# Examining newly qualified teachers' use of textbooks to support a mastery approach to mathematics teaching in primary schools

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This paper reports findings from a small-scale case study of four primary schools in England who have adopted mastery textbooks/schemes for their mathematics teaching. We focus on the case of Newly Qualified Teachers (NQTs) who bring to their first post recently developed understandings of mathematical learning theory together with limited experience in the classroom. In joining a school undergoing what Mathematics Subject Leaders (MSLs) hope to be transformational change in mathematics teaching practices, they face a unique combination of issues: how to learn to take responsibility for their pupils' mathematics learning, developing their understanding and practices of mastery, and managing the structure, organisation and recommendations of the textbook/scheme. Our focus was on how these NQTs, supported by their schools, managed these three complex – and sometimes contradictory – aspects, and the role textbooks played in managing their journey through these issues.

**Keywords: textbooks; mastery; newly qualified teachers**

## Introduction and context

Education sits highly on the agenda of politicians and lay-people as vested parties attempt to find the panacea to school improvement with one – not always stated – aim being to move England up the international comparison tables. It is within this agenda that 'Teaching for Mastery' and its incumbent practices, borrowed from the high-performing education systems of Shanghai and Singapore, has come to play an increasingly important role in mathematics education in England. While not explicitly stated as such, many have regarded the current mathematics national curriculum (DfE, 2013) as a 'mastery curriculum'. In response, programmes and resources have emerged to support individuals and schools in implementing 'Teaching for Mastery'.

Recognising the challenges inherent in implementing a mastery approach in primary mathematics, and looking to the practices of the highest performing jurisdictions, the government, through the Maths Hubs, have promoted the use of high quality textbooks to support schools and teachers in implementing a mastery approach. The use of textbooks in England has a controversial – if not in many cases, warranted – past. Textbooks have historically been evaluated as being of poor quality relative to other countries with mathematical rules and facts presented in an unstructured manner, language limited or absent, and investigation minimal (Haggarty & Peppin, 2002). The new wave of quality textbooks purports to move away from these earlier concerns with the structuring of research-informed content and approaches providing coherence and a theoretically driven pedagogic basis. Currently, the Department for Education (DfE) approves two textbooks for primary mathematics: Maths No Problem! and Power Maths (Key Stage 1). The role of the teacher is central to these programmes, with teacher guides (either printed or online) and extensive programmes of professional development.

### *Research aims and questions*

This research focussed on the use of textbooks as a central feature of 'Teaching for Mastery'. We use the term textbook to refer to physically published textbook schemes and materials as well as online programmes (e.g. White Rose), reflective of the materials in use in classrooms today. Our study aimed to explore how NQTs made sense of, and were supported to use, textbook approaches. This research was underpinned by three questions:

1. What is the nature of primary NQTs' understanding of a mastery approach?
2. How do NQTs make use of textbooks to translate theory into practice?
3. How are NQTs supported to understand the role of textbooks in the transfer of theory to practice?

## Research approach

This research took the form of a small-scale multi-site case study, involving four primary schools in urban settings in the South East of England. Each school used a mastery textbook for the majority of their mathematics teaching and had done so for at least a full academic year. Across the schools, textbooks used included: Maths No Problem! (MNP); Inspire Maths; and White Rose (WR), reflective of the schemes and programmes predominantly used in the geographical area in which the research was conducted. White Rose, although not a physical textbook, shares many of the features of textbook programmes and is central to the mathematics provision in many schools.

Site visits were made by two members of the research team. At each site we conducted an observation of the NQT teaching using the school's selected textbook, an interview with the NQT, and an interview with the MSL (recorded here as pseudonyms) The NQT observations were carried out to provide a stimulus for the subsequent interviews and did not include any evaluation of the quality of teaching or textbook use.

The eight interviews were transcribed and thematically analysed. Theoretically driven codes were initially used to code one interview with the coding scheme refined inductively as themes arose from the data. New codes were agreed and added to the coding structure, allowing for the development of a unified coding scheme. Intercoder reliability checks ensured both coders were applying the codes consistently and in the same ways. Following coding, the grouped codes provided the thematic framework which drove the accounts underpinning the discussion presented here.

## Findings and discussion

### *NQTs' conceptions of mastery*

The NQTs described a complex and interconnected understanding of mastery, both as a goal and as an approach. When considering the goals of mastery, they frequently referred to 'depth' which they interpreted to mean children understanding 'why' or making connections:

> Mastery [is] their deeper understanding and to know why they're doing what they're doing. (Taylor, NQT, MNP)

Related to this was evidence of the NQT's intention to enable children to develop and use flexible solving approaches:

> It's promoting different ways of thinking rather than just I need to follow these steps to get the answer. (Phil, NQT, Inspire)

In both cases, the focus on 'why' and on making connections brings to the fore the NQTs' awareness of conceptual and relational understanding, and while not always citing Skemp (1976) specifically, echoes of such theory underpinned their thinking and actions. While the focus on conceptual understanding was strong, we do raise the question of the extent to which this emphasis came at the cost of a weakened focus on other elements, for example the development of knowledge of number facts, the learning of formal algorithms or strategies for extended problem solving.

The NQTs also understood mastery to comprise of a set of connected teaching approaches. Among these was a view of mastery as a collective activity in which children were engaged in the same or similar learning activities and were seated in mixed-attainment groups. Within mixed-attainment classroom arrangements, NQTs valued the opportunities provided for collaboration, talk and mathematical thinking:

> When they're part of a collaborative group it might be that you have to argue why you think actually yours is the right answer. (Daryl, NQT, WR)

It was noted that in enacting a mixed-attainment approach, readying children for subsequent lessons was essential. As such, intervention was understood as an essential element of taking a mastery approach:

> When I look at the children's maths books at lunch I'll identify any children that have really struggled this morning that I haven't picked up in the lesson or that I think need a little bit more support and they'll have over-learning this afternoon. (Taylor, NQT, MNP)

> They'll then come to same day intervention this afternoon and then hopefully I can then pre-teach a bit of tomorrow before then we move on. (Daryl, NQT, WR)

Mixed attainment teaching was not seen, however, as unproblematic. NQTs found themselves presented with a problem of how to enable all children to access the same learning outcomes while ensuring the learning was pitched appropriately for each individual. While all the NQTs displayed a desire and willingness to enact mixed-attainment teaching, they were not always able to find ways to ensure all children could access the same learning outcomes. In such cases, teaching assistants (TAs) were deployed to provide alternative provision.

A common response to the diverse and wide-ranging needs of a class – essentially a significant prior attainment gap – was to use mathematical representations in a flexible manner, allowing for the development of 'deep' understanding, but also as a form of differentiation. Specifically, representation was described as a means through which pupils could access the mathematics:

> It's about all the children having the same learning intention but giving them the different resources to be able to get there. (Taylor, NQT, MNP)

Beyond the use of representation, the NQTs also talked about simplifying the learning focus as important in a mastery approach, ensuring that the learning objective was accessible to all:

> To make them understand [the lesson objective] I had to simplify… the simpler nature of it means that you can… everyone's understanding it. (Daryl, NQT, WR)

### *Structure and progression*

Textbooks offer structure both in the way that learning is organised over time, and in how learning is structured within individual lessons. This appeared to be key to

supporting NQTs to translate theory into practice because operating within these structures provided the NQTs with a strong degree of security:

> So that's what I think's quite good about this scheme, is that right from reception to year six it's all laid out with what they learn in the same order… it's a rigid structure, but it does just work. (Sam, NQT, MNP)

> Coming into a new school, a year group I've never taught in before and it's my first year of teaching, it is really useful to have a structure that says here's the progression, this is what we're trying to get to… I'd have a lot more questions and doubts …if I didn't have the textbook. (Phil, NQT, Inspire)

While Sam noted a consistency of approach to medium term planning, Phil connected the structure provided by textbooks to the particular circumstances often faced by NQTs: an unfamiliar class, unfamiliar year group and limited experience on which to base pedagogic decisions. For these NQTs, the textbook supported decision making and removed some of the many uncertainties faced in their first year of teaching.

Lesson structure was a feature addressed by the three NQTs whose schools are using hard-copy textbooks rather than an online scheme. Here, the NQTs described how organisation of each lesson was drawn from the textbook; their descriptions reflecting confidence with the organisation, and importantly, the purpose of different aspects of the lesson in supporting learning and assessment.

### *Teacher autonomy*

The NQTs recognised the balance that needed to be struck between following the recommendation of the textbook and drawing on their own decision making. Their sense of autonomy in not being bound by the textbook, together with a clear sense of being responsible for decision making, was evident:

> The point isn't that you just take it [the outline on the scheme website] and you just use that. It's just a short paragraph written about what the aim of that lesson is and then we put it into this format [school lesson plan template] with those key questions. So it's designed for you to not copy and paste. (Sam, NQT, MNP)

This expectation of, and recognition of the importance of, teacher autonomy in mediating the textbook's use was echoed by the MSLs:

> I wanted them to be able to get it to work for themselves and still be able to be an individual teacher and not have to be a robot and do it in a certain way. (Jamie, MSL, MNP)

Thus, there was no indication from either the NQTs or MSLs that using a textbook reduces the teacher's role to that of a "technician" (Boyd & Ash, 2018, p.221). Moreover, the full involvement of NQTs alongside more experienced teachers in actively mediating and making decisions about how the textbook or online scheme is used was evident across all interviews.

### *Translating theory into practice*

Interviews with the NQTs revealed explicit awareness of some connections between theory and practice in their use of textbooks. For example, all of the NQTs spoke of the importance of the use of representations, some explicitly making a connection between Bruner's (1966) theory of representation and the use of enactive, iconic and symbolic representations of mathematical ideas, and the concrete, pictorial, abstract approach that is characteristic of Mastery teaching. For some NQTs, this was heavily influenced by the focus on the use of representation during their Initial Teacher

Education (ITE), which provided them with a theoretical foundation for the use of resources in their mathematics teaching practice.

A second clear link with theory arises in the NQTs' frequent reference to the importance of a pedagogical focus on understanding as well as a focus on competence in processes, linked to Skemp's (1976) work on relational and instrumental understanding. This was connected to their perception of mastery as aiming for depth of understanding. This awareness of the need for children to have time to deepen their understanding was evident in all of the NQT interviews and underpinned the confidence to adjust lessons to better meet the needs of their class. NQTs felt that the textbook supported them in doing this.

From this small-scale research, it appears that a strong focus on specific theoretical aspects (in this case, depth) precludes a focus on other aspects of mathematical pedagogy and a mastery approach. Such broader aspects were not forthcoming in the interviews with the NQTs. For example, while they described the small steps taken as part of their textbook approaches, an understanding of how this built over time into a coherent whole was not evident; though faith that it would was clearly reported. Secondly, the use of procedural and conceptual variation (Hodgen, Monaghan, Shen & Staneff, 2014) was less well understood. However NQTs were not alone in this development need as noted by two of the MSLs:

> That's [variation] something that we're trying to embed, but we're quite early on in that journey of actually understanding what that really means. (Bobbie, MSL, WR)

## Professional development and support for textbook use

The NQTs talked positively of the individualised support they had received in school to support their use of the textbooks. This came from their NQT mentor, the MSL or year group colleagues. Wide-ranging support included team teaching, observing the MSL or other colleagues, watching videos of colleagues teaching, being observed, planning sessions with the MSL, collaborative (year group) planning, ongoing discussions and drop-in advice. It is evident that the MSLs in our case-study schools, the NQTs' mentors and their year group colleagues invested significant time to support this aspect of NQT practice:

> We did a lot of team teaching at the beginning. I had someone come in my classroom once a week to team teach … which is so helpful. (Sam, NQT, MNP)

Additionally, frequent staff meetings supported professional development across the staff team:

> We kind of looked at that [generalisations] as a whole staff, which was really good and an opportunity to actually to discuss it with other year groups as well…..so it's consistent across the school. (Taylor, NQT, MNP)

Here, Taylor describes a collaborative development, not an exchange where the NQT is the recipient of advice. The structure and recommendations of the textbook thus provide a focus around which pedagogical discussions are regularly held, as school teams, including the NQTs, sought to maximise the impact of textbook use on their children's learning. The importance of this ongoing investment in professional development was recognized as essential by all MSLs:

> It's not going to be something that stands still. It has to keep on developing. (Stevie, MSL, Inspire)

For the three schools using physical textbooks, intensive (over several days) publisher led training had also been a feature of their initial textbook introduction in the years prior to the NQT joining the school. While highly evaluated by all MSLs, we found a large variability in the number of school staff who had attended such intensive training, from all staff bar the NQT in one school to just the MSL in another. Cost will clearly be a factor in the decisions schools make regarding such training; we note a differing impact on the responsibility placed on the MSL to provide support for staff, including the NQT, arising from these decisions.

## Conclusions and recommendations

Within six months of taking up their first posts, the NQTs in this study were already demonstrating understanding of many key components of a mastery teaching approach. Unsurprisingly there is more for these NQTs to learn and in this regard, ITE, schools and textbook publishers all have a role to play in making explicit the connections between learning theory, mastery and the structure and organisation of textbooks.

The use of textbooks provides support through structure and progression without reducing teacher autonomy. We found a reassuring confidence in decision making on the part of the NQTs interviewed, together with an understanding of their responsibility, (not the textbook's) for pupil learning and progress.

Support for induction of NQTs into the use of textbooks needs to be comprehensive, ongoing, explicitly linked to theoretical underpinnings and connections, and to increasingly address the more subtle features of textbook structure and organisation. While publisher-led intensive training may not be appropriate in their first year, the benefits that those attending such training have derived from it suggests that it would be a worthwhile investment in supporting new teachers in their second or third year of practice.

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