Choosing and using curriculum resources in primary mathematics

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In 2016 the Department for Education (DfE) launched a match-funding scheme to support primary schools (ages 5-11) in England to purchase approved mastery textbooks. This funding opportunity – and the potential changes to mathematics pedagogy within a school that textbook adoption brings – comes at a time when there is a dearth of understanding around curriculum resource (including textbook) use in primary mathematics, particularly in terms of large-scale investigations. Our ongoing Nuffield funded project engages with this gap, using a population wide survey to identify what is being used and to understand some of the decisions primary schools make around resource adoption and use. This interim paper presents tentative outcomes from early analysis of our survey, providing an initial picture of resource adoption, identifying some of the reasons behind these decisions, and noting the influence of Covid-19 on the adoption decisions schools have made.

Keywords: curriculum resources; textbooks; primary; large-scale survey

Introduction

Since 2016, the Department for Education (DfE) in England has invested £76 million in providing primary schools in England with grants to purchase DfE-approved textbooks to support the teaching of mathematics. This initiative, grounded in longstanding concerns about mathematics attainment in England, draws evidence from international comparisons of teaching practices in high-performing jurisdictions (Askew et al., 2010; Oates, 2011). Each of the approved textbooks (Maths – No Problem! and Power Maths for KS1 & KS2) is underpinned by a Teaching for Mastery (TfM) approach grounded in East-Asian principles. These include carefully sequenced lessons, an emphasis on procedural fluency and automaticity alongside deep conceptual understanding, and a philosophy that all children can succeed (Boylan et al., 2019).

Between 2016 and 2020, DfE funding to support textbook purchase took the form of match-funding of up to £2000 for schools who were part of the National Centre for Excellence in teaching Mathematics (NCETM) Teaching for Mastery programme. From the beginning of the 2020/21 academic year an 80% subsidy has been available. This subsidy has a cap based on the number of pupils on roll; schools identified by the DfE as having a high proportion of disadvantaged pupils were contacted and invited to express interest in receiving this subsidy. The DfE aim is that by 2023, 9,300 primary schools will have had access to DfE funding (approximately 55% of primary schools) with the recommendation accompanying the subsidy scheme that schools "buy into full sets of textbooks, workbooks and teacher guides to see the most benefit" (NCETM, 2021).

However, historically, the use of textbooks in primary mathematics in England has been minimal. Indeed, in the last international study that surveyed textbook use in primary schools, England recorded the third lowest use in the 36 countries surveyed (Mullis et al., 2008); moreover, at this point the use of textbooks was declining with the

authors commenting that England appeared to be "working towards only supplemental use or no use at all for almost all students" (p.289) in relation to students at the primary level. Instead, many primary teachers have developed 'patchwork' approaches to teaching mathematics, creating, and sourcing their own curriculum resources. A move towards the use of a textbook or single whole school scheme thus represents a significant shift, organisationally, culturally, and pedagogically.

Within the context of the DfE funding schemes and the increasing emphasis on the use of textbooks in primary mathematics in England, this project used a large-scale quantitative survey to establish the prevalence of textbook and curriculum resource use in primary mathematics across England and to understand how textbooks and curriculum resources are currently used in primary mathematics. Our definition of textbooks and curriculum resources draws on CGR/DfE research to include online/printed, digital and physical resources "linked directly to curriculum delivery" (2018, p.4). This allows us to examine where DfE funded textbooks and other whole curriculum schemes fit within the broader landscape of resources used by teachers to structure their teaching and develop children's mathematical capabilities. This methodology also enables identification of how different factors, including proxies for pupil disadvantage (e.g., geographical location, free school meals status), impact textbook adoption and use. Specifically, we sought to respond to the following research questions:

RQ1 What are the current trends in the national and regional uptake of textbooks in primary mathematics in England?

RQ2 How are textbooks being used in English primary schools?

RQ3 How does eligibility for DfE-approved textbook funding affect (RQ1) and (RQ2)?

In this paper we begin to map the landscape of textbook and curriculum resource adoption identifying some of the influences on adoption decisions.

Textbook research

Textbook research is a developing, but rapidly growing, field of study (Trouche & Fan, 2018). Despite some notable exceptions (e.g., Millett et al., 2004), the majority of UK based textbook research has focussed on secondary education, employing qualitative methodologies involving small-scale case-studies and documentary work. While this has contributed to existing understanding, there have been calls for further research, in particular, that which "survey[s] the full range of resources from which teachers select" and their reasons for selection (Siedel & Stylianides, 2018, p.123).

Existing instruments capturing textbook use are limited, with a focus on learners' use of textbooks or alignment with the curriculum (e.g., Polikoff et al., 2020), rather than school-level decision-making. Since the last school-level survey of textbook use in primary schools (Mullis et al., 2008), there have been significant changes in primary mathematics education. Additionally, within this previous survey, textbook use constituted just one of the 41 items on the Teacher Questionnaire, asking whether teachers used textbooks as a primary or supplementary resource.

Study design

This study involved a quantitative survey; the instrument addressed the prevalence of textbook and curriculum resource use in English primary schools together with the decisions schools have made about the selection and use of these materials. We drew on the themes of earlier instruments (Mullis et al., 2008, Boylan et al., 2019) and

developed new items to elicit decisions about textbook adoption, school-level use of textbooks, and change in use over time. The survey was designed to collect data relating to schools' current practices (21-22 academic year) and included a focus on the influence of the Covid-19 pandemic on decisions relating to resource use. Additionally, for schools eligible for and taking up DfE funding, questions addressed the timing and detail of purchases within and after the year in which they accessed funding. The instrument consisted of multiple-choice questions with free-text boxes to capture additional information relating to the rationale for decisions. Fields within the survey (e.g., school Unique Reference Number (URN), school name, and address) enabled us to reliably match survey responses with the extensive demographic data freely available via the DfE 'Get information about schools' portal (DfE, 2022).

The survey items were refined following discussions with our project Advisory Group and an Expert Teacher Panel. The survey was developed using JISC Online Surveys, the questions piloted, and the survey tested for use with a range of web browsers, and on computers and mobile devices. The survey was directed to the mathematics lead teacher in each school through an education database provider.

Survey population, implementation and achieved sample

Our target population was mathematics lead teachers (commenting on school-level practices) working in state-funded primary schools in England. The primary phase is organised in slightly different ways across different localities, and we therefore included First, Infant, Junior, Primary, all-through schools, and some Middle schools, all educating children in all or part of the primary-phase and amounting to around 17,000 institutions. We excluded special schools, pupil referral units and other alternative provision, where textbook use is unlikely to be in-line with that intended.

Given the known low return rates on similar surveys (e.g., Taylor et al. 2022) we included all 17,000 institutions in our survey. The survey was administered between late November 2021 and the end of January 2022. During this time, rates of Covid-19 infection in England were extremely high, with over 234,000 daily cases (UK HSA, 2022). The resulting staff and pupil absenteeism and necessary focus on practical adjustments in schools are likely to have had an impact on survey response rates. 664 valid responses were received and although this only represents a 3.9% return rate, this is in excess of the 639 required to establish representativeness to the population. Sample checks (using Pearson's chi-squared test and sample t-tests) confirmed that there were no significant differences from the population distributions on the following demographic indicators: School type (e.g., LA, Academy); Age phase; Number on roll; Free School Meal eligibility; Ofsted rating; Geographical region in England and Rural or urban setting.

Data analysis

Raw response data was imported into Excel and merged with DfE demographic data using variables (e.g., Unique Reference Number) to verify cross-referencing. Free text data was coded against themes relating to the research questions. Data analysis is at an early stage and thus far has comprised the use of descriptive statistics and graphing which is beginning to build an account of current practices and trends at a national level across primary schools.

Further analysis will continue the use of descriptive statistics alongside multiple regression analysis at a sub-group level to provide specific information about the impact

of the DfE funding initiative and deepening our understanding of how the prevalence of textbook use is distributed across groups and how group characteristics impact on textbook use patterns.

Initial findings

In relation to the range of resources used in schools, initial discussions with our Expert Teacher Panel, our project Advisory Group and with members of the BSRLM Early Years and Primary Working Group identified 64 curriculum resources which were known to be in use in English primary schools. These included textbook and online schemes, and supplementary resources, including those that target either one aspect of the curriculum (e.g., mathematical reasoning) or one aspect of provision (e.g., homework). Survey respondents were invited to indicate which of these resources were in use in their school and included 'other' as an option, with a free text box for further details.

In addition to the 64 curriculum resources detailed in the survey, survey respondents' additions resulted in a total of close to 100 curriculum resources in use across the country, substantially more than our initial discussions had elicited. In terms of prevalence, one resource was used in some way by more than 80% of schools and a further 4 resources were used in some way by 60-79% of schools. It is noteworthy that of the five most frequently reported resources, only one is a whole curriculum scheme. At the other end of the spectrum, responses revealed over 80 resources in use in some way by fewer than 20% of schools. It is important to note that this refers to the identified resource being in use somewhere in the school; no indication as to the frequency of use of any resource or the centrality of it to mathematics teaching and learning was specified in responses to this question. Figure 1 represents the percentage of primary schools in the sample using each of the 30 most frequently reported curriculum resources in some way. What this indicates is that whilst the curriculum resource landscape appears to be dominated by a small number of widely used resources, it is evident that a broad range is in use across the country, albeit each by a small number of schools.
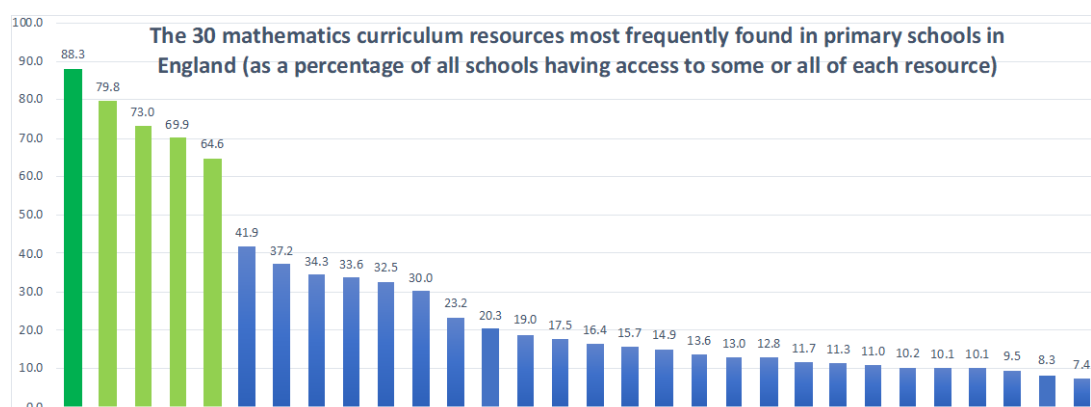

Figure 1: The percentage of schools using each of the most frequently found curriculum resources [curriculum resource names redacted to protect anonymity]

The practice of multiple resource use indicated by the above data is also reflected in responses which reveal that close to half of schools have no main resource on which they base their teaching but draw from a range of sources. With just over half drawing mainly from one resource (textbook or whole curriculum scheme) but supplementing from other sources where needed, this leaves only a very small

proportion, approx. 3%, of schools reporting the use of one sole resource. Free text comments from those using either one main resource supplemented where needed, or one sole resource with no additional supplements provide some important context for these decisions. Frequently cited was confidence that curriculum coverage, progression and consistency of approach across the school are catered for via this approach:

> We needed consistency and a progressive approach and [to] ensure good coverage at the correct level

Reflecting the structured nature and guidance provided, the use of a main or sole resource was also seen to provide subject knowledge support for primary teachers:

> The structure helps support new teachers

> [RESOURCE] provides excellent support for non-specialist Maths teachers

Additionally, support for the development of a mastery approach, or features of it (such as the 'concrete, pictorial, abstract' progression in representation of mathematical ideas, or a 'small steps' approach) was frequently cited as a reason for selecting a sole or main resource:

> We trusted it, liked it, it supported our Mastery approach…. and we like the way that it has evolved and been adapted

> We wanted a CPA approach and [RESOURCE] was fabulous quality.

Responses to this question also indicated the impact that the Covid-19 pandemic had and continues to have on resource adoption decisions. The need to teach remotely during times of lockdown, and then later cater for children isolating and not able to be taught in school, appears to have provided an opportunity for publishers offering materials designed for online use; these adoption decisions appear to have been maintained despite a return to more normal school operation:

> The main reason was the pandemic. [RESOURCE] offered us a way to teach remotely and maintain some level of work life balance

> We were using [RESOURCE A] prior to lockdown, but [RESOURCE B] had the most accessible offer for home learning and we stuck with them

> After researching, we felt [RESOURCE] gave us the most freedom to adapt and this proved to be a good decision in lockdown due to their home learning content that helped us to be consistent online and in school

Conclusions and next steps

Analysis of the substantial data set generated from the main survey is still at an early stage and this necessitates the tentative nature of outcomes reported here. As such, conclusions must also be seen as indicative. Nevertheless, what is emerging at this stage is a landscape of multiple curriculum resource use in English primary schools. Indeed, whilst many schools cite the development of mastery approaches as a rationale for their resource adoption decisions, schools are rarely following the practice of East-Asian and other jurisdictions of operating a sole resource use model. We are additionally able to identify that the requirement for remote teaching and home-based learning has impacted on resource adoption, importantly in a manner that appears to have persisted, possibly enabling some publishers to increase their market share in a way that may otherwise not have been the case.

Acknowledgements

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