSE (Wolf, 2011).

It is therefore clear that mathematics has been perceived as more important over time, although for *some* students, with an increasing emphasis on numeracy and the 'basics' for all. Indeed, since 2011, mathematics has been treated as having greater importance than all other curriculum subjects (e.g., Noyes & Adkins, 2016). However, noting the diverse views, there is still confusion among ministers and others over *why* mathematics is so important and what mathematics should be learnt. As the Vorderman Report put it:

Too much of the curriculum experienced by students who are currently low attainers is a trickled down version of the requirements of the top 15%, those who will go on to study STEM subjects at university. (Vorderman et al., 2011, p. 22)

It is not clear, for example, why students who struggle with basic concepts and skills to get a Grade 4 at GCSE are at the same time currently expected to learn trigonometry.

Broadening of scope in the target group and in the search for solutions

Across these reports, we see evidence of a gradual widening of concern over time. This progresses from suggestions about what to do about a specific group of "some, perhaps many" (Newsom, 1963, p. 4) students from the lower-attaining half, who were perceived as very weak in basic skills, to broader questions, with the need perceived to be to raise

mathematical attainment not just across England's "long tail" (Blair, 1996), but across almost the entire cohort (80-90%, according to Joseph, 1984, p. 140) in order to compete with other nations on the world stage.

Newsom (1963) was commissioned in the context of moves towards comprehensive education (see Crook, 2013), from a divided education system in which children of average or below average levels of attainment did not receive a fair share of educational resources (Gillard, 2011). Thus, he proposed, rather tentatively, a shift in the targeting of support:

The point is, could many people, with the right educational help, achieve still more? If they could, then in human justice and in economic self-interest we ought, as a country, to provide that help. (p. 5)

Four years later, the Plowden Report (1967) on primary education focused on child-centred approaches that emphasised the uniqueness of the individual child and a need for collaborative, inquiry approaches to teaching and learning, adopting the *progressive educator* ideology of Ernest (1991). Consequently, we see the lower-attaining group of students transitioning from being a distinct group in Newsom (and even in parts of Cockcroft) to being seen as an integrated part of the whole cohort, with a change in pedagogy as a recommendation.

With Gilbert, the rhetoric moved towards 'closing' (or 'narrowing') 'the gap', with this 'gap' representing the distance between more- and less-advantaged students within the cohort. The notion that the 'gap' may be closed or at least narrowed, suggests the rejection of fixed-ability thinking and a shift towards Ernest's *public educator* policy stance. 'The gap' is also sometimes used to refer to the distance between England and other jurisdictions, which became a strong preoccupation of Conservative governments, and in particular of Truss and

Gove post-2010. In this, we see a further broadening out, to international comparisons (Askew et al., 2010) and the borrowing of practices from high-performing jurisdictions. Whereas Her Majesty's Inspectorate (HMI) reports discussed practical matters, such as calculation and curriculum range, in an attempt to promote what was accepted in the educational community as 'good practice' used in the best British schools, the trend more recently has been to imitate practices found in areas with high rankings on international comparative assessments, such as TIMSS and PISA. For example, Gove (2011) stated that:

One of the lessons from the international evidence is that in East Asia there is much greater focus on fundamental number concepts, fractions and the building blocks of algebra in primary school. They have minimum standards that they aim to get practically all children to reach so they have a firm foundation for secondary. (np)

In referring to "practically all children", Gove uses the international context to move away from a fixed notion of ability. Thus, at least for primary children, we see a focus on adopting a uniform curriculum and pedagogical practice for the *whole cohort*, which is intended to raise standards for all.

Truss (2013) pointed to cultural differences in the perceptions of mathematics, noting that:

In our culture ... inexplicably, it is completely acceptable for adults and children to shrug their shoulders and say, laughing, 'I'm rubbish at maths' (np)

By implication, she argued, a change towards societal attitudes more typically seen in East Asian cultures could raise mathematics attainment for all. Her Majesty's Chief Inspector, Amanda Spielman (2017), took a similar line, going beyond basic skills as an entitlement:

Low-attaining pupils need basic skills, as all pupils do, but they shouldn't as a consequence be shut out of parts of the essential body of knowledge for any pupil.
(np)

The Wolf Report also expressed concern for equitable provision for low-attaining students:

However, there remains a serious risk that schools will simply ignore their less academically successful pupils. This was a risk with the old 5 GCSEs measure; a risk with the English Baccalaureate; and will be a risk with a measure based on selected qualifications. It needs to be pre-empted. (Wolf, 2011, p. 136, original emphasis)

Since 2010, a growing feature of interest in the high-attaining systems of the Pacific Rim has become the notion of *mastery* (McCourt, 2019; NCETM, 2014). The term was first used in education by Bloom in the 1970s, who argued that typically schools and teachers teach most students in the same way, and that, in order to reduce the variation in attainment among students, teachers should vary their teaching (see McCourt, 2019). More recently, the notion of mastery learning in the UK has been influenced by comparisons with high-performing countries overseas, particularly those from the Pacific Rim. Typically, these systems place considerable emphasis on *all* students grasping, or 'mastering', the key ideas in a topic (Askew et al., 2010). However, the recent use of the term in England is much vaguer and encompasses a range of approaches. Nick Gibb (2015), for example, referred to mastery as follows:

Here we are today talking about mastery - which embodies the idea that every pupil can do well and achieve high standards in maths. Mastery is the model of the high-performing Asian systems such as Shanghai, Singapore and South Korea. It delivers a meticulous approach to arithmetic, whole class teaching and focused 35 minute

lessons. Frequent practice allows pupils to consolidate their understanding, and pupils are assisted through immediate and tailored in-class questioning and scaffolding techniques. (np)

The notion of *teaching for mastery*, particularly as enacted by the National Centre for Excellence in the Teaching of Mathematics (NCETM), has thus expanded to include a large amount of what might be termed general 'good practice' (e.g., NCETM, 2104). In an interesting move for right-of-centre politicians, this has also led to expectations of uniform outcomes via mixed-attainment teaching:

Differentiated teaching is not common in Shanghai, as it reinforces the performance gap between pupils. Across the OECD as a whole, the use of differentiating by ability whilst teaching has a negative relationship with pupil outcomes ... There appears to be no conception in Shanghai that some pupils can 'do' mathematics, whilst others cannot. Instead, the focus is on all pupils mastering a concept before moving to the next part of the curriculum sequence, allowing no pupil to be left behind. (Gibb, 2015, np)

The international gaze does therefore have some potentially positive features. However, despite some good intentions, the conflation of low-attaining students' needs with the addressing of low attainment across the entire cohort seems to have led to any particular needs of the lowest attainers being overlooked and a tendency towards a discourse which Owens and de St Croix (2020) argued obscures the important structural disadvantages and endemic social inequalities faced by many students.

Conclusion

Our analysis of the changing policy discourse of low attainment in mathematics in England has highlighted the evolving language of 'ability', with the welcome shift from a deficit discourse (Valencia, 2012) towards at least a rhetoric of inclusion (see Koutsouris et al., 2020). We observed an increasing political emphasis first on numeracy and then mathematics, together with a broadening of the scope of low attainment, from something focused on a specific, relatively small group of individual students, towards the recognition of a wider, more systemic set of problems within the education system as a whole. This has been brought into particularly sharp focus in recent years through international comparisons, which have led to a dominant focus on 'mastery' rhetoric as a solution to low attainment, with its positioning of low-attaining students as needing to be included in the mainstream, but without their particular needs always being adequately addressed.

We note with concern that, despite the growing consensus regarding the inappropriateness of ability/deficit discourses (see Valencia, 2012), the policy documents examined, most of which set out to reform the system, are nevertheless still rooted in these problematic discourses. Although the most egregious examples of language and terminology derive from earlier documents within the period of study, deficit discourses are by no means confined to this earlier period.

Like all students, low-attaining students benefit from good pedagogy, and much of good pedagogy is applicable across the attainment range. However, we know from the literature that low-attaining students appear to miss out on conceptual understanding, as well as on particular strategies which appear to be especially important, such as explicit teaching and effective feedback (see Hodgen et al., 2020). We strongly concur with many of the sentiments regarding equality of access and opportunity expressed in the more recent

'raising attainment for all' discourse. However, there is good evidence to suggest that low-attaining students *do* need something different in order to achieve equality of access to mathematics (see Hodgen et al., 2020). One danger of the 'mastery' discourse is that it encourages schools and teachers to treat all learners the same and to ignore differences in the curriculum, pedagogy and support needed by low attainers.

A major danger of a deficit discourse (Valencia, 2012) is a tendency to encourage schools and teachers to prioritise remedial mathematics teaching for low-attaining students, which is often narrow, repetitive and uninspiring. Repeating without modification what has been unsuccessful for the learner in the past is unlikely to achieve a breakthrough. The assumption of a meritocratic education system contributes to placing the burden on individual schools and students to 'pull themselves up' and fails to acknowledge the serious systemic obstacles to this (see Owens & de St Croix, 2020). A number of studies have demonstrated an association between socioeconomic status and attainment (e.g., Cooper & Dunne, 2000; Gorard et al., 2012; Power et al., 2002) and between later progression and early mathematical attainment (e.g., Duncan et al., 2007). As a result, there has been a shift within research to a more sociological focus, which stresses socioeconomic factors and systemic interventions, rather than specific approaches to pedagogy (e.g., Duckworth et al., 2009), since the causes and solutions are perceived to lie largely outside the mathematics classroom. However, as Dunne et al. (2011) observed, the obstacles faced by low-attaining students include in-school factors such as:

difficult group dynamics; insufficient learning challenges; low motivation, self-esteem and aspirations; working mostly as a whole class rather than in small groups;

reduced likelihood of being taught by more experienced teachers or subject specialists; and increased experience of changes of teacher (p. 488)

Despite the considerable interest in low mathematical attainment at a political and policy level, as an important aspect of 'narrowing' the attainment gap (e.g., Marshall, 2013; Truss, 2013), there has been until recently relatively little systematic research into low attainment in secondary mathematics, especially into strategies to address low attainment. In a recent secondary meta-analysis of the literature addressing low attainment in mathematics (Hodgen et al., 2020), we found the research evidence about low attainment in mathematics to be limited and fragmented. Among the 76 meta-analyses and 31 other relevant papers (mainly systematic reviews) we identified, we found evidence on the effectiveness of pedagogical approaches to teach specific mathematical topics to be severely limited, with most studies being carried out in the US. We found relatively little research addressing the mathematical understanding of the broader group of low-attaining secondary students, or demonstrating what approaches are effective at addressing these students' difficulties. Until mathematics education research can provide some of these much-needed answers to these questions, the experience of low-attaining students in mathematics is likely to remain a serious cause for concern. However, it is difficult to attempt to address the problem of low attainment as purely a technical problem of teaching pedagogy when it is embedded within an inequitable society and education system. Operating within a background of contested educational ideologies does not help, and it would seem that some elements of each of Ernest's (1991) five discourse positions (old humanists, industrial trainers, technological pragmatists, progressive educators and public educators) could have a role to play in a balanced educational approach. These tensions will not go away, and more pluralist approach would seem to be productive, in order to

generate policies that are more robust to changes in government (e.g., the National Numeracy Strategy), that seek robust evidence and eschew the confusions generated by overclaiming (Heath et al., 2013), and that offer something to advocates of all perspectives. However, while elements of a deficit discourse persist, this will be extremely difficult to achieve. We have shown how the interest in international comparisons has highlighted how low attainers in England fare worse than low attainers in some other educational systems, and how this has led to a focus on general pedagogic approaches and increased school accountability. It would also be productive to consider how these educational systems respond specifically to the needs of low attainers. In Singapore, for example, low attainers take their statutory mathematics examination a year later, thus offering students more opportunity to learn, without the stigma of failure attached to retaking the GCSE post-16 (Hodgen et al., 2013). Such policies indicate that it is possible to “close the gap” in ways that appear to be beneficial to low attainers.

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