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**E822 EMA Dissertation - SSI**

*Teachers' interpretations and classroom practices in relation to 'mastery' teaching in mathematics: a case study of one English secondary school.*

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**Abstract**

Through a case study analysis of one English secondary school, this dissertation aims to understand teachers' interpretations of mastery mathematics teaching; a pedagogical approach adopted by some schools in England, in the hope to emulate the academic successes of pupils in South-East Asia. A literature review revealed, although the principles of mastery are consistent, the finer details and depth of knowledge needed to deliver them in practice is unclear. Through interviews and policy documents, the study explores modifications teachers make as part of their classroom practice, variables they consider when making adaptations, and perceived evidence of mastery on pupil progress.

## Chapter 1: Introduction

Teaching for mastery has become increasingly commonplace in English secondary schools over the last five years. The adoption of mastery began in English primary schools, principally as a result of the mathematics teacher exchange (MTE) longitudinal programme (Boylan et al., 2016). Leaders believed incorporating mastery practices into mathematics lessons would improve academic outcomes in England, and they could hence mirror the attainment of pupils in South-East Asian countries, who had already been utilising mastery techniques for several years. After the MTE, the Department for Education (DfE) established national ‘Maths Hubs’ to deliver training to participating schools. Training is centred around ‘five key ideas’ which were developed by The National Centre for Excellence in the Teaching of Mathematics (NCETM, 2014; 2017). They include coherence, representation and structure, variation, fluency and mathematical thinking. Some of these already reflect the longstanding key aims of the national mathematics curriculum, to develop fluency and problem-solving skills in pupils studying mathematics (DfE, 2014; 2019).

Through a small-scale investigation (SSI), this case study of one English secondary school aims to look at how teachers interpret mastery mathematics teaching; and significantly, if, when and how their practice changes to teach for mastery. The literature surrounding mastery highlights inconsistencies (Hammersley, 2004; Westbrook et al. 2013); notably, what educators are told constitutes mastery teaching; what practice looks like in the classroom; and how much training individuals receive, for example how much, in what format, and by whom. The continuing professional development (CPD) offered to teachers in England appears unpredictable and sporadic, both in terms of content and delivery (Yuan and Huang, 2019). It is important to comprehend what teachers’ understanding of mastery is, both theoretically and in practice. Ultimately, aspects of mastery teaching from South-East Asia seem to have been incorporated into English schools, but not all. It is not clear whether the seeming disparities are due to funding, transferability issues, cultural or structural differences between schools, issues in leaders delivering and organising training, or other reasons altogether (Fullan, 2015). The SSI aims to provide more research on this current and pertinent topic in the mathematics teaching arena. Information could prove meaningful, if for example there proves to be variations on the original idea of mastery teaching from Singapore and Shanghai.

This study focuses on the following interlinked research questions:

- 1) How do mathematics teachers interpret ‘mastery’ teaching and what, if any, modifications do they make in their own classrooms?
- 2) What variables do they consider when making adaptations?
- 3) What, in their view, counts as evidence of pupil learning and progress as a direct or indirect effect of the use of ‘mastery’ teaching in their own classrooms?

These questions will allow an exploration into teacher agency in relation to mastery mathematics; agency being one of the key module themes from the master’s programme (Andrews, 2003; Bahou, 2011). The rationale behind these questions is to understand how teachers interpret mastery teaching, if and how they use mastery in practice (pedagogy), and what effect they think it may or may not have on pupils (assessment attainment, for example). Furthermore, whether teachers’ concept of mastery teaching aligns with the mastery principles set out by the National College for School Leadership (NCSL) and NCETM after the MTE (NCSL, 2013). The research questions have evolved since TMA01 to also consider the different variables that might influence teacher practice, for example pupil age or contrasting attainment groups. The structure of the school, cultural and transferability issues need to be explored as part of the change innovation process; raising the question can mastery ever be employed in a uniform way when going from South-East Asian to English schools (Boylan et al., 2016).

The setting for this research is a medium, average sized secondary school mathematics department in the North of England. Mathematics teachers in the setting, School A, are instructed to teach the mastery way. That is, to follow the principles of mastery teaching as prescribed by the NCSL and NCETM, and for mathematics teachers across the academy trust to coordinate practice to consistently ‘teach for mastery’ (School A, 2022). In recent years, as mastery teaching has increasingly taken off in English secondary schools, individuals in School A have questioned the implementation of the mastery programme. It has been observed that teachers have received varying amounts of training from different providers, and that there has been no benchmark to assess the effectiveness of mastery teaching in terms of pupil progress. The study therefore aligns with the interpretivism paradigm, aiming to construct meaning from researcher-participant interviews in a natural setting (Bryman, 2012). Positioned as an insider, the research is concerned with the views of individuals, their personal opinions surrounding mastery teaching, and how this might filter down into their classroom practice. Furthermore, whether this correlates with the national mastery principles, and the topic literature.

## Chapter 2: Review of the literature

Having identified a topic, mastery mathematics teaching, this dissertation aims to answer the main and subsidiary research questions which are as follows:

*Teachers' interpretations and classroom practices in relation to 'mastery' teaching in mathematics: a case study of one English secondary school.*

- 1) How do mathematics teachers interpret 'mastery' teaching and what, if any, modifications do they make in their own classrooms?
- 2) What variables do they consider when making adaptations?
- 3) What, in their view, counts as evidence of pupil learning and progress as a direct or indirect effect of the use of 'mastery' teaching in their own classrooms?

Of concern was what this style of teaching might look in practice in a secondary school context and what CPD is available, if any, to teachers. A review of the literature surrounding mastery teaching highlighted emerging themes which caused adaptation of the key search terms and subsequently the research questions in this study. The four key themes in this chapter (meaning of mastery; teacher agency; training; and evidence of effects) were chosen as a result of a preliminary search and analysis of what the literature search revealed. A secondary review also allowed an exploration into research methods, namely the advantages and disadvantages of different methods. The engagement with this literature informed the approach to this investigation and will be covered independently in the research design chapter, and in part, the data analysis chapter. This chapter, however, will solely focus on emerging themes associated with the specific, identified topic.

Initial searches for this systematic review and synthesis of findings included using The Open University Library and its online educational research database collections, primarily Education Research Complete but also the British Education Index. Search terms mainly included 'maths' AND 'teaching' AND 'mastery'. It seemed important not to limit searches to just 'secondary' results, so to keep the search wide enough and to identify any other potential concepts or gaps in research. The mastery phenomena began in English primary schools, so there is generally more research available surrounding the primary setting, however this research can still be explored as part of this review; the mastery principles first used in primary schools in England and the same ones now used in secondary schools who are incorporating mastery teaching (NCSL, 2013). Furthermore, there exists

sufficient global research which covers all key stages. Citation searches were carried out when required for this review. In addition, Google Scholar was utilised as a secondary source to find relevant research papers.

The main key term discussed in this SSI is ‘mastery’, so to begin with it is salient to give a brief definition of what is meant by ‘mastery’ or ‘mastery teaching’ within this dissertation. Mastery alludes to a style of teaching, with certain associated practices and principles as well as key ideas, first adopted in Shanghai and Singapore. English primary schools incorporated mastery after the MTE programme, when it was believed mastery practices would lead to better academic outcomes for pupils (Boylan et al., 2016). Mastery teaching then spread to English secondary schools; and prevalently, an increasing number are taking up mastery teaching today. It was hoped English schools could mirror the mathematics progress of pupils abroad. This review intends to explore what mastery teaching looks like in practice in the classroom and to understand what is meant by mastery teaching amongst the education community.

## **2.1 Meaning of Mastery - Theory**

Of interest in this paper is what teachers understand mastery teaching to be, and how individuals define mastery. Disparities exist in the literature as to what mastery teaching encompasses in theory (and in practice). England’s attempts to emulate mastery practice could be argued difficult when the universal definition is unclear (Hammersley, 2004; Westbrook et al., 2013). Although presented as five key ideas, the principles of mastery teaching as prescribed by the NCSL and NCETM, do not offer much detail. Expansion of these ideas in the literature is minimal, and certainly not extensive as to precisely what they mean. There are likely different approaches to the principles, both across individuals within the same school, but also between individuals over different schools (NCSL, 2013). Boylan et al. (2018) state the mastery principles must be explored in detail if mastery teaching is to be completely understood. This led to the development of the first research question in this study. I imagined the review would detail specific teaching practices to incorporate into lessons when teaching for mastery. However, mastery in the literature is presented as more as a group of ‘things’ teachers and pupils ‘should’ be able to achieve; I learned there perhaps are no set techniques to be used.

## **2.2 Meaning of Mastery – Practice**



Along with teachers' interpretations of the word mastery is the consideration of how this changes their classroom practice, and what, if any adaptations they make. The NCETM (2014; 2017) state the fundamentals of mastery teaching include representation, problem and solving and variation theory. Studying topics at a greater depth is emphasised, and breaking problems down into smaller steps to aid learners. Although the general ideas of mastery are the same, Shanghai and Singapore invest heavily in textbook use, have larger class sizes, and allocate teachers much more non-contact time (Kaur et al., 2021). This is something that I have not seen as apparent in English schools. This could be due to funding issues or expectations within unique settings to conform to a certain 'look' of teaching. Certain practices and change strategies seem to have been adopted in England, but not all. It seems reasonable to wonder how teachers can increase pupil attainment through delivering mastery practice, when they are not given all the same tools to succeed.

In Singapore, the National Institute of Education (NIE) coordinate all national recruitment, teaching and learning for teachers; there is only one route into teaching and training is uniform. The NIE plays a huge role in the mastery practice delivery in Singapore schools (Leong and Kaur, 2021). Teachers must possess a certain level of subject knowledge and be specialist teachers, even at primary school level. Teachers are allocated considerably more time per year to focus on CPD, where they can develop their practice. Whereas in England, CPD is left to the discretion of individual schools (Blausten et al., 2020). And, when teachers train in England, the knowledge of their subject is not covered (Eraut, 1994); in fact, teachers do not have to be specialists at all to teach mastery mathematics. I consider this a pertinent issue when it comes to implementing the change of mastery teaching.

Lee and Safii (2021) suggest mastery practice is when teachers can achieve a cycle of consolidation during their lessons, which requires pupils to recall learning they have studied previously. They also state pupils should benefit from teacher worked examples and then have enough time to complete lots of independent practise, which develops fluency and problem-solving skills. Although I generally agree these methods seem like a 'good' way to teach for mastery, I reflect that this requires a deep level of teacher subject knowledge which seems to have been overlooked; there appears a gap across the literature of the importance of teacher subject knowledge when delivering mastery teaching methods such as those above. Ball and Bass (2003, cited in Opfer and Pedder, 2011) assert teachers do not need greater depth of knowledge than their pupils, however I argue this is not the case. Darling-Hammond and Richardson (2009) echo my reflection, suggesting CPD plays a part in teachers

developing their own subject knowledge, in order to be able to teach pupils most effectively. I believe possessing a deep subject knowledge and being a successful mathematics practitioner are intertwined; as Stevenson and Shearman (2021) state, teachers should challenge and work on their subject knowledge when teaching for mastery.

### **2.3 Teacher Agency**

Agency can be thought of as the autonomy teachers hold and the pedagogical actions they subsequently take in their classrooms. These actions are not thought of as a binary process; agency is not simply the result of teachers' desires. Rather there are strong political, cultural and societal influences working against the individual as they take any decisions (Bahou, 2011; Godley, 2019). Mastery is an educational change process; there are several factors which affect the implementation of this educational change, both at an institutional local level but also a national level. There are school structural variations to consider as well as potential transferability problems due to cultural differences between South-East Asian and English schools (Fullan, 2015). Agency is therefore an important construct in the literature – it affects the implementation of the mastery regime. Despite this, there seems little literary reference to the part agency must play when teaching for mastery.

Teacher identity, a person's past and present experiences and beliefs, shape knowledge for, in and of practice in educational settings (Kneen et al., 2021). The teacher experience level comes into play when talking about teacher agency, as teachers with a vast amount of experience will usually be more confident in the classroom. However, Bandura (2018) claims longstanding teachers could be less inclined to take risks and struggle to adapt to change, thereby not using their autonomy. This could especially be the case in a setting with a negative morale where colleagues have low motivation, as they may have low regard for school management and new policies, especially policies which have been imposed top-down. Biesta and Tedder (2007) state leaders need to crucially recognise the social constructs of where a teacher works, looking at the structural and cultural elements of the educational setting. This is especially poignant if leaders in the setting wish to align and standardise individual practice, so it meets school objectives and is in line with any mastery policy. Mastery seems to me to require both a bottom-up and top-down strategy approach, which would provide that extra support. Hence teachers would become more likely to make the required changes and exercise their agency. Level of agency could also alter depending on if

the teacher is a mastery specialist from a hub who delivers training to the setting they are based, as they would arguably be more confident in making adaptations to their lessons.

As suggested earlier in this chapter, exact mastery practice, for example for certain topics of mathematics teaching, for what duration of time and in what format, seems unclear. When there are already existing constraints on general teacher agency, this is especially problematic when it comes to the effects agency has on a change innovation like mastery teaching. The external environmental context also plays a fundamental part in the success of teacher agency and therefore the educational change implemented (Imants and Van der Wal, 2019; Priestly et al., 2012; Woods and Jeffrey, 2002). The Office for Standards in Education, Children's Services and Skills (Ofsted) place accountability and performance measures on teachers which in turn can lead to teachers feeling powerless to make decisions. This is more so true when settings do not support teachers to make pedagogical choices and there are new government policies being introduced (Biesta, Priestly and Robinson, 2017; Watkins and Mortimore, 1999). If settings are supportive however, this can increase the effectiveness of any CPD undertaken; teachers feel they have greater autonomy and freedom to deliver change using their professional judgement (Armour et al., 2017).

## **2.4 Training**

Change theory implies that for an innovation such as mastery teaching to be implemented well, then the change has to be deployed in the correct manner (Fullan, 2015). It is important that mentoring support is in place in schools when implementing changes in the classroom environment. This could be achieved through organisational support and strategic planning (Lord, Atkinson and Mitchell, 2008). However, top-down schemes in schools could be argued particularly weak when it comes to training and coaching support. Work by Joyce and Showers (2002) states understanding how teachers acquire and use knowledge is key to how they use this evidence to develop their practice. Teachers learning how to learn, they argue, is equally important to gathering new knowledge when it comes to implementing a change. Teachers must receive coaching to understand how to use any new knowledge effectively. They suggest that, as part of an effective coaching model, teachers should make use of joint planning to develop resources and observe and learn from peers (although peer feedback is noted as time consuming). This links to the first and second research questions, looking at modifications or variables which may affect mastery teaching. It would be useful to know from this study, do teachers plan independently, use shared lesson plans, or indeed utilise

resources provided by organisations such as White Rose Education. Fullan (2015) claims that implementation of a change has to have appeared to have taken place if it is to be adopted effectively. It could be argued joint lesson planning would aid implementation, as colleagues would likely be sharing and talking about ideas within their settings; teachers have a greater sense of identity and responsibility when they share a common goal (De Neve and Devos, 2017). A collegial intelligence is known to give individuals a shared sense of purpose and sense of commitment to self-improvement (MacGilchrist, Myers and Reed, 2004). Whereas if teachers plan alone, they might be more likely to revert to old methods if lessons do not go to plan, or not implement the change at all. Although, Little (1990) argues collaboration can lead to conformity. It is not clear from the literature whether this is the goal of mastery teaching in England, so it is difficult to say whether this would be a positive thing. Once this idea of change theory was identified within the training theme for this SSI (and after TMA01), it was thought prudent to refine the research questions slightly, to consider the different variables that could alter the delivery of mastery teaching. It could be how teachers plan lessons for example, or more to do with pupil age or ability level.

When the curriculum was updated to include mastery teaching, teacher CPD increased which enabled teachers to develop their classroom practice. After the MTE, the DfE set up national Maths Hubs to deliver training to schools participating in the mastery programme. Teacher research groups (TRG) were established to share and standardise practice, mirroring the practice used in Shanghai and Singapore (NCSL, 2013), meanwhile new mastery specialists were trained to enhance awareness and spread ‘good’ practice amongst schools. Consensus within the literature does not exist over whether all participating schools (and individuals within schools teaching the mathematics curriculum for that matter) have been trained by a hub, by another form of delivery, or indeed not received any training at all. However, the same company train all teachers in Singapore (Boylan et al., 2016; DfE, 2019). In contrast, mathematics teachers in England are not necessarily trained to a high standard or provided with uniform mastery training; CPD seems to have been sporadic and random in English schools (Yuan and Huang, 2019). The NCSL recommend increased non-contact time off timetable for teachers, most of which should be used for CPD; however, this does not seem to be the case in English schools (NCSL, 2013). Teachers in Shanghai and Singapore are allowed time to evolve as practitioners, even carrying out their own research in work time. Ultimately, not all of the training elements required for teachers to teach for mastery

successfully have been incorporated into English settings. The research questions aim to explore this; the interview questions are open-ended in nature.

## **2.5 Evidence of Effects**

It has already been argued that to fully unlock the potential of mastery, its principals need to be investigated (Boylan et al., 2018). By the term unlocking potential, this paper refers to meeting the DfE goal of improving academic outcomes and ensuring pupil progress in mathematics in English schools. Pupils in Singapore have performed consistently well as a result of mastery mathematics teaching. This has been evidenced through assessments such as those run through The Programme for International Student Assessment (PISA). However, it is not clear from the literature why or how these pupils perform well (Leong and Kaur, 2021). Maybe because it is difficult to measure cause and effect in education. Therefore, the final research question in this SSI aims to explore what teachers view as pupil progress as a result of mastery teaching; in other words, what the success indicators are. It may be that participants feel it is down to assessment results, or perhaps evidence might be seen through an increase in the number of pupils studying mathematics post-16, or through bookwork feedback. After researching, I considered the final research question carefully to keep the question open. Rather than asking specifically about progress in terms of assessment results (which is essentially why England adopted mastery from Singapore in the first instance), I asked what participants thought counts as evidence. This was thought would allow for a wider variety of responses, as cause and effect in education is hard to establish in a linear way. Of course, still an element of concern with this question was an element of any Hawthorne effect (Diaper, 1990), if participants felt they had to answer in a certain way. Teachers are more likely to become guarded when it comes to talking about pupil progress and results, especially when they perceive they might be judged. Teaching in a school can sometimes prove a challenging environment to work in, depending on the structure and culture. After this literature review, I also considered my research instruments to evaluate the evidence of effects. However, I decided I was still content on trying to interpret how teachers view evidence of learning through interviews. Perhaps a consideration for further research under a contrasting research design would be looking at quantitative pupil results to seek to compare between ‘non-mastery’ and ‘mastery’ schools. However, as is discussed, this would likely still be difficult to measure.

## Chapter 3: Research design

### 3.1 Research Paradigm

This SSI takes on the interpretivism research paradigm philosophy which has guided the design frame, methodology, methods and analysis for this study (Ryan, 2018). When realising this to be the case, and to begin with, this felt unfamiliar; as a mathematician I am used to analysing quantitative data and testing hypotheses. Despite this, over the course of the module I have increasingly recognised and understood the importance and place for qualitative data research in the educational field. Furthermore, the benefits of mixed methods post-positivist studies (Beach, Bagley and Marques da Silva, 2018; Plowright, 2013). However, of concern in this study is fundamentally the subjective opinions of mathematics teachers from one English secondary school. It is of interest how different teachers view the South-East Asian mastery style of teaching, and what this may look like in their varying classrooms. This suits an ontological position consistent with subjectivism; the research questions are trying to understand what individual teachers think about mastery teaching and what they might do in their classrooms to accommodate for mastery practice. It is of interest whether these also align with the national mastery principles set out by the NCETM and NCSL.

With a positivist researcher using a deductive method, a theory is taken to the data in the form of a hypothesis test and the researcher accepts or rejects the null hypothesis after the data collection and analysis stages of research (The Open University, 2021a). However, this study lends itself to an inductive method; theory is derived upwards from the data and inductive reasoning used. A positivist stance would not be suitable for this study as it is of no interest to utilise specific quantitative data and work in a downwards fashion to confirm a particular theory. The epistemology, looking at the very subjective nature of knowledge, highlights a clear alignment with the interpretivism paradigm. This is the case for many social science studies like this one, as meaning is assembled and interpreted from researcher-participant interactions in a familiar, natural setting; education is a social science (Bryman, 2012; Cohen, Manion and Morrison, 2018; Gidney, Hemmings and Jewitt, 2022). Critical theory, like positivism, would also be unsuitable; the study not looking in from a particularly political perspective or necessarily viewing teachers from School A as a marginalised group (Willis, 2007).

### 3.2 Design Frame

A case study will form the methodology for this SSI. A case study design frame allows for an appropriate range of data gathering methods, allowing an exploration of the position as an insider researcher within a single setting, as well as an addressment of the research questions (The Open University, 2022a). The scope of this study is suited to a case study design; School A is set by its own framework of conventions. The research is bounded by the mathematics department within a single secondary school setting, where judgements are dependent and unique depending on level of teacher experience and context. When practice in a unique field is to be explored in a single setting, some say case studies are a preferable design frame (Shawer, 2010; Yin, 2003). Mastery practice, although becoming more prevalent, is still considered relatively uncommon at secondary level. Views for this SSI will only be explored in a single setting, on a given practice; therefore, is suited to a case study design. When looking at qualitative data on a small-scale, as is this SSI, researchers tend to use case study designs to frame their research. Even though thought of as time consuming and requiring considerable effort by some, case studies are thought to be rewarding, useful and insightful (Cohen, Manion and Morrison, 2007; Farrugia, 2017; The Open University, 2021b). They allow participants to tell their truths (Merriam and Tisdell, 2015). There are, of course, some practical and ethical issues when it comes to case study designs which will be discussed later in this paper.

### 3.3 Methods

Ethnography is used as a qualitative, interpretivist method to interpret and draw conclusions about teachers' interpretations of mastery teaching, both in theory and in practice (Madden, 2017). It was considered the nature of reality and perception of knowledge will be different across the individuals sampled. Hammersley (2011) asserts that the methods used should always be tailored to the research questions. The primary research method used for this SSI were therefore audio-recorded semi-structured interviews. Interviews were an apt method for this study as they allow participants' opinions to be explored in depth (The Open University, 2022b). However, it was important when composing them that they were created in a non-biased way, especially with the study centred on insider research (Stutchbury and Fox, 2009). Semi-structured interview schedules have the benefit of being flexible and allow the researcher to ask open-ended questions, with a greater opportunity to probe than a questionnaire would offer for example (Cohen, Manion and Morrison, 2018; Marvasti and

Freie, 2017). This research instrument can also be updated over time to reflect the ongoing research process, especially once a pilot has been created (Appendix A). Simply observing participants, such as during a lesson observation, would not be able to provide the same information as an interview. An observation may offer insight into how teachers use or practice some of the mastery principles, but this would be biased from the researcher point of view. It would furthermore not offer clarification on how individual teachers interpret mastery teaching, or how they make adaptations in the classroom, or monitor pupil progress for that matter. This information can only be gathered from having face-to-face, and natural, conversations with participants. Interviews were hence thought the most appropriate method to understand the perspectives of staff within School A, even though they are not necessarily the easiest method to set up and analyse. Roulston (2010) expresses the need for researchers to analyse the culture of the research setting and also the lived experiences of the participants on a day-to-day basis. This is important when composing interview questions and considering the quality of this method. As the questions must be comprehensible to participants and also be robust.

A subsidiary method used for this SSI was secondary document collection which was thought might support the interview analysis stage (Cohen, Manion and Morrison, 2018). Olsen (2012) suggests systematic document analysis can also increase the reliability of findings when it comes to research analysis. By looking at NCETM mastery principles documents and School A department mastery policy documents, a better comprehension and understanding of participant interpretations of mastery could be gathered. It was important, however, to only look at the relevant sections when going through the documentation. Looking at the sections of interest, linked to the research questions up for investigation, ensures study analysis such as this remains focused and specific.

Analysis of data collection and methods used comprised of a thematic analysis (Braun and Clarke, 2006; Guest, MacQueen and Namey, 2012). The qualitative data was systematically sifted through once it was collated; responses were categorised by theme and linked to the research questions. An inductive approach was used to generate themes and identify any patterns. Recordings of the interviews were repeatedly listened to, and critically analysed by theme.

### **3.4 Context**



Tikly (2015) asserts, as well as individual beliefs, the subjective nature of knowledge and context comes into play when interpreting social interactions. Consideration of the context of the research setting could be argued equally important when interpreting teachers' values and practices in relation to mastery teaching. An interpretivism paradigm essentially allows for a bigger focus on the research context, where a different paradigm would not (Mincu, 2015). The interview method used ensured that researcher-participant interviews for this study were conversational and free-flowing, offering an informal dialogue within the immediate context. With structured interview schedules there is a natural tendency to move onto the next question more quickly, typically because they include more closed questions. However, the open-ended nature of the questions for this SSI allowed for longer interviews within the setting, without an urgent need to quickly move on.

Research participants for this SSI included ten teachers from the mathematics department within School A. These research participants were chosen to be involved and interviewed for this study, as the research is concerned with mathematics teachers' interpretations of mastery mathematics teaching within a single department. The mathematics teachers at School A are supposed to be following the mastery style of teaching, as described by the NCETM. The participants interviewed held varying amounts of experience in education (both teaching experience and mastery teaching experience), some being early career teachers (ECTs), others having taught for several decades. This sample was thought to provide a more comprehensive overview of how teachers, of all stages in their careers, view mastery teaching. There were several contextual factors to consider when planning and collecting the data. One of those was postponed interviews due to strikes, sickness days and examinations. This meant a delay in collecting some of the data plus a need for an adapted research schedule. Even though the cancelled interviews were scheduled for as soon as possible after the intended interview date, one could argue responses might be different depending on the day. Responses after a day off or after examinations could be different than those before a day off or before pupil examinations. Furthermore, many colleagues (including four in the mathematics department) handed their resignation notice in during the summer term. This could arguably have factored into the responses if staff morale and motivation was generally low. Another contextual factor to consider was the fact that School A is already on board with incorporating mastery teaching into policy and classroom practice. This fact could have altered responses, especially if participants felt wary answering certain questions; an ethical issue which will be discussed in the next section.

### 3.5 Ethical Considerations

Like Mertens (2018) asserts, to better solve ethical issues in the future, they should be predicted as many as feasibly possible in the present. There were several ethical concerns to consider before starting the research for this SSI. Research integrity must always be maintained by following The British Educational Research Association (BERA) codes of practice. In addition to these codes of practice and complying with the Data Protection Act, The Open University's Ethics Principles had to be followed (BERA, 2018). Stutchbury and Fox (2009) note how ethical issues and transparency must be at the forefront of the research process at every stage, to minimise any risks arising from the research. The Ethical Appraisal Form (Appendix B) also played a fundamental part in the process; all research was in keeping with the form. Research protocols included seeking gatekeeper permission and gaining consent from all participants. All participants were provided with information letters and consent forms which they were given enough time to read and agree to if they wished to take part in the research (Appendix C). Participants were aware that they had the right to withdraw from the process at any stage, and any data deleted. If they consented to staying in the SSI, they were told when their data would be destroyed once their data had been used for the research. Participants were also made aware that any data would be confidential and anonymous in line with data protection, and they could ask questions at any time during the research process. It was of utmost importance, for both ethical and research efficiency reasons, that participants were aware how their data would be used, when, and for what. They also were made aware of how their data would be used, now, but also potentially in the future and who could have access to this. Interviews for the SSI were audio-recorded on a secure password protected device which was locked away. Participants were informed they had the right at any time to access their data and clarify or amend anything they thought as misleading or misinterpreted. This was important, as mastery perhaps being a sensitive and contextually influenced topic, might have provoked challenging responses. Teachers are likely to become dubious when discussing personal teaching styles, especially when expressing views which might be considered controversial in a setting that states to uphold mastery teaching methods (School A, 2022). Acting in a consistently ethical manner with ethnographic research can sometimes prevent challenges such as these (Lopez-Discastillo and Belintxon, 2014; Madden, 2017).

The interviews took place at a mutually agreed time and location to best suit the participants. Gathering primary data was thought to be an insightful way to gather

information from the educational context. As an insider one can thoroughly immerse themselves into the research, with the opportunity to provide feedback to the setting once the research has come to an end. Access did not prove to be an issue with this study (Clark, 2011); all participants were sampled from School A, and it wasn't necessary to interview any other mathematics teachers from the local academy trust of schools. This was beneficial as the case study was designed around and set to be bounded by one department only, with its own framework of conventions. The scope was considered suitable with this being a small-scale study. The sample size proved sufficient for this SSI so to accurately reflect the population, which could be due to the insider nature of the research. As an outsider there are likely to be more problems surrounding small numbers of participants, if people do not trust or know the researcher's intentions. It could be argued participants will be more open and honest in their interview responses too, if they have a pre-existing relationship with the researcher. However, insider researcher can also pose ethical challenges with knowing the participants (BERA, 2018). For example, some participants might be fearful if they already know the researcher and/or there are differential power relations. They might not want to express their views, or they could be sceptical or withhold information, especially if they are not fully informed of the research process from the start or are afraid of being identified (The Open University, 2022c). Participants in this study could view that responses might be benchmarked against a certain 'normative' practice (the 'true' meaning of mastery teaching), which again raises ethical but also validity concerns. They might worry they are being judged, both again setting mastery policy, but also a specific national mastery prescription. Building on this, they might have feared their responses were not 'good enough' – as if their responses should lead to some sort of positive change within the school setting.

Tuckman (1972) talks about overall reliability in educational research. There lingers the question can claims be reliably deduced and accurately supported from subjective opinions. This study considers reliability and validity of the methods used and research actions and will be discussed further in a later chapter on data analysis (Lincoln and Guba, 1985). For example, sources of error could have occurred due to the researcher interviewer – do they hold unconscious bias towards certain mastery practices already or hold any preconceptions? It was considered that the researcher perhaps has their own experiences of mastery training and teaching, which could infiltrate the SSI or possibly affect the data analysis stage. Cohen, Manion and Morrison (2018) suggest it is due diligence to avoid assuming the participants have prior knowledge of mastery, which could be argued difficult

for an insider researcher to do. It was hoped several open-ended interview questions would allow opinions to be explored and not limit responses. As touched upon in the previous section, another challenge to consider for this research were the contextual details, such as the political and cultural landscape within the context and whether this would affect the dissemination process (Macfarlane, 2009; The Open University, 2022d). As part of trying to cap the limitations of the methods used for this research, it was important to remain neutral when analysing interviews and looking at documentation. However, whilst also keeping in mind the context and values of the setting, to show participants the expected level of respect (British Psychological Society, 2014).

## **Chapter 4: Data presentation and analysis**

### **4.1 Introduction**

Primary data collection in the form of insider interviews can provide invaluable insight into the experiences and views of participants, as discussed in the aforementioned chapter. A researcher-participant existing affiliation can encourage increased disclosure; participants can become more willing to share their interpretations and perceptions (Harrison and Waller, 2018). However, an insider positionality can also create a power imbalance; something Burton and Bartlett (2005) asserts researchers should be conscious of, notably by remaining neutral and by not using leading questions. Several factors shape how interviews are conducted, and the data collected, including the context. Marvasti and Freie (2017) note how semi-structured interview schedules, like the one used for this SSI (Appendix A), allow for greater flexibility and detail of responses. Each question on the schedule aims to investigate individuals' interpretations of mastery teaching in a specific setting, and ultimately, the research questions. Data was generated through interviewing participants in their normal working environments at a mutually agreed time and place. The qualitative data (interview notes) were analysed thematically; an inductive approach was used to reveal patterns in the data (Cohen, Manion and Morrison, 2018; The Open University, 2022e). The key topics explored in the literature review also played a part in the overall analysis and allowed links to be explored. The research questions remained at the forefront of the research process to guide the analysis.

### **4.2 Mastery Definition**

A common theme when analysing the data was that mastery teaching involves an element of depth (Appendix D) – “Mastery means checking the pupils have mastered topics to a certain depth” (Interview 2, 2023). The NCETM (2014) do not specifically mention depth in their five key ideas, however they do state coherence, fluency and mathematical thinking as three of them. It could be argued that these ideas naturally require an element of depth, as to understand mathematical concepts you must be able to make connections between ideas; to be able to move fluently across units and make links between different mathematical topics. When participants were asked if they could state the ‘prescribed’ five key ideas of mastery teaching in England, the responses ranged from none at all to naming all five, to everything in between. However, all participants did infer mastery teaching has to involve pupils learning mathematics to a greater depth than they otherwise would have done prior to a mastery style

of teaching. One interviewee explained how they consistently show high ability pupils ‘beyond’ what they are doing, for example by showing further mathematicians A level content (Interview 4, 2023). How this concept of depth could be measured at a national level would arguably be very difficult and would naturally be different across varying school settings with unique make ups.

Using representation and structure, incorporating variation theory into lessons (changing the numbers/content of the question slightly to aim to get pupils to better understand the links between question, answer and topic) and breaking problems down into smaller steps are all practices to be utilised when teaching for mastery (NCETM, 2017). A common theme when analysing the data was that teachers perceive they should use some sort of diagram, for example bar models, to teach for mastery in the classroom effectively (Appendix D). This concept of representation is supported by Leong and Kaur (2021). Previously, under a non-mastery regime, teachers may have used less representation to support mathematical problems. From experience of my own practice, I know this to be the case. Whereas now teachers are expected to regularly use number lines, bar models, pictures or diagrams, displays and physical items such as counters to teach pupils (School A, 2022). Some participants claimed using diagrams such as bar models were sometimes confusing for pupils (Interview 2; 6, 2023). However, from personal experience of teaching with bar models and without observing any specific lessons for this study, I argue they could have been perhaps used in a more effective way. Thinking about the boxes to leave blank, and what numbers to include in the question, can make a big difference to pupils’ understanding when using pictorial representations such as bar models. This is subjective of course and may come down to experience and subject knowledge levels, and whether individuals have received direct training from a mastery specialist from a hub. Relating to my own practice, this investigation has highlighted the need for individuals within School A to look at how bar models are used to teach mathematics. I would be interested to share practice off the back of this study, looking to give peer feedback perhaps in a department meeting. This could help teachers and pupils in the setting over the longer term.

### **4.3 Variables**

It was interesting to hear how teachers change adaptations based on ability or age, for example. As, in Singapore and Shanghai, there is not much emphasis on differentiation and ability grouping is avoided (Boyd and Ash, 2018, cited in Blausten et al., 2020). In the

literature, there was little reference to how teaching should change based on ability level. Often, prior to participants being asked question 2) b) (Appendix A), they freely offered immediate insight into how they change their practice depending on different variables such as ability and age. Some teachers thought representation as less important for higher ability pupils; they practise a quicker pace to cover more content and so as not to “waste time” (Interview 1, 2023). And that representations should decline in use for higher ability KS4 pupils. There was certainly some belief that certain content and representation should only be pitched to classes of lower ability, younger (KS3) pupils (Interview 3, 2023). However, the NCETM suggest all pupils, regardless of their ability, should work on the same tasks and be taught the same content. It is only the differentiation and scaffolding that should change (NCETM, 2014). One could argue that this is slightly misleading; the support needed could vary greatly, meaning the timescale needed for a lower ability group simply might not coincide with the timeframe desired for a higher ability group. It could be said that there is only so long teachers can spend expanding on the abstract of one topic in the curriculum, before feeling like they need to move onto the next topic. This would be dependent on their context, personal feelings, teacher agency and likely other factors too. There was a persisting confusion amongst participants regarding balance; balance of lesson practice depending on ability and age. The consensus was that KS3, and lower ability, pupils should receive more modifications in class (time; manipulatives; diagrams) than KS4 pupils. Some participants expressed difficulties in terms of making sure pupils have enough challenge, whilst also breaking problems down enough into small steps using diagrams such as bar models to assist learning (Interview 2, 2023). As all pupils, of all abilities, should be able to access challenge; teachers should hold high expectations for every pupil (DfE, 2014; Drury, 2018). Mastery could be argued sometimes difficult to judge, when pupils need further representation (perhaps more boxes filled in in a bar model, for example), or when they are able to move onto some more complex applications. One participant shared that if mastery is completing diagrams in this way, then all pupils can achieve this. However, they do not think of this as the definition of mastery; they have their own definition. They believe mastery is showing pupils real-life applications and talking about the abstract applications of different mathematical topics, which teachers can only do with higher ability pupils (Interview 4, 2023).

#### **4.4 Training**

As is discussed, there is an implicit theory of change when it comes to the innovation of mastery teaching in English schools. Fullan (2015) states that adoption of an idea is usually only followed through when implementation has appeared to take place. It could be argued that, after educational professionals viewed and decided to adopt mastery methods from Singapore, and then relayed some of these insights to English primary schools, an implementation of sorts had begun. This study aims to also explore mastery in practice; namely, what teachers think mastery in practice looks like in their setting and what modifications they make in their own classrooms on a day-to-day basis. If mastery practice is ‘taught’ (the change) and implemented well, then teachers are less likely to return to their old teaching methods they feel secure with once the implementation phase has been removed (Fullan, 2015). As is discussed in the review of literature, it is often the case that new policies schools want to implement are poor when it comes to providing ongoing support for the change and when providing training to implement the change ‘successfully’ in a ‘real’ life classroom setting. Therefore, a wider issue surrounding mastery is the change strategy being used to get the desired changes.

If a change is implemented ‘well’, then teachers have likely been provided with the tools to succeed and perhaps been provided with a mentor to support at the classroom level. Joyce and Showers (2002) explain how important coaching and training is at a classroom level when implementing a change. A key component of implementing a change is noted as practising the knowledge/new theory to be introduced for a substantial period of time. Guskey (2000) claims CPD should be intensive and sustained over a long period of time, to generate the best results. However, when there is no apparent time commitment to CPD and little collegial activity, teachers can encounter problems implementing new practice in their classrooms (Darling-Hammond and Richardson, 2009). Boylan et al. (2019) state how imperative it is that individual practice is closely linked to teacher learning activities. However, no participants in the study appeared to have received consistent or prolonged training in the mastery field, which surely raises doubts as to its roll out success across English secondary schools.

A common theme highlighted from the thematic analysis of the interview data set revealed too much variation in mastery training. And certainly not enough mentoring at classroom teacher level. This links to the wider change strategy being used, raising implementation concerns. To achieve the desired changes then it could be agreed that the change strategy has to be effective, both at a national and local context level. However, in the



case of mastery teaching, it does not seem to be clear what exactly the desired changes should look like; mastery in practice differs between individuals in the same setting and also across literature. All participants in the study however referred to a mastery Maths Hub specialist (Appendix D); the data therefore supports the claim that teaching for mastery training has, in some form (namely, all participants at least having awareness of the specialists), reached teachers of all experience levels in the particular setting for this SSI. It could be assumed that the teaching practice recommended by these national specialists, should be considered 'correct' teaching for mastery. Although it does appear from the data that there is confusion over what this should look like, as is discussed in the previous couple of sections.

All participants mentioned mastery specialists or having access to a mastery Maths Hub specialist at some point in time. Some mentioned the setting having a direct link to a local mastery specialist, as well as national mastery specialists associated with the hub, and the NCETM. However, most participants had only received relayed information from other teachers that had gone on the mastery training, so were receiving knowledge second-hand. So, it could be argued unreliable, as individuals might have interpreted the training differently. Therefore, delivery of training to colleagues would also be different to how they received it, and across settings. Only one participant had received mastery training first-hand from a mastery specialist; they mentioned going on a course three or four times a year. Since the initial training, they had been invited to two online sessions per year. They expressed disappointment in this through their body language and use of the word "only" (Interview 3, 2023). It was mentioned that the NCETM provide resources which helps with lesson planning, both in terms of including elements of mastery content and also the sequencing of lessons (Interview 1, 2023). However, some teachers create their own resources to teach for mastery, and do not use the ones provided by the NCETM or White Rose Education, for example (Interview 5; 6, 2023). Blausten et al. (2020) agree that there should be great freedom amongst teachers when it comes to how they adapt the mastery approach, depending on the teachers' individual needs and personal school context. Personally, although liking the greater autonomy in terms of teacher agency, I question how mastery practice if delivered in this way can ever be measured. As the data suggests teachers view mastery slightly differently, at least in this one school setting. Drury (2018) suggests a carefully organised sequence of lessons improves pupils' conceptual understanding when teaching for mastery, however, does not clarify the manner in which you should go about this.

It was interesting that 50% of the participants interviewed said they had learnt about mastery teaching from independent research, without any prompting to do so that was mentioned. This included looking at guidance from the Mathematics Association, Mathematical Pi and Symmetry Plus publications. Interviewee 4 (2023) views this to be mastery as the writers take a sideways look at curriculum problems; rather than commenting on specific mastery methods, it was their understanding that the teacher should look at mathematics problems with a sceptical eye and then talk through potential links with other topic areas. It could be said that this requires a level of subject content knowledge (also highlighted in the literature review), to be able to see such links, and also to use mathematical talk effectively (Smith and Mancy, 2018). Especially when teaching higher ability pupils. Teachers in Singapore and Shanghai, for example, are encouraged to develop as practitioners whilst they are teaching pupils by taking on postgraduate research projects. They are all trained by the same organisation, whereas teachers in England can take many different routes into mathematics teacher training. Some teachers can even be non-specialists, only in the role through a need for a mathematics teacher; teacher retention being a current issue in English schools, particularly for science, technology, engineering and mathematics (STEM) subjects (Blausten et al., 2020). Teachers in Shanghai are allocated much more CPD time (Huang et al., 2010). This arguably improves their teaching practice, so teaching for mastery methods, and also personal subject knowledge. As they may be spending much of their CPD time carrying out their own independent research. This particular finding from the SSI made me reflect on my own practice and whether indeed I carry out enough independent research into how to teach pupils effectively for specific topics. I could, for example, look to build a bank of resources (which colleagues at School A could benefit from) which would detail worked examples, solutions and supports for topics across the mathematics curriculum. I consider this would be useful for my colleagues and will have much more of a practical use than the five general mastery ideas. Obviously, this would take considerable time for me to put together as teachers in School A are generally given less than ten hours a year for CPD (School A, 2022). However, longer term it could benefit individuals in the mathematics department.

#### **4.5 Pupil Progress**

When asked about evidence of pupil progress, participants 1, 3, 8 and 9 (2023) say evidence can be judged by retrieval practice. That is, pupils remembering topics they might have studied several months ago and achieving success (getting the question correct). Through mastery modelling, some participants believe that pupils are able to see the relationships

between topics more clearly, and this is reflected in their retrieval practice bookwork (Interview 1; 10, 2023). Participant 1 (2023) also referred to pupil voice over time. They suggested pupils can recall prior topics and facts better than they used to, and that is “how we can judge their success”. Of course, this idea of pupils retrieving knowledge more successfully since mastery teaching was introduced, is still arguably subjective. Not all teachers will have taken part in pupil voice, and the ones that were may have not thought relevant to mention it when interviewed. This could have been an oversight, or simply they do not view more feedback from pupils during pupil voice and them remembering more topics, to be indeed evidence of progress. One participant said that there is no way to evidence pupil progress in respect to mastery teaching. It was their view that national data is not fit for purpose to begin with, let alone be able to be adapted to account for mastery teaching. It was implied the signs should be there, because the principles of mastery teaching are good (even though they could not name them – so it is assumed going off their own principles of mastery). However, measuring the effectiveness of these from the data would be extremely difficult (Interview 4, 2023). This was the only participant that referred to assessment results as a measure of pupil success, despite Lee and Safii (2021) stating formative assessment measures pupil progress in Singapore. This is concerning as Joyce and Showers (2002) state teachers need to understand the concrete evidence behind a practice change if it is to be implemented successfully.

#### **4.6 Document Analysis**

Through a documentary analysis of department policy in the setting (School A, 2022), it was hoped extracts could be used to help with this SSI’s research questions. This proved a useful method of analysis to support the critical review of literature and the case study interviews, even if the investigation results could not be generalised to practice in other school settings; more on this in the next section. Document analysis can have many advantages, so was thought of as a potentially useful research method to answer the research questions. One advantage is the researcher does not need to collect the data themselves as it already exists, which saves time. And, once gatekeeper permission has been sought, the process of looking at the documents should arguable be quite simple. Less of an ethical concern is another advantage with analysing policy documents; researchers do not need worry about asking participants about sensitive topics or being obtrusive. However, secondary data may not be completely neutral and without bias; the documents could have been created with a social and/or political agenda (Cohen, Manion and Morrison, 2018).

Extracts from the policy documents suggested mastery is defined and based around the principles set by the NCETM (2017). That is, teachers should use coherence, fluency, representation and structure, mathematical thinking and variation theory to teach pupils. Exactly how they should teach pupils this, the specific methods and practices, remained unclear; it was not specified. So, it could be claimed modifications teachers make in the classroom is a personal matter, dependent on unique feelings towards the principles of mastery, their agency and also their particular context. The document did not mention altering mastery practice dependent on age or ability, for example. Perhaps a thought for further exploration is why many participants felt mastery increasing applied to KS3 and/or lower ability pupils. Furthermore, there was also no reference to measuring pupil progress in terms of mastery teaching. In fact, the details of mastery teaching were kept very brief. It is my belief that the absence of knowledge and detail in the department policy documents is telling. Perhaps the writer was not sure themselves or did not want to impose their personal views on the rest of the department. Or maybe it was a purposeful act; teachers should view mastery as slightly interpretive, and this is the idea.

#### **4.6 Generalisability**

Both validity and reliability are concepts from positivist quantitative research and therefore not applicable to this study which analyses qualitative data. Validity and reliability tend to be associated with judging whether claims made are well founded in the data and can be applied and replicated to other settings, using the same methods. As this in-depth qualitative study looks at a single bounded instance in one school, it is more appropriate to consider the generalisability of the research when considering its credibility and quality (Hammersley, 2011). This SSI looks at one mathematics department (teaching mastery mathematics) with one set of people at a specific point in time. Therefore, it may not be considered generalisable to other settings; opportunities for generalisations of results may be limited or sparse. However, that does not mean professionals cannot still take valuable information from the case study. The instruments used and analysis methods can still be utilised by other researchers in their personal settings.

As is discussed previously, all researchers must hold and show respect for their participants (British Psychological Society, 2014). This is especially true for interpretivist researchers, where relationships are increasingly important, and learning can be accessed by both parties throughout the research process. Lincoln and Guba (1985) discuss four criteria

surrounding interpretivist research, for example credibility and transferability. Transferability could be a goal in this study if other schools in the local area or academy trust can relate to the study. They may, for example, wish to incorporate elements of the data presentation and analysis into their department/school meetings or change their current mastery provision. Transferability could, however, require an element of trust and for settings to hold the same values. Stakeholders should feel empowered where interpretivist research is involved, despite Lincoln and Guba (1985) contending this.

## Chapter 5: Conclusions and implications

To conclude I review the research questions for this SSI and look at to what extent I feel I have answered them. Beginning with the first research question, notably teachers' interpretations of the 'definition' of mastery, I consider there is credible evidence to claim mastery teaching should be centred around the five principles listed by the NCETM (2017). This seems to be consistent across the topic literature, thematic interview analysis and also policy documentation analysis. Even though the principles were not always literally referred to, participants generally referred to mastery involving an element of depth. That is, pupils should be able to make connections between different mathematical topics. As a practitioner, when I look at the principles, they do infer pupils acquiring a certain depth of knowledge. Of course, there is an element of interpretation here and not all mathematics teachers might see this concept of depth. Furthermore, even if they do, they may have to battle with agency in their setting, personal values, or even quality of their own subject knowledge. Modifications in the classroom to teach for mastery typically involved using diagrams such as bar models to help communicate concepts. It was unclear whether teachers feel this specifically supports depth of knowledge, or whether it is down more to using methods such as increased textbook use or questioning in their mathematical talk. What was apparent was that, even though the evidence supports the principles are indeed the fundamental ideas behind mastery, researchers need to explore the principles in more detail (Boylan et al., 2018). That is, if researchers and teachers want to fully comprehend mastery teaching, they need to understand the methods they can use in practice that will achieve these principles. The data strongly suggests that modifications vary, and it is very much up to the individual teacher how they deliver content to teach for mastery. There is not a national scheme of learning, with a set of lesson slides, which all teachers enrolled in mastery use. Teachers in School A very much use their agency to decide what and how they teach for mastery, based upon their own interpretations of how you can achieve depth of knowledge.

When looking at the second research question, I consider it plausible to claim lower ability, KS3 pupils should benefit from the most amount of adaptations when teaching for mastery; teachers should use differentiation appropriately dependent on the class. It could be argued that this is no different to normal teaching; mastery curriculum or not, teachers should uphold teaching standard five (DfE, 2021). Age and ability level were highlighted as variables affecting taught mastery content and adaptations in class. There appeared no evidence to support any other variables affecting adaptations. I found it interesting that lower

ability pupils were referred to more than higher ability pupils. Naturally, teachers might focus on the pupils in their setting that require the most amount of support, however all pupils need to be challenged and have lessons adapted accordingly. It made me question my own practice, and whether I indeed focus more on my lower ability classes. It may just be that it is easier for teachers to remember adaptations for lower ability pupils, as they tend to use more diagrammatical methods to achieve fluency. Whereas, for higher ability pupils, there seems to be a greater use of mathematical talk to bring about topic understanding, which might be easier to forget as a set method. To develop my own practice, I aim to review my lesson content for my higher ability classes, and ensure I am still using what I perceive to be 'good' mastery techniques. To develop this investigation further, it would be useful to understand more about the adaptations made for higher ability pupils, for example questioning used by the teacher and their mathematical talk, as these seem to be used more than representation. This could be done by further interviewing and asking participants specific questions to do with this. Or what would likely be more useful to explore this, would be carrying out lesson observations. Perhaps like the study by Lee and Safii (2021). Observing first-hand examples of this type of modification used would arguably provide better insight into how these methods are used on a practical, real-life level. If using this method, I would have to ensure I maintained an awareness of and upheld my ethical responsibilities as a researcher. Observations as a method come with different considerations to interviews, such as researcher unconscious bias or participants acting differently if they know they are being watched.

The final research question was concerned with evidence of pupil learning and progress as a result of mastery teaching. Disappointingly, there appears no evidence to claim what this progress looks like; this SSI has not shed light on this last question. There was a slight theme amongst the participant interviews that pupil progress is evident through an increased retrieval of knowledge over time. This could be seen through pupil bookwork or expressed during pupil voice sessions in school. However, if this is evidence of mastery teaching, then how you would measure this on a national scale would surely be difficult. Over the years there have been several excursions by ministers to other countries, with a view to change government policy and impose new ideas on classroom teachers. This is even more the case since more secondary schools have been converted into academics under a conservative regime, where under decentralisation, trusts are given complete autonomy to set school policies (Mansell, 2016). However, rarely education professionals hear how these

policies have worked in practice, and which have proved successful or not. Jones and O'Brien (2011) state there are disparities in how these policies are then applied, depending on context. The Education Endowment Foundation (EEF) note how only some aspects of mastery teaching are informed by research; only a few aspects have been evaluated for pupil impact (EEF, 2022). This resonates as over my teaching career I have not heard or seen evidence to support new policies introduced in school. This includes teaching for mastery. These SSI findings might be relevant to a wider audience, especially schools wanting to potentially introduce mastery teaching. Schools may want to look deeper into the existing literature surrounding pupil progress as a result of mastery, or indeed allocate more funding to training and resources if they wish to proceed. I argue the policy change will be more successful (pupils will make more progress) if teachers undertake sustained and intensive mastery training, with plenty of free time in their calendars to incorporate the new methods. Looking at my own practice, I do not view I have had enough time to incorporate mastery as well as I perhaps could.



**Postscript:** Narrative critical reflection

To support this brief reflection, a summary of evidence of key targets and feedback has been categorised, and I have explained how these examples shaped my dissertation (Appendix E). I have developed as a researcher through the course of this module by engaging with my tutor, peers and the content provided through The Open University, as well as independent research. Through a Personal Development Plan (PDP), I was able to set and adapt clear goals as the module progressed, which helped me to structure my SSI. At the start of this course, I immediately knew I wanted to take the SSI route as I enjoy taking on a more active role in research. I felt I would benefit more from insider researcher and taking more of a practical approach in a topic I felt passionate about. The selection of the focus for my investigation was quite straightforward, it being a topic I have been intrigued by for several years as it has directly affects my daily practice. However, the research design took a little bit of time for me to get my head around. Design and method(s) decisions should be informed by the research questions aims; however, I struggled initially as my epistemology aligns with the positivist approach. Whereas my study lent itself to an interpretivist paradigm. Fortunately, I was quickly able to see the benefits of an interpretive approach after talking to my tutor. And, as I was able to gain access to my setting without any difficulties; therefore, I could proceed with the SSI topic and case study as planned.

A challenge I encountered during the dissertation process was writing the review of literature (Appendix E, example 1; 7). Despite getting the feedback in my previous EMA to ensure the clarity of my points was clear, I still found it problematic to get across my own lines of argument. And this was evident when I received the feedback from my second draft submission. As I had reviewed so much literature surrounding the topic and made so many notes, I started to struggle when I needed to put the chapter together for my dissertation; my initial draft did not flow that well and I ended up missing key theories, such as the theory of change which supports implementation of an innovation like mastery teaching. After my tutor feedback, I felt much clearer about how I needed to rework my literature review. I found it useful to go back to the review after working on other parts of the dissertation; this seemed to focus my mind and also allowed me to see how my dissertation linked together as one piece of work. I attempted to follow a staggered approach using principles by Cronin, Ryan and Coughlan (2008). Notably, I reviewed my review which is stage four. This process of constantly revisiting the review as I worked through my SSI allowed a cycle of positive change to be regularly applied. Links and themes were able to be developed after each stage

in the research process, especially after the data collection and analysis stages. This method of response to this experience seemed to work well; I was able to organise my notes more efficiently which aided the write up. Looking forward to future research, I would ensure I used this approach again and work on my content/thematic analysis of literature. It is worth reminding myself that the research questions should be at the forefront of my mind, so using a table with research questions on the left, methods I am going to use to answer them, and notes on the right, could prove worthwhile as an alternative approach to solve this challenge.

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## Appendices

### Appendix A: Interview schedule

- 1) Please could you explain the term 'mastery' and what it means to you.
- 2) a) What modifications do you make, if any, in your classroom to teach for mastery?  
b) Are there any variables that affect the adaptations you make?
- 3) a) Could you tell me about a mastery lesson that you have taught well, in your opinion.  
b) Could you tell me about a mastery lesson you have taught that has not gone so well, in your opinion.  
c) On the back of this, did you make any changes for the next lesson in the sequence?
- 4) What training, if any, have you received in relation to mastery teaching?
- 5) Can you list 'the five principles' of mastery teaching, as prescribed by the National Centre for Excellence in the Teaching of Mathematics (NCETM)?
- 6) How do you know if pupils are making progress as a result of mastery teaching?

## Appendix B: Ethical appraisal form

### E822 Ethical Appraisal Form

Masters: Education, Childhood and Youth



NB: it should be noted that The Open University is unable to offer liability insurance to cover any negative consequences students might encounter when undertaking 'in-person' data collection. It is therefore very important that you follow appropriate research protocols which should include seeking Gatekeeper permissions to undertake any data collection within your setting and adhering to ethical principles for the safety of yourself and your participants.

Because ethical appraisal should precede data collection, a completed version of this form should be included with TMA02 for those developing a Small-Scale Investigation (SSI) and as part of the EMA submission for those completing an Extended Literature Review and Research Proposal (EP) form of the Dissertation.

Fill in section 1 of this document with your personal details and brief information about your research. For section 2, please assess your research using the following questions and click yes or no as appropriate. If there is any possibility of significant risk, please tick yes. Even if your list contains all "no" you should still return your completed checklist so your tutor/supervisor can assess the proposed research.

#### Section 1: Project details

a.	Student name	Rebecca Scott	
b.	PI	[REDACTED]	
c.	Project title	<i>Teachers' interpretations and classroom practices in relation to 'mastery' teaching in mathematics: a case study of one English secondary school.</i>	
d.	Supervisor/tutor	Dr RJ Chatwin	
e.	Qualification	<u>Masters in Education</u>	
		Masters in Childhood and Youth	
f.	MA pathway (where applicable)	Learning and Teaching	
g.	Intended start date for fieldwork	13/03/23 (subject to the return of TMA02 and receiving all ethical approval)	

h.	Intended end date for fieldwork	31/03/23
	Country fieldwork will be conducted in	England - UK
	<i>If you are resident in the UK and will be conducting your research abroad please check <a href="http://www.fco.gov.uk">www.fco.gov.uk</a> for advice on travel.</i>	

Section 2: Ethics Assessment		Yes	No
1	Does your proposed research need initial clearance from a 'gatekeeper' (e.g., Local Authority, head teacher, college head, nursery/playgroup manager)?	-	
2	Have you checked whether the organisation requires you to undertake a 'police check' or appropriate level of 'disclosure' before carrying out your research? <sup>1</sup>	-	
3	Have you indicated how informed consent will be obtained from your participants (including children less than 16 years old, school pupils and immediate family members)? Your consent letters/forms must inform participants that they have the right to withdraw from the study at any time. <sup>2</sup>	-	
4	Will your proposed research design mean that it will be necessary for participants to take part in the study without their knowledge/consent at the time (e.g. covert observation of people in nonpublic places)? If so, have you specified appropriate debriefing procedures? <sup>3</sup>		-
5	Does your proposed design involve repetitive observation of participants, (i.e. more than twice over a period of more than 2-3 weeks)? Is this necessary? If it is, have you made appropriate provision for participants to renew consent or withdraw from the study half-way through? <sup>4</sup>		-
6	Are you proposing to collect video and/or audio data? If so, have you indicated how you will protect participants' anonymity and confidentiality and how you will store the data?	-	

<sup>1</sup> You must agree to comply with any ethical codes of practice or legal requirements that maybe in place within the organisation or country (e.g. educational institution, social care setting or other workplace) in which your research will take place. If required an appropriate level of disclosure ('police check') can be obtained from the Disclosure and Barring Service (England and Wales), Disclosure Scotland, AccessNI (Northern Ireland), Criminal Records Office (Republic of Ireland), etc.

<sup>2</sup> This should normally involve the use of an information sheet about the research and what participation will involve, and a signed consent form. You must allow sufficient time for potential participants to consider their decision between the giving of the information sheet and the gaining of consent. No research should be conducted without the opt-in informed consent of participants or their caregivers. In the case of children (individuals under 16 years of age) no research should be conducted without a specified means of gaining their informed consent (or, in the case of young children, their assent) and the consent of their parents, caregivers, or guardians. This is particularly important if your project involves participants who are particularly vulnerable or unable to give informed consent (e.g. children under 16 years, people with learning disabilities, or emotional problems, people with difficulty in understanding or communication, people with identified health problems). There is additional guidance on informed consent on the Masters: Education and Childhood and Youth website under Project Resources.

<sup>3</sup> Where an essential element of the research design would be compromised by full disclosure to participants, the withholding of information should be specified in the project proposal and explicit procedures stated to obviate any potential harm arising from such withholding. Deception or covert collection of data should only take place where it has been agreed with a named responsible person in the organisation and it is essential to achieve the research results required, where the research objective has strong scientific merit and where there is an appropriate risk management and harm alleviation strategy.

<sup>4</sup> Where participants are involved in longer-term data collection, the use of procedures for the renewal of consent at appropriate times should be considered.

7	Does your proposal indicate how you will give your participants the opportunity to access the outcomes of your research (including audio/visual materials) after they have provided data?	-	
8	Have you built in time for a pilot study to make sure that any task materials you propose to use are age appropriate and that they are unlikely to cause offence to any of your participants?		-
9	Is your research likely to involve discussion of sensitive topics (e.g. adult/child relationships, peer relationships, <u>discussions about personal teaching styles</u> , ability levels of individual children and/or adults)? What safeguards have you put in place to protect participants' confidentiality?	-	
10	Does your proposed research raise any issues of personal safety for yourself or other persons involved in the project? Do you need to carry out a 'risk analysis' and/or discuss this with teachers, parents and other adults involved in the research?		-
11	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?		-
12	Will the study involve recruitment of patients or staff through the NHS or the use of NHS data?		-

If you answered 'yes' to questions 12, you will also have to submit an application to an appropriate National Research Ethics Service ethics committee (<http://www.nres.npsa.nhs.uk/>).

## Appendix C: Participant information and consent forms for interviews and documents



### E822 Information letter for adults (aged over 18): Interviews

#### What is the aim of this interview?

The aim of the interview is to gain an individual's perspective on an aspect of education, childhood and youth studies as part of a small-scale investigation for a Masters qualification designed to contribute to knowledge and practice in my chosen area of specialism. This particular interview is designed to help answer:

*Teachers' interpretations and classroom practices in relation to 'mastery' teaching in mathematics: a case study of one English secondary school.*

#### Who is conducting the research and who is it for?

This interview is part of my studies on the Open University Masters module E822 'Multi-disciplinary dissertation: Education, Childhood and Youth'. On this module I have an opportunity to design a small-scale investigation which will generate findings relevant to and of value to practice settings. The interview has been agreed with my tutor to be an important part of this design to allow me to include the perspectives of selected participants in addressing the above research question. I will be analysing the data collected and reporting my findings in the dissertation I submit to the University as my final assessment for my Masters qualification.

#### Why am I being invited to participate in this research?

You have been chosen as your experiences and opinions would be highly valuable in helping to address a question which is considered one which will have value for your setting and others like it.

#### If I take part in this research, what will be involved?

The interview is intended to last no longer than 30 minutes and a place which I will negotiate with you and others in the setting to be mutually convenient. This might include an online interview setting. If there is anyone else affected by the interview, such as a member of staff, they will also have been consulted about when would be a convenient time and permission has been granted from the Department of Studies for Mathematics. If we will be using video conferencing software for the interview, you can choose whether to use your video and show your face or not. I would like to ask your consent to make an audio recording of our discussion so that I can refer back to what was said more accurately than would be possible just from my notes. If you do not wish to be audio recorded, I will accept your wish, and rely only on my written notes. Only I will have access to the audio recording. I do not need to share this with those at the University or in this practice setting. I will transcribe and anonymise the interview before sharing any part of this with my tutor or it form part of the final dissertation. Your contribution will be recognised by a pseudonym and you will be asked if you would like to suggest what name should be used. Any other real names referred to during the interview will be removed and renamed.

#### What will we be talking about?

The focus of the interview will be to find out your perspective on mastery teaching. I can share the questions with you in advance, if you would like.

#### Will what I say be kept confidential?

Your participation will be treated in strict confidence in accordance with the Data Protection Act (2018). No personal information will be passed from me to anyone else. Your consent forms will be stored safely in our professional setting as agreed with the senior leader overseeing the safe conduct of this research. In the case of the audio recording and my notes of the interview, these will be kept confidential and typed up as soon as possible. However, if you disclose anything during your interview which I consider means that you might be unsafe or have been involved in a criminal act, because this is a safeguarding concern, I will need to pass this immediately to the organizational Designated Safeguarding Officer. The anonymised records of the interview will be stored securely on password protected devices and the original notes and recording will then be destroyed. I will be submitting an analysis of the data collected from the interviews as part of my dissertation submitted as the end-of-module assessment. I also plan to present my findings to relevant audiences. I can confirm that neither you as an individual nor the setting will be identifiable in any of these reports and presentations.

The ethics protocols and documentation to support the E822 Multi-disciplinary Dissertation: Education, Childhood and Youth have been developed with advice from the Open University Human Research Ethics Committee and have been confirmed by the Chair as fully compliant with The Open University's Ethics Principles for Research with Human Participants.  
Link: <http://www.open.ac.uk/research/sites/www.open.ac.uk/research/files/files/Documents/Ethics-Principles-for-Research-with-Human-Participants.pdf>





**What happens now?**

After reading this information sheet, please review and complete the consent form. Your participation is entirely voluntary and you can withdraw your consent at any point up by letting me know, until the time I am using your data in my University assessments. As soon as you let me know you wish to withdraw, your consent forms and any data collected will be destroyed.

**What if I have other questions?**

If you have any other questions about the study I would be very happy to answer them. Please contact me at [watsonjbecca@gmail.com](mailto:watsonjbecca@gmail.com).

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Link: <http://www.open.ac.uk/research/sites/www.open.ac.uk/research/files/files/Documents/Ethics-Principles-for-Research-with-Human-Participants.pdf>



## ECYS/WELS

### E822 INTERVIEWS CONSENT FORM

(To be completed by all participants)

Please indicate YES or NO for each of the questions below and return the completed form by 17/03/23 to Rebecca Scott, either in person or at [watsonjbecca@gmail.com](mailto:watsonjbecca@gmail.com).

Have you read (or had read to you) the information about this interview?	YES	NO
Has someone explained this interview to you?	YES	NO
Do you understand what this interview is about?	YES	NO
Have you asked all the questions you want?	YES	NO
Have you had your questions answered in a way you understand?	YES	NO
Do you understand it is OK to stop taking part at any time?	YES	NO
Are you happy for the interview to be audio recorded?	YES	NO
Are you happy with how your data will be stored?	YES	NO
Do you understand that your and any other real names as well as any identifiable information will be removed from what will be shared after the interview?	YES	NO
Are you happy to take part?	YES	NO

If any answers are 'no' you can ask more questions. But if you **don't** want to take part, please let me know and **don't** sign your name.

If you **do** want to take part, please write your name and today's date

Your name \_\_\_\_\_

Date \_\_\_\_\_

Thank you for your help.

The ethics protocols and documentation to support the E822 Multi-disciplinary Dissertation: Education, Childhood and Youth have been developed with advice from the Open University Human Research Ethics Committee and have been confirmed by the Chair as fully compliant with The Open University's Ethics Principles for Research with Human Participants. Link: <http://www.open.ac.uk/research/files/www.open.ac.uk/research/files/Documents/Ethics-Principles-for-Research-with-Human-Participants.pdf>



**Faculty of Wellbeing, Education, Language and Sport**  
**Study related to Masters module 'E822 Multidisciplinary**  
**Dissertation: Education, Childhood and Youth'**

**For participants invited to provide documents**

**E822 Information Letter: Documents**

Dear Gatekeeper,

I am currently studying on the masters module 'E822 Multidisciplinary Dissertation: Education, Childhood and Youth' at the Open University in the Faculty of Wellbeing, Education, Language and Sport. My studies are being supervised by a personal tutor and I am following research protocols recommended by the University which have been approved by a named supervisor in this setting. I am using a range of ways of collecting information to answer the following question: *Teachers' interpretations and classroom practices in relation to 'mastery' teaching in mathematics: a case study of one English secondary school.*

This is as part of a small-scale investigation aimed to help me better understand and develop mastery practice and to share my findings with others for whom the findings will be relevant to changing practice.

I invite you to provide your permission to use department mastery policy documents as part of my study.

If this is specifically created documentation, I confirm that documents will be either created so that the author cannot be identified or will be de-identified.

- I confirm that I will not be collecting images which include images of people (whether children and young people or adults).
- If this is existing documentation, then I confirm that all identifiable information will be removed before the documents are shared beyond the setting.

All documentation will be kept confidential, being stored securely on password protected devices. In the case of paper copies, digital images will be taken as soon as possible. The original versions will then be destroyed. You can withdraw your permission for the documents to be included in my study. If you wish to do so, please contact me by 31/03/23.

If you do not consent for the requested documentation to be used in my study, please contact me and I commit to excluding your data. Please feel free to ask me any questions about how this document will be used in my research before making your decision. Please contact me in person or by email at [REDACTED]

Yours sincerely, Rebecca Scott

The ethics protocols and documentation to support the E822 Multi-disciplinary Dissertation: Education, Childhood and Youth have been developed with advice from the Open University Human Research Ethics Committee and have been confirmed by the Chair as fully compliant with The Open University's Ethics Principles for Research with Human Participants.

Link: <http://www.open.ac.uk/research/sites/www.open.ac.uk/research/files/files/Documents/Ethics-Principles-for-Research-with-Human-Participants.pdf>



## ECYS/WELS

### E822 DOCUMENTS PARTICIPANT CONSENT FORM

(To be completed by all participants)

Please indicate YES or NO for each of the questions below and return the completed form by 17/03/23 to Rebecca Scott, either in person or at [watsonjbecca@gmail.com](mailto:watsonjbecca@gmail.com).

Have you read (or had read with you) the information about the documents to be collected?

YES NO

Has someone explained the reason for collecting the documents to you?

YES NO

Do you understand which documents will be collected?

YES NO

Have you asked all the questions you want?

YES NO

Have you had your questions answered in a way you understand?

YES NO

Do you understand it is OK to withdraw your permission to use the documents?

YES NO

Are you happy with how your data will be stored?

YES NO

Do you understand that your name and any other real names as well as any information that would identify you will be removed from the documents?

YES NO

Are you happy for documents relating to you to be used as explained?

YES NO

If any answers are 'no' feel free to ask for further information. However, if you **don't** want to allow your documents to be used, please just let me know and **don't** sign your name.

If you do give consent, please write your name and today's date. You can change your mind later, by letting me know.

Your name \_\_\_\_\_

Date \_\_\_\_\_

Thank you for your help.

The ethics protocols and documentation to support the E822 Multi-disciplinary Dissertation: Education, Childhood and Youth have been developed with advice from the Open University Human Research Ethics Committee and have been confirmed by the Chair as fully compliant with The Open University's Ethics Principles for Research with Human Participants.

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## Appendix D: Interview notes

1	<p>"...developing a deeper understanding of the subject".</p> <p>"I make more use of displays".</p> <p>"We have a link to a mastery specialist and collaborate with the local Maths Hub and NCETM".</p> <p>"...coherence, representation, fluency, variation theory. Can't remember what the fourth or the fifth one is".</p> <p>"As a result of increased mastery modelling, pupils seem to be able to see the relationships between topics more easily. Pupil voice has also shown better retrieval of topics. Pupils can articulate their responses better than they used to, and that's how we can judge their success".</p>	<p>-Policymakers have previously gone into English schools and noticed algorithmic approaches being used, but the pupils did not necessarily understand where they came from. Mastery is about putting more of an onus on the pupils to come to conclusions. It is about the questions you ask the pupils and how you use resources.</p> <p>-Number lines or bar models can be used for higher ability pupils, but perhaps not practised as much; a quicker pace would be present so as not to waste time. Lower ability pupils practise the models more, before moving onto abstract problems. However, all pupils still get the same content; just the scaffolding would vary.</p> <p>-Received a lot of training. Most of it from independent research when mastery was first thought about. Some teachers have been on courses with mastery specialists and relayed information back to the school.</p>
2	<p>"Mastery means checking the pupils have mastered topics to a certain depth".</p> <p>"It is hard to quantify what those variables are I guess".</p> <p>"I do not insist pupils use bar modelling as I have found over time pupils get more confused".</p> <p>"No specific external training".</p> <p>"Fluency, variation... is representation one?"</p> <p>"Seeing pupils get things right and respond".</p>	<p>-Modifications are greater at KS3 than KS4. They check the examples and ensure there are always small steps present. So, depth can be accessed for all pupils. In terms of variables, it is about knowing the pupils in the class and how likely they are to pick things up. It can be a hard balance achieving challenge in lessons (especially for high ability pupils) whilst also breaking things down into small steps.</p> <p>-Trying to use bar modelling sometimes creates more confusion.</p> <p>-Received a little training internally from colleagues going to sessions with specialists.</p> <p>-Seeing pupils get things right – feedback.</p>
3	<p>"Mastery is making sure that pupils really understand the topic".</p> <p>"I go over lesson plans".</p> <p>"At higher GCSE the goal is to move pupils away from representations".</p> <p>"Don't think I have taught that many mastery lessons properly".</p> <p>"I started training about six years ago where I went on a course three or four times a year with a local specialist from the mastery hub".</p> <p>"Coherence, representation, variance, fluency and mathematical thinking".</p> <p>"If pupils can remember what they have done when you revisit it, then they have made progress".</p>	<p>-Pupils have a deeper understanding of what they are doing and not simply doing maths on rote.</p> <p>-Checks for modelling required and is careful with that when planning. Teacher pitches representation at lower ages and abilities.</p> <p>-Variation theory works well. However, solving equations doesn't lend itself to negatives when trying to model questions. So, the teacher has looked at function machines etc. but they are not entirely sure how to teach this topic using representations. Most have limitations - links to subject knowledge.</p> <p>-Training since the initial training with the specialist has only been a couple of times a year online.</p>
4	<p>"To me it means something different to how the school do it. It means being fluent at things and being able to use several methods. And being able to competently check each method".</p> <p>"Use of bar models is encouraged".</p> <p>"I do not know if I use mastery properly. Or in the way that other people would define as mastery. I have my own definition".</p> <p>"A primary school maths hub specialist teacher came in once and talked about mastery".</p> <p>"No, I cannot, sorry. I think I once knew them. Maybe not".</p> <p>"I have no idea. There is no way to judge pupil progress, certainly not in respect to mastery teaching. You can try, but it is difficult. Some people would say they know, but I am not sure they would".</p>	<p>-Means being able to pull out specific techniques and have a depth of understanding.</p> <p>-The teacher goes through what is in their head as they are teaching. They think mastery for high ability classes makes sense because you can show them beyond what they are doing, e.g., you can show further maths GCSE pupils A level content. With low ability classes, they think apart from diagrammatical methods, showing them the abstract is too difficult. If mastery is doing diagrams, then pupils can do that a little bit. But they do not agree this constitutes and defines mastery.</p> <p>-Mastery is about bringing the human side, knowledge, to complex problems in the classroom.</p> <p>-They believe some low ability pupils cannot achieve mastery in tests.</p> <p>-Department meetings mentioned. They do not think the training has been successful on themselves because they cannot remember the different methods you are meant to use. They have taken mastery guidance independently from the Mathematics Association, Mathematical Pi and Symmetry Plus.</p> <p>-Mentioned looking and comparing to national data. However, national data does not work, and ALPS is not fit for purpose in their opinion. There should be signs there because the principles of mastery are good. But telling this from the data would be difficult.</p>

5	"I use my own resources, not those from the NCETM".	-Depth mentioned. -Knew about specialists but had not spoken to one directly. -Had researched independently. -Could list all five principles. -Was not sure how you can measure progress.
6	"The NCETM provide some links to resources, but I do not use them. I use a mixture of lessons, most of which I have made myself". "I do not use the resources from the specialists at the hub".	-Mastery is using bar models. They go through examples, so pupils have a deeper understanding of the topic taught. Although they thought confusing for some pupils. -Received internal training from a colleague who had been on a mastery course. -Mentioned they had researched independently after their training.
7	"I have been on one training course with a mastery specialist".	-Mastery is pupils using textbooks to understand several different methods to answer the same question. However, we do not use them here as there is not enough money. -Had received internal training with a specialist. -Still carries out mostly independent research.
		-Could list two principles.
8	"Pupil progress is evidence of retrieval practice".	-Mention of depth. -Had awareness of mastery specialists but wasn't sure how you go about meeting one. -Was not sure of the mastery principles.
9	"Remembering things"	-Mastery is a deeper understanding of topics. -Mastery was thought of as using diagrams, such as pictures and bar models. -Had been on a few courses with a "informal" mastery specialist, but nothing for a while. They couldn't remember the last course they had been on. -They have mastery textbooks for the pupils, but only a few. Noted that this is a shame because pupils in South-East Asia benefit from heavy textbook use in class, whereas English pupils do not.
10	"Mastery modelling allows for greater retrieval of knowledge".	-Fluency mentioned. -Retrieval of knowledge can be seen in better bookwork. -Aware of mastery specialists but had not gone to any training as there wasn't time.

Theme 1 – Depth of understanding

Theme 2 – Mastery in practice

Theme 3 – Training

Theme 4 – Evidence of pupil progress

### Appendix E: EMA evidence reflection grid

Category	Feedback received, targets achieved, and areas of development worked on	How did this shape my dissertation
<p><b>Knowledge and understanding:</b></p>	<ul style="list-style-type: none"> <li>• <b>Feedback from draft submission 2:</b> To provide a brief content/thematic analysis of the literature, so arguments are then conveyed as clearly as possible in the dissertation.</li> <li>• <b>Feedback from TMA02:</b> Feedback centred around triangulation and how it is a positivist concept and practice.</li> </ul>	<ul style="list-style-type: none"> <li>• I looked at the NFER Mentoring and Coaching Review of Literature (Lord, Atkinson and Mitchell, 2008) which helped me to refine the search strategies used for my SSI. This was useful when it came to pulling my dissertation together, linking my knowledge with a then more critical analysis. I also made mind maps in my research journal, which helped me to see links between topic themes.</li> <li>• To see alternatives to triangulation for qualitative researchers I read extracts from Lincoln and Guba (1985) which improved my understanding.</li> </ul>
<p><b>Critical analysis and evaluation:</b></p>	<ul style="list-style-type: none"> <li>• <b>Feedback from previous EMA:</b> Make sure all arguments are supported by evidence/references.</li> </ul>	<ul style="list-style-type: none"> <li>• I cross-referenced my arguments/analysis with my references, making sure any claims were backed up with evidence.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>PDP Target (from end of previous module, EE831):</b> To complete a National Professional Qualification (NPQ) course, to critique and analyse their impact on teacher effectiveness.</li> </ul>	<ul style="list-style-type: none"> <li>• I used my research journal to make notes whilst on this course. This helped with my dissertation, as I looked at some of the references relevant to my topic in more depth. I also challenged my practise based on some of the content taught through this course.</li> </ul>
<b>Links to professional practice:</b>	<ul style="list-style-type: none"> <li>• <b>PDP Target:</b> To manage workload and personal motivation by creating a writing timetable for the EMA.</li> <li>• <b>PDP Target:</b> To challenge my own assumptions of teaching for mastery.</li> </ul>	<ul style="list-style-type: none"> <li>• Managing my time by creating a daily writing goal allowed me to factor in time for editing and checking my EMA before it was due in.</li> <li>• I considered how this case study research would benefit me professionally. I also regularly referred to my research journal notes surrounding ethics, as a reminder to myself to try to remain neutral during the research process, but also question practice in my setting.</li> </ul>
<b>Structure, communication and presentation:</b>	<ul style="list-style-type: none"> <li>• <b>Feedback from previous EMA:</b> Ensure the clarity of arguments in the literature review is clear,</li> </ul>	<ul style="list-style-type: none"> <li>• I made sure to add in an extra couple of sentences to my literature review, introducing the emerging themes from the literature</li> </ul>



	<p>stating how these feed into the research questions.</p> <ul style="list-style-type: none"> <li>• <b>Tutor Group Feedback (and PDP Target):</b> Use Cite Them Right Harvard Referencing.</li> </ul>	<p>review, how they were derived, and explicitly stating how they linked to my research questions.</p> <ul style="list-style-type: none"> <li>• I looked at the referencing guidance on the OU library, using referencing software such as Mendeley to support. Peers in the tutor group helped with guidance and were able to provide tips on how they were collating their references. I used my own personal referencing notes and the online guidance to check my referencing.</li> </ul>
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