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Abstract

Tracing translation of an education policy initiative (Maths Mastery) into primary school teachers' classroom practices: an actor-network theory ethnography

Ruth Unsworth

Teachers' classroom practices in the English primary sector have long been subject to prolific intervention by government policy and policy initiatives. The influence of education policy and policy initiatives on teachers' classroom practices has been discussed from multiple perspectives, including theories intended to increase effectiveness of policy implementation and others aimed at problematising government policy-led standardisation efforts. However, few studies empirically describe how policies come to be part of teachers' classroom practices. This thesis seeks to address this gap in the literature. Drawing on data from a four-month short-term ethnography in a primary school in the north of England, I describe how one policy initiative – Maths Mastery – is translated into teachers' classroom practices. I use a combined theoretical framework of actor-network theory (ANT) and literacy studies (LS) as a lens through which to view ethnographic data, drawing particularly on Callon's *four moments of translation* to describe key moments in the adoption of the new policy initiative into existing classroom practices. The findings of this thesis offer schools, policy-makers and the academic field an example of the ways in which a government policy initiative interrupts and changes existing classroom practices by becoming part of the network of practices in a school. Material actors, particularly texts, are described as key to the establishment of changes to practices, and yet reliant upon the work of human actors, particularly spokespersons for the change. This thesis thus argues the value of attending to associations between human and non-human actors in studies of policy-based change.

**Tracing translation of an education policy initiative (Maths
Mastery) into primary school teachers' classroom practices: an
actor-network theory ethnography**

**This thesis is submitted to
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ORCID ID: 0000-0002-4900-3590

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List of Abbreviations

ANT – actor-network theory

DfE – Department of Education (England)

EYFS – the Early Years Foundation Stage

LS – Literacy Studies

OfSTED - The Office for Standards in Education, Student Ren’s Services and Skills

NCETM - The National Centre for Excellence in the Teaching of Mathematics

MAT – Multi-Academy Trust

TRG – Teacher Research Group

Dedication

*To Chris, the most patient of listeners to actor-network theory readings of all aspects of reality;
and to Rose, for giving up much of our playtime to the prolonged writing of this thesis.*

1. Introduction to the Thesis

1.1 Introduction to the research

When I began this research, I was working as a deputy headteacher in a primary school in the north of England. Within this school, I was tasked with the role of Professional Development Lead, which involved observing, and talking with teachers about, their classroom practices: the strategies and pedagogies which characterise teachers' actions and interactions in the classroom. I had held this role previously in different schools, and in different education systems: the English independent schools sector, British international schools and as a local authority education consultant in England. In each school, I noticed variation in classroom practices from classroom to classroom. Teachers drew on different sources to shape their practices, often drawing on multiple sources simultaneously. These sources included policies currently being promoted in the school or on a national basis (the national curriculum, systematic synthetic phonics, Talk for Writing, for example), professional experience, past policies (resources and pedagogies from the Literacy Hour, for instance), ideas found on teaching websites or in student textbooks. Variation was present between teachers' practices despite the existence of school and national policies aimed at standardising them. Some teachers I observed would show a tendency to closely follow government policy around classroom practices, resulting in some similar practices to others in their school and in other schools. Other teachers (or the same teacher in different subjects) would largely eschew such external dictations of practice, drawing on what they perceived to be their professional experience, leading to highly idiosyncratic practices.

My observations made in these professional roles echoed the findings of the Cambridge Primary Review (Alexander, 2010), which reports variation in teachers' practices in England, particularly in responses to universally prescribed curriculum and pedagogy. Some teachers in

the review rail against a perceived compliance culture in English education in 2010, with teachers dependent on government policy for ideas; whilst others are happy to use ready-made banks of lessons and not to move beyond external support in relation to their classroom practices. Further studies explore variation in classroom practices as the result of an amalgam of multifarious influences – both formal and experiential – on professional learning (Eraut, 1994). Efforts to explicate these influences range from exploring situational differences specific to individual classrooms and schools (Kyndt et al., 2016), to the influence of the professional and personal self (Nias, 1987), or influences from wider activity in politics (Ball, 2013). I became curious about how these diverse, and at times conflicting, influences might combine to form different iterations of classroom practices in a school. This curiosity, along with Alexander's (2010) recommendation for further empirical research into variations in teachers' classroom practices, provided the impetus for the initial broad focus of my research:

What influences the formation of teachers' classroom practices?

My approach began broadly, exploring influences on teachers' classroom practices in general, following common threads of practice as they emerged during fieldwork. However, as my fieldwork progressed, I became interested in recurrences in my data around the role of policy initiatives in the different ways that classroom practices were discussed and enacted. I define 'policy initiative' in relation to 'policy' at the beginning of my literature review (see Chapter 2.1), but a brief working definition is that 'policy initiative' refers to a policy project (Hamilton, 2011) which is not delivered directly to schools in a singular law, system or procedure, but rather consists of a collection of policy definitions, requirements or guidance texts which together make up a specific course of action. The policy initiative which forms the focus of this thesis is Maths Mastery. During fieldwork, Highland School (the site of my study) was in a period of intense focus on initiating changes to their classroom practices based in this policy

initiative. Maths Mastery is a subject-specific non-statutory pedagogical approach, which has been heavily supported, promoted and funded by the English government (see Chapter 5.3).

This style of policymaking (non-statutory in nature but heavily recommended and backed by central government) rose in popularity in England post-2010 ‘The Importance of Teaching’ white paper (DfE, 2010). This white paper was directed towards English schools (rather than all schools in the UK), with education in Scotland, Wales and Northern Ireland a devolved matter since the late 1990s (each country has separate education systems and curricula under separate governments). In this white paper, the English government promise a substantial return of agency to its schools in relation to the determining of their practices; to ‘devolve as much power as possible to the front line’ (DfE 2010, p.3). What followed this move was a reduction in centrally determined statutory teaching strategies and pedagogies such as those prescribed by previous National Literacy and Numeracy Strategies, but a simultaneous rise in government promotion and funding of non-statutory ‘evidence-based guidance’ or policy initiatives around classroom practices (Biesta, 2010).

I became intrigued by the ways in which the non-statutory Maths Mastery initiative, which presents more as a ‘movement’ than a policy in the sense of a single document, enters teachers’ discussions with colleagues around their classroom practices and then their practices in the classroom: how it is translated into their practices (Callon, 1986). Particularly, I found interesting how the non-statutory initiative becomes imbued with a sense of authority in the determining of teachers’ practices; how practices gradually become aligned to the Maths Mastery approach and where variation still exists despite the growth of widespread common usage of the initiative in the school. It is hoped that in giving an empirical account of the translation of the Maths Mastery policy initiative into teachers’ classroom practices that I may highlight potential ways in which such policy initiatives may come to influence teachers’

classroom practices. For teachers, schools and policymakers, this affords opportunity for more informed discussion of future developments to classroom practices.

1.2 Research questions

The main research question of this thesis is: *How is an education policy initiative (Maths Mastery) translated into teachers' classroom practices?*

My focus in this study is the ways in which an education policy initiative enters into, and becomes part of, an existing network of classroom practices in an English primary school. To retain this focus, I foreground the various ways in which the newly introduced policy initiative interacts with existing influences to produce a change to practices. In this sense, I do not offer a critique of the Maths Mastery policy initiative. I only describe particular elements of the Maths Mastery approach to enable discussion of which elements become part of, or are excluded from, teachers' practices and how this is achieved. In essence, Maths Mastery could be replaced by the name of another initiative, if the participant school had been implementing a different approach in a different subject. I have therefore reflected this focus in the use of brackets around 'Maths Mastery' in the main research question.

My main research question is split into four sub-questions, which are addressed sequentially in the four findings chapters of this thesis:

- 1. How are existing practices problematised in order to initiate change?*

This question explores how existing classroom practices are brought into question in order to establish a need for change.

2. *In establishing this change, how are teachers' ties to existing practices weakened and ties to the new approach formed and strengthened?*

This question explores what happens when the Maths Mastery policy initiative enters into the existing network of teachers' classroom practices. It interrogates initial interactions between existing and new influences on practices, specifically seeking ways in which teachers' ties to the 'old' way of doing things are weakened and how buy-in to the new approach is garnered in the early stages of the introduction of the policy initiative.

3. *How are actors enrolled into the new pedagogic practice?*

This question seeks to describe how the policy initiative expands into different teachers' classroom practices, establishing the new approach more widely. Through this question, I seek to describe the negotiations, inclusions, exclusions and adaptations that occur in relation to the policy initiative and existing practices as they come more widely into contact. Through describing these interactions, I provide an account of the ways in which the policy further becomes part of, or is rejected from, classroom practices as teachers in the school begin to work with Maths Mastery more widely.

4. *How is the new approach mobilised into teachers' classroom practices?*

This question interrogates how the network of classroom practices in the school now operates, or does not operate, within the parameters of the policy initiative. It seeks to describe how the policy initiative is established as a central part of teachers' practices in the classroom; how it is sustained and reified as such, or, conversely, how it is undermined or resisted.

1.3 Scope of the study

This thesis aims to describe how a policy initiative enters into an existing iteration of teachers' classroom practices in a way which establishes a change to those practices. In describing the scope of this study it is perhaps easier to describe what it is not. Firstly, the purpose of my study is not evaluative: I do not seek to evaluate how *successful* the school is in implementing the policy initiative, nor to evaluate the impact or content of the focus policy initiative - Maths Mastery. This is not a study of the effectiveness of policy implementation or of the impact of a particular policy. In fact, within this thesis, the Maths Mastery policy initiative is treated in a way in which the phrase 'Maths Mastery' could be easily replaced by the name of any other policy, in the sense that the policy initiative itself is only the focus of the study in the ways in which it is translated into practices. I do not engage with the content of the Maths Mastery policy initiative in a way which seeks to analyse or critique the pedagogical approach it describes. Rather, I focus my thesis on describing the associations of influences which produce a change to classroom practices based on a policy initiative: the social actors at work; how they associate; how actors become agentic; how they gain dominance over others or become excluded from the resulting (new) iteration of classroom practices. My aim is thus to describe the actors and how they associate to establish a change to practices, rather than evaluating the impact of a particular policy initiative.

Similarly, whilst this thesis speaks to how a change to teachers' classroom practices is established, it does not seek to describe a change management approach (see for example Fullan, 2014; Kotter, 2012). My description of the establishment of a policy-based change to teachers' classroom practices rather seeks to provide empirical food for thought around the multifarious ways in which a policy initiative comes to be part of teachers' classroom practices.

Finally, in speaking to the scope of this study, it is necessary to acknowledge the partiality of the account of the policy-led establishment of change to practices offered in this thesis. It would be impossible for me to detail all possible influences at work in the production of teachers' classroom practices; for example, those relating to teachers' lives, actions and thoughts outside of the school which may exert influence on how they view and enact their practices inside the school. This study, then, describes some of the central influences at work in the establishment of a policy-led change to teachers' practices, with the hope that awareness of these influences might illuminate discourses of the relationship between policy initiatives and teachers' classroom practices.

1.4 Organisation of the thesis

This thesis is organised into ten chapters. In what follows, terms relating to the theoretical framework and explained in Chapter 3 are italicised.

Chapter 2 reviews the literature relating to the relationship between education policy/ policy initiatives and teachers' classroom practices. Drawing on literature from a range of perspectives on education policy, I explore different approaches to the policy/practice relationship. Through this explication, I situate my study in the field of study of the relationship between education policy and teachers' practices.

Chapter 3 sets out the theoretical approach of the research. I introduce the central theoretical assumptions of Literacy Studies (LS) and Actor-Network Theory (ANT) and position a school's classroom practices as an actor-network. I describe an ANT-LS approaches to giving an account of a change to an existing actor-network of classroom practices, and how this approach deals with related notions of power and agency.

In Chapter 4, I set out my methodology. I explain and justify the ethnographic approach I have taken, arguing the case for a short-term ethnography. In relating the theoretical approach to my ethnographic methodology, I justify the presentation of findings as a rich description – a story. This chapter also details the methods of data collection used and how data was analysed in relation to the theoretical framework.

Chapter 5 provides information relating to the site of fieldwork – the research field. I describe Highland School and introduce the social actors in the ethnographic story. I provide an overview of the Maths Mastery policy initiative that is the basis of the change to classroom practices for the teaching of mathematics described in this thesis. I unpack the main research question in relation to Callon's (1986) ANT notion of *translation* and introduce the data I draw upon in my findings chapters.

In Chapter 6, I present my first of four chapters dedicated to the findings of the research. I describe the *literacy events* (Heath, 1982), *literacy practices* (Street, 1984) and *assemblages of actors* (Latour, 2005) which effect *problematization* (Callon, 1986) of existing practices and establish a need for change, in particular a need for introduction of the Maths Mastery initiative into teachers' classroom practices. This chapter details the creation of early central *nodes* in the existing network of classroom practices which begin to destabilise existing practices and create buy-in to a promoted need for change.

Chapter 7 is my second findings chapter, in which I describe *interressement*: the weakening of links between existing actors in the network and the strengthening of links to concepts from the Maths Mastery approach (Callon, 1986). I describe the expansion of Maths Mastery actors within the actor-network through further *literacy events*. I trace *intertextuality* between texts

representing the new approach and how ties to the new approach are forged and reified through certain *literacy practices* in training provided by Maths Mastery ‘experts’.

In Chapter 8, I describe how other actors within Highland School become *enrolled* in the new approach (Callon, 1986) to teaching mathematics. I describe how the initiative is localised for use in Highland School, creating a *network effect* (Latour, 2005) of an *intertextual hierarchy* (Smith, 2006) which becomes a textual infrastructure for the change to classroom practices. I describe how the new approach gains influence and the associations between actors which bring about localisation of the policy initiative and *enrolment* of further actors into the ways of the new approach.

Chapter 9 is the final findings chapter, in which I describe how the new approach to classroom practices is *mobilised*, whereby actors act – or do not act – within the new practice parameters (Callon, 1986). I explore the role of collaborative technologies, repeated phrases, team-teaching and photographs as technologies of *mobilisation*. I conclude my findings by considering the actor-network as perpetually in motion: I examine the role of variance in the patterned orderings of actors and describe actors that produce structural tension which maintains the actor-network.

Chapter 10 brings together understandings developed through this empirical study and explores the implications of these for the wider field of study. I explore what we can learn from viewing policy-based change as *translation*. I argue the value of tracing the *literacy practices* and textual artefacts of policy-based change to classroom practices. I reimagine notions of power and agency apparent within many current perspectives of the policy-practices relationship and argue the value of seeing these as *network effects*. I use this to problematise the ‘non-statutory’

nature of initiatives like Maths Mastery, rather arguing that the ways in which such initiatives enter schools rather positions them as softer methods of government control of teachers' practices, tied to wider government agendas of accountability and performativity towards centralised educational goals. Conversely, I also explore how through tracing *translation*, we can see how the initiative becomes localised, counteracting the extent of government control of classroom practices. Finally, I explore what an ANT-LS approach offers to the study of the relationship between policy and classroom practices.

2. Literature Review

2.1 Introduction to the literature review: defining the subject

My research is a study of how a government-promoted education policy initiative is *translated* into teachers' classroom practices. In this study, *teachers' classroom practices* is a term used to denote the strategies and pedagogies which characterise teachers' actions and interactions in the classroom (Carr, 1989; Gipps et al., 2015). For example, classroom practices may include a certain approach to marking, a behaviour management strategy, a method of teaching a particular subject. A study of a change to teachers' classroom practices is thus seen here as a study of a change to these strategies or pedagogies.

The policy context of this empirical research is the English education system, which is different to that of other UK countries (education has been a devolved matter in Scotland, Wales and Northern Ireland since the late 1990s). National policies referred to in this thesis are thus to be read as English national policies. *Policy* is used in this research as an overarching term which acknowledges the many forms associated with it – laws, systems, procedures, for example –, but whose common aim is to put into action a specific course of actions or processes (Gorur, 2011). In English primary schools, there are often many policies being enacted simultaneously (Clarke, 2019). Many of the policies mentioned in this thesis are English government policies relating to schools, curriculum and teaching: a national assessment policy document (DfE, 2016a) or the national curriculum (DfE, 2014a). Other policies described are those created by schools, or collectives of schools, and are often local interpretations of government policies.

The sense of *policy* meant in this thesis also acknowledges the different physical/ abstract forms policy can take: for example, policy as *text* or policy as *discourse* (Ball, 2003). To unpack this a little, we may see policies which enter schools as written text(s), such as a policy document,

and others which enter schools as part of a wider discourse or professional movement. These discourses or movements may also exert influence on teachers' classroom practices (Kemmis, 2005). In the case of the latter, discourses come to characterise the work of teachers through systems, procedures, conversations, resources, buzz words, and so on, which teachers begin to use and relate their classroom practices to. To differentiate these types of discourses and movements from policy contained within a single policy document, I adopt the term *policy initiative*. This is meant in the sense of a policy project (Hamilton, 2011) which is not delivered directly to schools in a singular law, system or procedure, but rather consists of a collection of policy definitions, requirements or guidance texts which together make up a specific course of action.

The *Maths Mastery* initiative discussed in this thesis (see Chapter 5.3) is, in this sense, a policy initiative because the course of action is promoted to schools, not through a single policy document, but rather through government backing of the Maths Mastery teaching approach through various channels and projects. These include: a government-funded initiative to send teachers to Shanghai to see Maths Mastery methods in practice (DfE, 2016b); a government-funded national mathematics association who roll out training in Maths Mastery to schools (Boylan, 2018); the latter's associated websites and training materials. Maths Mastery thus is referred to as a policy initiative in this thesis as the course of action it represents comes to Highland School through a suite of related definitions, requirements, guidance texts, websites, training materials, and so on (see Chapters 6-9).

In this literature review, I expand these definitions of policy by describing ways in which the relationship between *government* policy and teachers' classroom practices is presented in the literature. Much of the literature which speaks to education policy in relation to teachers' classroom practices in England focuses on government policy, rather than policymaking within individual organisations. This focus is perhaps instigated by the consistently fractious

relationship in England between schools and government policymakers (Ball, 2003), in which the English government sets both the goals and parameters for ‘raising standards’ in schools (DfE, 2022a) and sets about achieving this partly through continued generation and dissemination into schools of myriad policies. Developing teachers’ classroom practices can thus be said to have become a site of deeply contested policymaking (Clarke, 2019) from which antithetical perspectives on the policy-practices relationship emerge. I first explore models which can be seen as ‘top-down’: a body of academic research that frames policy in a top-down manner, or put simply, of government policy direction and teacher policy following. I next explore the latter’s opposite: ‘bottom-up’ perspectives which start from a practitioner or school view of policy, which are often used to critique top-down views. Thirdly, I discuss non-linear models which explore relationships between policy and practices as constituted by interactions between the people, places and things that produce them. Finally, I revisit my research questions in relation to these perspectives and situate my study within a non-linear approach.

2.2 Top-down perspectives of policy

Top-down approaches to government education policy often foreground the idea that socio-economic problems found in national/ global societies can be addressed “through the production of policy texts ... and insertions into practice” (Ball et al, 2012, p.2). For example, the English government’s ‘Opportunity for All’ (DfE, 2022a) links its recommendations for significant change to England’s education system to a gap in educational progress caused by social inequities during the Covid-19 pandemic. Similarly, the DfE’s ‘Sustainability and Climate Change’ (DfE, 2022b) policy paper sets out a strategy to address climate change issues through the English education system. From this positioning of education as a tool for

addressing social problems, top-down models of policy begin from government policy and seek to explicate effective ways of implementing policy in practice. Thus, a large body of work taking this approach sits within the field of policy implementation research (O'Toole, 2000).

Within policy implementation research is a trend towards studies which are directed at evaluation of policy implementation or effectiveness of policy implementation (Malin and Morrow, 2009). Studies in policy implementation research often take the form of large scale reviews of how effectively policies have been implemented and their impact on (government-defined) outcomes for education. This is particularly true of policy implementation research conducted in England during periods of intensive policy-driven reform of teachers' practices in the 1990s and early 2000s. An example of these types of studies is a report to the Department for Education and Employment (as then known) around the implementation of a skills audit in schools (Steedman, 1999). A further example is an analysis of the implementation of government policy relating to the success of teaching vocational qualifications in further education institutions (McIntosh, 2002). The focus of the top-down model of the policy-practice relationship is on the implementation of policy; how policy can be (or has been) accomplished as a working change or direction to practice (Odden, 1991). The policy/practice relationship in this model is thus seen as one-directional: an achievement of changes to practice through hierarchical systems of command and control in which policy asserts change (Cairney, 2018).

Within this top-down direction of policy creation and policy following, policy is approached theoretically as a generic system that can be learned and applied to any context (O'Toole, 2000). Authors employing a top-down model thus critique policy by treating all schools as homogenous: the insertions into practice that top-down models describe or evaluate are generalised for all schools, with the focus of studies on the *product* of policy: evaluation or

description of how the policy might be, or has been, implemented. One widely used approach to discussing policy implementation is the policy cycle approach (Brewer and deLeon, 1983), in which the implementation of policy is seen as a cyclical process. This begins with homogenous agenda-setting, moving through periods of decision making, legitimatisation of change, implementation in practices and leads back to evaluation and agenda-setting on a general, or shared level (common to all schools in England, for example) (Sabatier and Mazmanian, 1980).

In light of this homogeneity, product-focused top-down approaches to the study of policy implementation have been criticised for arbitrary and unexplored notions of context (Gilbert, 1992) in which policy is seen as studied in a decontextualised way (Ball et al., 2012). This view argues that product-based top-down approaches omit the possibility that each individual policy has a context, in the sense that a policy is created and enacted by people, in places, in the reading and writing of other (perhaps policy) texts (Rizvi and Kemmis, 1987). This criticism is highly significant to an educational context, in that schools can be seen as full of simultaneous and varied influences, including the likelihood of several (sometimes competing) policies being enacted at the same time. English primary schools have been explored as in a state of continual receivership of government-led policy texts, each carrying varying reform requirements, engendering a variety of statuses and reach (Braun et al, 2011). These include policies containing mandates of practices set down in accompanying law, such as ‘Working Together to Safeguard Children’ (DfE, 2018) - statutory policy enforced through the Children Act 2004. Simultaneously, schools are in receipt of policies maintaining recommendation status as a policy initiative or recommended practices, such as the Model Music Curriculum (DfE, 2021), tied to other statutory policies such as the National Curriculum for England and Wales (DfE, 2014). Viewing policy as a product of implementation separate from the contexts in which it is enacted may risk marginalising the interactions between people and policy,

between people with multiple policies and multiple other contextual influences which establish policy-led change in practice, hiding from view “moments in processes of policy and policy enactments that go on in and around schools” (Ball et al, 2012, p.2).

However, recent directions in top-down approaches to education policy move beyond homogeneity in the treatment of schools, by shifting focus from evaluation or description of the product of policy – the successful/unsuccessful policy-directed change to teachers’ practices – to a focus on the *process* of policy. Such studies offer a ‘synthesised’ view of policy implementation, seeking to explore influences within school (and related social) contexts in implementation (Hill and Hupe, 2002). One such model is that of Bell and Stevenson (2015), whose model of the policy implementation process includes considerations of how policy may be influenced by contested discourses, personal/ institutional values and socio-political trends in relation to the policy theme. This positions policy implementation as an iterative process of enactment (Viennet and Pont, 2017), in which changes to educational systems or practices are influenced by multiple actors at various stages of the process. In this model, policy implementation is defined as ‘a purposeful and multidirectional change process’ (Viennet and Pont, 2017, p.6).

This perspective resonates with other top-down approaches such as the ‘multiple streams approach’ (Kingdon and Stano, 1984), which posits that change driven by policy occurs when three ‘streams’ relate: problems, politics, and policies. Whilst the three streams may exist independently of one another, relations between the three need to occur in order for policy-driven change to occur. In essence, the multiple streams approach posits that policy-making and policy-enacting require problematisation of an element of existing reality, the generation of a solution and opportunity to enact it (Cairney, 2018). This model assumes a need to understand the three streams and how they interact in order to understand the policy and its implementation. Drawing on analysis of this branch of policy implementation research,

Viennet and Pont (2017) posit that through such models, policy implementation has become more purposeful and multidirectional through wider acknowledgement that the change process may be “influenced by actors at various points of the education system” (Viennet and Pont, 2017, p.6).

Such developments in policy implementation research offer food for thought in terms of the relationship between policy product and policy process. These studies require us to look beyond the single site of individual policies to investigate how policy travels across institutional boundaries. From this perspective, to understand policy implementation, it would be beneficial to see the relationship between policy and teachers’ practices as multi-actor processes of implementation which involve different combinations of influences or actors at different stages (O’Toole, 2000). This perspective affords opportunity for exploring how policy may enter teachers’ classroom practices, through a hierarchical system of policymaking and policy implementation processes.

The ‘synthesised view’ and ‘multiple streams’ models seek to address concerns raised around many evaluation and effectiveness-focused top-down models of policy. However, the direction of travel of the analytic perspective in these studies remains in top-down mode, looking from policy to practice. This perspective can be seen as limiting in respect to its underlying assumptions around power and agency in relation to government and teacher. In this view, government policymaking is seen in a position of controlling power (Ball et al., 2012) and the teacher, as policy-follower, in position of disempowered agency (Lipman, 2009). Top-down models have thus been criticised for exacerbating a perceived compliance culture in education (Troman, 1996) and a subsequent reduction in teachers’ agency in relation to the determining of their own practices. The approach’s focus on the outcomes of policy implementation has been critiqued as having “shut down the spaces in which teachers can exercise their capacity to think for themselves, to theorise and generate their own practice” (Swann et al., 2010, p.552),

forming an artificial, homogenised construct of teachers' practices (Jones and Moore, 1993). Foregrounding of government policy implementation has thus been linked to 'deprofessionalisation' of teaching (Buchanan, 2015), with a narrowing of professional and public conceptions of 'successful' practices, based on how well teachers conform to certain national policies (Cribb, 2009).

2.3 Bottom-up perspectives of policy

A large body of studies exploring the relationship between education policy and teachers' practices position policy as a *process*. Within a process view, teachers are seen to operate within different institutional contexts, alongside political, societal, economic contexts, "all of which play an inter-dependent role in sustaining change" (Taylor, 1997, p.182). Policy is viewed as tied to discourse (Ball, 1994), an analysis of "the meaning making which goes on in legal and policy debates" (Bacchi, 2010, p.46). Government policy is thus often seen in terms of how it is ascribed meaning; how policy is enacted, and reacted to, perhaps differently, by certain people, in certain places.

Views of policy as a discursive, situated, social process can be seen in some top-down models, such as the 'synthesised view' and 'multiple streams' models. Other studies shift focus slightly, examining policy from the perspective of the daily professional lives of schools and teachers that the policy enters, rather than tracing the route of policy into practice. In this sense, these studies may be seen as 'bottom-up' perspectives.

From a 'bottom-up' perspective, the policy-practice relationship is often explored by positioning policy as within complex relations between situated influences. Some studies, for example, afford a view of how policy is mediated by local circumstance (Jones, 2009), by the schools, the colleges, the teacher training establishments that enact the policy (Hargreaves

and Goodson, 1996). Researchers writing from this perspective often attempt to deconstruct policy processes, foregrounding analysis of the ways in which policy is created, circulated and given prominence within different educational institutions. Processes of enactment and the people doing the enactment of policy are foregrounded in this view. For example, Stronach et al (2002) explore the ways in which “‘discursive dynamics’ come to re-write the professional teacher and nurse as split, plural and conflictual selves” (p.109) as they seek to go about their daily lives (and construct their identities within) “a complicated nexus between policy, ideology and practice” (p.109). In this study, the relationship between policy and practice also contains further contextual actors – metaphysical actors such as practitioner ideologies, trust and creativity – and influences already existent within the institutional contexts in which different teachers and nurses work. These influences are seen as holding potential to conflict with (government) policy that enters into the ‘ecology’ of the workplace. Explorations in this regard posit that the resultant character of teachers’ practices depends significantly on the character of local educational contexts (Talbert and McLaughlin, 1996). Variations in local educational contexts have been explored as influenced and led by local authority representatives, school leaders and department heads, whose agency may be seen to mediate policy and in turn mediate teacher practices (Wallace, 1988). School leaders are viewed as having potential to enable or disable, promote or interrupt elements of policy, or policy in its entirety (Riseborough, 1993). Through such studies is made visible a commonality in bottom-up perspectives, which often seek to understand the policy-practice relationship through an examination of what people *do* with policy in different professional places: the situated discursive processes through which policies are enacted.

This bears potential to balance questions of products and processes of policy-led reform with questions of situational aspects of education: relationships, purposes, public discourse (Biesta, 2013). Policy implementation is reimagined as a “process of interaction and

negotiation, taking place over time, between those seeking to put policy into effect and those upon whom action depends” (Barrett and Fudge, 1981, p. 4). This affords potential for a more expansive view of policy than many top-down models in the sense that actors from within and beyond the classroom and school may be seen as influential in the outcome of the introduction of a new policy into a school or classroom, as the policy is discussed and actioned.

Within a bottom-up model of the policy-practices relationship, affordance is given to the role of the teacher’s professional and personal self: their values and beliefs systems and how these interact with values and beliefs inherent to the school and policy contexts in which they work. For example, from this perspective, teachers’ practices have been widely explored as shaped by a complex mixture of technical and normative influences, which together construct and are constructed by the professional self (Nias, 1987), with the latter pertaining to values and beliefs; ideas about what is educationally worthwhile (Biesta, 2009).

Values is a term which often occurs in government policy. Eraut (1994), for example, discusses three policy avenues in which teachers’ values about their practices are defined: the profession’s code of conduct (national educational policy), legal values for society’s code of behaviour (national social policy) and the employing institution’s values (organisational policy). However, Eraut also adds a fourth category of teachers’ professional values: the individual teachers’ personally held values about education. Indeed, affective positioning towards policy has been shown to influence teacher buy-in to policy enactment. Swann et al (2010)’s national surveys of teachers’ conceptions of their role found that whilst teachers formed opinions on imposed elements of practice, they did not always assimilate these into personal conceptualisations of their practices in a coherent way. Instead, teachers conceptualised their practices via an “inner core of strong, shared beliefs and commitments” (Swann et al, 2010, p.549). These were integrated with choices around elements of contested

but accepted components of practice imposed by others and an outer layer of unintegrated disputed elements contained within policy.

These findings are echoed elsewhere in the literature. For example, Nespor (1987) explores the notion of teachers' episodic memory: that teachers' past experiences are stored within memory and bear influence on teachers' present understandings of their practices. Nespor posits that these memories have both affective and cognitive elements which form concurrently acting knowledge and belief systems. Belief is viewed as implicit, impacting how the teacher teaches even if they have the same knowledge bank as others. Moreover, whilst knowledge systems can adjust to system changes, beliefs are posited as individual and hard to shift. Belief systems are simultaneously inflexible and more influential on teacher agency and teachers' practices than knowledge systems (Pajares, 1992); teachers may have the same knowledge, but teach in different ways according to their underlying beliefs about education. Indeed, drawing on Pajares and also on Nespor's notion of episodic memory, Kind (2016), in empirical work with pre-service secondary science teachers, found that "beliefs have a stronger affective and evaluative loading than knowledge" (p.124). If teachers are asked to change their conceptualisations of their practices in order to meet imposed policy aims, a 'false belief' may be created (Langford, 1989): teachers may experience a loss of the sense of whether what they are doing is for the right reasons and even what those might be. For example, Cribb (2009) depicts teachers as ethical agents who must navigate the waters of conflicting ethical commitments: Is 'doing my job' the same as 'doing the right thing?' Valuable positioning towards a new policy may, then, influence how far teachers buy-in to a change to their practices and becomes an important element for consideration in the relationship between policy and practices.

Taking into account teachers' valutive positioning towards policy has useful implications for how we can view power and agency in the policy-practice relationship. Within these complex

relations, in contrast to many top-down models, the idea of power is recognised “in both its repressive and productive dimensions” (Clarke, 2019, p.15). Policy may be repressive towards teachers’ classroom practices, but also may be affected, or produced, by how teachers position themselves towards the policy. From a bottom-up perspective, a homogenous approach to policy is thus seen as unobtainable due to situational and individual teacher influence exacting situational differences in policy implementation. This reduces the sense of assumed power imbued to government policy texts in top-down perspectives (Ball et al., 2012), with implementors of policy able to activate more useful practices or to ignore policies, or aspects of policies, seen as less useful/vital. Discretion by agentic practitioners – teachers and school leaders, for example – is indeed the underlying premise of the bottom-up approach (Matland, 1995) and offers a view which splits agency across the policy-practices relationship: teachers may enact the policy in different ways, whilst, however, remaining obliged to implement government policy.

In this sense, bottom-up accounts may open up our view of teacher agency in relation to their classroom practices, moving away from a compliance model to a more complex reading where policy compliance meets affective and situationally diverse responses/influences. Agency has been described from this perspective as “identities in motion” (Buchanan, 2015, p.714): a continual building of teacher identity through situated experiences, integrating cognitive, evaluative and emotional aspects of the role with the doing of policy (Weber and Mitchell, 1996). In this regard, Hoyle and Wallace (2009) suggest a refocusing of discourses around policy and practices to focus on how teachers develop their capacities of professional agency in relation to policy and other influences on their practice, rather than seeking to measure the impact of rigidly managed government policies.

It is from this perspective on the policy-practice relationship that arguments for a more agentic profession in terms of policymaking have been made. Included within these are

attempts to formulate or influence policy around teachers' classroom practices through practitioner research. Advocates for this approach argue the case for creating a 'new' professionalism in which teachers collaboratively generate knowledge which can inform policy and practices (Reeves, 2007). This construction of professionalism is argued to be achievable through the development of research-active practitioners who can validate models of teacher practices through ground-up research (Sachs, 2000). In this argument for an 'activist professional', Sachs continues efforts towards increasing teacher agency in the policy-practices relationship found in the *Teaching and Learning Research Programme* (TLRP) in England (Pollard, 2010). The TLRP gathered practitioner research studies into one online repository with the idea that teachers can develop policy around practices by learning from the studies of other teachers. In this view, the position of power – as the 'expert' dictating practices – is shifted from government policymakers to teachers. However, this view has also garnered much criticism around a restrictive determining of teachers' practices through banks of 'what works' bottom-up 'evidence' on which to base classroom practices, in a power/control relationship similar to that of top-down government policy (Biesta, 2010).

Bottom-up analyses indeed do have some key drawbacks. Firstly, whilst the model of analysis offers much potential to explore different influences on the establishment of policy-led changes to teachers' classroom practices, this approach tends to be used within theoretical frameworks based within neoliberal critique or emancipatory sociology, resulting in a body of research weighted towards discussion of power and agency aimed at railing against government oppression of teachers' practices. Bottom-up analyses of the policy-practice relationship are often deliberately positioned to explore the impact of government policymaking on teachers' agency, drawing conclusions around negative impact of increased national standardisation of educational systems and practices (Gewirtz et al, 2021; Birch and

Jacob, 2019). Other areas of focus include explicating the outcomes of policy-following as increases in managerialism in educational leadership (Inglis, 1989) and explorations of negative impacts on education of high-stakes accountability to centralised national policies in the work of schools (Jones, 2009). These trends tend towards a continual reiteration of the point that an over-emphasis on audit-based policy in western educational contexts produces an opposite effect to that intended by policy: quality in teaching practices may deteriorate to some extent due to conflict between what teachers perceive to be their role and that imposed upon them (Bullough, 2015).

In this regard, the aim of bottom-up research can be seen as to highlight how governments construct policy ‘problems’ (Watts, 1993). This often speaks to the idea that teaching practices are shaped by neo-liberal agendas (Ball, 2008), in which government power is achieved through dispersed and pervasive neoliberal movements within the social world, which simultaneously establish a reduction in teacher agency. Thus, research in this vein tends towards a negative interrogation of policy-led reform as a way to highlight a need for more democratic development of the role of the teacher (Whitty, 2008). In this sense, bottom-up perspectives have been criticised for their obvious political positioning of authors’ analysis (Bacchi, 2010) and distract from the potential of the perspective to offer more open descriptions of power and agency in the policy-practices relationship.

2.4 Non-linear perspectives of policy

Perhaps the main issue with both top-down and bottom-up perspectives is that both perspectives create ontological separation between *policy* and *implementation* of policy (Grantham, 2001) with government and practitioners appearing to be placed at opposite ends of a binary relationship. Out of dissatisfactions with this ontological separation has grown the

use of different critical frameworks which position policy as part of a dynamic and non-linear process of becoming, in which policy and processes of implementation entwine (Ball et al., 2012). Studies employing a non-linear perspective often aim to discover how education policy is constituted, by whom, and to what effects (Allen and Bull, 2018). This perspective sets out to examine the players involved in policy and practices, with these understood as situational, relational and dynamic (Young and Diem, 2018).

There are several assumptions to unpack here. This first of these being that the view of the policy-practices relationship is neither foregrounding a certain policy text, or a certain discourse which serves to enact policy, but that the relationship can more usefully be viewed as a process through which a variety of actors interact to simultaneously 'do' the ideas within the policy (Ball et al., 2012). In this way, both policy and practices are seen to be constituted by interactions between people, places and things that produce them. Policy is explored from this perspective as existing within relations between people, discussions, places, policy texts, what Colebatch (2009) terms 'policy activity'. Negotiations and associations between these influences are viewed as constituting policy. Teachers' classroom practices may be seen from this perspective as developing through building connections between the classroom and the wider context, including, but not limited to, policy (Kyndt et al., 2016). This is highly similar to a bottom-up approach, which focuses on the influence of situational and relational factors to the enactment of policy. However, a non-linear approach goes further, shifting focus from what often purports to be emancipatory study of a perceived binary government-teacher paradigm, to focus on description of interactions constitutive of classroom practices.

Descriptions of these interactions which reveal how the teacher may simultaneously continue local practices and work within (new) politically defined aims; the teacher is positioned as both agent *for* the local society and agent *of* the national society (Cochran-Smith, 2008).

Thus, top-down and bottom-up views of the policy-practices relationship become implicit within each other as part of a network of relations. These networks of relations can be interrogated to reveal how policies and practices come to be entwined (Ball et al., 2012). For example, Allen and Bull (2018) analyse key policy actors whose relations raise the profile of government policies concerning ‘character education’ in England. The study serves to “trace and make visible the interconnections between actors within the character education community” (Allen and Bull, 2018, p.440), identifying a small group of individuals – policy entrepreneurs – “who appeared to do significant ‘joining up’ work between network members”. The study offers a view of how the content of policy is given authority through the relations of multifarious actors: how it is disseminated through networks spanning multiple geographical and professional spaces: universities, third party organisations, individual politicians or researchers’ websites. This non-linear, relational view of policy offers insight into how a policy gains credence and influence through multiple, sometimes surprising, associations between the policy and the actors which establish the policy in practice.

In this way, non-linear perspectives highlight situational influences on how policy ‘gets done’. Situational influences – for example, materials, spaces and ideas existing in a school into which policy enters – may affect how the developing teacher interprets and enacts policy. In this view, classroom practices become an effect of interaction between existing influences and the new policy text(s) and/or discourse. Researchers taking this perspective highlight the emergent nature of teachers’ practices, with professional actions growing out of prior actions, experientially and tacitly. This positions the development of teachers’ classroom practices as context-dependent and constituted by the interaction between multiple influences, which extend beyond policy (Beckett, 1996; Sikes 1985). In this perspective, the teacher may be seen both a craft worker drawing on complex networks of influences in

practical experiences, and a technician adhering to formalised bodies of knowledge promoted in policy/ national policy initiative (Winch et al., 2015). Teachers' practices are thus positioned as constructed through an amalgamation of wide-ranging situational influences (Wideen et al, 1996).

From this perspective, interesting insights into the relationship between policy and teachers' practices may arise. For example, Clandinin and Connelly (1996), through research into teachers' practices and knowledge bases, find that teachers act differently in different professional contexts, such as the classroom or in the staffroom. The staffroom is found to be "a place littered with imposed prescriptions" (Clandinin and Connelly, 1996 p.25).

Contrastingly, and perhaps surprisingly, classroom contexts are viewed as 'safe' places, away from policy prescriptions, where teachers feel 'free to live stories of practice'. However, these freely lived stories are done in 'secret', in moments away from scrutiny of school leadership. If the classroom and shared spaces contrast, the study finds that teachers tell 'cover stories' in the shared spaces, paying lip-service to policies. Despite this, teachers' narratives about their practices change over the course of implementation of reform through policies, suggesting that teachers' views of what constitutes effective practices may be "defined more by values and norms established by the principal and others committed to the reform" (Clandinin and Connelly, 1996, p.29). New practices emerge 'under pressure' of the values associated with the reform, which Clandinin and Connelly contrast with generic effective teaching practices claiming a research evidence base. Thus, both policy and teachers' practices are understood as constituted by situated interactions involved in the social, the emotional and the discursive (Kemmis, 2005). Exploration of situational influences in the association of teachers and policy thus affords a view of different ways in which government policy and pre-existing situational influences entangle and effect multiple iterations of practice.

Within a non-linear process view of policy, notions of power and agency in relation to the determining of teachers' practices are shaped differently to those inherent to bottom-up and top-down perspectives. In a non-linear view, any oppressive them/us hierarchical power/control dynamic inherent to many top-down perspectives and reacted to within bottom-up perspectives is replaced by a more expansive view of how effects of power and agency are produced. A non-linear perspective of policy sees power and agency as part of a temporal and relational, situated ecology (Biesta, Priestley, & Robinson, 2017). This is meant in the sense that a non-linear view acknowledges the malleability of agency and power as situated and relational constructs, vulnerable to structures and cultures within which the teacher works and lives. Research taking this perspective often draws upon Foucauldian readings of power and agency, not as elements to be owned, but as ever shifting and developing from within the complex interweaving of multiple social world actors (Ball et al., 2012). In this view, we are never outside the influence of power, but always within it: our agency regarding our practices is inextricably linked to the dynamic power relations produced by influences in the social world as they connect, disconnect, morph and change.

Within this model, notions of power and agency are situated within complex webs of relations between policy, people and the places within or through which the policy is being implemented. They are influenced by relationships between the different actors at play in policymaking and policy doing (Malen, 2006). Power and agency are effected through, for example, the ways in which assumptions underpinning the policy being implemented, multiple stakeholders' interests and influences already at play within institutional and sociocultural settings align or misalign (Viennet and Pont, 2017). From this perspective, teachers' classroom practices can be seen as resulting from a process that relates to the ways teachers and other stakeholders attempt to influence the quality and character of their work. This is seen as an enacted discourse of power from which emerge everyday practices

(Hilferty, 2008), through the processes in which teachers interact with policy and situational actors to control and shape their practices. Empirical studies advance this theoretical model, highlighting variations in factors gaining influential dominance on practices, including where policy is significantly and continually modified in different schools, undermining any standardising intentions and sustainability of policy-led change (Datnow, 2002).

By interrogating the relations which establish policy within practices, we can thus see how effects of power and agency are produced; how the ideas within a policy come to dominate practices or shape the things around it (Rowe, 2022). For example, we can describe a series of interactions through which long-distance policy-led control of teachers' practices play out (Nichols, 2009), or how policy 'facts' are generated and moved around in a network (Law and Singleton, 2005): a network of teachers' practices. Thus, through a non-linear perspective, we can dismantle binary conceptualisations of power and agency in the relationship between government policy and practice. This can be achieved by describing the interactions between different influences which combine to produce effects of government power or teacher agency/ reduction of agency.

Within this perspective is afforded potential to more fully interrogate how texts act in the production of power and agency in networks of policy-led establishment of teachers' practices. Policy texts can be seen as taking a key acting role in policy-led change processes, often in unison with other texts to hold together networks and effects of power produced in relation to certain policies (Rowe, 2022). Lendvai and Stubbs (2009) describe through empirical study in international and transnational policy processes, a high frequency of 'active readership' and 'writerly work' involved in the doing of policy. Through such work, teachers may be seen to create and align other actors – other texts – with policy texts. This can be seen to occur through a process of 'interpretation of interpretations' (Rizvi and Kemmis, 1987), in which new texts are created based on discussions or readings of policy

texts. For example, policy texts may influence teacher practices through a reflective-evaluative process of teachers being required to prove themselves and measure their practices against criteria contained within policy documents (Teaching Competencies Policy) and other documents relating to, or growing out of these (Performance Management review documents) (Liew, 2012). Thus arises the value of exploring intertextuality between texts (Barton, 2007): policies may be seen as gaining effects of power through a wider network of related texts.

Intertextuality acts to render the ideas contained in policy texts more visible within the network (Ceulemans et al., 2012), and may extend the reach of the policy, for example, from boardroom to classroom (Nichols, 2006). Intertextuality in policy processes may also be perceived not only as links between policy texts and new texts created during the policy process, but also in the relationship between policy texts and other, pre-existing policies or related texts circulating within the network. Definitions of teachers' practices from previous interpretations of other policies may linger in the ways in which teachers interact with new policies (Hargreaves, 2000), for example. We may thus see aspects of past policies implemented into associations between teachers and new policy texts. Additionally, policies may act alongside other current policies, or be influenced by preceding policies (Skocpol, 1993; Maguire, 2012). Policies may work together as a mutually-constitutive cluster of texts aiming for the same change to practices (Ball et al., 2012) and in this way come to gain dominance within the network. Conversely, teachers' interpretations of texts may reveal effects of agency: they may make adaptations to policy, acting to exclude, include, foreground or background some actors, producing effects of authority in relation to conceptualisations of what counts as accepted professional practices (Hamilton, 2011).

A non-linear perspective thus opens up the field of study exponentially in terms of explicating how a policy-led change to teachers' classroom practices is established. We may

interrogate how policy and practices entwine, through relational, situational and dynamic interactions of multifarious influences to produce change.

2.5 Situating the study in relation to the literature

In this chapter, I have described three ways in which policy-led change to teachers' classroom practices is modelled in the literature. I now revisit these perspectives, relating these to my research question. I draw conclusions around where my study sits in relation to the perspectives presented in the literature review and explicate a scarcity in literature which speaks to the focus of my study.

My main research question asks: *How is an education policy initiative (Maths Mastery) translated into teachers' classroom practices?* Through this question, I seek to describe the ways in which an education policy initiative enters, and becomes part of, an existing iteration of classroom practices (see Chapter 1.2 for full explication of my research question).

In asking this question, I do not align my research with top-down approaches. My research question does not seek to evaluate the effectiveness of policy implementation as many product-based top-down approaches do. Equally, I do not begin from the positivist positioning of government policy common to both product- and process-based top-down models (Young and Diem, 2018). This is a position in which policy texts and the ideas they contain are treated by the researcher as accepted necessary and conclusive top-down acts of government (Swann et al., 2010), rather than as a guide for teachers which may, or may not, come to form part of their classroom practices (Carr, 2000). Rather, my research question positions policy more tentatively, perhaps more vulnerably, in the sense that it is one (new) potential influence amongst others at play in producing teachers' practices in a school. I seek

to describe how the policy enters into this existing network of practices (my reading of ‘network’ is described in Chapter 3.2).

To some extent, how I approach my research question aligns with a bottom-up perspective in that I position teaching as a social practice, influenced by situational actors which affect how policy-led change to practices is brought about (my interpretation of teaching as a social practice is fully explained in Chapter 3.2.2). In this view, the aim of the researcher “is to see it [teaching] as its practitioners see it and so to see it as the product of its history and to have some idea of the way in which it is now changing” (Langford, 1989, p.30). This affords a view of how policy-led change happens ‘on the ground’ and its consequences relating to teachers’ daily practices. However, my research differs from a bottom-up perspective in that I eschew the often overtly political aims of these studies, which tend to assume an ontological modelling of government powerful policies at one end of a policy implementation process and teachers’ agency reduced or empowered at the opposite end.

My research best fits with a non-linear perspective. My main research question is divided into sub-questions seeking how existing practices are problematised within a school, how ties to the new approach are formed and how recommendations of policy become part of the daily practices of teachers (see Chapter 1.2 for full explication of my research sub-questions).

These questions seek changes, negotiations, adaptations within an existing set of practices as policy enters into it. I feel that a non-linear perspective offers the most expansive potential for addressing these questions, as from this perspective policy and practices are seen as complexly intertwined, products of situated and dynamic relationships between many social actors which constitute them (Young and Diem, 2018). From this perspective, policy and practices may be explored as simultaneously produced by the way they influence each other, rather than as two opposing ends of a hierarchical power relationship. Notions of power and

agency are liberated from hierarchical or binary perspectives, viewed as shifting and complex products of the associations between actors in the social world (Nespor, 1984).

I thus situate my study within a non-linear perspective, and more particularly within a small body of research which draws on actor-network theory (ANT) and literacy studies (LS) to discuss policy-led change to teachers' practices (see Chapter 3 for full explanation of literacy studies and ANT). These studies (discussed in more detail in Chapter 3.2.2) describe policy in the action that occurs in association with it. In ANT-based studies, policy exists in action involving people, texts, discussions, materials, places (Kamp, 2017). Changes to teachers' classroom practices are viewed as 'collective and distributed' between networks of people, places, things and ideas as they associate (Fenwick, 2016, p.3). Similarly, in LS-based studies, policy is seen as established through interactions between people, places, practices and texts in the social world. For example, Nichols (2006) describes how a policy initiative moves from policymakers' boardroom to teachers' classrooms through a series of discursive and textually-mediated events, a process which produces adaptations and interpretations to policy as it is translated into practice. Policy-led changes to practice may thus be reconceptualised as socio-material movements in which the meaning(s) attached to policies shifts as they "expand and contract across various networks of advocacy and practice" (Hamilton, 2011, p.365).

In these ANT and LS perspectives, policy is often positioned as subject to 'betrayals' based in social interactions (Fenwick and Edwards, 2012) in that a lack of fixed common meaning around policy documentation may generate ambiguities and resultant differences in enacted versions of these (Tummons, 2016). This supports explication of the adaptations, negotiations and changes to existing practices instigated by the addition of a new policy, as sought by my research question and sub-questions.

Studies taking a non-linear perspective on the policy-practices relationship are relatively small in number in relation to the vast field(s) of research aimed at understanding education policy. Few studies seek to trace how government policy comes to be part of teachers' classroom practices; how policy moves from policymaking into the activity taking place in classrooms. A small number of studies, explored above and in the next chapter, focus on how education policy is *translated* into teachers' classroom practices. There is a lack of literature pertaining to how policy is translated into primary school teachers' practices in England. This thesis seeks to address this gap in describing how one government-promoted policy initiative – Maths Mastery – is established in an English primary school.

2.6 Conclusion to the literature review

In this literature review, I have highlighted three ways in which the relationship between government policy and teachers' practices is framed in the literature. I have examined how this relationship is discussed from often seemingly binary perspectives, in the sense of either viewing government policy from a top-down perspective intended to increase effectiveness of policy implementation, or from a bottom-up perspective aimed at explicating (often negative) impact of government policy on teachers' practices and morale. I have argued the value of non-linear perspectives which examine policy as part of dynamic and non-linear processes of producing teachers' practices and situated my study within this perspective. In the next chapter, I turn to the theoretical framework of this study. I explain and justify approaching the research question through a unified framework of literacy studies and actor-network theory.

3. Theoretical Framework

3.1 Introduction to the theoretical framework

In this chapter, I describe the theoretical approach of the research, which combines concepts from actor-network theory (ANT) and literacy studies (LS). I introduce actor-network theory (ANT) and justify my positioning of the classroom practices within a school as an *actor-network*. I frame my research as an account of how an existing actor-network of classroom practices is transformed by the introduction of a suite of new actors relating to a policy initiative commonly known in England as ‘Maths Mastery’. I describe some of ANT’s key terms which I use in this thesis to describe the way the existing actor-network of classroom practices is changed by the introduction of the policy initiative. I then introduce literacy studies as complementary to ANT. I justify equal use of this theoretical lens in terms of how teachers’ classroom practices, particularly in relation to education policy, may be viewed as involving *literacy practices*, offering a ‘way in’ to describing how policy enters a network of classroom practices. I describe the key tenets of literacy studies on which I draw in this thesis. Finally, I acknowledge the limitations of an ANT-LS framework.

3.2 Teachers’ classroom practices as an actor-network

3.2.1 Introducing actor-network theory

3.2.1.1 A material-semiotic approach

Actor-network theory (ANT) was developed in the early 1980s, originating from anthropological and ethnographic work at the Centre de Sociologie de l’Innovation at the École Nationale Supérieure des Mines de Paris. Researchers central to ANT’s development

such as Bruno Latour, John Law and Michel Callon, drew on post-structuralist ideas to examine and problematise how authoritative knowledge in the sciences is generated (Gorur, 2011). Of particular centrality to the development of ANT is the post-structuralist concern with problematising the (structuralist) idea that human culture – the social world – may be understood in relation to concrete and pre-established social structures. In contrast to this notion, ANT developed as a material-semiotic approach to describing the social world. This means that researchers working within this approach view the world around us as a product of interactions between different social actors, which are simultaneously semiotic (they may carry meaning within social activity) and material (in that social activity is caught up with physical things) (Law, 2009). Put simply, the reality we perceive around us is, from a material-semiotic perspective, the result of interactions between people, places, stuff and things, rather than a predetermined, positivistic entity, or solely the result of human activity and interpretation. The ramifications of a material-semiotic approach centre around the idea that if the world is viewed as created by interactions between human and material actors, then we should seek to understand the world by looking for and describing these interactions (Law, 1994).

3.2.1.2 Symmetry

Whilst there are several material-semiotic approaches which share this theoretical starting point, ANT can be defined in relation to several of its key assumptions. The first of these relates to ANT's treatment of actors in the production of the social world. One of the key assumptions of ANT is the recognition that both human and material actors hold equal potential to act, in *symmetry* (Latour, 1987). A text, for example, may shape meaning making within a lesson planning conversation just as much as a teacher may. Through the notion of *symmetry*, the role

of material actors (texts, computer screens, teaching resources, for example), metaphysical actors (ideas, beliefs, and so on) and people (teachers, students, school leaders, for example) are all afforded equal importance in the researcher's tracing of how multiple actors come together to produce the social world.

Symmetry contains within it the idea of entanglement (Fenwick and Edwards, 2011), in that actors are often tangled up with other actors, on whom they rely for their existence and shape. From an ANT perspective, there are not, on the one hand, material actors and the on the other hand human actors as clearly distinct and separate actants, but rather entanglements of the two. This is due to the idea that actors may *mediate* the work of other actors (Latour 1994), exerting influence on their shape, their activity, or acting in a way in which other actors come to be reliant on them. So, on the one hand, the interactions of people are seen as routinely mediated by material objects (Michael, 2017), whilst on the other hand, things are "full of people" (Nespor, 2011, p.19): they are created and used and given agency by people. In this way, people and things are intertwined, entangled, reliant upon and produced by each other.

It is thus that the notion of *symmetry* encourages the researcher to remain open to the idea that the influence of things and people are bound up in each other, reliant on the ways in which they associate (Tummons et al, 2017) and how, studied in unison, they produce our reality. The project the ANT researcher follows is to explore and describe these mutual entanglements of physical, metaphysical, and human actors and how they simultaneously shape individual actors and the social world they are part of.

3.2.1.3 Actor-networks

A second key assumption of ANT is that the social world is produced by associations of actors which bring it into being and hold it together:

The objective is to understand how these things come together—and manage to hold together—to assemble collectives or ‘networks’ that produce force and other effects: knowledge, identities, routines, behaviours, policies, curricula, innovations, oppressions, reforms, illnesses and on and on. (Fenwick & Edwards 2012, p.xi)

In ANT, the social world is seen as the production of associations of actors in the ways that actors connect, disconnect, merge or disassociate with one another. In this regard, ANT rejects over-arching causal frameworks often implied in terms such as ‘society’, ‘fact’, ‘culture’ or ‘context’, when these are used to explain the existence of aspects of the social world. Instead, ANT assumes that ‘society’, ‘fact’, ‘culture’ or ‘context’ may be understood as *performed into being* (Law, 1994) through repeated patterns in the associating and organising of (human and non-human) actors. For example, in their study of daily professional life within a scientific laboratory, Latour and Woolgar (1986) describe how authoritative knowledge in the form of scientific ‘facts’ may be seen as constructions produced by the ways in which scientists, texts and laboratory materials associate. Patterns in the associations between these laboratory actors lend certain statements about science a sense of authority, whilst changes in associations between actors serve to destabilise or reify this authority. This permits the reader of the ANT account to see how authoritative knowledge is produced, rather than ‘fact’ being perceived in a matter of fact, pre-accepted manner. In this way, ANT accounts consider the social world as a *matter of concern* (Latour, 2005); associations of actors to be questioned and explored, rather than readily accepted.

In viewing the social world as a production of associations between actors, ANT researchers seek to describe how aspects of this world hold together as recognisable features: facts, the cultural practices of a social group, material artefacts, and so on. These features are seen as made up of networks of associations of actors – *actor-networks* (Latour and Woolgar, 1986), whose constituting associations can be traced. The researcher may describe how actors organise

and order within the actor-network (Law, 1994), to see how the network has been produced, how it is sustained in its recognisable form (or changed into something new).

In describing an actor-network, the project of the ANT researcher is not to explain *why* actors associate, but *how*.

ANT generally eschews any assumptions about what goes into forging associations between actors. It is by engaging with the empirical specificity of the encounter between actors that we come to an understanding of its character – the elements that comprise it, and the outcome that follows. (Michael, 2017, p.24).

An ANT account does not start with a theory about the world and seek to evidence it, nor do ANT researchers seek to explain why an event or idea occurs. Rather, the central aim of the research is to describe how perceivable aspects of our world – for example, events, ideas, practices, things – come into existence; how they organise and hold together. In this way, ANT is known as a sociology of associations (Latour, 2005), a way of coming to know the social world by describing the associations of social (human and physical) actors which produce it.

3.2.1.4 A flat ontology

In describing actor-networks that produce the social world, ANT eschews models of society which distinguish between macro, meso and micro contextual levels (the local, the global, the superstructure (Michael, 2017)). Instead, ANT offers a *flat ontology* (Latour, 2005) in which all actors are part of the same plane. For a flat ontology views all actors as diverse parts of the same network, whilst acknowledging that some actors have ranges of associations with other actors which are larger or smaller than others. For instance, a school policy document may circulate within – and associate with actors solely within – the school, whilst a national policy

document may associate with actors in schools nationally, or with the general public. However, both the school and national policy documents may be present within the actor-network of one school's practices. Thus, a flat ontology views actors as existing within the same plane but whose (local/ national/ global) reach may differ, determined by different ranges and/or intensities in their associations (Latour, 1996).

This is useful for describing an actor-network in that contextual boundaries upon actors are dissolved (Latour, 1987). Put simply, people, stuff and things interact with other people, stuff and things both within our immediate environment and those “spatially and temporally removed from us, but nonetheless present in the situation in some way” (Nespor, 1994, p.3). Actors in the immediate geographical or temporal vicinity and actors geographically far away, or far away in time, such as actors in the past, may both entangle in the same actor-network. This widens the researcher's tracing of the actor-network beyond specific places of study in terms of what has come to constitute the element of social world which is the focus of the research.

3.2.1.5 Recursive actor and actor-network relationships

Actors and actor-networks are, in ANT, viewed as existing in a recursive relationship (Law, 1994). This implies that they simultaneously perform each other into being (Fenwick and Edwards, 2012) as the actions of individual actors effect the shape of the actor-network, whilst the actor-network helps to shape the actors within it through the associations made within the it. Changes in an actor or in the ways in which they associate with other actors are therefore likely to result in changes to the network or to *effects* – or products – of the network (Nespor, 2002). From an ANT perspective, the actor-networks produced by the organisation and association of actors are thus seen as temporary (Latour, 2005). Actors bring different pieces

of the puzzle to the table. As they move within the actor-network, as they associate and interact with other actors, these movements and associations may alter the shape of the actor-network, through associations which may exclude, include, alter or merge parts of the existing actor-network.

The reality we perceive around us – the context, the culture, the society – is thus seen by ANT researchers as an ongoing achievement, through the continual associations of actors, subject to change as prevailing conditions or associations change. Therefore, in ANT there is no *one* social order but lots of continuous *ordering* (Law, 1994). Within this, some actor-networks may change at a slower rate than others, resulting in this temporariness being perceivable as a stable part of the social world, such as a particular set of practices or cultural traditions. The perceived stability of an actor-network is an effect of the work of ordering done by the actors which constitute it: repeated patterns in the associations of actors. Where significant changes to the actor-network take place, this can be a useful starting point to trace the associative activity of actors which serves to (re)shape the actor-network (Callon, 1986).

The ANT researcher starts in the middle of things (Latour, 2002), follows actors, traces and describes their associations and the reality they produce. Moving back and forth to follow actors as they circulate around the network of associations which produce an idea, a practice, a thing, the ANT researcher is always working empirically. To those unfamiliar with the approach, this empirical work appears to be seemingly rather messy: to follow the actors is to follow the associations, any twists and turns, any recursive tracks, across geographical, temporal and institutional boundaries and back again (Latour, 2005).

3.2.1.6 An anti-reductionist stance

It is worth noting at this point that ANT theorists take an anti-reductionist stance about ANT itself, rejecting references to ANT as a distinct method or theory to be applied (Latour, 2005; Law, 2009). This position affords the researcher flexibility and open-endedness in approaching their subject: the researcher can begin in the middle and follow the actors in any way they see fit to describe how a particular iteration of reality is created. In this sense, an ANT account can be viewed as an “an empirical version of post-structuralism” (Law, 2009, p.6), with a commitment to the fluidity of reality as in post-structuralism, alongside a commitment to the empirical tracing of this fluidity by following the associations of actors which establish (changes to) elements of reality.

However, ANT’s anti-reductionist nature also leaves ANT itself difficult to describe in the more categorised ways of other epistemologies. To be true to ANT, the researcher cannot say, ‘I am applying ANT epistemology or following the methodology of ANT’. There is no epistemological or methodological statement within ANT literature which defines how to ‘do’ ANT. This offers a significant challenge to the writing of an ANT-based account of the social world: how to continue to introduce ANT – to discuss how I have approach the research question with ANT and the methodologies and method employed in relation to an ANT account – without betraying its essential anti-reductionist nature?

I address this firstly by positioning my research in the timeline of ANT. As ANT has developed over time, it has been critiqued and adapted by its users. An early ANT approach (based in the early work of Latour, Callon and Law) uses specific conceptual tools relating to a *network* (see section 3.2.2) as a lens and language for talking about empirical data. Later ANT scholars – often dubbed ‘post-ANT’ or ‘after-ANT’ – see the language of ANT (terms reified by early ANT researchers) as problematic (Law and Hassard, 1999). For example, the term *actor-*

network is criticised in post-ANT work as reductionist in its focus on describing a singular network. This criticism suggests that the singularity of the term ‘actor-network’ conceals from the researcher’s view multiplicity in the production of the social world: “many different networks exist and produce multiple versions of phenomena... which may seem singular at first” (Gad and Jensen, 2010, p.66). Such criticisms view ANT’s conceptual language as creating overt models of analysis which conflict with ANT’s intentions to disrupt such models. Post-ANT researchers tend to discard or adapt the conceptual tools of early ANT accounts (Fenwick and Edwards, 2012).

My research sits with early ANT research, using the language and tools of ANT to describe a network of classroom practices. In this sense, I can secondly draw upon versions of ANT which work within the early ANT approach and which describe ANT as a ‘sensitivity’ towards empirical data (Mulcahy, 2011; Nespors, 1984). In this view, a commitment to tracing the fluidity of reality remains, with ANT providing a way of talking about – a language to describe – the associations observed in the production of the social. Extending this further, Gorur (2011) talks of telling ANTish tales. Stories which describe the associations that produce accepted ideas, objects, beliefs, and so on; empirical narratives in the language of ANT. Indeed, ANT research is often (but not always) ethnographic, telling richly empirical stories of specificity (Michael, 2017). I thus set the tone of my thesis as one of storytelling, using ethnographic fieldwork data (see Chapter 4: Methodology) to tell the empirical story of the establishment of a change to an actor-network of teachers’ classroom practices. ANT is my lens and language for telling the story.

3.2.2 *Reading a school's classroom practices as an actor-network*

In this thesis, I position teachers' classroom practices as an actor-network: a collection of actors which together produce a certain set of practices or 'way of doing things around here'. I use this framing of a school's classroom practices to examine what happens when new actors representing a policy initiative called 'Maths Mastery' enter the existing actor-network of classroom practices. In so doing, I foreground description of how the network reconfigures itself as new actors relating to a policy initiative enter into it. As already noted, one of the key assumptions of ANT is that any actor-network is temporary, a (perhaps slowly, perhaps quickly) shifting part of a reality which is in a constant state of production; its shape is established on an ongoing basis. At moments of change, we have the greatest opportunity to see the associations which produce and sustain, destroy, or rebuild the network:

The action of objects (human and non-human) is only rendered visible when they break down and it is at this time that new assemblages are demanded, when black boxes need to be opened and explored in detail to see what connects to what, why, and with what consequence. (Kamp, 2017, p.8).

ANT suits well an exploration of how a policy initiative-led change to teachers' classroom practices is established. Teachers' classroom practices are a contested area of educational research (see Chapter 2), which continue to be actively cultivated and theorised by different stakeholders in education. An ANT account offers a way of seeing how specific iterations of classroom practices are produced and impacted by the circulation and association of (sometimes competing) different actors, and by the introduction of new (policy) actors. For example, Mulcahy (2011) employs ANT to reject oversimplistic views of singular policy definitions of professional standards, describing standards as "shifting assemblies of practice" (p.1) in which the interplay of different people and things in different locations or at different

times brings about different practices around the intended standards. ANT offers language and tools with which to trace associations of actors which change the existing actor-network. Policy-based change to teachers' classroom practices can thus be viewed as activity within the actor-network; movements in the associations of actors which imbue certain actors with *network effects* of power and agency (see section 3.2.4). The ways in which material and human actors entangle as the actor-network is continually established can be traced to see how policy morphs into practices which resemble (or reject) the policy initiative.

In this thesis, description of how a government-promoted policy initiative enters into an existing actor-network of teachers' classroom practices is offered as a new sensibility to teachers', schools' and policymakers' awareness of how (changes to) teachers' classroom practices are produced. My description simultaneously adds empirical detail to popular discourses of power and agency (see Chapter 2) in relation to the policy-led change to classroom practices as I describe how effects of power and agency are imbued to certain actors as the policy enters the actor-network. The description of a policy-based change to an actor-network of classroom practices contained in this thesis is offered as a view through which different educational stakeholders may consider the relationship between national education policy initiatives and the classroom practices of teachers in schools. It is offered as a view through which current policy-practices relationships may be interrogated and future iterations of these planned for. For through an ANT account we can see "how prevailing conditions can be transformed or interference run on those modes that achieve predominance" (Mulcahy and Perillo, 2011, p.141). In other words, through the assumption inherent to an ANT account that actor-networks are only temporarily stable, ANT affords potential for interrupting current relationships between policy and teachers' classroom practices – and any effects of power and agency produced within these relationships – through harnessing the increased awareness of how these effects have been produced.

3.2.3 *Tracing change to an existing actor-network of classroom practices: translation*

To describe moments of significant change in an actor-network, Callon (1986) draws on the wider sociological construct of *translation*, co-opting this to create a way of speaking to change in an actor-network. *Translation* in ANT refers to when “agents attempt to characterize and pattern the networks of the social” (Law, 1994, p.101) and is often used in ANT research to examine moments of change. Callon (1986) sets out the idea of translation through his description of the attempts by three marine biologists to develop a conservation strategy for a declining population of scallops and the fishermen who farm them. He traces the interactions of people and material things which effect successful (or in this case, unsuccessful) development of the strategy as accepted practice:

Four ‘moments’ of translation are discerned in the attempts by these researchers to impose themselves and their definition of the situation on others. (Callon, 1986, p.196)

Callon’s version of *translation* offers a way of viewing how an imposed alteration (the ideas of the researchers) to pre-existing practices (the actions of the fishermen and scallops) is achieved (or in Callon’s case, is not achieved). In detailing each of the four moments of *translation*, Callon describes the interplay of existing and introduced actors, producing successful, or unsuccessful, use of the conservation strategy through a process of interaction.

First in the process is *problematization*, in which a need for change to an existing actor-network is established. In the second moment of change – *interessement* – we see the weakening of links between existing actors. At this stage, we may also see the simultaneous strengthening of associations to new actors in the network. The third moment of change is *enrolment*, whereby

more actors are enrolled into the ways of the new practice. Finally, the fourth moment of change is *mobilisation*, in which actors act – or do not act – within the new parameters for practice.

Within each moment of translation, actors associate, creating either an achievement, or dissolution, of the intended development. Translation is thus a useful analytical tool with which to describe how change, development, alteration plays out in an actor-network. In education research, Callon's four moments of translation have been used to examine the ways in which policy becomes part of teachers' practices. For example, to reveal how social policy initiatives such as England's 'Skills for Life' becomes part of educational practices; how "complex policy reform is choreographed through mobilisation of many actants" (Hamilton, 2011, p.68). In this thesis, I draw upon Callon's notion of translation to trace the implementation of a government-promoted policy initiative in primary mathematics teaching into a school's existing classroom practices.

3.2.4 Power and agency in an ANT account

ANT provides a lens with which to take an alternate view of power and agency to aggrandised notions of power and agency in much literature surrounding policy-based change in education (see Chapter 2). These are destabilised by ANT's flat ontology (see section 3.2.1.4), through the removal of any distinction between a powerful macro and oppressed micro (Latour, 2005). In ANT, there is no macro level of the social world existing as a thing by itself to exert power or effect agency, nor a micro level full of abjectly powerless entities. Therefore, the binarism surrounding discourses of micro/macro, local/global tensions around power and agency in education policy-based reform drops away. Rather, ANT positions power and agency as *network effects* (Law, 1994): an outcome of the ways in which actors in the network associate, as distinct from an a priori quality or essence. Power and agency are thus not seen as an ability

or privilege owned by an institution or a person, but as performed through the associations of actors (Fenwick and Edwards, 2012); they are *effects* of the associations of actors in the actor-network. As actors associate and entangle, they order and pattern. Certain orderings and patterns of actors gain dominance in relation to others, creating effects of power or effects of agency within the network.

In terms of notions of *power*, we cannot thus, from an ANT perspective, rightly speak of policy in terms of government power over teachers' classroom practices. Rather, we have a valuable opportunity to describe how effects of power are produced in how policy actors and other actors constituting teachers' practices meet (Mulcahy and Morrison, 2017). In turn, through better understanding the construction of classroom practices as a meeting of new policy actors with an existing actor-network, we have greater potential to interrupt effects of power. This may be achieved by describing the entanglements of the actors which perform the establishment of policy-led change. In a discussion of two state-wide curriculum reforms in Virginia, USA), Nespore (2002) positions reform and context as the "contingent *effects* of struggles and negotiations in which groups try to define themselves and their interests" (p.366), describing these struggles and negotiations. In so doing, Nespore explicates how effects of power are produced in relation to the reforms taking place. Power in an ANT account is therefore not seen as pre-determined, but a "collective endeavour" (Plum, 2017, p. 3), the work of the assembling of many actors. Following these examples, I describe power in this thesis as the contingent effect of the associations of teachers, leaders, parents, students, documents, technology, buildings, media, and so on.

Effects of power become visible within a network via repeated associations between actors. For example, researchers may describe *assemblages* (Law, 1994): gatherings of actors, or 'clusters of associations' (Fenwick & Edwards 2012, p.xi), which repeatedly associate within the network so that they seem to consistently act in unison. These assemblages can be seen to

form *nodes*: recognisable features of the network (Latour, 2005) that contribute towards the shaping of the whole. *Nodes* may be seen as intersections within the actor-network, where patterns of *assemblages* make visible the activity of the actor-network that shapes the whole. For instance, we may see how an *assemblage* pertaining to school governance becomes a defining node shaping the actor-network of teacher practices in a school (MacBeath, 2008). In a similar vein, Mulcahy and Morrison (2017) describe the Australian government's innovative learning environment initiative as *assemblages* of actors which perform the initiative differently in different physical spaces, through various social, material, and affective negotiations between the actors involved. The roll-out of the initiative is resituated as a process of assembling: the actors at play and the ways in which they pattern and order reveal how policy gains influence in different ways, through increasing occurrences of certain assemblages. Through this ANTish sensibility to data are achieved descriptions of how perceptions of power are effected within the social world of the teacher, performing the initiative in different places, sometimes in unanticipated ways.

We may also describe the production of power effects through the notion of *tokens* (Latour, 1996). Tokens, underexplored in ANT accounts of educational change, can be seen as stuff and things produced by associations of actors – *effects* of the network. They are passed between actors within the network, instigating associations of actors in their wake. As they move through the network *tokens* influence, and are influenced by the actors they associate with (Gaskell and Hepburn, 1998). Thus, a *token* should be thought of as “a moving actant that transforms those who do the moving, because they transform the moving object” (Latour, 1996, p. 379). The mover and the moved have no specific morphism but can take various forms. An example of a *token* is an educational ‘buzz word’ such as ‘broad and balanced’ or ‘evidence-based practice’. Effects of power can be traced in the movement of *tokens* through the network. From an ANT perspective, the word or phrase comes into being through an association of actors

and moves through the actor-network which produces the practices in a school, passed from actor to actor. As it moves, the phrase both becomes shaped by the actors it associates with and increasingly reified/ forfeited. For example, Gaskell and Hepburn (1998) use the notion of a *token* to trace how a new applied physics course (viewed as a *token*) introduced in British Columbia circulates within different actor-networks of school practices. They describe how the *token* of the course is influenced by, and produces, different orderings of actors, in each network. Similarly, Edwards (2011) uses the notion of a *token* to trace the ways in which short statements constituting descriptors of units of work in schools and colleges are shaped differently in different settings, resulting in variety in *translations* of prescribed curricula into teachers' practices. We can thus trace *tokens* as ways of exploring network activity (Latour, 1996) and describe how certain *tokens* achieve reification, adapted or adopted meaning attached to them, or abandonment within the actor-network.

The establishment of effects may also be made visible by tracing centralised actors with which everything in the network must associate at some point: *obligatory passage points* (OPPs) (Law, 1994). It is through examining OPPs that we may gain insight into actors which hold oppressive potential over other actors. For example, we may see how an actor-network of teaching practices comes to be dominated by an assemblage relating to 'core competencies' through the association of all actors with the competencies (Ceulemans et al, 2012). Teachers, school leaders, texts, resources are *enrolled* into a set of core competencies by core competency statements (reified in texts) becoming actors with which all others must associate, intensifying effects of standardisation in teacher education in Flanders. In this sense, we can see how actors in a network come to position themselves in relation to central *assemblages* in the actor-network and thus how the network takes shape as some actors gain prominence and others are shaped, or excluded, by them. From this perspective, we can trace *assemblages*, *nodes* and

obligatory passage points in an actor-network to speak to actors which together may gain dominance – effects of power – in relation to others.

In terms of notions of *agency*, a common topic of discussion in literature surrounding policy-led change to teachers' practices is the idea of the oppression or suppression of teacher agency in relation to government policy (Ball, 2003; Buchanan, 2015). Authors in the field often position agency as a quality to be owned; a human-bounded act (Nespor, 2011). ANT takes a different view of agency. Much like notions of 'power', agency is viewed in ANT accounts as a *network effect*: a 'relational effect' (Law, 1994, p.100), or, put differently, an effect of the organisation of actors within the network.

Through the notion of *symmetry*, ANT research speaks of the agency imbued to any actor by the associations of actors that produce it. We may thus speak to the agency of material, metaphysical and human actors: the agency of texts, of teachers, of ideas, of technological devices, and so on. Through this perspective, ANT research often explores how there may several *agencies* present at any one time (Latour, 2004). These agencies – a text imbued with agency working alongside a computer and a teacher both imbued with agency – together constitute the agency of each actor – a teacher, a text, a computer. Thus agency, from an ANT perspective, can be seen as recursive, in that combinations of agencies of different actors combine to produce the agency of each actor (Mulcahy and Perillo, 2011). Effects of agency are subject to changes within associations between several agentic actors which together produce the agency of one actor. This renders agency as unstable and malleable. Viewed as a *network effect*, agency becomes situational and reliant upon the associations and ordering of actors at any one time (Latour, 1996). Thus, *teacher* agency may be explored as changeable, effected differently in relation to the associations occurring at any one time in the daily professional life of the teacher (Mulcahy and Morrison, 2017).

We can trace these agencies by relating agency to action within an actor-network:

action is not done under the full control of consciousness; action should rather be felt as a node, a knot, and a conglomerate of many surprising sets of agencies that have to be slowly disentangled. (Latour 2005, p.44)

In this thesis, this idea is used to disentangle and describe the many agencies which produce an actor-network of teachers' classroom practices. These agencies are described within, and traced through, the action(s) of teachers, texts, ideas and technologies in relation to the establishment of classroom strategies and pedagogies for the teaching of mathematics. Disentangling the sets of agencies that produce action in an actor-network offers a way of stepping outside notions of agency which bind the term to something that exists within, is bound to, people. It offers us a way of seeing how agency is produced at different moments in a *translation* process. The potential for transience in agency inherent to the ANT perspective also enables a view of how agency emerges and shifts over time (Nespor, 2011).

ANT's positioning of power and agency as *network effects* enables us to trace and describe the production of these effects and how they are distributed amongst the actors which produce them. This offers an alternative view to discourses of power and agency as dominance or compliance: agency is seen as achieved by certain *assemblages* of actors and how effects of power and agency are attributed to specific actors, or *assemblages* of actors. This view offers practitioners and other stakeholders in education a perspective from which to potentially interrupt current iterations of these effects of power and agency in schools.

3.2.5 *Texts as artefacts of policy-based change to an actor-network of classroom practices*

ANT's perspective on the *symmetry* of human and non-human actors lends much to an account of a change to teachers' classroom practices enacted through a policy initiative. For whilst most obviously involving people – teachers, students, parents, governors, school leaders, etc – teacher's classroom practices are also surrounded by an often unspoken presence of *things*, either intentionally or unwittingly woven into the teacher's classroom practices. Documents, training materials, training rooms, emails. Curricula, textbooks, technologies, resources. League tables, media coverage, OfSTED reports. It thus makes sense to consider the material in relation to the role of teacher. It seems pertinent to explore how people, stuff and things act to constitute each other from a perspective of equal potential to any actor to act. For instance, Nespor (2011) examines two cases of device-mediated educational change: the introduction of a computer-assisted interactive video module to a university course and the introduction of an assistive communication device to the education of a pre-school child. In both cases, Nespor highlights how the relationship between technological devices and people – their agency and identities – act upon each other, with people activating the influence of devices and “agency and identity positions emerge and shift over time through the mediation of devices” (Nespor, 2011, p.15). A further example can be found in Tummons et al (2018), who explore how technology and curriculum in a Canadian medical education programme are bound together as ‘pedagogical partners’ which enact the programme; their relationship is binding and reciprocal. In this regard, Plum (2017) describes how in practising teaching, nursery teachers relate themselves to the action through material objects, ‘signing in’ (Plum, 2017, p.3) to classroom activity through these objects, mobilised by signs in the environment which come to signal the need for certain professional action. We may thus use the notion of symmetry to show how entanglements between material objects and education professionals to do with education

reform become the means through which policy is carried out, together acting to produce intended politically driven change (Mulcahy and Perillo, 2011).

In this study, I foreground description of a particular type of material actor in a policy-based change to classroom practices: texts. Education is a profession saturated with texts: textbooks, reading books, lesson plans, assessment documents, pupils' written work, parent reports, policies. In terms of policy, primary school teachers are in continual receivership of government policy texts, with schools in a position of trying to align practices with several simultaneously and often competing textual mandates of practice (Clarke, 2019). Throughout fieldwork, associations of actors which pertained to the new policy appeared to be centred around texts (see Chapter 4.3.5).

The notion of *symmetry* is particularly useful here in what it offers for exploring the role of documents in a policy-led change to practices. For documents are excellent examples of ANT's notion of *symmetry*, in that the human and the physical are truly entangled: documents are material actors which are full of people (who create and read and talk about them), whilst (through creating, reading and talking) documents come to be part of the actions of people.

In describing the role of texts within a change to an existing actor-network, I draw on the notion that in ANT, texts are a type of *immutable mobile* (Latour, 2005): something that can circulate within a network whilst maintaining its shape (Law, 2009). An immutable mobile holds its shape in two main ways. Firstly, a text remains physically unaltered as it travels across geographical space. Secondly, it holds its shape in associating with other actors and in the different ways in which it functions within these associations. Latour (2005) uses the example of a map to explain this concept and I will summarise his example here. In an actor-network producing understandings of a new land in which the actors are spread far and wide and distant from the land, a map is inscribed with the dimensions and measurements of the

distant land. The map represents the land. It remains unaltered as it passes from person to person, in different places. The map can be transported to different places and read by different people, whereas the land itself cannot. Thus, the map carries the idea of the land: the idea of the land becomes mobile across the actor-network.

ANT recognises the importance of talking about the role of texts. The notion of *immutable mobiles* gives us a way of talking about texts in terms of how they may carry meaning and intention across physical boundaries in ways in which people cannot (Nespor, 1994). When seen as immutable mobiles, texts extend the geographical reach of certain actors, or *assemblages* of actors, within a network (Law, 1994). How people talk about texts and then go on to generate other texts can play a large role in the establishment of what is accepted as authoritative knowledge. In the aforementioned study of daily professional life in a scientific laboratory, Latour and Woolgar (1986) demonstrate how interpretation of scientific papers, discussions about them and the writing of subsequent papers established perceptions and acceptances of certain ideas as ‘facts’ within the laboratory. Thus, an ANT account helps us to see that “texts may have ordering effects that spread across time and space” (Law, 1994, p.102).

In relation to teaching, the idea of textual *immutable mobiles* is under-explored in the literature. One example is a tracing of a Teaching Standards document (Ceulemans et al., 2012). In this study, a government-provided Teaching Standards document is traced in its journey into usage in classrooms. Ceulemans et al argue that the immutable mobility of the standards document supports the permeation of these ideas as they are translated into teachers’ practices. Through multiple usages of the standards document in different times and places, the standards represented in the document are seen to influence various other parts of the education system: policy, curricula, teacher training programmes. Similarly, Nichols (2006) describes how an initiative around thinking skills is carried from boardroom to classroom through the immutable

mobile of the image of six ‘thinking hats’ (derived from Edward de Bono’s book ‘Six Thinking Hats’):

whenever it [the visual or phrasal cue of ‘6 thinking hats’] is employed, thinking is fragmented into the same array of cognitive orientations (Nichols, 2006, p.189).

The images of the hats become connotative visual reminders of the ideology as a whole that sits behind them. They carry the meaning of the hats from place to place, from person to person. Texts may thus be seen as artefacts of policy-based change to classroom practices, actors which *mediate* the work of other actors and thus support the production of change in the actor-network (Latour, 1999). The idea of *immutable mobiles*, particularly of textual immutable mobiles such as in the above studies, thus can be used to trace the ways in which certain ideas are reified within a network through representation in textual forms that can traverse a network without altering, carrying the ideas the immutable mobile represents to multifarious situations, interactions and associations.

3.3 From Actor-Network Theory to Literacy Studies

I approach the study of how a policy initiative is translated into teachers’ classroom practices from the perspective that education, and education policy, involves heavy usage and creation of texts of all sorts. Education policies may reach the classroom as a government-published policy text, or in myriad textual forms by which people in the school or another organisation (local authority, training body, etc) has interpreted the policy – school policies, self-audit tools, and so on. The Maths Mastery policy initiative discussed in this thesis is represented to schools in a variety of texts created by different educational stakeholders: policymakers, training bodies, school leaders, teachers (see Chapters 5.3 and 5.4).

As demonstrated in discussion of *immutable mobiles* (see section 3.2.5), how people talk about texts and then go on to generate other texts can play a large role in the establishment of what is accepted as the ‘way of doing things around here’ (Latour and Woolgar, 1986). And yet texts and other material artefacts which form part of the daily life of the teacher are often hidden from view, backgrounded in research and practice. We don’t notice them until they become defunct or no longer relevant to the flow of daily activity in the actor-network (Latour, 1999).

Whilst ANT’s notion of symmetry offers a way to explicate the role of non-human actors (such as texts), as well as human actors, its anti-reductionist nature, which is so useful in providing a flexible basis for exploring complex associations, is somewhat less useful when it comes to tools with which to discuss the associations of texts. I found the language and tools of ANT to be lacking in ways to speak to how texts are *used* and *created*; how people read them, discuss them, write them or how texts relate to people, people to texts and texts to other texts. For this reason, I combine ANT with Literacy Studies (LS) to create a unified and equally weighted ANT-LS framework which supports explication of how a policy enters into an existing network of classroom practices, in ways which I observed to be heavily oriented towards the use and creation of texts. LS shares many of the epistemological assumptions on which ANT rests and extends the analytical possibilities of an ANT account, providing constructs with which to talk about textually mediated practices and ‘ways in’ to the actor-network of classroom practices through which to explore how the entrance of new (policy) actors reconfigures the network. In the remainder of this section of Chapter 3, I introduce LS and the key tenets on which I draw in this thesis.

3.3.1 *Introducing Literacy Studies*

Growth in the field of Literacy Studies in the 1980s brought a paradigm shift away from a view of literacy as an individualistic psycholinguistic process to a view of literacy as a social and cultural practice (Gee, 2015). This paradigm shift instigated the use of the term *New Literacy Studies* by some authors, later to be largely abandoned.

Approaching literacy as a social and cultural practice involves several key assumptions. Firstly, this perspective rejects notions of literacy as a neutral cognitive process, detached from social contexts (Street, 1984). Rather, LS theorists argue that literacy should be understood as practices interwoven with, and emerging from, cultural practices within social groups (Heath, 1980). From this perspective, LS has been used to explore differences in aspects of literacy which are rooted in, and help to perpetuate, cultural phenomenon. One example of this is Shirley Brice Heath's 'Way With Words' (Heath, 1983), which traces children's language development in two distinct, yet related, communities in southern USA. Studying language development in context, Heath highlights deep cultural differences between each community's 'ways with words' which reveal sources of communication problems in schools and workplaces in the area. Through a growing number of studies from the 1980s onwards, LS makes the case that literacy should be studied "in an integrated way in its full range of contexts and practices, not just cognitive, but social, cultural, historical, and institutional" (Gee, 2015, p.35). This approach to literacy has been taken up by many researchers by drawing on anthropological and ethnographic methods to study literacy in the contexts in which it is developed and used: Street's (1984) anthropological study of literacy in Iran, for example, or Prinsloo and Breier's (1996) edited volume investigating the social uses of literacy in South Africa through anthropological methodology.

Within the notion of studying literacy in context lies a further assumption of LS, that there is no one common definition of ‘literacy’, but rather that the meaning and characteristics we associate with literacy may be different in different places. As in ANT, LS rejects overarching nominalisation of causal frameworks, rather accepting that there may be many different practices and normative understandings of the term which vary with social group (Heath, 1997).

...it is a normal and absolutely fundamental characteristic of language and of literacy to be constantly remade in relation to the needs of the moment; it is neither autonomous or stable, and nor is it a single integrated phenomenon; it is messy and diverse. (Kress, 1997, p.115)

Practices and understandings of language and literacy are seen as perpetually in motion, continually shifting as literacy is mediated by activity within the practices of a social group. Thus, as in ANT, ‘meaning’ is seen as “contingent and situated, shifting according to context, purpose and social relations” (Hamilton, 2011, p.56). Literacy as a social practice is in this way described as an ecology (Barton, 2007), characterised by movement and change, linked to movement and change in the social practices in which literacy practices are seen to be created and used (Millard, 2006).

An LS approach embraces the texts and technologies (equipment, resources, artefacts, digital technologies, visuals and so on) of reading and writing, but does not seek close linguistic analysis of texts. Rather, researchers who take an LS approach explore how texts and technologies are created and used within social groups (Baynam and Prinsloo, 2009). As in ANT, LS rejects the notion that a text embodies a fixed meaning. Meaning making in the social world is viewed as relational, activated by the reader(s) and mediated by their prior experiences and ways of knowing (Barton, 2007). In this way, as in ANT, texts and literacy practices are

approached in LS in relation to the people that create and use them. LS seeks to explore the relationships between these:

Textual analysis of all sorts can lull people into believing that texts themselves do things, and to forget the people behind the texts. (Barton, 2007, p. 82).

LS also echoes ANT's notion of the recursive nature of actors and actor-networks. Literacy is positioned as being "part of the environment and at the same time influences and is influenced by the environment" (Barton, 2017, p.29). LS scholars seek to understand the dialogic processes involving texts and people in which texts are created and used. It is perhaps for this reason that data within LS-based accounts shares a trend with ANT in that research in the field tends towards the ethnographic (Heath, 1980; Street, 1984).

The conceptual framework of LS supports an ANT account. LS provides 'ways in' to an actor-network in which texts are frequently occurring actors. It provides constructs with which to talk about recurring textually mediated moments in an actor network and the ways in which texts and people associate. The terms I draw upon in the thesis are detailed below.

3.3.2 Literacy events

Literacy events (Heath, 1982) are a key tenet of LS. The notion refers to events in the everyday sense of the word; moments of the everyday in which interactions centre around the written word. For example, teachers discussing texts together in order to write a plan for the week's lessons, or composing an email to a parent, or reading a story to the whole school in an assembly.

From an LS perspective, literacy is acknowledged as playing an integral role in communicative activities, with texts seen as mediating people's experiences (Mills, 2010). Talking of literacy

events is to talk of the dual notions of what literacy *does for* people and what people *do with* literacy (Heath, 1980). Put simply, the idea of literacy events allows us to talk on the one hand of how people use texts to establish understanding. On the other hand, we can examine within literacy events how texts position people in relation to them. For example, Barton (2007) explores how texts “can function to include – and exclude – people” (p.79), impacting how people view themselves, their identities, in relation to the text.

In ANT, the researcher begins in the middle of things (Latour, 2005). The notion of *literacy events* affords potential starting points; a ‘way in’ to the actor-network of classroom practices. In seeking how a policy initiative enters into a network of classroom practices, I look to textually-mediated ‘events’ in the network; moments when texts carrying information about the initiative are interacted with. *Literacy events* can be seen as moments when many actors may come together – texts, people, physical objects, ideas. We can observe interactions between these actors and explore the roles people and texts take on. We can compare the associations of actors in one literacy event to another and describe patterns in relationships between texts and people: patterns which form teachers’ or institutional literacy practices.

3.3.3 *Literacy practices*

The term *literacy practices* (Street, 1984) is another key tenet of LS which supports analysis of the relationship between actors in how a policy initiative is translated into teachers’ classroom practices. From an LS perspective, the word ‘practices’ refers, in its broadest sense, to routinised, effortful, repeated or repeatable things that people do (Street, 1984). In relation to literacy, ‘practices’ refers to the “ways of using literacy which are carried from one particular situation to another similar situation” (Barton, 2007, p.37). *Literacy practices* might be *everyday* practices or *professional* practices. The distinction is made around personal,

idiosyncratic practices of reading, writing, conversing (such as chatting with friends or writing in a diary), or work-based practices carried out according to the norms of a particular institution.

LS acknowledges that the patterned ways in which people use and create texts may be different in different groups and that this affects the outcome of *literacy events* (Heath, 1983). The shared *literacy practices* of a social group – the ways that people and texts interact – affect the meaning-making of the group. In relation to institutions such as educational establishments, Barton argues that literacy practices “are embedded in and get their meanings from” the institutions in which they occur (Barton, 2007, p.42). Institutions select and privilege certain practices (Hamilton, 2011), which impacts the ways in which people perceive their work or in which work within the institution is carried out. In this way, the notion of *literacy practices* helps us to explicate how the relationships between texts and people which are selected and privileged in a school impact the actor-network of classroom practices.

Unlike *literacy events*, which are relatively straightforward to observe and to capture from an ethnographic perspective, *literacy practices* are more complex to unravel (Hamilton, 2011). This is because they also involve how people feel about, or the extent to which they value, the literacy in question. In this way, the affective matters to the ways in which texts and people associate (Pahl and Rowsell, 2006). Gowen (1992), for example, describes how affective tensions in the implementation of a literacy programme in an American hospital negatively impacted the resultant programme. The conceptual tool of *literacy practices* thus also affords researchers a way of talking about affective elements of textually-mediated moments within the actor-network; how teachers buy-in to or resist the meaning and intent carried by texts, or how they come to be *enrolled* into (Callon, 1986) the ideas the texts contain.

3.3.4 *Intertextuality*

Intertextuality refers to the ways in which texts explicitly and implicitly refer to other texts. Thus, single documents acting in a particular part of the actor-network can be seen as part of a series of other, related, texts. Furthermore, texts may be created with direct or indirect reference to other texts, creating conscious or unconsciously made links between multiple texts. In these links, texts may replicate parts of other texts, or change parts of other texts into something new (Barton, 2007). For example, a teachers' planning document may refer to elements of the national curriculum, but often changes or additions are made to make the plan make sense to the teacher and the class at hand. Brandt and Clinton (2002) argue the usefulness of combining ANT and LS perspectives lies in exploring how texts link, particularly in the view this unified framework affords of how individualised versions of nationally or internationally produced texts (such as government policy documents) are achieved and how these in turn feed into further discourses and further texts.

Thus, we can use the idea of *intertextuality* to extend the ANTish idea of *immutable mobiles* (Latour, 2005). Describing *immutable mobiles* and their movement in an actor-network supports a view of how intent, meaning and purpose are carried across geographical boundaries. The notion of *intertextuality* affords deeper exploration of how several *immutable mobiles* within an actor-network may be linked. We may trace, for instance, how textual *immutable mobiles* may work in unison to create a framework which mediates the experiences of teachers into the intent and purposes of the promoted practices. In this sense, linked documents may be seen as creating an 'infrastructure' for change by the ways in which teachers are positioned to a series of texts carrying policy messages (Hamilton, 2011, p. 61).

We may also talk of links between texts which form an *intertextual hierarchy* (Smith, 2005). An *intertextual hierarchy* is created, Smith argues, when texts are created based on other texts

so that a chain of texts emerges, with some documents acting as regulators of subsequent ones, the latter positioned as subordinate to the base text. We can use the notion of *intertextual hierarchies* to see “how texts regulate other texts” (Smith, 2006, p.86). Through *intertextuality* we can unpack the role of texts in relation to other texts and how these are used together, to see how information flows within a school and comes to inform classroom practices.

3.4 Limitations of the theoretical approach

There are several pragmatic restrictions at work within and across this theoretical approach or ‘sensitivity’ to data. The first of these lies in the specific ‘moment in time’ view that this thesis offers of a change to teachers’ classroom practices. In ANT, actor-networks are seen as temporarily stabilised (Law, 1994) until the actor-network holding them together shifts and changes, destabilising and reconfiguring into a new form. Actor-networks and the individual nodes which form within them and at whose intersections meaning is made (Latour, 2005), can expand, dissolve or change: no network is completely stable or can exist outside the interconnected networks as a predetermined entity (Nespor, 1994). This means that the shape of the social described in ANT accounts is transient. This is true also of LS in the sense that ‘meaning’ is seen as contingent upon the practices of the social group, which are subject to alter as the social group and its constituent physical and human parts alter. The classroom practices described in this thesis are likely to have changed by the time of publication. I therefore acknowledge that I describe one iteration of change to teachers’ classroom practices and that, by the time of publication, that iteration is likely to have altered, adapted, grown.

This does not, however, detract from the value of the study, for in describing one iteration of change to teachers’ classroom practices, I seek to highlight the workings of influences upon the establishment of the change. I invite educational stakeholders to view classroom practices

and education policy in terms of possible entanglements of actors which establishing change and how these produce certain effects of power and agency. This contributes to discussions around the relationship between policy and practice. This study thus acknowledges that a static formula of the relationship between education policy and classroom practices is unlikely to reflect the reality of how these entwine. Instead, I aim to describe, illuminate and to enable the raising of questions, much as Gorur (2011) focuses on opening up the notion of PISA results; using ANT (and in my study, ANT-LS) to explore, to question.

A further limitation of this study is that in highlighting the associations of prominent actors such as texts in a network, I risk neglecting movements of less prominent actors (Nespor, 1994). To go some way to counteract this, I have explored instances of variation and resistance within the change in the network of classroom practices observed, noting how these influence the network, or are quelled by other actors within the network. This is useful particularly in discovering destabilising threats to the network and how these are overcome (see for example Chapter 8.8).

However, it is also important to note that an ANT-LS account will always be a partial account (Latour, 2005). ANT's flat ontology and both ANT and LS's associative-productive view of the social world imbue an inexhaustive potential of the field in which the researcher can never describe the whole actor-network: the associations which produce every material object, idea, belief. Acknowledging this limitation of an ANT-LS approach, I instead aim for rich specificity of description of part of the actor-network (Michael, 2017), through which the field may glean interesting (if rarely generalisable: see Chapter 4.4.3) insights into part of the network described.

An additional issue is that an ANT-LS approach, by nature of the ANTish half of its formulation, is not explanatory. An ANT account does not seek to explain reasons for why a

policy exists/why teachers do what they do or think what they think. Instead, an ANT approach *describes*. Whilst, therefore, an ANT approach may not be the best approach to take to look at the *why* behind this change to classroom practices, this study hopes to open further discussions and explorations by other researchers which could encompass such reasoning. I achieve this through detailed description of *how* the actor-network of classroom practices is reconfigured by policy, and the movements and relationships between actors which establish this reconfiguration. This adds valuable empirical descriptions to both academic and profession-based discourse on the topic of the relationship between government policy and teachers' classroom practices. Indeed, the value of this unravelling lies within the visibility it will create as to how policy-based change to classroom practices is established in a school. If we can see even some of the complexities of the establishment of change – what has been an actor, what has tried to be assimilated into the actor-network and has failed, what has exerted influence across global and local geographical domains, how meaning has been transformed at different stages –, then we can discuss and evolve our understandings of the relationship between policy and classroom practices from a more informed standpoint. In other words, if we recognise that reality is performed into being (Law, 1994), then we can interfere in the associations which create the reality (Law, 2008).

3.5 The thesis as 'performed into being'

My approach sees teachers' classroom practices as 'performed into being' (Law, 1994) by the actors which combine to create it. The writing of this thesis must be viewed in the same vein: it is a production of associations of actors (data, computer, researcher, participants, and so on). Just as the textual actors discussed in the findings and conclusions of this thesis are treated as laboratories (Latour & Woolgar, 1986), with meaning made through the interaction of people,

things and systems of literacy (Barton, 2007), so too must I see my thesis. To follow this paradigm to its end, employing the approach described here also entails that the thesis will be performative:

The text, in our discipline, is not a story, not a nice story. Rather, it's the functional equivalent of a laboratory. It's a place for trials, experiments, and simulations. Depending on what happens in it, there is or there is not an actor and there is or there is not a network being traced. And that depends entirely on the precise ways in which it is written. (Latour, 2005, p. 149)

So what does this mean for the writing (and reading) of this thesis?

Firstly, that *objectivity* becomes a tricky concept. As I write, I acknowledge that I am attempting to weave a tapestry through the ways in which I present data. It is quite possible that my own preconceptions (and the perceptions of readers of this thesis) will come to bear upon the actor-network. Law (1994) stresses the issue in that what is being attempted in an ANT account is a history of some sorts and that 'history is the product of interaction between story-teller and subject-matter' (Law, 1994, p. 19). Thus, objectivity cannot be an aim of this research. I cannot claim to be entirely objective in the sense of being *outside* of the data looking in (Nespor, 1994). I am part of it: I am telling its story. This is indeed a necessary part of this study. As in many accounts of the social world, a subjective stance allows the researcher to study activities of the society or culture that occur in the pattern of everyday life by becoming part of those patterns for a while (Alasuutari, 1995).

Whilst objectivity is not my aim, *authenticity* is. It is my aim to detail an authentic account of policy-based reconfiguration of new classroom practices: a new social (Latour, 2005). Measures to maintain *authenticity* have been taken. I look for patterns in common orderings of actors which occur again and again, interlocking like atoms in a molecule, either in complete

or partial orderings. I look for multiple consistencies in the triangulation of data from fieldnotes with interviews, documents, and across multiple observed situations. As Law surmises,

stories are often more than stories; they are clues to patterns that may imputed to the recursive sociotechnical networks. (Law, 1994, p. 19)

It is such patterns, gained through thorough comparison of data across times and places and people and materials in the school, that gives an authentic view of the establishment of change to classroom practices described in this thesis.

The thesis as performative, then, offers a particular challenge to its creation. I hereby acknowledge these challenges and set out my aims of *pattern elucidation, multiple consistencies and (partial) orderings*, and aim to write an authentic tale of change at Highland School: to tell the ethnographic story of policy-based change to classroom practices through description of actors associations and their constituent battles, victories, defeats and entanglements.

3.6 Conclusion to the theoretical framework

In this chapter, I have spoken of the value of an ANT-LS account in terms of describing how a policy enters an existing network of teachers' classroom practices. I have described ANT and the ways in which an ANT sensibility to ethnographic data supports explication of a change with the professional social world of teachers. I have also spoken of the limitations of ANT when it comes to talking of the work of texts in an actor-network and the importance of addressing this limitation due to the textually saturated nature of education and a prevalence of texts in fieldwork. I have argued that drawing on tools from LS allows for closer tracing of the work of textually mediated moments within an actor-network, from a perspective which fits

nicely with the epistemological assumptions of an ANT account. LS expands the analytic possibilities of ANT and offers a ‘way in’ to an actor-network of classroom practices. What LS brings to an ANT study of textually mediated associations within an actor-network is, I have argued, to provide ways of thinking about particular kinds of stable mobile that ANT simply cannot. An ANT-LS approach is thus used as a unified framework (I use ‘framework’ in the loosest of terms here) for analysis of my data. This unified framework provides a lens with which to *unblackbox* the establishment of a policy-led change to teachers’ classroom practices at Highland School (Law, 1994).

In the next chapter, I describe the methodology of the study and methods of data collection and analysis.

4. Methodology

4.1 Introduction to the methodology

In the theoretical framework of this thesis I set forth my epistemological approach to answering the research question. I explained the value of a combined actor-network theory (ANT) and Literacy Studies (LS) approach. I detailed how ANT and LS-based research is often synonymous with the use of ethnographic methodology. Ethnography is a broad field and ethnographic methodology takes on many forms. In this chapter, I describe how I use ethnographic methodology within my theoretical framework. I first introduce tenets shared across branches of ethnography and ethnographic methodology. Next, I set out my ethnographic approach, explicating how ethnography suits an ANT-LS approach and argue the case for short-term ethnography in an educational organisation. I then describe my research design, detailing how access was negotiated to the field and researcher positionality, followed by methods of data collection and analysis.

4.2 The research as ethnographic

4.2.1 Issues with defining ethnography

In the general sense, ethnography is a systematic study of people in their own environments, which grew out of the field of anthropology. Ethnography has developed in different directions over time, with increasing difference in what the term *ethnography* is taken to mean (Walford, 2018). Variances exist, for example, in the extent to which the researcher participates in critical or political discourses, or the extent to which studies use supplementary methods beyond observation, discussion and documentation (O'Reilly, 2009). These variances have resulted in myriad of forms of ethnography, signalled by various

adjectives associated with the term: autoethnography; digital ethnography; visual ethnography. In this thesis, I situate my study within the wider field of ethnography as *short-term ethnography* (see section 4.2.6).

Variances in usage of the term *ethnography* offers a great challenge in seeking to describe its key tenets. Hammersley (2017) offers a useful way forward in this regard, suggest the use of a ‘thin’ description which acknowledges that there are a “range of types of ethnographic work” that vary in form whilst “sharing a basic set of methods and their associated ideas in common” (Hammersley, 2017, p.7). Following this approach, I thus first set out the basic ideas of ethnography on which I base this research and then proceed to detail how my research specifically is ethnographic; where it sits within the field of ethnography as ‘short-term’ ethnography.

4.2.2 Some key basic tenets of ethnography

Ethnography typically involves sustained contact with people and places studied within the context of daily life (Gray, 2003). In order to describe the lives and perspectives of the people studied, ethnographic accounts draw on everyday experiences and vernacular knowledge from within the subject group (Hammersley and Atkinson, 2019). The way of achieving such data is typically through researcher immersion in the social group. The role of the researcher during this period of contact, or ‘fieldwork’, is often explained in terms of ‘deep hanging out’ (Geertz, 1998). Deep hanging out involves overt or covert positioning of the researcher within the group being studied, learning about its norms and nuances by observing daily life, talking with people, and sometimes actively participating in day-to-day activities. ‘Deep hanging out’ affords the researcher opportunity to see patterns in the everyday activities of

the social, as well as opportunity to build a rapport with informants which may lead to more richly detailed data (Pawluch et al., 2005).

During this period of immersion, ethnographers may begin from an open-ended perspective in terms of what may be of interest in the field (Maxwell, 2012). Approaches to data gathering and analysis from this starting point tend to be iterative-inductive, in the sense that the researcher establishes themes from ongoing data collection and analysis as the fieldwork progresses, rather than testing a theory out in the field. An iterative-inductive process of analysis is commonly used throughout the fieldwork period to enable the researcher to gradually define what is of value to pursue within the context (Mills & Morton, 2013).

O'Reilly (2009) describes this process as a spiral, in which data is processed and analysed as it is gathered, a process through which the researcher identifies further data to be collected along the lines of emerging themes. Iterative-inductive analysis allows the activities and perspectives of people to emerge from their natural setting, through examination of what people do, what they say, how they interact, their perspectives and patterns within all of these (Brewer, 2000).

In order to collect data to support the discovery and telling of the narrative of the social, ethnographers draw on a family of methods to enable cross-referencing of data and perspectives in creating accounts of the social (Newby, 2014). Ethnographic methods tend towards the qualitative, although they are not exclusively qualitative (Walford, 2018) and draw upon the ways in which we understand the world around us in the everyday: seeing, conversing, documenting. These are shaped into methods we can systematically and purposely learn from (Hammersley and Atkinson, 2019).

The often everyday nature of the methods of ethnography seeks to maintain and draw upon researcher rapport with members of the group being studied (Gray, 2003). For example,

participant observation, in which the researcher learns about the culture through taking a participating role, also lends insight through the affordances of a naturalised presence: people may feel able to openly share their perspectives through the development of a working relationship with the researcher (Shensul, 1999). Similarly, oral accounts in ethnography are often characterised by their semi-structured nature, in which participants feel comfortable in their relationship with the researcher to share insights into the culture, sometimes wandering off topic into elements they feel are important or worth sharing (Heyl, 2001). Although perhaps not used as widely as observations and oral accounts in describing elements of the social world, ethnography has also long afforded value to material data in the form of artefacts and documents. Material and documentary data is valued as part of the construction of meaning within the social group (Atkinson and Coffey, 2004) and acknowledged as containing and carrying ideas such as facts, rules or records used in social activities (Prior, 2003). Emergent patterns and trends are looked for across the family of methods and used to write richly detailed ‘thick descriptions’ of life within the social group (Geertz, 1998).

4.2.3 Criticisms of ethnography

Criticisms of ethnography have centred around the idea that social research has as its basis “the human capacity for participant observation” (Hammersley & Atkinson, 2007, p. 18). This has been positioned as problematic to accounts of research focused on the social world in several regards. Firstly, around inherent reflexivity within ethnographic accounts. From the post-structuralist perspective on which the ANT-based ethnography of this thesis rests (see Chapter 3.2), through immersion in the field, the researcher and the researched are seen as locked in a co-construction of reality, in which it is difficult to separate out whether

researcher beliefs or participant positioning towards the researcher produce participant or researcher predispositions towards the data.

On one side of this coin, ethnographic fieldwork involves the researcher making choices around what to record and what is of importance, interpreting the field through their own experiential lens (Denscombe, 2010). An ethnographer is likely to be tasked with a paradoxical overload and simultaneous lack of data as fieldwork progresses, wanting to ‘observe everything’ whilst knowing that this is impossible; as the researcher writes, they are missing what is happening around them (Strathern, 1991). An overload of data is often overcome through iterative-inductive analysis of data as it is being collected. However, inherent to this process is the idea that the researcher continually selects the elements of the behaviours of the social group to follow in further data collection. It is thus important to acknowledge potential bias in relation to data and seek to account for it, rather than dismiss it, or manage it out of the ethnographic story (see Chapters 4.2.6 and 4.3.3).

On the other side of the coin, is the problem of “while I was watching the watchers, they were watching me” (Van Maanen, 2011, p. 176). This has been associated with increased risk of researcher presence impacting data, through adaptations of the actions of the subject group in relation to the researcher presence: how participants wish to be perceived, or think they should be perceived, for example.

Ethnographers address such criticisms by acknowledging the subjectivity of the researcher as part of the account, rather than positioning the researcher as objective and neutral to the social group studied. As such, many ethnographers detail their own backgrounds and position in relation to the research, to enable the reader to consider this in relation to the claims of the research (Crang and Cook, 2007). This is the case in my study, which begins with

explication of how I came to choose the topic of focus for the study and how the research question developed (see Chapter 1.1).

4.2.4 *ANT, LS and ethnography*

ANT-based research has been acknowledged as largely ethnographic (Latour, 2013). As discussed in the theoretical framework, ANT grew out of anthropology using ethnographic methodology in the field of Science and Technology Studies, as a material-semiotic constructivist approach to understanding how authoritative knowledge is produced in the sciences (Latour, 2005). Whilst not all ANT research is ethnographic, and whilst ANT-based research draws on many different types of ethnography (Winthereik, 2019), the corpus of ANT accounts make use of ethnography's key tenets to explicate the relationships between actors which perform into being different realities.

Similarly, many studies based in the post-1980s paradigm shift in Literacy Studies (see Chapter 3.3.1) draw on ethnography and ethnographic methods to describe the *literacy practices* (Street, 1984) inherent to *literacy events* (Heath, 1982) in different social groups. Heath (1982), for example, enters the social worlds of two communities only a few miles apart in the south-eastern United States as an ethnographer, describing how children learn to use language at home and at school in these social groups.

Ethnography and an ANT-LS study sit well together. In both, meaning in the social world is seen as created through experience, rendering it intersubjective and embodied, shaped through interaction and personal perspectives which are built up over time (Tedlock, 2000). Beginning from a naturalistic and open-ended standpoint, ethnographers enter the field of study to observe what is there. In an ANT-LS ethnography, this observation is positioned as how the researcher 'follows the actors' (Latour, 2005), describing their interactions and

detailing how these interactions perform into being meaning, practices, objects, values (Fenwick and Edwards, 2012) including literacy practices in textually mediated moments in the actor-network.

The tools of ethnography allow for close observation of associations of actors within an ANT-LS account. The ‘deep hanging out’ approach of ethnography offers the ANT-LS researcher opportunity to observe the associations of different actors close-up. Within this, and pertinent to ANT’s notion of *symmetry* (see Chapter 3.2.1.2) and to the assumptions underpinning LS, people and things (texts, for example) can both be attended to within ethnographic data. Particularly pertinent to the study described in this thesis is the acknowledgement of the potential influence of documents and artefacts, which has long been part of the ethnographer’s work (Shankar, 2018). Actors to be followed in tracing actor-networks emerge from trends, patterns and anomalies noted during an iterative-inductive process of analysis. Ethnographic methodology thus lends a way by which the ANT-LS researcher can trace the actors in an actor-network.

An example of this can be found in the work of Nespor (1994) which gives an ethnographic ANT-based account of the daily lives of students in university programmes. In this study, through close observation of, and interaction with, these social groups Nespor details the associations of actors which perform constructions of education and power. Nespor describes his study as “ethnographic fieldwork” (Nespor, 1994, p.1). Through observing and participating in daily activities and talking to people in the social group studied, Nespor builds a detailed record of the politics and practices of knowledge in relation to two undergraduate courses at a ‘United States University’. In studies such as Nespor’s, through fieldwork data gained by following actors within the field, we can see the work of the influences at play in constructing the social (Mills & Morton, 2013).

In presenting data, ethnographic accounts tend to culminate in rich descriptions of people's actions and perspectives. This also suits an ANT-LS account well. ANT accounts and LS accounts, as for other ethnographic accounts, tell of specific encounters (Michael, 2017) in that they are situated in time and space and resist generalisation. Thus, ANT and LS-based ethnographies typically consist of data-rich descriptions (Barton, 2007) which present the microprocesses of negotiation of the social (Latour and Woolgar, 1986). Additionally, ANT's flat ontology eschews reduction of findings to generalised interpretative concepts (see Chapter 3.2.1.4) in favour of *deployment* of juxtaposed sections of data in rich descriptions which magnify parts of the actor-network in turn (Latour, 2005). This tends to result in a descriptive ethnographic tone to ANT accounts, providing another way in which ethnography and an ANT-LS account sit well together.

4.2.5 Ethnography in an organisation

In many of the early ANT accounts and later LS accounts with which my research aligns, exploration of *actor-networks* and *literacy practices* is achieved through the use of ethnographic methodology within organisations. Examples of ANT-based studies include the work of Latour and Woolgar (1987), who became participants in the work of scientists in a laboratory, using ethnographic methodology to explore how scientific fact is created. Similarly, Law (1994) draws on organisational ethnography to study the management and organisation of a scientific laboratory. Examples of LS-based ethnographies in an organisation include Gowen's (1992) study of the response of employees in a US hospital to a functional literacy program aimed at developing workplace literacy. In each of these studies, researchers spent time 'deep hanging out' in the organisation, tracing trends in the associations of actors to discover how knowledge is produced. It is in this same vein that my

research is ethnographic: it is an ethnography in an educational organisation (Highland School).

My research is an ethnography *in* an organisation and is not to be confused with other types of organisational ethnography which draw more formal links with organisational studies. Ethnographies *in* organisations, rather than *of* and *about* them (which draw more specifically on organisational theory) are characterised by “the general use of ethnographic methods in formally organised fields of study” (Schubert and Röhl, 2019). Organisations in these instances are the main *settings* of the research rather than the main *focus* of the research. My research joins a growing group of studies which marry ANT and LS with ethnographic methodology to conduct research in educational organisations. For example, Plum (2017) uses an ANT-based ethnography to explore the creation of knowledge and action in nursery schools, whilst Hamilton (2009) uses an ANT-LS approach to study the alignment of teacher identities with system goals in different educational organisations through the use of Individual Learning Plans.

In researching in a school, the sense of an organisation extends beyond the physical boundaries of the school site. For example, I observe teachers training at external venues and trace ideas contained within documents and materials used in the school through to educational websites and government documents which are part of their creation. Whilst ANT eschews macro and micro divisions of society (see Chapter 3.2.1.4) – there is *only* the local (Law, 1994) – the local may consist of actors both physically present in the school and those geographically distant. Exploring associations of actors present in the actor-network but not physically present in the school lends insight into the ways in which the local is connected to the trans-local (Tummons et al, 2015); the spaces outside of everyday experiences within the local organisation, but present in the formation of its norms. In Tummons et al.’s study, for example, the authors describe how trans-local actors within

universities and political arenas come to be mediated into medical programmes through creation and usage of multi-modal texts. In a similar way, using an ANT-LS approach, Nichols (2006) describes how primary school teachers' classroom practices come to be influenced by teachers' usage of a series of external websites and policies, not all of which end up physically present in the classroom.

In this respect, the ethnographic place of my research is open and unbounded (Pink, 2007), representing a "configuration of things of which locality can be part, but yet go beyond locality" (Pink and Morgan, 2013, p.354). Thus, my fieldwork took place in a specific educational organisation – Highland School – yet is multi-sited in that it extends beyond the school in tracing the work of different actors (Hine, 2007), to multiple sites of observation/participation that 'cross-cut dichotomies such as the "local" and the "global,"' (Marcus, 1995, p.95).

4.2.6 *Short-term ethnography*

I conducted fieldwork in Highland School between April and July 2018. Whilst much ethnography runs to longer time scales, sometimes over years, this was the amount of time available to me to dedicate to fieldwork. Here, I argue that there is value to be found in short-term ethnography and describe my researcher positionality in relation to the short-term ethnographic approach.

Short-term ethnography uses the basic ethnographic approach and methods described above whilst entailing certain key differences to longer ethnographies. One such difference lies in the researcher's focus on a selected *part* of a studied culture. Short-term ethnography has long been used as an approach in anthropological ethnography to study 'small elements' or 'culture traits' of a society (Knoblauch, 2005). Observations tend towards focused

exploration of aspects of the subject social group (Pink and Morgan, 2013), selected in early stages of fieldwork for explication. Within the focus of exploration, informants are selected who hold specific knowledge about that focus (Andreassen et al, 2020). These informants are intensively and deeply observed and talked to (Pink and Morgan, 2013), with the researcher entering their daily lives for a concentrated period of time. This approach is being increasingly used in the fields of education and medical education, emerging under a variety of labels, such as ‘rapid ethnography’, ‘micro-ethnography’ (Pink and Morgan, 2013) or ‘focused ethnography’ (Andreassen et al, 2020).

Short-term ethnography suits research focused on classroom practices well. Teaching is a profession in which the act(s) of learning its practices may be seen as multi-faceted and episodic. This is meant in a similar vein to that of Andreassen et al (2020): discussing short-term ethnography in relation to medical education, the authors set out the appropriateness of short-term fieldwork to a profession in which learning the job can be seen as multi-faceted and complex, occurring along different themes, in multiple places (a conference room, a ward, a clinic, for example). Medical education is thus depicted as episodic and suiting a shorter, focused period of fieldwork which explicates “episodes in social fields” (Andreassen et al, 2020, p. 297). This resonates with a study of a change to classroom practices in primary education, whose practices have also been noted as multi-faceted and complex (Hargreaves and Goodson, 1996) and can be similarly seen as episodic: practices are continually developed through different episodes: training, meetings, discussions, etc. Teachers learn to teach in different school settings, in a different year group, learn specific teaching strategies on specific courses, for example. Teachers’ classroom practices are often reshaped by changes in guidance around classroom practices, changes to the required curriculum, new pressures from issues in the media or economy, and so on.

Speaking in depth to particular episodes in teachers' professional development, such as those in the research reported in this thesis, lends value to the field of education research in that it offers rich descriptive insight into how aspects of teachers' classroom practices are established. For example, short-term ANT-based ethnographies have been used to explicate how different nursery school teachers align their practices with certain aspects or approaches to professional knowledge and action, through the use of material objects and physical actions which signify and represent the associated knowledge/professional action (Plum, 2017). Another example is provided by Nichols' (2006) ANT-LS based short-term ethnography, which traces how a teaching strategy and the thinking surrounding it – De Bono's 'Thinking Hats' – comes to be part of teachers' classroom practices, tracing its introduction into a school from boardroom to classroom. Short-term ethnography can thus be used to study episodes within the wider arc of teachers' development of their classroom practices throughout their career. In the short-term ethnography reported in this thesis, one episode is explored in Highland School: the establishment of a change to teachers' classroom practices for the teaching of primary mathematics.

Short-term ethnographies also differ to other ethnographic approaches in the choices that researchers tend to make around researcher positionality. Short-term ethnographies are recommended to take place in familiar cultures, in which the researcher has background knowledge to the field (Andreassen et al, 2020). Familiarity with the field is seen as enabling the researcher to enter the field with prior knowledge of key elements which would otherwise take time to come to know. This sets up a very particular form of researcher positionality, in which the researcher enters the field of study as an 'insider' (Crang and Cook, 2007). With this insider perspective, the researcher will often take the stance of *observer as participant* (Higginbottom et al., 2013). This positionality is common to many short-term ethnographies. It is an alternative approach to *participant as observer* positionalities often used in longer

studies (Crang and Cook, 2007), but is not seen as a replacement for participant observation or learning through doing on the part of the observer. Rather, learning through doing and through participation still occurs, but is shaped differently in that background knowledge of the field is drawn upon in making intensive observations (necessary over the shorter time span) from the side-lines, with light (rather than more immersive) participation in the activities of the group (Pink and Morgan, 2013).

In my research, I entered the field as an ‘insider’ - a teacher and a school leader from a different school, familiar with the profession. I openly discussed my own professional background with participants. I am an observer-participant in that my presence within Highland School was often in a corner of the room with my notebook, or at a table with students, or in the staffroom, observing and making fieldnotes. Teachers and students often included me in their conversations and activities. For example, I would help sort resources with a teacher before a lesson whilst we chatted about their work or join in briefly in a lesson activity being modelled, writing fieldnotes immediately afterwards. As I wrote following these activities, teachers and students often asked about my notes, which I would share. Teachers would then often say more about aspects I had observed, extending my notes. In this way, I grew awareness of what the people studied (the teachers) are trying to achieve (their classroom practices) (Pink and Morgan, 2013).

Familiarity with the profession was beneficial in two main regards. Firstly, as an insider I was familiar with the curriculum, national policies past and present and had knowledge of the practices of the teachers in different schools I had visited or worked in. This familiarity reduced issues relating to language – references, acronyms, metaphors – common to teaching (O’Reilly, 2012) and I could also note particularities in teachers’ behaviour through comparison to others I had seen. Secondly, as is necessary in short-term ethnographies, I was able to quickly ‘naturalise’ as a presence within the field (Andreassen et al, 2020): I knew

how to 'be' in a classroom and was a readily accepted presence in Highland School. My background in teaching supported in quickly building a rapport with participants, helping me to 'talk the talk' (Crang and Cook, 2007, p.22) and converse easily with participants.

Interviews often lasted longer than expected due to participants seemingly relaxing into the semi-structured conversation (see section 4.3.4) and teachers regularly offered for me to join them in training courses or staff meetings, on playground duty or in a cup of tea and a chat in the staff room.

However, this positionality and, in general, conducting research in a familiar field, also has its drawbacks. Notably, there is increased potential for the interpretative influence of my own prior experiences on data collection and analysis (Newby, 2014). Issues around researcher interpretative bias in relation to researcher familiarity with the field in short-term ethnographies are commonly addressed through the perspective of the researcher being one of making the familiar strange, rather than making the strange familiar (Knoblauch, 2005). For example, the researcher may observe informants who are experiencing the familiar in an unfamiliar setting, such as teachers swapping places to teach in each other's schools (Plum, 2017). Alternatively, the researcher may study a familiar field but in a setting new to them. In my research, I am familiar with teaching in primary schools through my professional background as teacher, school leader and education consultant. To make the strange familiar, I chose to conduct my research in an unfamiliar school. This is discussed further below in relation to negotiating access (see section 4.3.1 below).

A further issue around researcher familiarity with the field in short-term ethnographies is also in the potential for ethical issues around participant bias towards the researcher (Andreassen et al, 2020). I was fortunate that Highland School is a school which frequently welcomes observers into their classrooms to take part in, and learn from, the practices of the teachers there and my presence was naturalised quite quickly. However, this had implications for my

positionality as a researcher and research ethics. The relationship between myself and teacher participants seemed so trusting and accepting at times that I was concerned that my professional background had meant that many teachers may have forgotten that I was there as a researcher. This is a common effect of immersive research such as ethnography.

Participants forget that the researcher is a researcher as they get to know them as a person (Hammersley and Atkinson, 2007), an issue potentially amplified in the case of short-term ethnographies, where the researcher is already an ‘insider’ (Pink and Morgan, 2013). To counteract this effect, I first began by clearly stating that I was at Highland School in the role of researcher (see Appendix 6: Participant Information and Consent Forms). I also continually reminded teachers that I was there as a researcher by gaining verbal permissions for data gathering when observing. This is discussed further in relation to ethics (see section 4.4.3 below).

4.3 Methods of data collection

4.3.1 Negotiating access

Gaining access to the field is an important part of ethnographic fieldwork, which involves developing relationships which will result in open access to data. In literature around ethnographic methods, three issues in particular are highlighted in relation to access which were important parts of the process of entering my field of study: choosing a research site, negotiating access through gatekeepers and obtaining the trust of research participants.

Ethnographic research often tends to begin with an initially foreshadowed focus, rather than a clearly defined theory to be tested in practice (Crang and Cook, 2007). The foreshadowed focus of this thesis was a broad exploration of the formation of teachers’ classroom practices, as already discussed in the introduction to the thesis (see Chapters 1.1 and 1.2). In seeking a

school in which to explore this focus, I cast my net amongst the teachers and leaders of the schools in areas I could travel to but were not within a local authority in which I had worked. As explicated above, I wished to gain access to a school with which I wasn't familiar, in order to make the familiar strange (see section 4.2.6). I also wished to access a 'good' school, meant in the sense that I wanted to find a school which was perceived positively all-round: by inspection ratings, within local community feedback and within its performance data. The significance of this choice lies in widely explored effects of being perceived negatively by these success markers (Perryman, 2007), which often leads to a reform presence of external-organisation workers in the school and a sense of demotivation within teachers (Ball, 2003). Studying the establishment of classroom practices in a school which may be under external agency scrutiny or in various states of demotivation risked an imbalance in power relations between myself and the research participants (Delamont, 2012), entering the field with participant perceptions of 'outsiders' as negative, particularly one who has been a school leader and education consultant. Highland School, as presented in more detail later (see Chapter 5.1), is a school which is highly regarded locally, has performed highly historically in nationally-reported tests at age 7 and 11, and has inspection reports of the highest grade. Staff are used to visitors external to the organisation, these being frequent due to the school's involvement in teacher training and several teacher research networks.

In addition to a school that is generally positively perceived on all fronts, I was looking for one whose gatekeepers (usually the school leadership team) would see the value of the research and therefore grant permission for full access to data gathering in their school. As Hammersley and Atkinson (2007) highlight, gatekeepers are often most concerned as to the portrayal of the organisation and that the research will not negatively impact its work.

Gaining overt access, rather than covert, involves being clear and honest about the purpose, methods and uses of the study (Pawluch et al., 2005). I approached leadership teams in this

way, sharing the aims, purpose, and benefits of the study. The leadership team at Highland School were already open to the benefits of research in general, encouraging and supporting staff to study on Masters-level courses, or to run practitioner research projects through programmes such as the National Professional Qualification of Headship (NPQH). They agreed to allow me access to data (aside from safeguarding related data: see section 4.4.3) around the development of teachers' classroom practices in their school.

Once gatekeeper buy-in was secured, it was vital to gain the trust and buy-in of teachers who were to allow me to document their daily professional lives. I approached this access task in a similar manner to gaining gatekeeper access, openly setting out in a staff meeting presentation the purposes and methods of the study. This was done in the vein of working *with* people rather than 'on' people (Crang and Cook, 2007), in the hope of gaining insights useful to the research participants as well as the wider field. Following this presentation, 10 teachers signed up to the project (see Chapter 5.2), giving me full access to their daily professional lives for a week each. In addition, throughout the project, I was able to observe and talk to school leaders and a teacher trainer, totalling 12 participants. Open access to school meetings and documents was supported, with the exception of documents and meetings relating to the safeguarding of children (see section 4.4.3).

4.3.2 An overview of the data

Data gathering itself becomes an intensive process in short-term ethnography (Knoblauch, 2005). During fieldwork for this research, I joined participants in their year group teams, with some year groups involved in the project having more than one teacher participating in the study (see **Table 1** for fieldwork schedule). I spent one week with each participant, observing

their practice from the time they arrived at school to the time they left, roughly from 8-9am to 5-6pm.

Table 1: Fieldwork schedule

<i>Participant (teacher, unless indicated otherwise)</i>	<i>Fieldwork dates (where I principally follow participant)</i>	<i>Teaching team participant is a member of</i>	<i>Any issues with observations</i>
Charlie	Week beginning 23 rd April 2018	Key stage 1 (5-7 year olds)	None
Alex	Week beginning 30 th April 2018		None
Frances	Week beginning 7 th May 2018		None
Benny	Week beginning 14 th May 2018		None
Rowan	Week beginning 21 st May 2018	Key stage 2 (7-11 year olds)	None
School break for half term			
Laurie	Week beginning 4 th June 2018	Key stage 2 (7-11 year olds)	None
Sam (senior leader)	Week beginning 11 th June 2018		None
Jamie	Week beginning 18 th June 2018	Early years (3-5 year olds)	One safeguarding conversation I was unable to document due to ethical reasons
Wallace (senior leader)	Week beginning 25 th June 2018	Senior leader	Limited observations
Toni (external course trainer)	Week beginning 25 th June 2018	External to the school	Limited observations
Joss	Week beginning 2 nd July 2018	Early years (3-5 year olds)	None
Meri	Week beginning 9 th July 2018		None

This involved being present for all activities the teachers were involved in each day: planning and preparation activities before school, teaching in class, playground duties, staffroom breaks, planning meetings, training events, etc. Although ethics and the scope of the study entailed that I could not join them for professional activities conducted at home (as most of the teachers reported doing), we discussed these in both informal discussions and semi-structured interviews.

There were two participants for whom observational data is reduced: Wallace and Toni (see **Table 1**). Wallace and Toni were additional participants to the original ten teachers, who took part as tracing of the network progressed. I therefore did not expect to gain a week's worth of access to their professional activity. This was also due to the nature their roles: as a senior leader, Wallace was often involved in professional activity which was classed as unobservable in relation to the ethics of my study (see Chapter 4.4.3), whilst Toni, as an external trainer, was accessible only during two days: one training day and one day where I negotiated access to visit Toni in her school. I thus observed these participants in the same week and I was also able to conduct interviews and follow up on tracing actors discerned within the network during iterative-inductive ongoing analysis (see Chapter 4.4.1). Whilst this is a limitation of observational data around these three participants, this was supplemented in Wallace's case by presence in interactions in fieldwork weeks when I was principally following other participants. For whilst my focus for each week was in following one participant particularly, inevitably, participants appear regularly in fieldnotes from other weeks; teachers work in teaching teams and regularly meet and train and socialise together as a whole school staff. Therefore, it is important to note that in reporting findings, the dates of fieldnotes relating to the above participants may fall outside of the weeks noted in **Table 1** in which I followed their professional lives.

Throughout fieldwork, the prevalence of documents in teachers' daily interactions came to the fore of fieldnotes. I collected the documents which were part of the teachers' interactions, as well as describing their creation and usage in fieldnotes. Also noted were other aspects of materiality, such as sketches of the physical environments in which the teachers enacted their professional lives and the technologies involved.

During fieldwork, I used three methods of data collection: fieldnotes, including drawings and lists of physical aspects of the actions and interactions I observed, as well as records of incidental conversations); semi-structured interviews (n=12) and document collection (n=86). Below, I set out my data collection methods in detail.

4.3.3 *Fieldwork observations*

There are many different approaches to recording fieldwork observations, varying according to when, what and how information is recorded. In terms of what is recorded, early ANT research typically draws upon fieldwork observations which detail the associations of actors that perform parts of reality (Latour, 2005). "If a description remains in need of an explanation, it means that it is a bad description." (Latour, 2005, p.137). The ANT researcher aims to *deploy* rather than *explain* data, in that richly detailed observations which evidence the work of actors are juxtaposed with other data in the account of the research, to reveal the organisation of the actor-network. In this way, aspects of the actor-network are magnified in turn.

In order to gather data of a standard to deploy in magnifying aspects of the actor-network, the researcher needs data rich with the interactions and associations of actors, showing "energy, movement, and specificity" (Latour 2005, p.131). To achieve this, I focused on recording the behaviours and interactions of the teachers as much detail as I could: what teachers did, when

they did it and what their actions involved interacting with (for example, a teacher may have clicked onto a new slide on a Google Slide deck using a mouse, whilst asking a question to the class). I also recorded conversations between participants and colleagues/ as they went about their classroom practices, but also conversations that participants had with me. I would occasionally ask for clarification of something I saw, or a teacher would offer a perspective incidentally. See Appendix 1 for an example fieldnote.

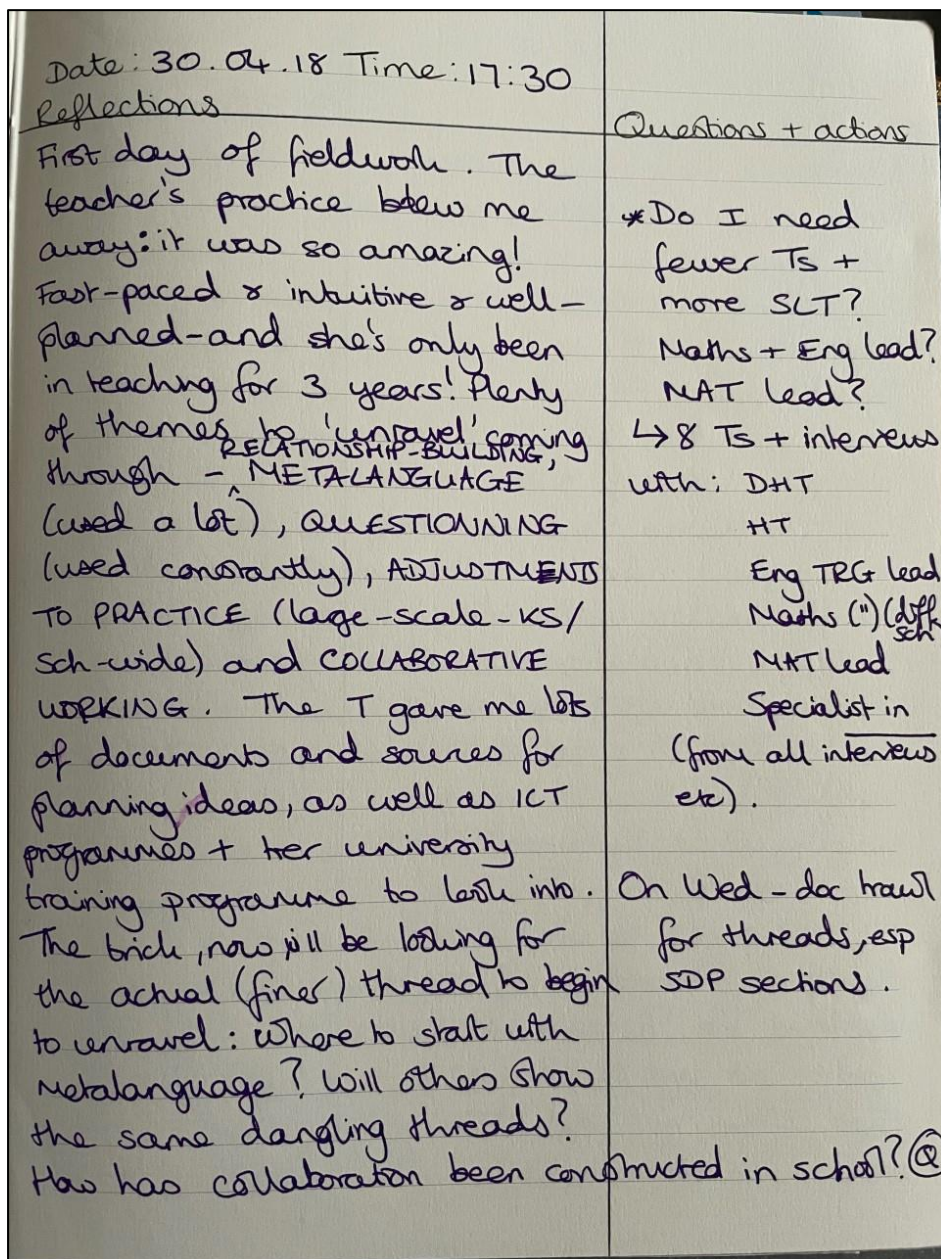


Figure 1: Example of notebook 1 - enquiry log notebook entries

To catalogue fieldnotes in a useable way, Latour (2005) advises a basic system of notebooks, which I chose to follow. Observations in notebooks, along with documentary data and interview transcripts, were largely inputted into Computer Assisted Qualitative Data Analysis Software (CAQDAS) every evening, specifically into Atlas.ti (see section 4.4.2).

The first notebook contains a log of the enquiry itself as it unfolds, detailing appointments, notes about reactions to events, etc. **Figure 1** provides an example of enquiry log notebook entries. This page is from the first day of fieldwork, where my excitement about the project is clear in the notes I made. I used this as a space to note my own reactions and feelings to each day of fieldwork, as well as ideas around avenues to follow from reading through the day's fieldnotes (notebook 2, explained below) and questions to consider in moving forward with data collection. This gave me a record of the fieldwork experience and how it unfolded. It also gave me an avenue for my own researcher emotions and simultaneously, a way of highlighting to myself on returning to my data for writing up my findings, potential affective bias around certain observational notes. For instance, I found the first teacher I observed to have 'amazing' practice; I could interrogate this bias this later in writing up fieldnotes made in observing this teacher and use these reflections to take account of and reduce the effect of bias in observational data.

The second notebook details fieldwork observations. **Figure 2** provides an example. Whilst I refer to this as a second notebook, in fact, I filled one thick A5 notebook for each teacher participant and one additional notebook containing observations of training events or group meetings I was given permission to observe.

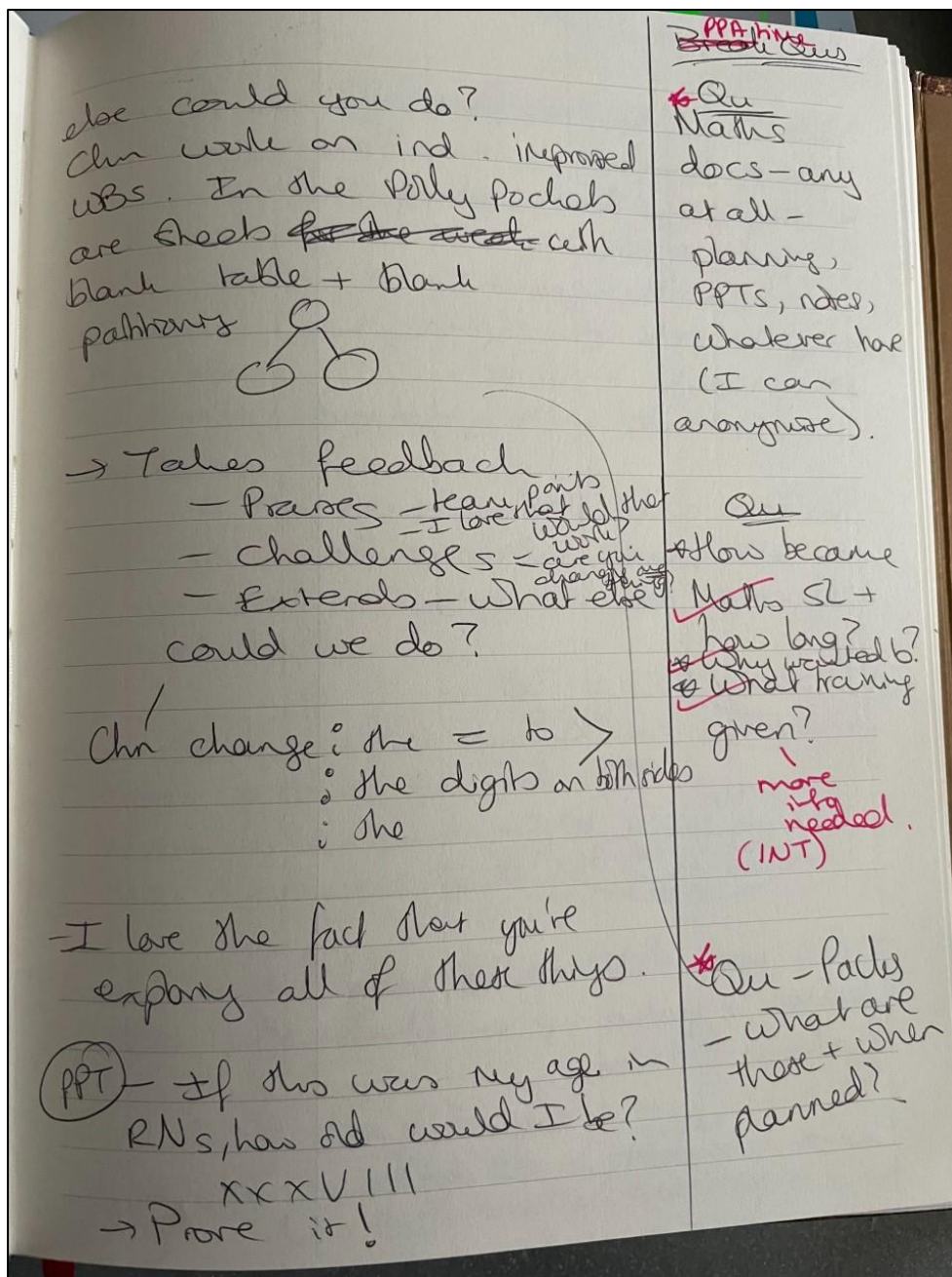


Figure 2: Example of notebook 2 - fieldnotes notebook example

In these notebooks, I made hurried jottings and sketches, along with questions in a right-hand margin which I used to follow up on or clarify points in later conversations with participants or, if I did not manage to cover these in day-to-day conversations, I made note to include these within semi-structured interviews as additional discussion points.

Notes made during fieldwork in the day were fleshed out every evening and typed into Atlas.ti (see section 4.4.2). All observations were preserved in chronological order in Atlas.ti, whilst also being able to be easily designated into categories, maintaining both pliability and original-form data (Latour, 2005).

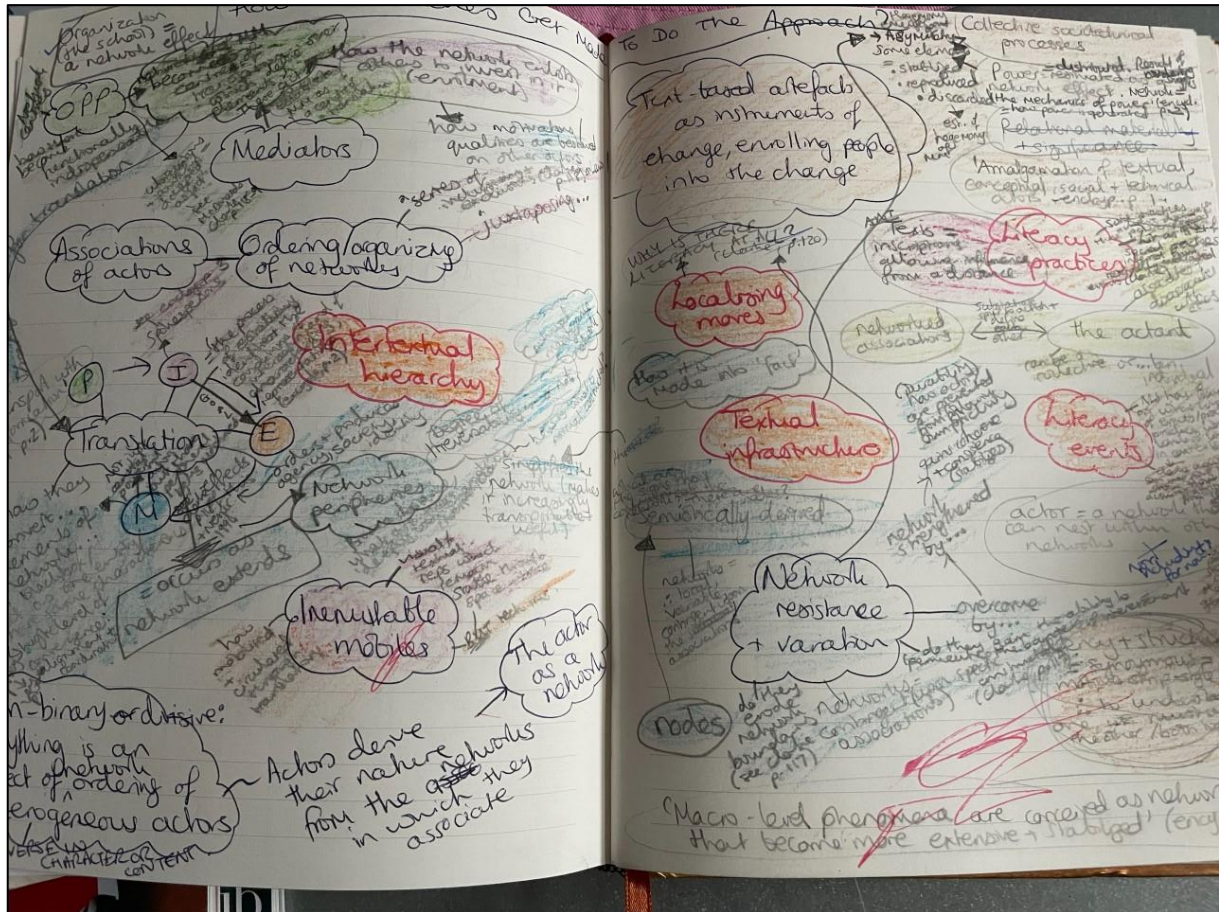


Figure 3: Example of notebook 3 – themes and memos notebook

A third notebook (see **Figure 3**) detailed ongoing ideas, themes and memos that connected sections of data. It is through this notebook that I worked through themes emerging from data collection and continually interrogated connections between associations of actors occurring in multiple fieldnotes, interviews and documents. This notebook supported me in identifying and keeping a record of associations of actors to trace in the network of the formation of teachers' practices, and, as clear patterns and trends emerged, supported me in tracing the

establishment of a policy-led change to teachers’ classroom practices. I revisited this notebook multiple times a day, looking for trends and patterns. Later, I connected literature to the themes in note form, giving ideas as to where focused reading may support explication of description of the actor-network. Again, these ideas were noted first in hand-written notebooks and then as memos in Atlas.ti, with digital links made between sections of the data which evoked the connections I had noted. Having this notebook in digital form supported in the ease of bringing forth connected sections of data during periods of analysis and writing.

Table 2: Overview of research effects notebook table

Overview of the journey of the research findings: the ‘research effects’ notebook	
<i>Journey of the research findings within Highland School</i>	<i>Journey of the research findings outside of Highland School</i>
End of fieldwork slide deck and presentation to school leaders at Highland School, shared with research participants	Ethnography in Education Forum, University of Pennsylvania (February 2019) – presentation of findings: <i>An actor-network theory analysis of actors influencing the formation of teachers’ practices</i>
Transcriptions of interviews shared with interviewees	Cambridge University Kaleidoscope Conference (May 2019) – educator/research conference, presentation of findings: <i>A socio-material understanding of the formation of teachers’ classroom practices</i>
	Oxford Ethnography in Education Conference, Oxford University (September 2019) – paper presentation and seminar: <i>Reassembling teachers’ professional knowledge: a socio-material view of the role of intertextual hierarchies during a change to primary mathematics teaching</i>
	Journal paper: Unsworth and Tummons (2021), Reassembling teachers’ professional practice: an ethnography of intertextual hierarchies in primary mathematics, <i>Ethnography and Education</i> 16(1), 109-126
	Oxford Ethnography in Education Conference, Oxford University (September 2022) – paper presentation and keynote: <i>The Voice of Google. Cloud-based collaborative technologies and teachers’ practices: an actor-network analysis.</i>
	Journal paper: Unsworth, R. (2023). ‘Teaching through the cloud: An ethnography of the role of cloud-based collaborative technologies in the formation of teachers’ classroom practices’. <i>Anthropology and Education Quarterly</i> https://doi.org/10.1111/aeq.12471

Finally, a fourth notebook was used to record research effects (Latour, 2005): the journey of the research findings after the fieldwork ended. I share an overview of this notebook in **Table 2**. In this notebook, I noted down how the research was shared with the school, at conferences, in the publication of papers. Whilst this notebook was not of much practical use during data collection and analysis, it continues to support me in keeping record of the ways in which I have represented the actor-network back to the field. According to Latour (2005), research should not be considered as finished and at an end once the writing of it has been accomplished, but that it is necessary and valuable to trace how the research becomes part of further networks: its journey once fieldwork and writing have been concluded.

These notebooks formed a key part of the iterative-inductive analysis process, which began at the start of fieldwork (see section 4.4.1 below).

4.3.4 Semi-structured interviews

In ethnographic methodology, oral accounts of social group members' perspectives are often gained through interviewing (Crang and Cook, 2007). These oral accounts lend the researcher the perspective of the individual about the activities of the group (O'Reilly, 2009). Insider perspectives may reveal, contradict or clarify, aspects of the social group observed and thus are important elements within the ethnographic family of methods. For example, in an ANT-based ethnography of education, Gorur (2011) explores insider perspectives gained through interviews with key people involved in the design of the Programme for International Student Assessment (PISA) to gradually lay bare the processes and influences that produce PISA knowledge. In an ANT-LS based study, interviews are used alongside other ethnographic methods to glean insights into teachers' work in the 'Skills for Life' sector (Hamilton, 2009). There are many different approaches to the use of interviews within ethnographic research, although it is common for ethnographic interviews to be semi-structured, to allow for

inclusion of topics the researcher has observed as important and to allow for responsive expansions by interviewees (Fontana & Frey, 2000). An ethnographic interview is conducted in the context of a relationship that has been often established between researcher and interviewee during fieldwork (Heyl, 2001). The importance of this is that the interviewee should feel relaxed enough with the researcher to, as Heyl puts it, wander off topic within the semi-structured interview schedule, revealing incidental insights into the activities of the group which may lead to further investigation during fieldwork. In my research, I conducted 12 semi-structured interviews, each lasting between one and one-and-three-quarter hours (see

Table 3).

Table 3: Overview of interviews

<i>Participant</i>	<i>Interview date</i>	<i>Interview place</i>	<i>Length of interview</i>
Charlie	Week beginning 30 th April 2018	Participant's classroom	105 mins
Alex	Week beginning 7 th May 2018	Participant's classroom	65 mins
Frances	Week beginning 4 th June 2018	School meeting room	60 mins
Laurie	Week beginning 4 th June 2018	Participant's classroom	100 mins
Sam	Week beginning 11 th June 2018	School meeting room	60 mins
Jamie	Week beginning 11 th June 2018	Participant's classroom	80 mins
Toni	Week beginning 18 th June 2018	Meeting room at Toni's school (external trainer based at another school)	60 mins
Wallace	Week beginning 18 th June 2018	School meeting room	60 mins
Joss	Week beginning 18 th June 2018	Participant's classroom	65 mins
Meri	Week beginning 25 th June 2018	Participant's classroom	70 mins
Rowan	Week beginning 25 th June 2018	School meeting room	60 mins
Benny	Week beginning 2 nd July 2018	School meeting room	60 mins

The length of interviews varied according to time available to talk, although in each case there was sufficient time for conversation around classroom practices. Ethnographic interviews should be of sufficient length to allow for the relationship between researcher and participant to develop into a genuine conversation (Heyl, 2001) in which the interviewee and interviewer co-construct the interview, allowing an understanding to emerge around the practices of the social group (Ortiz, 2003). For example, enough time is needed for the researcher to have opportunity to tune in to the systems of meaning in the site of research (Spradley, 1979), to the ways in which participants develop and communicate meaning about their worlds and how these systems characterise communication. Specific words may, in different organisations (such as different schools), signify specific and bespoke meanings. In this thesis, for instance, teachers are seen to attach certain qualities and definitions to the term ‘depth’. In this sense, ethnographic interviews are “like an in-depth conversation that takes place within the context of reciprocal relationships... based on familiarity and trust” (O’Reilly, 2009, p. 125).

To support the development of conversation around classroom practices within the time available for interviews, my semi-structured interview schedule began with a card-sorting task. Starting points for conversations within ethnographic interviews are often elements of the studied group that the researcher has observed in fieldwork (Spradley, 1979). However, following the short-term ethnographic approach, my research had a focus on a specific part – or ‘episode’ – of the group under study: teachers’ classroom practices (see section 4.2.6). I therefore wanted a way of starting interview conversations with a focus on practices. This focus was also desired because time available for interviewing teachers and school leaders was often limited to an hour. I needed a way to gain participant perspectives on their practices in a relatively short amount of time. As with any interview-based research, there is the risk that interviewees may find it difficult to discuss why they do what they do or think

what they think (Kvale, 2007). In other research methods focused purely on interviewing, allowing teachers to manipulate and organise card sorting tasks has been shown to be a powerful approach for addressing this issue and gaining insight into interviewee perspectives (Biesta, 2009). I thus began interviews with a card-sorting task (Appendix 2) which sought to encourage participants to enter into a train of thought around the formation of their practices. The pre-interview task offered interviewees a starting point for conversation.

The task asked teachers to use cards containing potential influences on teachers' classroom practices drawn from the literature to represent their understanding of how their classroom practices take shape. This carried an obvious risk of predetermining teachers' responses and thereby going against the grain of ethnographic elicitation of the practices of the social group. I therefore needed the task to remain as open-ended as possible in relation to participants' response to this conversation starter. In order to achieve this, I designed the task to be inclusive of as many themes around teachers' professional practices as I could find from an initial review of literature conducted during the initial stages of the study (see Chapter 1.1). Links between each card and the literature can be found in Appendix 2. Opposing and overlapping views were included. Additionally, deliberately blank cards and writing implements were included in order to allow for teachers to add elements which may not have emerged from the literature. Scissors were provided for teachers to separate out and organise elements on the cards if they wished to do so. Interviewees were able to organise the cards in any way they felt necessary in order to represent their understanding, as well as enabling the formation of connections between elements on the cards (Pink, 2007).

Following the card-sort task, the interview opened with a briefing which set the scene, followed by semi-structured interview questions beginning with discussion of participant response to the pre-interview task (the interview schedule is available in Appendix 3). This then led into the main structure of questions, which was designed to be as open-ended as

possible around the subject of the influences on the formation of teachers' practices. These were added to or amended as discussion flowed around observations of the emerging focuses of research: classroom practices for the teaching of mathematics. During the interview, conversation included discussions of observations, sketches, documents and photos gathered during fieldwork so far. In preparation for needing to elicit richer responses from interviewees, question stems were prepared to prompt further discussion of an aspect brought to light. These were based on ideas from interviews presented in Kvale (2007) and are available in Appendix 4.

A major criticism of interviewing as a method of data collection is that interviews only provide what people say and not what they do (Shensul, 1999). This leaves data open to bias in terms of the interpretation of events and experiences by the participant, and also interpretation of this interpretation by the interviewer (Kvale, 2007). To counteract this effect, it was important to juxtapose data collected via fieldwork observations and documentary data, comparing and contrasting a family of methods (O'Reilly, 2009) to gain a fuller, firmer picture of the ethnographic story (see Chapter 4.4.3)

A further criticism of interview-based research is that participant responses can be said to contain ambiguity, leaving too much room for interpretation of meaning (Denscombe, 2010). It is the role of the researcher to clarify whether these inconsistencies are due to interview technique or exist as genuine ambiguities in the field to explore. In order to achieve this clarification, I asked control and interpretation-based questions during the interview (Kvale, 2007) and can be found in Appendix 5.

As participants shared information about their own opinions and beliefs around what influences their practices, which may contradict guidelines around their professional work imposed by school leaders or by government policy/ curriculum, it was anticipated that

interviewees may experience anxiety at the end of the interview. Kvale (2007) points out the importance, therefore, of debriefing participants. A debriefing section was built in to the interview schedule which can be found in Appendix 3. At the end of each interview, following Hargreaves (1994), summary reports around key themes were given verbally to participants. This allowed for immediate correction of misunderstandings and in some cases, further explication of their thoughts.

The interview schedule was piloted with volunteers from a different school. Whilst no changes were deemed necessary to the original design, the length of time needed for the interviews was extended from an originally planned 45 minutes to an hour. In actuality, as mentioned earlier, many interviews continued longer than this as participants wished to keep the discussion going.

4.3.5 *Documentary data*

Whilst early anthropological ethnographic research focused on oral cultures and foregrounded interview and observational data, the value of documentary and material data has long been acknowledged in ethnographic work. This trend has been attributed to sociologists of the Chicago School of Sociology in the first half of the twentieth century, who made explicit use of written materials, such as professional records, diaries and letters.

It is accepted amongst ethnographers, particularly those working within from ANT and Literacy Studies perspectives, that documents are part of the material culture of many groups (Nespor, 1994; Barton, 2007). As textual artefacts of social cultures, texts are seen as embedded in the practices of the social group (Barton, 2007). They may represent and carry meaning across geographical boundaries of the group (Law, 1994) and become woven into the establishment of the 'way of being' in the group through their usage (when people read or

discuss them) and creation (when people write and edit them). The value of documentary data thus lies in the idea that documents may hold information about the social group being studied (Marsh, 2006). Documents may thus reveal something about how the group is organised, may contain information unavailable elsewhere or may offer challenges to information gained from observation or conversation (Kell, 2006; Pahl and Rowsell, 2005; Shankar, 2018) and therefore form an important part of the family of methods which form the data basis of ethnographic narratives.

Documentary data is of great use to an ethnographer of education, whose myriad of documents created by and used by teachers renders teaching a seemingly textually saturated profession. Education falls into what Hammersley and Atkinson deem to be research settings where “it would be hard to conceive of anything approaching an ethnographic account without some attention to documentary material in use” (Hammersley and Atkinson, 2007, p.128). Documents relating to education are extensive in number and range. For example, ANT-based ethnographies in the field of education have drawn on documentary data such as teaching and course materials (Nespor, 1984), conference materials and the media (Gorur, 2011) and multi-modal texts (Tummons et al, 2015). ANT-LS-based ethnographies have similarly drawn upon documents such as those that detail a teaching strategy (Nichols, 2006) or individual learning plans and associated documents (Hamilton, 2009).

In total, 86 documents were collected which formed part of the actions of informants. Often documents were used multiple times by different teachers, enabling a view of trends and differences in how they were used. I saw several documents during their process of creation and thus was able to observe the relationship between the new document and its documentary and discursive sources. This enabled tracing of the associations of actors which brought text-based *immutable mobiles* into being (see Chapter 3.2.5), to become mediators of practice

through their usage. A variety of types of documents were collected and analysed: a complete list may be found in

Table 4.

Table 4: Types and quantity of documents gathered and analysed during the study

Type of document	Quantity	Type of document	Quantity
assessment documents	6	national initiative/ policy documents	5
descriptions/ printed copies of text-based classroom displays	5	notes from meetings or training events (teachers')	5
reflective journals (teachers')	3	planning documents created by teachers	16
lesson resources in textual form	6	presentation slides	16
lesson slide-decks	16	school policies	5
Multi-academy trust (MAT) policies	3		

To facilitate data collection around interactions between people and documents, the field notes constructed through observation were augmented through photographs of the document being used (without photographing identifiable people: see section 4.3.6) (n=24).

Photographs, along with hard copies of documents, were also used as aide-memoires during interviews (Fontana & Frey, 2000) to gain richer insights into the creation and usage of different documents (Pink, 2007).

I use photographs and documents within my findings to support the telling of the story of the change to teachers' classroom practices.

4.4 Approach to data analysis

4.4.1 *Iterative-inductive analysis*

As discussed above, ANT-based ethnographies tend towards open-ended, grounded starting points. ANT-based ethnographies begin in the middle of things (Latour, 2005), with researchers following patterns in the organisation of actors (Law, 1994), rather than from a theory applied in the field. Data analysis thus begins when fieldwork begins and continues throughout fieldwork in an iterative-inductive manner (Crang and Cook, 2007). Analysis is iterative in that the act of analysis is repeated over and over and inductive, in an ANT account, in that patterns and trends the researcher discerns in the data suggest actors and associations for the researcher to follow and trace (Latour, 2005).

This process, alongside the research questions, thus determines the direction of future data collection and the focus of the researcher's description of the actor-network. This means that an ANT account will only ever be a partial account of an actor-network (Gorur, 2011): in an approach which affords potential to any person, thing, idea, etc to act, the researcher cannot follow all possible actors, instead having to choose to follow certain actors and explicate certain parts of the network. This has been a critique of the approach (see Chapter 3.4) and is essential to mention here: as I chose to follow some actors, I chose *not* to follow others. This has implications for the generalisability of the account for contribution to the wider field (Denscombe, 2010) surrounding the relationship between education policy and teachers' practices. I acknowledge this limitation: this research is limited in its generalisability.

However, this is not the aim of my study. Rather, I aim to provide rich specificity (Latour, 2005; Michael, 2017) in my description of part of an actor-network of teachers' practices, which will provide food for thought in reflecting on other specific iterations of practices. Partiality of accounts of social groups are a long-acknowledged feature of ethnographic

studies (Clifford, 1986) and in defence of this partiality, the focusing of data gathering and analysis on emerging areas of interest allows for the researcher to explore in depth aspects of the social group being studied (Gray, 2003), entailing a rich account of those aspects as elements are followed up on. To provide richness, I have tried to be as thorough as possible, tracing moments of resistance and variation in the network of the change to classroom practices: the actors I chose to follow.

My iterative-inductive analysis began with open coding (Emerson et al, 2011): the data is coded according to what is observed, talked about, found in documents, rather than according to predetermined themes. In my research, open coding noted the actors and behaviours present in data, for example, 'textbook' or 'planning with colleagues'. In ANT research, noting actors in data often produces a large set of codes initially (Wright, 2015), and this was certainly the case in my research. My initial coding list can be found in Appendix 7.

In order to select which actors to follow from amongst the many, patterns and trends were looked for in initial codes, signalling avenues to explore in more detail in subsequent data. In this way, more focused coding emerged (Emerson et al, 2011). In the anthropological ethnographic research on which I draw, coding isn't about counting words, but rather is about reading data, noticing patterns, finding more information on a pattern and making links until a narrative emerges (O'Reilly, 2009). Following this principle, as fieldwork progressed, I noticed links and patterns in the associations of actors noted in the initial coding list and grouped these into code groups. Triangulation of fieldnote, documentary and interview data in the creation of each code groups ensured that patterns were evident across the family of data collection methods (Denscombe, 2010). To preserve the flat ontology of ANT (see Chapter 3.2.1.4), I resisted generalising into abstracted conceptual themes. In **Table 5**, my code groups are presented in order of prominence in data by the end of the first two months of fieldwork.

Table 5: Code groups in order of prominence in the data by the end of the second month of fieldwork

Code group	Name of code group
1	Actors and behaviours to do with a change to classroom practices based in ‘maths mastery’
2	Actors and behaviours to do with the school’s developing shared professional values
3	Actors and behaviours relating to the usage and creation of texts
4	Actors and behaviours to do with colleagues as actors
5	Actors and behaviours relating to the use of technology
6	Actors and behaviours to do with school leaders
7	Actors and behaviours to do with government or global (external to the school) actors

Prominence is meant in the sense of both quantity of data associated with the codes within the group, but also in the number of links between sections of data coded with actors relating to the change to classroom practices for the teaching of mathematics and other groups. Coding groups 2-7 often contained sections of data which were also tagged with Code 1. For example, **Figure 4** shows a screen shot of raw data in Atlas.ti, coded with three codes: ACTOR: funding, ACTOR: maths hub and ACTOR: policy or initiative: government source. These three codes were grouped into both Code 1, which traced actors to do with the change to classroom practices for the teaching of mathematics, and Code 7, as to do with government/ external to the school actors.

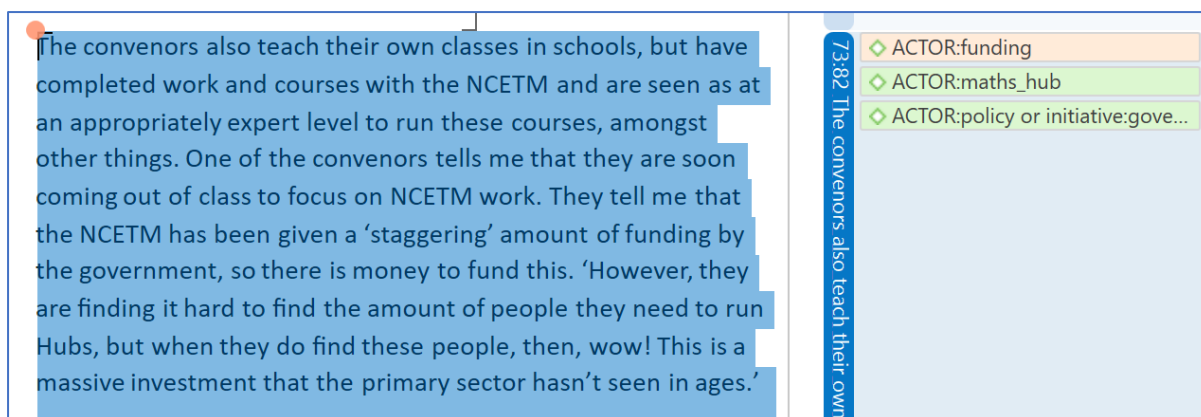


Figure 4: Raw data and its coding, showing three codes, which are part of two code groups: Group 1 and Group 7. This is one short example of how data in code groups were linked.

I thus took the change to classroom practices to be a key element of teachers' practices at the time of fieldwork, one which intersected with much of the other elements of teachers' practices. I made the decision to follow the actors in the establishment of this change to teachers' classroom practices.

I continued to collect data, now actively (but not exclusively) following associations of actors involved in the change to classroom practices. I used my third notebook (see section 4.3.3) to note associations between sections of data, using a copy in Atlas.ti and the programme's memo and linking functions to digitally link sections of data and to note explanations of the links. Following Latour (2005), these memos were where writing of the ANT account began, and from which have developed Chapters 6-9 of this thesis (its findings chapters).

4.4.2 Using CAQDAS

The choice to use CAQDAS, specifically Atlas.ti, for storing and analysing data was essentially a personal preference for a way of working which fits well with an ANT approach.

CAQDAS has been used in several ANT and LS-based approaches, acclaimed for its ability to handle large quantities of ethnographic data and large quantities of codes generated in

labelling actors present in different situations (Wright, 2015). Atlas.ti, like other CAQDAS, makes claims to be designed around the principles of grounded theory (Friese, 2019), which is useful to the open-ended, iterative-inductive design of an ANT-LS approach. Atlas.ti also contains within its functionality the ability to treat photos and PowerPoint-style slide deck presentations in the same way as text documents (Friese, 2019). This was key to my decision to use Atlas.ti over other CAQDAS due to the photos gathered during fieldwork and the usage of slide decks in lesson planning and staff meetings by the teachers at Highland School.

Whilst the design of CAQDAS programmes have been criticised for limiting the researcher's approach to analysis, the limitations or utility of the programmes depend upon the way in which they are used (García-Horta and Guerra-Ramos, 2009). I used Atlas.ti as a tool to support coding, linking and viewing data. Open coding and open memos are easily generated, pruned and edited within the program. Researchers can make and see links easily between sections of data (Friese, 2012), offering ease of movement for the researcher from sections of data in which actors in a network appear, whilst simultaneously preserving chronological data in its original form. The latter is crucial, as it is important in this process to be mindful of resisting fragmentation of data in the tagging and linking of sections of data with codes (Wright, 2015). To overcome this issue, linked data sections and memos can be viewed on screen whilst also retaining the ability for the researcher to flick back to the whole document the section is from, maintaining a view of the context of sections. This enables the researcher to follow the actors back and forth in their associations and assemblages whilst maintaining ANT's flat ontology: data is accessed 'in a scale-free manner that enables shifting magnifications and assemblages to preserve detail rather than abstract it into themes' (Wright, 2015, p.1).

4.4.3 *Ethical considerations*

An ethical approach to ethnography sets out to avoid harm to participants and to conduct fieldwork in a manner that respects the rights of participants (Fife, 2005). In my research, the first element of avoiding harm and conducting the research with respect to participant rights, was to consider the possible power relations inherent to my background as a school leader researching the practice of teachers within a school. Whilst my professional background meant that I could familiarise myself with protocols and practices in a new school fairly quickly (see section 4.2.6 above), this also came with the potential for teachers to see me as a ‘spy’ for the leadership team. To reduce the likelihood of this, I chose a school used to welcoming observers of all sorts – teacher trainees, teacher trainers, school leaders, researchers – and one whose success was lauded throughout all sources, so that they were not in the defensive position of schools in a low Ofsted category.

An overt stance to the research, in which I openly acknowledged the purposes and aims of the study to participants and their colleagues, was seen as beneficial to balancing power-relationships. Being open about the aims and purposes of the research often leads to more insightful relationships between the researcher and the researched (Mills and Morton, 2013). As mentioned earlier, if participants feel that the researcher has considered how the research will positively/negatively affect them, they are likely to feel that the researcher is working *with* them, rather than *on* them (Crang and Cook, 2007) and a positive, open relationship is formed. In my research, this was achieved through an initial presentation of the aims and purposes of the research (see section 4.3.1) and through pre-fieldwork information and consent forms (see Appendix 6).

Negotiating informed consent without reducing access to the field is key to ethnographic research (Newby, 2014). In my research, written permission (see Appendix 6) and ongoing

verbal permission was gained prior to access to all observations, including informal teacher conversations, copies of anonymised documents, photographs of documents (no people were photographed throughout the research) and interview data. These were willingly shared with me, and, due to my increasingly naturalised presence (see section 4.2.6), I ensured that continual verbal permissions were sought throughout the fieldwork: ‘Is it ok that I write this down?’, ‘Can I take a copy of that document for the project?’ and noted within my fieldwork diaries. This trusting relationship was extended through the arrangements for storing data confidentially using password-protected computer-assisted qualitative data analysis software (CAQDAS) (see section 4.4.2) and hard copies in a locked cabinet.

In relation to data analysis and protecting participants from harm, it is important to take early steps in the processing of data to mask participant identities and eliminate identifiable information from files to be analysed (Denscombe, 2010). In writing fieldnotes I used participants’ pseudonyms, rather than real names. To give participants ownership of data pertaining to them (so that they can recognise themselves in the data), participants created their own pseudonyms (which they could choose to share/not to share with others).

Documents were anonymised at the point of collection by removing the school’s name and any logos/ class names/ other identifying information before analysis.

To avoid misrepresentation of participants’ lived experiences, and to foster trust and confirmability in how data was being analysed and represented, I used participant-checking - a “member check” (Crang and Cook, 2007, p.148) - at three stages of fieldwork and analysis. Firstly, during each observation week, I shared emerging themes from ongoing iterative-inductive analysis with participants, maintaining an open dialogue about what was written in my field notebooks and commonalities/ anomalies in data. This enabled participants to actively engage in the analysis process; often further insights/ clarifications were given, or thoughts on what I could also observe. One example of this was in discussion with Charlie (a

key stage one teacher, training in Maths Mastery) about the school's focus on Maths Mastery. I had noted a prevalence of various global/local domain texts in the implementation of the new pedagogy and discussed this with her (a topic which forms a large part of the findings chapters of this thesis). Charlie confirmed this observation and extended opportunities for me to follow these textual actors: she suggested that I talk to Laurie (a maths subject leader at the school) and join him on a Maths Mastery Specialist training course (where a lot of the global texts used in the school are introduced to people training in Maths Mastery). Further participant-checks were made immediately following interview, where transcripts were given to participants electronically so that they could see how their speech was represented in written, citable, form. No participants suggested edits to transcripts. Finally, before presentations or papers reporting the data were published, I sent proofs to participants for checking. I cannot be certain that these were read, although a few participants responded briefly with thanks.

Additional responsibilities around ethics pertain to the research being based in participant observation in an educational organisation (Mills and Morton, 2013). Education ethnographers undertake fieldwork in a site which the ethical questions the researcher faces are not only part of the planning stage of the research, but are also continually, and perhaps unpredictably, raised during the fieldwork (Dennis, 2010). The education researcher cannot predict the ethical issues which may arise through immersion in the practical everyday lives of teachers and students. Helpfully in this regard, schools are governed by strict policies and procedures around safeguarding children. In terms of safeguarding requirements, the school shared their safeguarding policies prior to fieldwork, and I gained a specific Disclosure and Barring Service check for the fieldwork period. There were clear demarcations as to what I was also *not* allowed to document, and these centred around conversations involving the safeguarding of children. Photographs were taken of documents in usage but did not contain

identifiable people. Conversations between teachers around the safeguarding of individual students were not observed and documented only as ‘safeguarding conversation’.

4.4.4 Reliability of the account

We can talk of the reliability of ethnographic accounts in terms of how far the resulting account can be said to have credibility and confirmability. Achieving credibility involves achieving authenticity of the representation of the experiences observed (Lincoln and Guba, 1986). Authenticity was addressed primarily through seeking valid and typical data which fed into the ethnographic narrative. In tracing actors, methods of data collection included checking with informants the information that had been received, repeating a response, for example, or checking an understanding with interviewees (Ortiz, 2003). Additionally, data was gathered until, in relation to the research question, sufficiency of data was reached (Denscombe, 2010), where new data only reinforced the patterns of organising noticed already. Furthermore, data was gathered using a family of methods (O’Reilly, 2009), with evidence of associations of actors traced in data from all methods. This allowed for confirmation or conflict of findings in the associative patterns of actors. For example, I *observed* practices from which I extracted associations that spoke to me as pertaining to classroom practices and professional values and *discussed* that knowledge with multiple participants, with interviews as the “construction site of knowledge” (Kvale, 2007, p. 21), with interviewer and interviewee clarifying and co-constructing meaning. I also *traced in documents* associations of actors observed and discussed and *observed the use and creation of documents*. The family of methods was drawn upon throughout findings.

The reliability of ethnographic narratives is entangled in complexities relating to researcher positionality. Drawing on perspectives from feminist research, ethnographic findings can be

understood as positioned rationality (Haraway, 1991), in which the researcher declares their own background as a potential lens through which the research field has been viewed, allowing the reader to assess the claims of the thesis findings in full knowledge of this positionality (Denscombe, 2010). An ANT perspective acknowledges this in that, through the creation of a text: a thesis, a paper, researchers become part of the actor-network (Latour, 2005). In my research, I am open about entering the field as a teacher and school leader (see section 4.2.6). This positionality of being of the same profession as the participants and in taking an active role in their daily professional lives has its benefits, in terms of pre-existing knowledge of the field and a certain ease of rapport with participants useful to a short term ethnography (see section 4.2.6).

However, there are also potential drawbacks in that this positionality may bring with it biased interpretation of the field as a professional ‘insider’ (Newby, 2014). From an ANT perspective, this is further complicated by the notion that the researcher becomes part of the actor-network, that the act of researching and writing accounts of research is itself performative (see Chapter 3.5). In relation to this, I reiterate the thoughts of Chapter 3.5 in that in this research I do not make claims of objectivity or distance from the subject, but rather acknowledge my connections to the field so the reader may see this. From this view, I seek to offer authenticity of the account, as discussed above, through rich descriptions of a change to an existing actor-network, drawing on the above family of methods (O’Reilly, 2012).

4.5 Summary of the methodology

The key ideas set out in this chapter are essentially in demonstration of the synonymy between an ANT-LS approach to the study of (a change to) teachers’ classroom practices and

ethnographic methodology. I have argued that ethnographic methodology suits my ANT-LS account well due to its key tenets of immersion in the field and usage of a family of methods, through which associations of actors can be observed and traced at close quarters. Within this marriage of theoretical framework and research methodology, short-term ethnography is positioned as not only a necessity due to time constraints of the study, but also a fitting ethnographic approach to research in an educational organisation, conducted by a teacher. As part of the intensive observer-participant immersion in the field that a short-term ethnography entails, I have related the family of data collection methods that I have used to ‘follow the actors’ (Latour, 2005). Data from across the family of methods described in this chapter are deployed to tell the ANT-LS tale of the establishment of a change to teachers’ classroom practices for the teaching of mathematics at Highland School.

5. Introduction to the findings

In this chapter, I set the scene for the ANT-LS based ethnographic account that follows of how a government policy initiative enters an existing actor-network of teachers' classroom practices in a school. I first describe the school and research participants within the school. I next give an overview of the policy initiative – Maths Mastery – that is described in the ways that it enters classroom practices in the findings of the thesis. I give background to this policy introduction by detailing how the initiative reached the school; background around the development and growth of the initiative from its beginnings. Next, I return to the research question in light of the thesis so far, explicating the questions further in light of the ANT-LS approach to ethnographic data used in arriving at the findings and conclusions of the thesis. Finally, I detail the data drawn upon in presenting the findings.

5.1 The site of the research: an introduction to Highland School

Highland School is a state-funded primary school in the north of England, teaching students between 3 and 11 years old. It is part of a large Multi Academy Trust (MAT). The school is highly regarded within the local community, with parent surveys and local media both providing consistently positive feedback. The school has been awarded achievement of several national initiatives, including Investors in People, Healthy Schools, ACTIVE mark, Arts mark and Basic Skills Award and in its most recent school inspection was judged to be Outstanding (the highest grade possible in inspections in England). Part of the praise of Highland school focuses on student achievement in nationally standardised Standard Assessment Tests (SATs) at the end of key stage 1 (7 years of age) and key stage 2 (11 years of age).

Highland School acts as a professional training hub for teachers in schools within and beyond the MAT. Training courses span all aspects of the curriculum and professional role of the teacher/ leader/ teaching assistant and training of some variety is happening in school in most weeks of the school year. As well as training courses, workshops and teacher/leadership meetings on the school site, Highland School offers school-to-school support, in which teachers who are seen as expert at a particular aspect of teaching work alongside other teachers who have been identified as needing to develop in that area.

Classed as a large school by the Office for Standards in Education (Ofsted), Highland School has 3 classes per year group, each class containing its full legal quota of 30 students in Nursery-Year 2 and over 30 in Years 3-6. Highland School's staffing structure is as follows. Within each year group, there are 3-4 class teachers (some year groups have part-time teachers) and 2-4 teaching assistants. Year groups are led by a Year Group Leader, a middle leadership role who is responsible for leading day-to-day professional activities in the year group, such as guiding discussions in team meetings and leading discussions around student progress. An additional Phase Leader, also a middle leadership position, oversees each of the primary school two-year group phases: Nursery and Reception (the Early Years Foundation Stage or EYFS); Key Stage One (Years 1 and 2); Lower Key stage 2 (Years 3 and 4) and Upper Key Stage 2 (Years 5 and 6). Two deputy head teachers support the head teacher, forming the senior leadership team (SLT). The SLT are supported by the MAT leadership and administration team, who oversee the work of all schools in the MAT.

5.2 Research participants

There are 12 participants in this research. **Table 6** gives an overview of their pseudonyms, professional roles in the school, career stage and experience in relation to the policy initiative

Table 6: List of participant roles

<i>Participant</i>	<i>Role</i>	<i>Career stage</i>	<i>Experience in the Maths Mastery approach at the time of fieldwork</i>
	<i>EYFS: 3-5 years olds; KS1: 5-7 year olds; KS2: 7-11 year olds</i>	<i>Early: 1-5 years of teaching; Mid: 5-15 years; Experienced: 15+ years</i>	
Alex	Teacher, KS1	Experienced teacher	Part of the school's initial roll-out of the approach (2 nd year of implementation)
Benny	Trainee teacher, KS1	Trainee teacher	Part of the school's initial roll-out of the approach (2 nd year of implementation)
Charlie	Teacher, KS1	Early career	Trained as spokesperson for the approach through 'TRGs' and 'Hubs'
Frances	Teacher, KS1 Year group leader	Mid-career	Trained as spokesperson for the approach through 'TRGs' and 'Hubs'
Jamie	Teacher, EYFS Year group leader	Mid-career	Second phase of roll-out (in first year of implementing the new approach)
Joss	Teacher, EYFS Phase leader Senior leader	Experienced teacher and leader	Trained as spokesperson for the approach through 'Hubs'
Laurie	Teacher, KS2 Maths subject leader (one of two)	Mid-career	Leader of the approach in school, near completion of training to be NCETM Maths Mastery Specialist
Meri	Teacher, EYFS	Early career	Second phase of roll-out (in first year of implementing the new approach)
Rowan	Teacher, KS2 Year group leader	Mid-career	Training to implement the approach in third phase of the roll-out, next academic year
Sam	Teacher, KS2 Senior leader	Experienced teacher and leader	Second phase of roll-out (in first year of implementing the new approach)
Toni	Regional trainer for mathematics (NCETM) Teacher in another school	Experienced teacher	Regional trainer, fully trained national specialist in the approach, working with the NCETM
Wallace	Senior leader	Experienced teacher and leader	Leader of the approach in school, in second year of in-school training

(see section 5.3 for explanations of terms and 5.5 for explanation of phases of roll-out of the initiative in the school), with further details given in the vignettes that follow.

The following offers a brief vignette of each participant. Minimum detail is given in order to preserve anonymity. Quotes are taken from interviews with each participant between April and July 2018.

Alex: Alex is an experienced teacher, many years into his career. He has taught all year groups. Alex comments to me that he has ‘seen a lot of change in my time’: he has been involved with the implementation of many different government policy-led changes to his practices ‘over the years’. Alex was initially resistant to the change described in this policy, but, at the time of fieldwork, teaches following the ways of the new approach.

Benny: Benny is new to teaching and is training to be a teacher. He is in the very first stages of his career and is, this year, experiencing teaching in different schools within the MAT, to extend his teaching experiences as a student teacher. Benny tells me that he is ‘eager to learn anything new’ and enjoys working with Frances, his mentor at Highland School.

Charlie: Charlie is in the early stages of her career, having taught for a few years by the time of fieldwork. Charlie tells me that she ‘loves’ working at Highland School as there are ‘always so many opportunities available to get involved in new stuff’. Charlie is studying for a Masters level qualification in Education and has volunteered to be one of the teachers trained first in the new approach to the teaching of mathematics, who will act as in-house specialists in the approach. As part of this training, Charlie attends Teacher Research Groups (TRGs). TRGs are described further below (see section 5.3).

Frances: Frances is a mid-career teacher. He tells me that his driving focus is that ‘learning should be fun. We should all be having fun, teachers and children alike’. Frances is a year

group leader and is actively seeking further career development opportunities. At the time of fieldwork, he studied towards a professional qualification of school leadership. Frances was asked by senior school leaders at Highland School to support the leadership of the change to Maths Mastery as part of his career development. This involved attendance at NCETM training and Maths Hubs (see section 5.3), as well as running in-house training with Laurie for Highland School teachers. Frances is mentor for several early career teachers in the MAT, including Benny.

Jamie: Jamie is a mid-career teacher. She joined the school a couple of years ago and throughout fieldwork makes continual positive comparisons between her old school and Highland School that favour Highland School. Jamie tells me that she is ‘sometimes frustrated by the amount of changes we have to make to how we do things as teachers’, but takes on Maths Mastery and teaches using this approach. Jamie is a year group leader.

Joss: Joss is an experienced teacher and has worked at the school for many years. She takes on several roles within the school, including teacher, phase leader and senior leader. Joss’ leadership roles centre around staff development and training. She takes on a leadership role in the development of Maths Mastery, receiving training in the approach through NCETM specialists who visit Highland School as part of a wider MAT training network.

Laurie: Laurie is a mid-career teacher. He is one of the mathematics subject leaders at Highland School. As such, Laurie is tasked by senior school leaders with leading the introduction of Maths Mastery. Laurie tells me that he ‘didn’t totally buy in to it at first’, but that now (at the time of fieldwork) ‘it really does seem like the best approach for the children’. Laurie is training as a Maths Mastery Specialist (see section 5.3), attends TRGs and Hubs and leads staff training in the approach at Highland School.

Meri: Meri is an early career teacher in the first two years of her teaching career. She tells me that she is ‘passionate about this position’ and that she ‘works really hard to get it right’.

Meri’s team regularly use team teaching, having classrooms that open onto each other, without doors to separate them. Meri uses the Maths Mastery approach during fieldwork.

Rowan: Rowan is a mid-career teacher. He is a year group leader and as such, leaders of the change to practices ask Rowan to support his team in making changes within his year group.

Rowan’s year group is the focus of planned changes over the next two years in terms of the new approach for the teaching of mathematics and is not expected to have made major progress with using Maths Mastery at the time of fieldwork. This is explicated later in the description of Highland School’s phased approach to introducing Maths Mastery (see section 5.5).

Sam: Sam is an experienced teacher who has taught at the school for many years. He is a senior leader at Highland School. He also teaches in Laurie’s year group. Sam tells me that he has seen ‘lots of change; some good, some not so good’ in education. He teaches using Maths Mastery during the time of fieldwork. Along with Wallace, he works closely with other MAT senior leaders in choosing Maths Mastery as a way to address a fall in attainment in mathematics.

Toni: Toni is a teacher from a different school who is a fully trained NCETM Maths Mastery Specialist (see section 5.3 for details of what this entails). Toni, with her Maths Mastery Specialist colleagues, run regular training, TRGs and Hubs (see section 5.3) for schools within their geographical region. Toni uses Maths Mastery as a basis for her teaching and training of other teachers.

Wallace: Wallace is an experienced teacher who has been teaching many years. She is one of Highland School’s senior leaders and has been a senior leader at other schools prior to joining

Highland School. At Highland School, Wallace focuses on her leadership role and does not teach a class of her own. Along with Sam, she works closely with other MAT senior leaders in choosing Maths Mastery as a way to address a ‘dip’ in pupil attainment in mathematics (see Chapter 6.5).

5.3 An overview of the policy initiative

The changes to teachers’ classroom practices described in the findings of this thesis are based on a policy initiative known in English schools as *Maths Mastery*. In this thesis, I do not critique the Maths Mastery approach itself, although this has widely been written about (see for example Blausten et al., 2020; Jerrim and Vignoles, 2016; Vignoles et al., 2015). My focus is on explicating how the change in teaching practices to mastery pedagogy was made. A brief overview only of the approach is therefore given.

‘Maths Mastery’ refers to both the name of the teaching approach promoted by the English government for the teaching of mathematics and the name for a government programme of funds and initiatives employed to urge schools to embrace the approach. Derived largely from teaching strategies prevalent in Asia, particularly China and Singapore, the Maths Mastery approach also appears to stem from the work of Benjamin Bloom in the 1960s (Boylan, 2018) in that teaching concepts repeatedly, but in different ways, enables learners to master them.

The phrase ‘teaching for mastery’ describes the elements of classroom practice and school organisation that combine to give students the best chances of mastering maths. (extract from NCETM website, accessed June 2018)

Core elements of the approach include developing students' abilities in five 'Big Ideas' (NCETM, 2017). The following extract from the NCTEM website (accessed June 22nd, 2018) details these ideas:

Coherence: Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts.

Representation and Structure: Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation

Mathematical Thinking: If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others

Fluency: Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics

Variation: Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.

Teachers are guided to plan for small steps in students' learning and to focus on developing coherence and connection-making between ideas.

The approach is now a central element of the National Centre for Excellence in the Teaching of Mathematics (NCETM)'s professional development offer to schools. The NCETM is a government-funded association who provide free maths-specific professional development for teachers and teaching assistants in all phases from Early Years to post-16. Their 40 Maths Hubs across England offer training to all state-funded primary and secondary schools.

...the National Centre for Excellence in the Teaching of Mathematics (NCETM) started to talk about “mastery approaches” and then to the formulation of “teaching for mastery”, alongside a mathematics teacher exchange programme with Shanghai... It is also now the word that is becoming used to sum up good maths teaching. Teaching for mastery is where it’s at. (Boylan, 2018)

The NCETM deliver training in the Maths Mastery approach in a number of forms. Those discussed in this research are as follows:

Mastery Specialist training: The NCETM website describes Mastery Specialists as:

Mastery Specialists are classroom practitioners who develop expertise in the mastery approach to teaching maths. Through rigorous and interactive training, they become experts in introducing and embedding mastery. After first developing a mastery approach in their own classrooms, they go on to support colleagues in their own and other schools.’ [Extract from NCETM website, accessed June 22nd, 2018]

The part of the Mastery Specialist training I observe is the final day of a four day, full day training course, which takes place over the period of one school year (September to July).

Hubs: Regional meetings for trained Maths Mastery specialists. Hubs are described in the NCETM's website as a system which:

coordinated by the NCETM, brings together mathematics education professionals in a collaborative national network of 40 hubs, each locally led by an outstanding school or college, to develop and spread excellent practice, for the benefit of all students and students. ' [Extract from NCETM website, accessed June 22nd, 2018]

Teacher Research Groups (TRGs): At the TRGs I observed, teachers training in Maths Mastery from different schools within a geographical region gather together. Guided by NCETM-trained Maths Mastery specialists, teachers take it in turns to host the group in their school. They select an element of Maths Mastery from an NCETM-produced TRG reflection booklet to focus on in the meeting. The hosts then work with NCETM-trained specialists to design presentation slides to guide an introduction to the focus area. This training is followed by guest teachers observing the host teachers teaching a lesson which exemplifies the focus area. A further group training discussion after the observed lesson deconstructs the approach as seen in the lesson, reflecting on impact on learning, tricky parts in relation to teaching and learning, and discussing ways forward with this element in participants' own schools and classrooms. Throughout, participants write notes and reflections in their TRG reflection booklet.

Maths Mastery has now been adopted as a key policy in relation to mathematics education in England (see section 5.4), promoted widely by publishers and consultants in mathematics education and is the focus of many developers of maths teaching resources or teaching and learning websites for maths, as well as being widely used as an approach to teaching maths by schools throughout England (Blausten et al., 2020).

5.4 How the Maths Mastery policy initiative reached Highland School

If primary school teachers hear the word ‘mathematics’ in relation to primary education in England today, they are also likely to hear the word ‘mastery’. However, associations between these two terms are relatively recent, gaining popular usage from 2014 onwards (DfE, 2016b). The idea of ‘mastery’ teaching can be said to have older roots, based in the work of Bloom (1973), but its uses in relation to the teaching of mathematics appears to be more recent. The spread of the term ‘Maths Mastery’ amongst English primary teachers, and how the approach came to Highland School, can be traced (also see section 5.5 for a basic timeline of events).

Following the English government’s introduction of a new national curriculum for mathematics in primary schools in 2014 (DfE, 2014), the Ark Academy Trust – a multi-academy trust of 39 schools – started to write a mathematics curriculum extending the new national curriculum with pedagogies reported to be used popularly in countries such as Singapore and China. Reasons for drawing on this source of pedagogy are unexplained on Ark’s website, however, the approaches used in Singapore have been widely acclaimed in media aimed at teachers. Singapore teachers are praised as ‘world leaders in teaching maths’ (YPO 2022), with the nation’s students reported as ‘the highest achievers in international maths tests in results from PISA (Program for International Student Assessment)’ (BBC, 2016). In this context of acclaim for the Singaporean approach, in mid-development of their ‘Maths Mastery’ curriculum, the Ark Academy Trust gained funding from the Education Endowment Foundation to support expansion of the approach and associated teacher and student resources and teacher training materials. Following a period of development of the approach, a Maths Mastery curriculum and teacher training programme became distinct from Ark as its own not-for-profit company, Mathematics Mastery, founded by Dr Helen Drury. The company is described on the arkonline.org website as:

a non-profit school improvement programme aiming to transform mathematics education in the UK (arkonline.org 2019, accessed June 22nd 2018)

This transformation movement has its critics. Key criticisms centre around that the version of the mastery approach taught in England begins to lose resemblance to the maths taught in Singapore as English policymakers promote East Asian informed classroom practices, but not the Singaporean conditions of service of teachers, such as vastly greater class contact time and paid professional development time (Boylan, 2020). When speaking of Maths Mastery for the remainder of this thesis, it is important to note that I am speaking to the version of the approach generated and promoted as an English policy initiative.

In 2015, the English government set out plans to support and promote this method of teaching mathematics. One of their first moves was to fund a series of teacher exchange programmes between English teachers and teachers from Singapore and Shanghai in 2015-2016. Essentially, what the then Prime Minister Teresa May promised was the exportation of English teaching and the importing of Chinese/ Singaporean mathematics teaching (Boylan, 2018). Evaluation of this programme suggests that it gained significant influences over English teachers' classroom practices in respect to mathematics teaching, although not always in correlation with English education policy aims around student attainment (Boylan et al., 2018). Two teachers from Highland School took part in this exchange programme to find out about the approach. These teachers went on to become Maths Mastery specialists in the multi-academy trust (MAT) that Highland School is part of.

Additional government backing of the Maths Mastery approach was provided in 2016 through provision of £41 million of funding to 8,000 schools to support in implementing the change to Maths Mastery. In a press release about this investment in Maths Mastery, England's

Department for Education (DfE) stated the intention of this funding as widening of usage of the approach:

The funding will ensure it is used far more widely, with an initial 700 teachers to be trained to support schools in maths mastery, and funding available for textbooks. It will also be used to fund teacher release so teachers can be trained. (DfE press release online, 2016, accessed June 22nd, 2018).

Alongside this funding, the English government provided additional funding to the National Centre for Excellence in the Teaching of Mathematics (NCETM) to develop their own programmes of training and suites of resources to offer to schools. The NCETM is a government-funded agency set up by the DfE in the wake of the Smith report (DfES, 2004) to address recommendations in the report for improvements to mathematics teaching in England. The NCETM developed their own take on Maths Mastery methods, expanding the interpretations of Chinese/ Singaporean mathematics teaching approaches available to English schools. They developed several avenues of ‘rolling out’ Maths Mastery to English schools, including a network of ‘Maths Hubs’ and ‘Teacher Research Groups (TRGs)’ (see section 5.3) throughout England. In 2016 and 2017, the two Highland School teachers who took part in the DfE exchange programme accessed Hubs and TRGs, alongside a professional development package aimed at training specialist teachers in Maths Mastery.

In the academic year 2016-2017, these two teachers began the first phase of a rolling out programme for the Maths Mastery approach in Highland School. This involved introducing general concepts to all teachers in staff meetings and working on the development of the approach in two year groups: Laurie’s year group (key stage 2) and Frances, Charlie, Alex and Benny’s year group (key stage 1) (see section 5.2 for description of research participants). At the beginning of the academic year 2017-2018, the two trained teachers took on different

professional positions within the MAT, and school leaders at Highland School enrolled Laurie on the NCETM Maths Mastery Specialist training course. School leaders also signed up Frances, Charlie and Joss (a senior leader in the school) to NCETM Hubs and TRGs.

These teachers were tasked with rolling out the Maths Mastery approach more widely in the school. In October 2017, phase two of the roll-out programme began. Laurie, Frances, Joss and Charlie organised a series of staff meetings for further year groups: the Early Years Foundation Stage year groups (Nursery and Reception), Year 3 and Year 5. Meetings were intended to introduce elements of the approach to in-school leaders of Maths Mastery. Training sessions were also attended by teachers in the remaining year groups: Year 2 and Year 6, who were planned to introduce Maths Mastery into classroom practices fully in the following academic year, as the third phase of the roll-out. At the same time, Laurie, Frances, Joss and Charlie began working with school senior and middle leaders to create school policy, school development planning, curriculum mapping and resources for teachers to use. By the time I joined the school in April 2018, the introduction of Maths Mastery was well under way. Teacher development within the school throughout the year had taken a Maths Mastery focus and the summer term intensified these efforts with more regular staff meetings and collaborative teaching/ planning activities based around the new approach.

In relation to this description of how the approach reached teachers in Highland School (and the timeline that follows in section 5.5), it is to be noted that in discussing initial stages of the change to teachers' classroom practices, much of what I draw upon are teachers' and leaders' reflections on the decision to adopt Maths Mastery, documents deriving from this time and fieldwork observations of how the approach is presented to teachers during the approach's ongoing roll-out during the period of my fieldwork. Organisation of my findings using Callon's (1986) *four moments of translation* is intended to offer a clear way of describing the change, with data gained from tracing the movements of actors back and forth throughout the actor-

network. Therefore, some past events are discussed through interviewee's reflections on these events alongside copies of documents created at the time. One example is the school development plan, written in 2017 and available to me in April 2018. In this way, documents serve as useful to the researcher in terms of their stable mobility (Latour, 2005); they help me to describe associations between actors in past moments in the actor-network. In the next three sections of this chapter, I further unpack these ideas around how findings are organised and drawn together, revisiting the research question and explicating data drawn upon in the findings.

5.5 Timeline of the introduction of Maths Mastery to the classroom practices of teachers at Highland School

1970s

- Work on 'mastery' teaching methods (Bloom, 1973)

Sep 2014 – Aug 2015

- New national primary mathematics curriculum
- Ark Academy Trust develops Mastery Mathematics curriculum
- English government funds teacher exchange with Singapore and Shanghai

Sep 2016 – Aug 2017

- Government funding for schools in developing Maths Mastery
- NCETM develop programmes of training in Maths Mastery
- New national primary assessment strategy
- Highland School experience a dip in higher levels of attainment in mathematics
- Highland School teachers visit schools in Shanghai
- Phase One of the roll-out of Maths Mastery at Highland School:

- Frances, Laurie, Joss and Charlie attend NCETM training days and Teacher Research Groups (TRGs)
- Teachers from Shanghai school visit Highland School
- In-school training for all teachers on basic Maths Mastery concepts
- ‘S’ planning format and elements of Maths Mastery introduced to Y1 & Y4
- Laurie begins NCETM Maths Mastery Specialist training course
- Frances, Charlie and Joss attend NCETM Hubs and TRGs.
- School development plan includes Maths mastery for the first time

Sep 2017 – Aug 2018

- Phase Two of the rollout of Maths Mastery:
 - EYFS teachers, Y3 and Y5 teachers train in more depth
 - Training for all staff (see **Table 13** in Chapter 8.2)

Future planned developments at the time of fieldwork:

Sep 2018 – Aug 2019

- Phase 3 of the roll-out of Maths Mastery at Highland School: training and practice support for introducing the Mash Mastery approach in Years 2 and 6

5.6 Introduction to the findings: Returning to the research question

As set out in Chapter 1: Introduction to the thesis, my main research question is:

How is a policy initiative translated into teachers' classroom practices?

This question, asks, in an ANTish manner, how a change to teachers' classroom practices is brought about –how a policy-initiative is *translated* into teachers' classroom practices. I take as a starting point for accessing the actor-network of classroom practices at Highland School the LS notion of *literacy practices* in textually mediated *literacy events* which establish the new policy as an actor (or collection of actors) within the network; events in which processes of *translation* are made visible.

In order to describe how the Maths Mastery policy initiative is *translated* into an existing actor-network of classroom practices, I draw on a very particular way of writing an ANT account, using as a basis Callon's modelling of *translation* (see section 3.2.3). I break my main research question into four sub-questions, related to Callon's *four moments of translation*, with each of the four findings chapters (Chapters 6-9) addressing one of these sub-questions/ moments of translation, as detailed below. It is to be noted that this is intended as a way of making sense of the data in describing the establishment of a change to an existing actor-network of practices. It is not meant to suggest that data was collected sequentially. Data collection was obtained in a far less sequential, and far messier way: by starting in the middle (Latour, 2005), following the actors and their associations, tracing their associations back and forth throughout the network (see Chapter 4.3).

Sub-question 1: *How are existing practices problematised in order to initiate change?*

This question explores how existing classroom practices are *problematised* in a way that establishes a need for change. In answering this question, I largely draw upon documentary data and data from interviews to trace and describe *literacy events* in the process of *problematisation* that occurred before my period of fieldwork began (see timeline in section 5.5). To this, I interweave interview data in which people involved in these *literacy events*

reflect on the discussions that took place and the texts that were focal points of discussions. I also draw on observational data from moments during fieldwork where the need for change to classroom practices is articulated to teachers involved in later phases of the rollout of the new pedagogical approach.

Sub-question 2: *In establishing this change, how are teachers' ties to existing practices weakened and ties to the new approach formed and strengthened?*

This question aligns with Callon's second moment of change: *interessement*, in which, following the establishment of a need for change, associations between actors in the pre-existing network are weakened and associations with the new actors entering the network are strengthened. This shift in allegiance to what will substantiate the basis of practices is viewed as an ongoing process throughout the establishment of a change in the actor-network, rather than attached to a specific period of time (Callon, 1984). In the case of my research, associations between human and non-human actors – teacher, leaders, trainers, texts, computers, resources, for example – continuously bring into juxtaposition pre-existing and Maths Mastery practices, as the roll-out of the approach continues. In answering this question, I draw together documentary, observational and interview data from *literacy events* in which certain teachers and school leaders from Highland School receive training to become 'in-school' experts in the Maths Mastery approach.

Sub-question 3: *How are actors enrolled into the new pedagogic practice?*

This question aligns with Callon's third moment of translation: *enrolment*, in which further actors are enrolled/ not enrolled into the ways of the new practice, expanding/ destroying/

changing (parts of) the network. This question seeks to describe the associations of actors which establish the change more widely in the classroom practices of teachers at Highland School. Through this question, I aim to demonstrate how the ideas contained within a policy initiative travel further into classroom practices; the negotiations, inclusions, exclusions, adaptations within the network that establish the change. To answer this question, I focus on how teachers initially trained in Maths Mastery in Highland School pass this training on to other teachers, convincing them to change their practices to align with the new approach. I entered the school during an intensive period of focus on the development of Maths Mastery-based classroom practices (see timeline in section 5.5) and so I draw on data collected throughout fieldwork, from *literacy events* focused on establishing *enrolment* of further in-school actors into the approach (Callon, 1984).

Sub-question 4: *How is the new approach mobilised into teachers' classroom practices?*

This question is based on Callon's fourth moment of translation: *mobilisation*, in which actors act, or do not act, within the parameters of the new classroom practices. This question seeks how the actor-network stabilises into a common, new approach to classroom practices in Highland School; how variation and resistance are overcome so that the network holds together. At the time of fieldwork, the year groups involved in Phases One and Two of the roll-out of the Maths Mastery approach (all year groups except Years 2 and 6) had been focusing on developing its usage in the classroom for 20 months (Phase One year groups: EYFS, Year 1 and Year 4) and 8 months (Phase Two year groups: Years 3 and 5). During fieldwork, I observed teachers in these year groups predominantly using Maths Mastery as the basis for teaching mathematics (with some variances and resistance). In addressing this question, I draw

on observational, interview and documentary data from *literacy events* during fieldwork where teachers actively used, or discussed their use of, the Maths Mastery approach in the classroom.

5.7 Data drawn upon in presenting the findings

As discussed in Chapter 1 and Chapter 4, there was more data collected during my fieldwork than I refer to in this thesis. **Table 7** details the data referenced in the findings section of the thesis in comparison to data as a whole:

Table 7: Data drawn upon in the findings of the thesis in relation to data collected as a whole during fieldwork

<i>Type of data</i>	<i>Amount of data gathered throughout fieldwork period</i>	<i>Amount of data drawn upon in the findings of the thesis</i>
Fieldnotes	12 diaries, each pertaining to a participant	105 extracts, spanning all 12 diaries
Interview transcripts	12	41 extracts from all 12 participant interviews
Documents	86	Extracts from 34 documents
Photos	24	6

Documents and photos of documents being used or created were narrowed to those pertaining to the focus of this thesis: to the change to teachers’ practices for the teaching of mathematics. Other documents related to other aspects of the professional practices of the school and teachers, for example, some concerned practices in different subjects, such as phonics or religious education. Observations of all human participants are included in the findings, with fieldwork observations (see section 4.3.3 for fieldwork schedule) providing much of the data for how human and non-human actors in the actor-network associate. Interview data (see

section 4.3.4 for interview dates) adds to this picture, with all participant voices heard in the findings. Some human and non-human actors are more prominent in my findings: Laurie, Frances, an NCETM audit tool, a set of key Maths Mastery phrases. This is because these actors (as described in Chapters 6-9) are visible as pivotal actors in the (re)shaping of the actor-network of teachers' practices, and thus they appear frequently in descriptions of the actor-network. Whilst these actors are prominent in the account that follows, I have tried to ensure that I have described as much of the actor-network as possible within the scope of this thesis.

6. Problematisation: How are existing practices problematised in order to initiate change?

6.1 Introduction to the chapter

In this chapter, I describe the beginnings of the change to classroom practices for the teaching of mathematics at Highland School. I detail how previous practice is problematised in order to ascertain a need for change, as well as how the Maths Mastery approach is identified as a potential way of addressing this need. Through my description of early associations of actors in the school's introduction of the Maths Mastery approach, I reveal how central *nodes* in the actor-network are established; nodes which begin to destabilise existing practices and create buy-in to a promoted need for change. I describe how texts, as stable mobiles representing the approach, and school leaders interact through textually mediated discussions, initiating the change to practices.

6.2 Setting the scene for describing *problematisation*

In describing the *problematisation* of existing practices for the teaching of mathematics, I largely describe network activity from before my period of fieldwork began (see **Table 8**). To trace associations of actors in these early stages of policy entering the network, I draw upon documents in circulation within the period of September 2014-March 2018 (see **Table 9**). To extend and validate this data, I interweave interview data and fieldwork conversations with Highland School leaders.

Table 8: Timeline of the change to Maths Mastery: pre-fieldwork timeline (2014-2017)

<p>2014 - 2015</p> <ul style="list-style-type: none"> • New national primary mathematics curriculum • Ark Academy Trust develops Mastery Mathematics curriculum • English government funds teacher exchange with Singapore and Shanghai <p>2016 - 2017</p> <ul style="list-style-type: none"> • Government funding for schools in developing Maths Mastery • NCETM develop programmes of training in Maths Mastery • New national primary assessment strategy • Highland School experience a dip in higher levels of attainment in mathematics • Highland School teachers visit schools in Shanghai • Phase One of the roll-out of Maths Mastery at Highland School: <ul style="list-style-type: none"> ○ Frances, Laurie, Joss and Charlie attend NCETM training days and Teacher Research Groups (TRGs) ○ Teachers from Shanghai school visit Highland School ○ In-school training for all teachers on basic Maths Mastery concepts ○ ‘S’ planning format and elements of Maths Mastery introduced to Y1 & Y4 ○ Laurie begins NCETM Maths Mastery Specialist training course ○ Frances, Charlie and Joss attend NCETM Hubs and TRGs. ○ School development plan includes Maths mastery for the first time

Table 9: List of documents I draw upon in exemplifying pre-fieldwork problematisation of existing practices in Highland School

<p><i>List of documents I draw upon in exemplifying pre-fieldwork problematisation of existing practices in Highland School</i></p>
<p>English national curriculum (2014)</p> <p>English national assessment framework (2016)</p> <p>NCETM online texts (website) (2016-2018)</p> <p>NCETM Teacher Research Group (TRG) teachers’ reflective booklet (2017)</p> <p>NCETM Maths Hubs (regional meetings of Maths Mastery specialists) presentation slides (2017)</p> <p>Maths Mastery pupil textbooks and teachers’ guide books (2017)</p> <p>Nationally-published planning guides (2017)</p> <p>Highland School’s School Development Plan (written September 2017)</p>

During the time of fieldwork (April-July 2018), Highland School was in a period of intense focus in a three-phase roll-out of the new approach (see **Table 10**).

Table 10: Overview of the three-phase rollout of Maths Mastery at Highland School

Phase	Month phase begins	Staff included
1	September 2016	Senior leaders (Joss, Wallace, Sam) Maths subject leaders (including Laurie) Basic Maths Mastery training for all teachers Y1 and Y4 teachers train in more depth
2	September 2017	As above, plus: Early Years teachers Y3 and Y5 teachers
3	September 2018 (post fieldwork)	As above, plus: Y2 and Y6 teachers

By the time fieldwork began, some teachers and school leaders had already been working with Maths Mastery for 20 months. Other teachers, for 8 months. Others were only just being introduced to the new pedagogy. Thus, for some, problematisation of existing practices and the establishment of a need for change was an ongoing and present concern during the time that I joined the school. I thus also draw on observational data in which I observe continued network activity which effects *problematisation*.

6.3 An assemblage of government policy texts has authoritative agency in the network

To trace how Maths Mastery policy enters into an existing network of classroom practices at Highland School, it is first necessary to describe a different suite of policies which entered the school between 2014 and 2016, which provided the impetus for the introduction of Maths Mastery.

In 2014, the English government introduced a new Primary National Curriculum. The national curriculum is statutory for all English state schools and sets out the content and skills to be taught at each Primary key stage. In the 2014 version, the government made significant changes around the content and skills required to be taught to students in mathematics. In 2016, the English government issued schools with a new national assessment framework. The framework continued a statutory nationally standardised system of assessment at the end of each key stage: the Early Years Foundation Stage (students are 5 years of age at the end of the key stage), key stage one (students are 7 years of age at the end of the key stage), and key stage two (students are 11 years of age at the end of the key stage). In the new assessment framework, teachers are asked to assess whether students are ‘working at the expected level’ for their age group, ‘working towards the expected level’ or ‘working at greater depth’ (the highest standard of attainment). The 2016 Assessment Framework descriptors at all levels echo increases in expectations of curriculum content at each key stage brought in by the changes to the national curriculum in 2014 and examples of what each of these attainment descriptors should look like are provided within the policy documentation.

These changes in government policy are represented in policy texts, such as a National Curriculum document (DfE, 2014) and an Assessment Framework (DfE, 2016). These *textual stable mobiles* (Latour, 2005) form an intertextual *assemblage* (Law, 1994): actors in frequent association, which appear to circulate and act in unison in the actor-network. For when they enter the network, these textual stable mobiles are already associated and inextricably linked through their *intertextuality* (Barton, 2007): the ways that they contain or reference other texts. Curriculum and assessment policy texts are linked in that the latter assesses the content of the former. These texts are linked to others already in circulation in the network. Standard Assessment Tests (SATs) – a national system of standardised testing – were changed in 2016 to use the same wording and assessment expectations as the

assessment framework. Results of pupil performance in SATs and teacher assessment are published on the school's website in a further text: school data tables.

This *intertextual assemblage* has a particular nature. It consists of documents issued to schools by the English government, containing government policy. The 2016 Assessment Framework document (DfE, 2016) is a Department for Education (DfE) creation. School data tables are a requirement of the government-funded inspection group, the Office for Standards in Education (OfSTED). The national curriculum document is published by the DfE. SATs are created, set and marked by the English government's Standards and Testing Agency.

More than this, these documents are *statutory* government policy. National curriculum and assessment policy have been statutory since the late 1990s in England. Their statutory nature is enforced via long-established national (government) systems of professional accountability which draw upon outcomes of having enacted these policies (Ball, 2008). For example, the school inspectorate body, the Office for Standards in Education (OfSTED), use assessment framework outcomes to make judgments about the school. Highland School's last inspection report states that:

The inspectors evaluated the overall effectiveness of the school and investigated... achievement and standards... Evidence was gathered from national published data, the school's own assessment and evaluation records... [Extract from OfSTED Report, 2008]

As part of the OfSTED framework, each school in England is also required to publicly publish their student attainment data on their school website; a further way of associating the assessment-curriculum-data oriented assemblage with a sense of requirement. The 'new' curriculum and assessment policy texts are thus already imbued with authority when they enter Highland School through intertextual associations between statutory or evaluative texts,

an authority through which network ‘power’ over the activity of other actors may be traced (Nespor, 2002).

6.4 Extending authority: the assemblage is centralised in the school’s literacy practices

I cannot speak to observations of how this *intertextual assemblage* of government texts was interacted with when it first entered Highland School between 2014 and 2016. However, at the time of fieldwork, the authority of this *assemblage* is extended by the school’s *literacy practices* (Street, 1984), one of which is a consistent centralisation of the assemblage of government policy texts in *literacy events* (Heath, 1982) focused on the planning and preparation of lessons or on discussing assessment. I observed this throughout fieldwork in team planning meetings.

Every week, teachers from each year group meet for half a day to discuss lesson planning, preparation and assessment (and many other aspects of their professional roles). In English schools, this is commonly known as ‘PPA time’. This is a regular *literacy event* within the school, in that meetings are focused around the reading, writing and discussion of texts: lesson plans, lesson resources, lesson slides, pupils’ work, and so on. As such, these meetings offered a regular opportunity to observe classroom practices being planned and agreed; to observe regular *nodes* in the network where many physical, human and metaphysical actors came together at once (Latour, 2005). I attended these meetings each week with EYFS, Year 1, Year 4 and Year 6 teachers (the year groups in which my participants work). The *intertextual assemblage* of government texts mediates professional dialogue in each meeting.

To offer one example which exemplifies this well, I skip forwards in time to 23rd May 2018 and a meeting between Year 6 teachers. Rowan is a Year 6 teacher and Middle Leader [see

section 5.1 for details of the leadership structure in the school]. The meeting is post-SATs, which have taken place the week beginning 14th May. Year 6 gather in a small room next to ‘cook school’ in the Year 6 part of the school building. There are three computers, science resources and a cupboard and it is fairly warm inside on this sunny day. Rowan and two other Year 6 teachers sit at a computer each. Rowan welcomes back one teacher, who has been on paternity leave. They all share stories, photos and jokes and catch up on the news of the new baby. They fetch coffees and teas and get me a chair to sit on.

Rowan tells me that this is ‘a weird time for Year 6. It’s post-SATs and report-writing and the Year 6 production kind of takes over but we still have to address some gaps in learning.’ Rowan sits with the returned teacher with a copy of the school’s internal progress tracking document in front of him [a grid marking students’ names against standards descriptors from the Assessment Framework]. They discuss students’ progress in different subjects. The two teachers discuss students who ‘came up from Year 5 not even meeting Year 5 objectives, so it’s been a massive push to get them to where they have to be, yet they won’t make the grade.’ [Year 6 teacher planning meeting, May 23rd 2018]

Despite the pressures of other priorities of the school term, Rowan and his team continue to centralise the assessment framework document. The authority of the assessment framework policy is further reified by Rowan’s creation and usage of a further document: an assessment document (see example page in **Figure 5**). In this document, Rowan places importance on assessment ‘descriptors’, which are descriptive statements of what students should be able to do/ should know by the end of Year 6 in reading, writing and mathematics. He does so by replicating, in the new document, all assessment document statements for each subject contained in the assessment framework. The new document thus mediates the discussion in

delegation: in which the meaning of one actor/ assemblage of actors may be seen to be displaced to another (Latour, 1999):

Rowan has created a document listing the Y6 descriptors from the assessment framework document for different subjects. Together, Rowan and the returning teacher discuss the ticks showing where the student has met each skill, the dots showing where the student has shown some progress towards the skill but has not yet fully achieved it, and gaps where the student has not yet covered/ shown progress towards the skill. [Year 6 teacher planning meeting, May 23rd 2018]

Year 6		1	2	3	4	5	6	7
Working towards:								
I can use paragraphs		✓	✓	✓	✓	✓	✓	✓
I can describe setting and characters		✓	✓	✓	✓	✓	✓	✓
I can use devices to structure writing in non-narrative (headings, subheadings and bullet points)		✓	✓	✓	✓	✓	✓	✓
I can make some joins across sentences and paragraphs		✓	✓	✓	✓	✓	✓	✓
I can write verbs using the correct tense		✓	✓	✓	✓	✓	✓	✓
I can use coordinating and subordinating conjunctions		✓	✓	✓	✓	✓	✓	✓
I can use the following mostly accurately:	Capital letters	✓	✓	✓	✓	✓	✓	✓
	Full stops	✓	✓	✓	✓	✓	✓	✓
	Question marks	✓	✓	✓	✓	✓	✓	✓
	Exclamation marks	✓	✓	✓	✓	✓	✓	✓
	Commas for lists	✓	✓	✓	✓	✓	✓	✓
	Apostrophe for contraction	✓	✓	✓	✓	✓	✓	✓
I can spell most year 3 and 4 words correctly		✓	✓	✓	✓	✓	✓	✓
I can spell some year 5 and 6 words correctly		✓	✓	✓	✓	✓	✓	✓
I can use legible, joined handwriting		✓	✓	✓	✓	✓	✓	✓
I can use some genre specific features: Narrative		✓	✓	✓	✓	✓	✓	✓
I can use some genre specific features: Non-Narrative		✓	✓	✓	✓	✓	✓	✓
Expected Standard:								
I can use most genre specific features: Narrative		✓	✓	✓	✓	✓	✓	✓
I can use most genre specific features: Non-Narrative		✓	✓	✓	✓	✓	✓	✓
I can create an atmosphere		✓	✓	✓	✓	✓	✓	✓
I can use dialogue to show character and advance action		✓	✓	✓	✓	✓	✓	✓
I can use impressive vocabulary and select it carefully for purpose		✓	✓	✓	✓	✓	✓	✓
I can alter the structure of my sentences and write in a formal style		✓	✓	✓	✓	✓	✓	✓
I can use a range of devices to join my sentences and paragraphs		✓	✓	✓	✓	✓	✓	✓
I can write verbs using the correct tense		✓	✓	✓	✓	✓	✓	✓
I can use adverbials in my writing		✓	✓	✓	✓	✓	✓	✓
I can write using the passive sentence structure		✓	✓	✓	✓	✓	✓	✓
I can use modal verbs appropriately (could, can, would, if)		✓	✓	✓	✓	✓	✓	✓
I can write an embedded clause sentence		✓	✓	✓	✓	✓	✓	✓
I can write a main and then subordinate clause sentence		✓	✓	✓	✓	✓	✓	✓
I can write a subordinate and then a main clause sentence		✓	✓	✓	✓	✓	✓	✓
I can use short sentences for impact		✓	✓	✓	✓	✓	✓	✓
I can use adverb, pronouns prepositional and noun phrases for precision		✓	✓	✓	✓	✓	✓	✓
I can use the following mostly accurately:	Inverted commas	✓	✓	✓	✓	✓	✓	✓
	Commas for clause	✓	✓	✓	✓	✓	✓	✓
	Parenthesis (brackets)	✓	✓	✓	✓	✓	✓	✓
	Semi-colons	✓	✓	✓	✓	✓	✓	✓
I can show some correct use of:	Colons	✓	✓	✓	✓	✓	✓	✓
	Dashes	✓	✓	✓	✓	✓	✓	✓
	Hyphens	✓	✓	✓	✓	✓	✓	✓
I can spell most yr 5 and 6 words correctly		✓	✓	✓	✓	✓	✓	✓
I can maintain legibility and fluency of joined handwriting		✓	✓	✓	✓	✓	✓	✓
Greater Standard:								
I can manage shifts in level of formality (vocab and grammar)		✓	✓	✓	✓	✓	✓	✓
I can use a full range of punctuation correctly (see all of above)		✓	✓	✓	✓	✓	✓	✓

Figure 5: Year 6 assessment against Assessment Framework descriptors: document created by Rowan, Year 6 teacher. Collected May 23rd, 2018.

The new document, through intertextual links, extends the authority of the original policy document. The assessment statements that form its core are now in a form that is stuck into individual student workbooks and teacher files as one-page ‘at a glance’ documents and referred to regularly in discussions about teaching and learning. I see similar examples throughout the school, with each year group breaking down the end-of key stage assessment framework descriptors, in comparison to the year group’s national curriculum expectations, to create a basis for tracking and discussing students’ progress. The new documents are used as a tool for focusing upcoming teaching: a record for teachers to use in discussion of the shape of classroom practices to come, tailoring practices to each students’ ‘gaps’, as Rowan calls them in discussion with his teaching team, in relation to the assessment framework:

Rowan and his team highlight the skills that will be the focus for future teaching and use a copy of the national curriculum to discuss teaching focuses and approaches they will use to try and ‘plug the gaps’ in the time they have left in the year. [Year 6 teacher planning meeting, May 23rd 2018]

The new document is used in unison with the national curriculum 2014 document to determine the focus of future classroom practices. The sense of authority surrounding the assemblage of government texts is thus reified by the texts’ centrality in teachers’ literacy practices, the latter shaped and reinforced by Highland School leaders.

The ‘power’ effected in relation to this assemblage is traceable in the ways that school leaders and teachers talk about the curriculum and assessment policies represented by these texts:

‘Adhering to the national curriculum... well that’s important because that’s what we’re teaching. We need to stay abreast of what is happening in that. Like in maths.

It's not all about that. You're also teaching children's life skills, but we do have to make sure we have curriculum coverage and get the results we need.' [Sam, senior leader, interview, June 11th, 2018]

School leaders continue the sense of requirement surrounding policies in the *intertextual assemblage*: in this case, the national curriculum. In interviews, teachers echo this sense of necessity in following government policy which directs the focus of teaching:

'I think government policies and things are there for a reason. The curriculum is there for a reason. You know, that is what we have to work with and it's not about whether you like it or not, really. That is part of the professional job. Assessment too.'
[Meri, early career teacher, interview, June 27th, 2018]

Teachers imbue curriculum and assessment policies with a sense of requirement even when there is an element of questioning and resistance around them, for example when teachers disagree with the classroom practices set out in them:

'...the national curriculum, for example, we do have an obligation to teach 'dededede' so that children have that right definitely for this, that and the other. But they're all someone else's voice... when silly policies come in and you know actually that this is just wrong, but of course, do you know what? We've got to go with it.'
[Rowan, mid-career teacher, interview, June 28th, 2018]

The *assemblage* of government policy texts is established as an *obligatory passage point* (Law, 1994) in the actor-network: central actors with which other actors must associate. Reified in regular *literacy events* focused on planning and agreeing classroom practices, the intertextual policy assemblage becomes a central *node* in the actor-network of classroom practices at the school: a recognisable feature of the network that contributes towards the shaping of the whole (Latour, 2005). We can thus see how government policy 'power' is

established as a network effect (Nespor, 2002): the intertextual node works with school leaders' and teachers' treatment of the node to produce a network of classroom practices founded, in a large part at least, on these texts.

6.5 This *assemblage* acts in establishing *problematization* of existing practices

The *intertextual assemblage* of government policy texts plays a central role in the problematisation of classroom practices for the teaching of mathematics. Its authoritative presence in the network effects a change in school leaders' evaluation of practices (which are conducted in relation to the *assemblage*), establishing a sense that existing practices do not meet the requirements of the curriculum and assessment policy reified within the *assemblage*.

To describe this, I take us back in time again, to 2016. In June 2016, school data tables show that Highland School experienced a 'dip' in students achieving higher levels of attainment in mathematics at the end of Year 2 and Year 6, for the first time in many years. To try to ascertain leaders' reactions to the dip in 2016, I ask senior leaders about this anomaly in interviews during fieldwork. Their responses invariably link the 'dip' to the adoption of Maths Mastery:

'I'm not saying that everything is results-based, because it isn't, but our rationale for looking at Maths Mastery and greater depth has been looking at actually we need to increase the number of children who are coming through working at greater depth. We saw that there's disparity there and it's going to get greater over time unless we address it'. [Wallace, senior leader, interview, June 20th, 2018].

Wallace's reflection on school data identifies raising the number of students achieving the higher grade as a requirement, a 'need'. This sense of requirement is established in relation to

2016 school performance data and the new assessment framework descriptors; key elements of the *assemblage* of government texts.

Following identification of the dip in attainment, between June and September 2016, senior leaders held a series of initial meetings with the then maths subject leaders (now in different roles within the Multi Academy Trust (MAT)) and a couple of interested teachers: Laurie (the school's maths subject leader at the time of fieldwork), and Frances (a year group leader).

These discussions also centred around the *assemblage* of government texts, a further example of the centralisation of these texts in the *literacy practices* of Highland School:

'In these meetings, these involved data and curriculum and the assessment standards [the Assessment Framework]' [Wallace, senior leader, interview, June 20th, 2018].

Following my interview with Wallace, I talk to Laurie in the staffroom over a cup of tea.

Laurie is one of the school's maths subject leaders at the time of fieldwork:

'Maths Mastery? It began with the 2014 curriculum: there are so many things that younger and younger children now need to know, under this new curriculum and we needed a way to achieve that. Then came 'working at greater depth'. It made even more sense to change then.' He tells me that many schools weren't ready for the 2014 national curriculum. *'Here, in this school, it's been a process, a journey. We looked at changes to the curriculum in the curriculum document and saw what we had to do more of.'* Laurie identifies these areas to *'do more of'* as complex problem-solving and *'coming at problems from different angles, thinking in different ways'*. He tells me, *'That wasn't our focus before.'* [Laurie, maths subject leader, fieldnote conversation, June 20th, 2018]

From the reflections of Wallace and Laurie, we can gain a view of how school leaders responded to the 'dip' in attainment in 2016. This response was formulated, it seems, in a

series of meetings mediated by texts from the *intertextual assemblage*. The texts mediate by acting as lenses through which to (re)consider existing practices. They focus people's attention and give leaders a vocabulary with which to talk about mathematics practices.

Laurie offers to explain more and we return to his classroom where he locates an online copy of the Assessment Framework from 2016 that was discussed in the series of meetings (see **Figure 6** for an extract of the 'working at greater depth' standard from the 2016 assessment framework for the end of key stage 1: when students are 7 years old).

Working at greater depth within the expected standard
<ul style="list-style-type: none"> • The pupil can reason about addition (e.g. pupil can reason that the sum of 3 odd numbers will always be odd). • The pupil can use multiplication facts to make deductions outside known multiplication facts (e.g. a pupil knows that multiples of 5 have one digit of 0 or 5 and uses this to reason that 18×5 cannot be 92 as it is not a multiple of 5). • The pupil can work out mental calculations where regrouping is required (e.g. $52 - 27$; $91 - 73$). • The pupil can solve more complex missing number problems (e.g. $14 + \square - 3 = 17$; $14 + \Delta = 15 + 27$). • The pupil can determine remainders given known facts (e.g. given $15 \div 5 = 3$ and has a remainder of 0, pupil recognises that $16 \div 5$ will have a remainder of 1; knowing that $2 \times 7 = 14$ and $2 \times 8 = 16$, pupil explains that making pairs of socks from 15 identical socks will give 7 pairs and one sock will be left). • The pupil can solve word problems that involve more than one step (e.g. which has the most biscuits, 4 packets of biscuits with 5 in each packet or 3 packets of biscuits with 10 in each packet?). • The pupil can recognise the relationships between addition and subtraction and can rewrite addition statements as simplified multiplication statements (e.g. $10 + 10 + 10 + 5 + 5 = 3 \times 10 + 2 \times 5 = 4 \times 10$). • The pupil can find and compare fractions of amounts (e.g. $\frac{1}{4}$ of £20 = £5 and $\frac{1}{2}$ of £8 = £4 so $\frac{1}{4}$ of £20 is greater than $\frac{1}{2}$ of £8). • The pupil can read the time on the clock to the nearest 5 minutes. • The pupil can read scales in divisions of ones, twos, fives and tens in a practical situation where not all numbers on the scale are given. • The pupil can describe similarities and differences of shape properties (e.g. finds 2 different 2-D shapes that only have one line of symmetry; that a cube and a cuboid have the same number of edges, faces and vertices but can describe what is different about them).

Figure 6: Working at Greater Depth standard description for the end of key stage 1 mathematics (DfE, 2016).

Laurie explains how he worked together over a series of meetings with other senior and mathematics leaders in the Multi Academy Trust (MAT) to compare the new framework to the old. He tells me that they noticed an increase in two elements of maths – mathematical problem-solving and reasoning – in the new framework, a prevalence of which he highlights in the frequency of references to these elements in the ‘working at greater depth’ description in **Figure 6** to “reasoning” or the “solving” of problems.

‘We noticed that the new standard of ‘working at greater depth’ had more reasoning and problem-solving that was expected of the children that we probably currently didn’t focus on as much using the methods we were then teaching with. This reflected changes in the [national] curriculum too.’ [Laurie, maths subject leader, fieldnote conversation, June 20th, 2018]

Laurie moves to his computer and pulls up the 2014 English National Curriculum. Locating the maths programme of study, he points out the opening description of overall maths skills, highlighting to me a section which reads: “... students should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems” (DfE, 2014b, p.1). He explains that this is the definition of problem-solving and reasoning that he and other teachers in the MAT used to identify what they needed to do more of within teaching in schools across the MAT. The content of the curriculum text mediates meaning making in the discussion: teachers use the text to define mathematical concepts and to provide a basis for evaluation of existing classroom practices.

Problematization of existing practices is thus accomplished within a reciprocal relationship of human and non-human actors (Callon, 1984). An *intertextual assemblage* of government policy texts mediates school leaders’ perspectives of existing practices for the teaching of

mathematics into the assessment and curriculum systems that it represents and carries. In a reciprocal relationship, school leaders and teachers leading the change act as *spokespersons* for these government texts (Callon, 1986), imbuing them with a sense of authority in relation to teachers' classroom practices through their use of these texts as central to the *literacy practices* of the school (Street, 1994).

The foundation of *problematization* in the circulation and usage of government policy texts, imbued with authoritative agency in the network of classroom practices, echoes perspectives in literature which report widely on the foundations of much educational reform as rooted in (changes in) government policy (Apple, 2006; Stronach et al., 2002). This resonates with discourses of performativity (Gewirtz et al, 2021) in which systems designed to publicly reveal school performance to government-defined aims drive decisions around school and classroom practices.

6.6 Maths Mastery as a potential solution to the problem

As a need for a change to classroom practices for the teaching of mathematics is established, leaders at Highland School consider the Maths Mastery approach as a potential basis for the change.

Following discussions of the 'dip' in June-September 2016, school leaders initiate an exploration of the Maths Mastery approach, which is at this time heavily promoted and funded by the DfE, through organisations such as the National Centre for Excellence in the Teaching of Mathematics (NCETM) (see Chapter 5.4). This exploration involves several different training events for leaders and selected teachers in the school.

In late 2016, the school sends two teachers (not participants in this study) on a DfE-funded visit to Shanghai, to study the teaching methods involved in the Maths Mastery approach.

Others – Frances (a year group leader and Year 1 teacher), Charlie (a Year 1 teacher), Laurie (the maths subject leader at the time of fieldwork and Year 4 teacher) and Joss (a senior leader) – attend training events run by the government-funded NCETM. Laurie attends NCETM specialist maths leader training: a year-long course, with four days of training and associated reading and tasks to do in between the training days, spread over a year. He also attends a NCETM Maths Hub (Hubs are regional gatherings of specialist Maths Mastery teachers) and Teacher Research Groups (TRGs) (gatherings of teachers in different host schools to observe and discuss Maths Mastery-based lessons). Frances and Joss attend Maths Hubs and TRGs, whilst Charlie attends NCETM training days based on Maths Mastery and also TRGs.

To gain a picture of what these training events in the school's 2016-2017 exploratory stage of adopting Maths Mastery might have looked like, I explored any ongoing Hubs, TRGs and training courses taking place during my fieldwork period. I attended two TRGs, a Maths Hub and an NCETM training day. In each case, training opportunities are textually mediated: *textual stabile mobiles* representing the Maths Mastery approach are used as the focus for discussions in training and may then can be carried back into school. To illustrate this, I trace an example of a TRG attended by Charlie, a Year 1 teacher.

On 25th April 2018, I am halfway through a fieldwork week with Charlie. She is in her classroom in breaktime, looking over some ideas for teaching maths to bring to the team planning meeting. She shows me what she is looking at: a training 'reflection booklet' (see **Figure 7**) from a TRG she has been part of since September 2017.

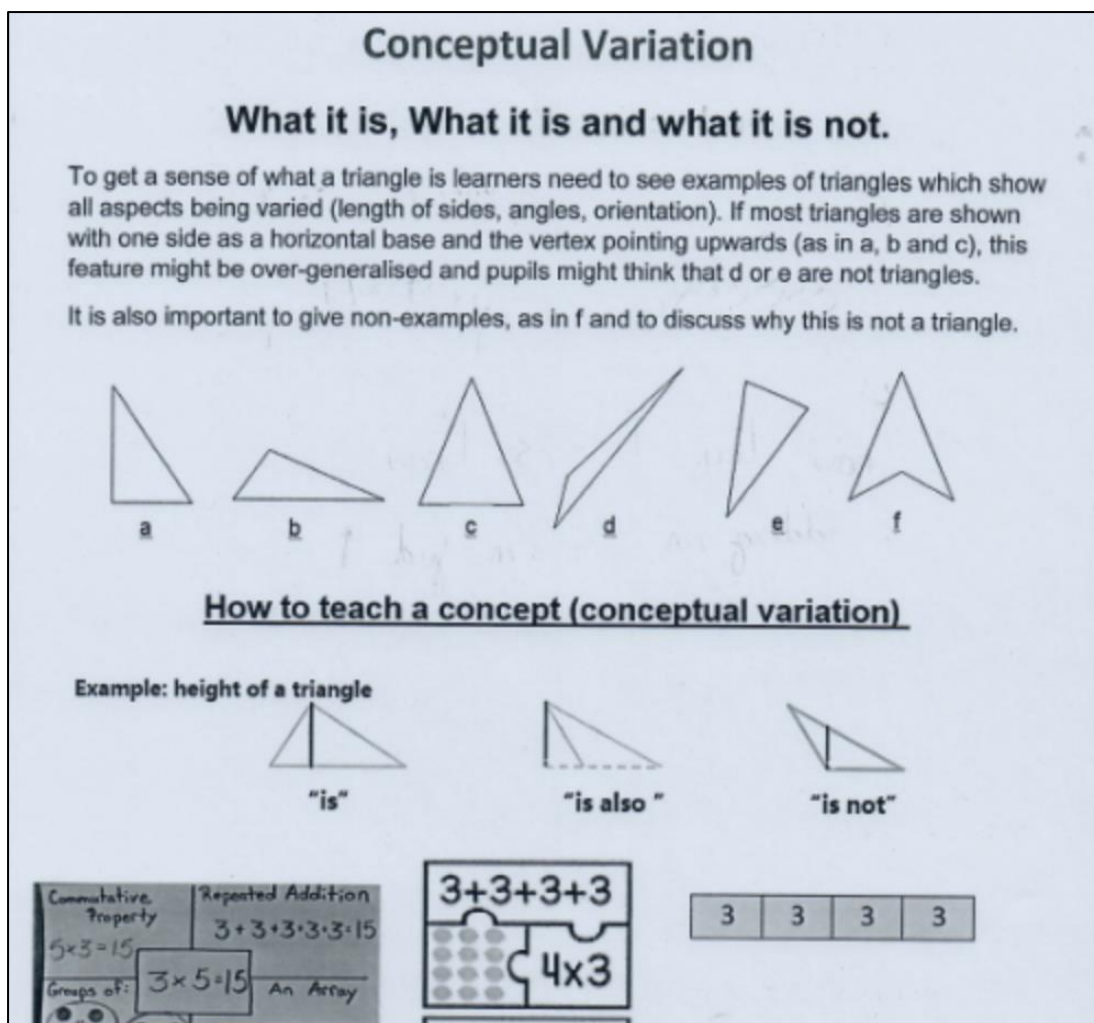


Figure 7: Extract from Charlie's 2017 TRG reflection booklet, showing one of the information pages in the book. This page explains a Maths Mastery concept: conceptual variation.

TRGs are an offshoot of NCETM-funded Hubs. In the NCETM Hub which Highland School is part of, there have been TRGs for teachers of specific year groups: Year Four, Year One and Year Three. In TRGs, teachers from different schools take it in turns to host their counterpart colleagues in their lessons. They meet beforehand to introduce the teaching and learning they will observe, and afterwards, with Maths Specialist support, collaboratively reflect on what went well and what could be developed further. Activity in TRGs is mediated by the TRG reflection booklet. The booklet details key concepts of the Maths Mastery

approach alongside spaces to make notes about each area of focus. In each TRG, teachers are encouraged to engage with the ideas contained within the Maths Mastery documents as they discuss and observe Maths Mastery-based classroom practices.

Charlie tells me that later in the term she will attend a TRG meeting and that I am welcome to come along. On June 12th, I arrive at a primary school twenty minutes' drive from Highland School and am shown into a staff training room: a spare classroom set up with tables, presentation slides on an interactive whiteboard at the front of the room and handout versions of the presentation on each table. I discuss the format of the TRG with Toni, one of the NCETM-trained Maths Mastery Specialists who organise and lead the TRGs:

'It might look slightly different in different settings, but the structure is the same... Teachers come to our school, we teach a lesson, we give a little bit of theory beforehand about the lesson design... We guide them [the teachers] as to what to look for in relation to the [Maths Mastery] theory using the TRG booklet or texts they have encountered in other sessions, then they watch the lesson and we unpick it, linking back to the theory... We think about what worked well, what was powerful for the children's learning, what misconceptions maybe came up that we didn't already think of. We really unpick it. Then people plan what to do back in their schools with that bit of theory, 'I'm going to have a go at this now', or 'I'm going to try and do this,' and we go away and come back again every half term.' [Toni, NCETM Maths Mastery Specialist, fieldwork conversation, June 12th, 2018]

Discussions in the TRG session are structured around this nationally produced reflection booklet in addition to handouts of the slide deck detailing the observed lesson/ discussion points generated by the Maths Specialist leading the session. During the session, the Maths Mastery specialists running the course first encourage the gathered teachers to discuss Maths

Mastery concepts using information pages in the booklet such as that in **Figure 7**, identifying what each concept is and is not. TRG members discuss the examples before observing a lesson taught by one of the teachers from the host school, during which they make notes in their reflection booklets. After the observed lesson, members of the group gather again:

The TRG leader draws teachers' attention to their reflection booklet. He talks through the design of the lesson the teachers have just observed, in relation to the Big Ideas; how different parts of the lesson demonstrate the use of different Big Ideas. He asks teachers to discuss the benefits that the Big Ideas brought to children's learning of the mathematical concept being taught in the lesson. [Fieldnote: June 12th, 2018]

The TRG leader here places the reflection booklet at the centre of teacher discussions, a central node in teachers' meaning making during the TRG session. Every aspect of the TRG is filtered through this text: the lesson design, teachers' reflections on their observations of the lesson, their discussion of the benefits of the Maths Mastery approach. In this way, the reflection booklet has a *mediating* role in teachers' discussions. It structures and provides a focal point to teachers' discursive meaning-making around each key concept. Members of the TRG use designated blank pages in the reflection booklet (next to each information page) to make notes on what they have taken away from these textually mediated lesson observations and discussions (see for example **Figure 8**).

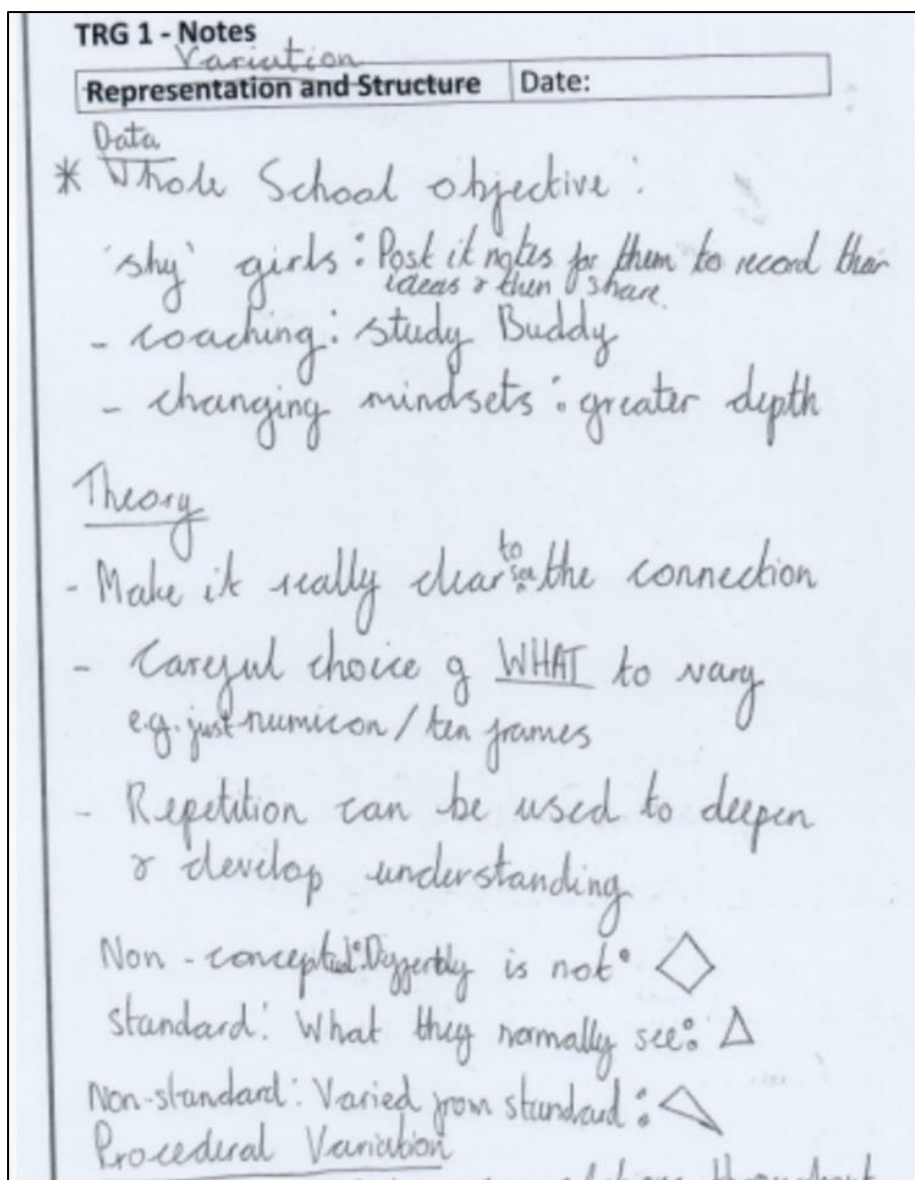


Figure 8: Notes page from Charlie's TRG reflection booklet

Here, Charlie's notes are centralised around the Maths Mastery notion of 'conceptual variation' (see Chapter 5.3 for explication). They extend this concept with ideas added from discussions within the group. These additional ideas forge links between the original model and how to practically put this idea into practice in Charlie's own classroom. For example, Charlie notes an idea for how to engage a group of 'shy girls' in the approach and which elements to focus on in her variation of concepts, relevant to her current class. The TRG

booklet also serves as a repository for ideas through which teachers can build connections between their classroom practices and the new pedagogical approach. The texts *mediate* these connections. The TRG booklet acts as a reminder of the key elements of the Maths Mastery approach, focusing teachers' discussions and observations on these elements and directly connecting them to practices they reflect upon or observe directly in another teacher's classroom during the TRG.

Immutable mobiles such as the TRG reflection booklet form part of the *literacy practices* of the TRG (Heath, 1982). The textually-mediated discussions of the TRG, whilst happening in different geographical places – different host schools – are centred around the same explanations of Maths Mastery concepts through the common usage in each TRG of the NCETM-published TRG booklet. The booklet also serves as a means by which these elements, and teachers' notes about them, can be carried back into schools, classrooms and planning sessions. During fieldwork, for example, I observe Charlie bringing ideas from the TRG booklet into planning discussions back in Highland School (see Chapter 8.6).

The Maths Mastery approach thus enters the literacy practices of teachers and school leaders at Highland School in the form of a body of different texts which represent the approach.

Along with the above TRG reflection booklet are: NCTEM website resources; texts published nationally in England which translate Maths Mastery concepts into a form which relates to the English national curriculum; journal articles used on training courses as the basis for discussion; presentation slides which form the focus of training conversations; worksheets; audits; online and hard copy resources; flyers advertising training courses; and so on.

This body of texts does not appear to work in the network as an obvious *assemblage* of actors working in unison (Law, 1994); they are numerous and not all are used by teachers at the same time, or in association. However, they largely carry the same information. Comparing

the myriad *textual immutable mobiles* that come back into school from these training sessions in the period of September 2016 – July 2018 reveals a core homogenous content, relating to the NCETM’s version of Maths Mastery. For example, core concepts are explained through replicated language, such as the NCETM’s core concept of ‘conceptual variation’ (see Chapter 5.3). This concept is exemplified in Charlie’s TRG booklet from the academic year 2017-2018 (see **Figure 7**) and an example slide from a presentation at an NCETM Maths Hub that Laurie attended in February 2017 (see **Figure 9**).

Conceptual Variation...

MathsHUBS

Conceptual Variation

Providing children with different, well-thought-out representations for the same concept.

larger

smaller

$\square \times \square = \square$

Figure 9: Maths Hub example slide from February 2017

This core content is reiterated in a wide range of textual forms which are carried into textually mediated discussions around the potential of Maths Mastery to address the ‘dip’ in maths attainment. Through this reiteration of the language of Maths Mastery, the approach gains agency in the actor-network of teachers’ classroom practices:

‘After all that, we decided to really go for it – everything was saying the same thing – that it’s worth the effort. Mastery was going to be great for getting that working at

depth standard.’ [Charlie, key stage one teacher involved in initial explorative training in Maths Mastery, interview, May 3rd, 2018]

This body of texts can be seen to flood the network with *immutable mobiles* which are all saying the same thing. Much as in the case of a policy initiative concerning the teaching of thinking skills (Nichols, 2006), the Maths Mastery approach gains agency through verification via multiplicity of encounters with different *textual immutable mobiles* representing and transmitting the same information across the network.

Whilst the *intertextual assemblage* of government policy texts establishes as an *obligatory passage point* (Law, 1994) in the network (see section 6.3), the body of texts representing Maths Mastery is agentic initially in the sense of holding *potential* to act in the production of classroom practices:

‘A couple of us went on TRGs and training events in that year. It was very much a case of ‘Well this is something very new to all of us and we’re deciding whether to develop it in school to help us achieve greater depth.’ There were little bits of CPD [continuing professional development] provided here and there. The NCETM was starting to become more prevalent with regards to that for Maths, so we looked at the documents on their websites and tried things out in our classrooms. Then, we got together to talk about what worked well and what didn’t.’ [Charlie, key stage one teacher, interview, May 3rd, 2018]

Charlie describes how those involved in initial explorative training into the Maths Mastery approach treated Maths Mastery documents and the approach in general in a questioning, probing manner. They held these up for examination, identifying what worked well from their trials of Maths Mastery ideas and what did not work so well. This speculative usage of the body of texts is echoed by others involved in the initial exploration of the approach:

'The first year was very much a couple of key individuals within school looking into it and researching it and thinking 'Where is this noise coming from? What is teaching for mastery? How does it work? What are the facets of it?'' That kind of thing. What are all the key parts of it.' Laurie tells me that those involved in early stages of exploring Maths Mastery gathered as much information as they could. He shows me slide decks and resources, journal articles and handouts discussed at training events and brought back to school to support discussions in meetings about adopting the approach.' [Laurie, maths subject leader, fieldwork conversation, June 7th, 2018]

The approach is pursued as the *likely* way forwards to address the school's dip in attainment of higher levels in math. It remains a *matter of concern* (Latour and Woolgar, 1986): an entity under active consideration through discussion of the texts which represent it.

This exploratory and questioning approach to deciding on a method to meet a required adaptation to practice is typical of Highland School's treatment of developments or changes to practices in general. Highland School leaders treat change to how things are done at the school as a continuous necessity, but also a continuous area for consideration of just *how* each adaptation to practice is carried out:

'So we have this reflective end of year that really is the beginning of what we are setting for next year. It starts the continuous process of planning, reflecting and developing that happens throughout the year. We need to have a conversation with the next year groups, explore where our students are and potential ways in to their needs. So that then feeds in to our whole school reflective planning session, when we look at individual and whole school drivers together and consider different solutions and come to a way forward, together. That's done on a training day.' [Sam, senior leader, interview, June 11th, 2018]

At the development planning training day, Sam reports, teachers come armed with various documents, which they actively use as reference points in determining which practice needs to be developed and in forming ideas as to what might help:

'The members of staff will come with all of their end of year data, teacher observations, maybe book scrutiny feedback, TRG reflections, professional diaries, that kind of thing. They have all of that and have a proper discussion about them with somebody to say, 'So, what do you need next year then? Where are you heading? Have you got ambitions to do this? Was there a gap in your teaching that you think, do you know what I need to develop that? Would this resource help?'. ' [Sam, senior leader, interview, June 11th, 2018]

Leaders encourage teachers to question and probe potential solutions to identified gaps in practice. The adoption of the Maths Mastery approach is not necessarily, therefore, a direct outcome solely of problematisation of current practices through the lens of a suite of government documents. Rather, it is one *possible* solution to a need for change defined in relation to the *assemblage* of government texts. It is a solution which gains agency through a variety of ways in which it is textually represented in *immutable mobiles* which come to mediate discussions around how to address the identified gap in attainment.

6.7 Leaders make connections between texts which reinforce the need for change

In the summer of 2017, school leaders make a decision. They decide that the Maths Mastery approach is to be adopted. In interviews during fieldwork, I ask those involved in the decision about the choice of Maths Mastery as the change to be made to practices:

‘Teaching for greater depth is all about teaching thinking in ways we haven’t done before. It seemed that Maths Mastery could help achieve that.’ [Frances, year group leader involved in the 2017 decision to introduce Maths Mastery, June 8th, 2018]

Leaders justify this decision to themselves (and later, to other members of staff) by linking the Maths Mastery approach to the desired outcome of helping more students achieving the standard of ‘working at greater depth’. Frances positions the Maths Mastery approach as holding potential for addressing the new national expectation of ‘depth’.

This is true of other Highland School leaders. When we talk about maths during fieldwork, often school leaders make direct comparisons between pre-Maths Mastery classroom practices and practices using the Maths Mastery approach, with the ‘working at greater depth’ standard serving as the mediating lens for comparison:

‘Maths Mastery and At Greater Depth is coming into its own now. We’re going deeper with problem-solving and reasoning than we used to, so they’re [the students] getting a deep understanding.’ [Joss, a senior leader, interview, June 21st, 2018]

Joss, a senior leader involved in the establishment of Maths Mastery pedagogy in Highland School, depicts pre-Maths Mastery classroom practices as unhelpful in achieving the standard of ‘at greater depth’ as set out in the expectations of the 2014 national curriculum and 2016 assessment framework. The Maths Mastery approach is seen as favourable to this end.

In discussions of the need for a new approach to teaching maths, school leaders explore texts published by the NCETM in which the standard of ‘working at greater depth’ is linked directly to the Maths Mastery approach. The NCETM course description in **Figure 10**, for example, details a planning project attended by Laurie in September 2017 which focused on planning maths using Maths Mastery with the goal of developing opportunities for all students to be ‘working at greater depth’.

Planning for greater depth (Primary teaching for mastery focused issue)	This project will consider how teachers can provide opportunities for all children to work at a 'greater depth' within the teaching for mastery context. Work Groups will focus on developing teachers' understanding of how to facilitate activities and questions to ensure that there is sufficient challenge for children when they are ready for it.
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Figure 10: NCETM course description for an NCETM planning project attended by Laurie, now maths subject leader, in 2017, accessed from the NCETM website, June 2018

Links between Maths Mastery and the 2016 Assessment Framework standard of 'working at greater depth' become increasingly synonymous through connections that school leaders make between Maths Mastery documents and the *assemblage* of government texts already acting with authoritative agency in the network. A clear example of this is the writing of the School Development Plan (SDP). In September 2017 (the beginning of the academic year in which I join the school for fieldwork), leaders rewrite the school's SDP (a working document in which school leaders set out plans for school improvement for the academic year). They include a heavy focus on changing classroom practices for the teaching of maths. Laurie, a maths subject leader at the school, shares the plan as it stood in September 2017 with me:

Vision: For all children to be able to access an engaging, coherent and challenging journey through maths with the belief that all students can achieve an in-depth understanding.

Mission: Whole school agreement on what the teaching for mastery approach will look like and develop thoroughly for [name of school]. [Extract from school development plan, written in September 2017]

Leaders note that 'depth' is the vision (the aim) whilst the Maths Mastery approach is the mission (the action to achieve the vision). Next to the vision and mission are written specific actions for all teachers in the school involved in Phases One and Two of the Maths Mastery

roll-out (see Chapter 5.5) to carry out. In these actions, the leaders creating the document continue to treat Maths Mastery and ‘working at greater depth’ as synonymous:

Action: CPD [continuing professional development] on Greater Depth understanding and development of a ‘Mastery Toolkit’ for staff to use to promote GD [Greater Depth] throughout lessons.

Action: Set out expectations of Mastery lessons e.g. structure, whole-class (Y1-Y5 from 2018-19), active feedback, opportunities for GD [Greater Depth]. [Extract from school development plan, written in 2017, active at time of fieldwork]

Explicit links are forged between Maths Mastery and the Assessment Framework. These links are continually reinforced 8 months on from the writing of the school development plan, when I join the school. During fieldwork, Highland School is in a period of intensive training around the approach. I join staff meetings in which leaders of the change of teaching approach – Laurie, Frances, Charlie and Joss – train teachers throughout the school in different aspects of Maths Mastery. Meetings early in the school term (April 2018) are focused around introducing (Phase 3)/ reminding (Phase 2) teachers (according to the phase of roll-out they are in) to/of the benefits and value of the Maths Mastery approach:

I join all teachers in the school in a staff meeting about an approach to teaching maths that the school is introducing. We all sit in a Year 6 classroom, gathered at tables facing the interactive whiteboard, on which is displayed a slide presentation. Frances, a year group leader, stands by the board and delivers the training to the group. He clicks onto a slide [see Figure 11] which contains quotes from the school development plan. [Staff meeting, fieldnote, April 25th, 2018]

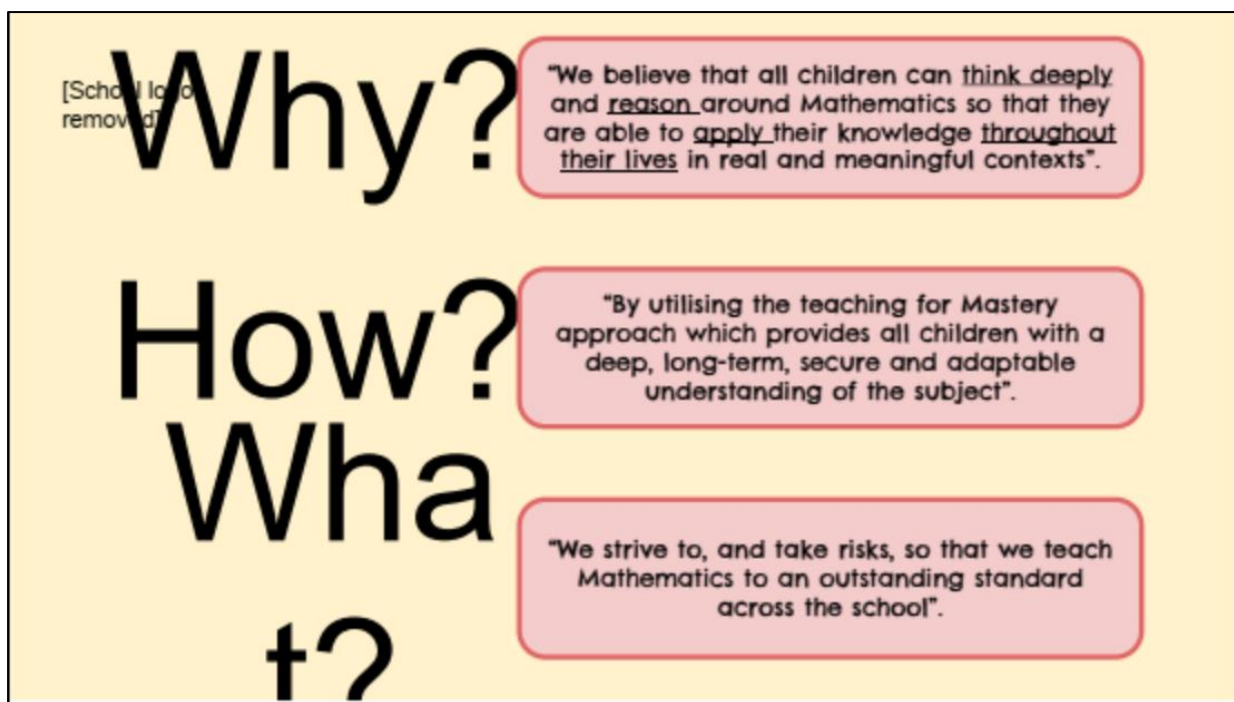


Figure 11: Slide that Frances, a year group leader helping to lead the introduction of Maths Mastery, talks through in a staff meeting in April 2018

Frances introduces the value and benefits of Maths Mastery into the staff meeting using this slide. On the slide are selected quotes from the school development plan. Frances talks through each quote, using them to address ‘why’ the approach is useful, ‘how’ it should be approached and ‘what’ is its purpose. These quotes echo the language of several other texts. When I ask him about the slide after the staff meeting, he tells me that the parts of the development plan he used on this slide draw on the Assessment Framework (references associated with ‘working at greater depth’), Maths Mastery explanations from various NCETM documents, the 2014 National Curriculum document (the ‘reasoning’ requirements) and OfSTED terminology (the highest ‘outstanding’ OfSTED grading). These links between Maths Mastery texts and government curriculum and assessment texts are represented and reified within the presentation slides created to communicate the value of Maths Mastery to other teachers.

From an ANT perspective, we can see that leaders expand the *node* in the network made up of government texts (Latour, 2005), adding Maths Mastery to it through further *intertextuality* (Barton, 2007). The intertextual node expands, represented within the new texts that leaders create to promote the approach. These documents and the ideas they contain are so often associated with one another that the links leaders have forged between them strengthen. They become synonymous, acting as a unit, so that people at Highland School begin to naturally connect Maths Mastery with core content from government texts, with the ‘working at greater depth’ descriptor of the Assessment Framework and with the areas of problem-solving and reasoning from the 2014 National Curriculum:

‘Teaching for Mastery is teaching for depth, all of that problem-solving’ [Interview with Joss, June 21st, 2018]

This expanded intertextual node frames the problematisation of current practices and reifies the idea of Maths Mastery as a way to achieve desired practices, reinforcing the need for change.

6.8 Resistance to problematisation and change

At the time of deciding to introduce Maths Mastery pedagogy into the network of classroom practices, not every teacher is initially convinced of the need for change:

‘Anyone who sits there and just follows the pattern and doesn’t challenge things and doesn’t try and make change their own, for priorities they see as important, isn’t, I think, doing their job properly as a teacher. If you’re not looking... if you’re bending to things when you don’t passionately believe in them... you just need to stop and do

something about them [your priorities]. That's what I was like.' [Laurie, maths subject leader, interview, June 7th, 2018]

In interview, Laurie reflects on his initial reactions between 2016-2017, as a teacher involved in discussions around adopting Maths Mastery. At that time, Laurie tells me, he attended meetings as an interested teacher: he was not yet the maths subject leader for the school. For him, he reflects, there was not a perceived a need for change to current practices in the teaching of maths. However, by the time of fieldwork, in April 2018, Laurie is one of the core advocates for the approach. I ask him about the change in his perspective. In response he fetches a TRG reflection booklet identical to that of Charlie, above. As part of the exploratory stage of interested teachers finding out about the approach from September 2016-July 2017 (see timeline extract in **Table 8**), Laurie attended a Teacher Research group (TRG), run by the NCETM. During these training events, Laurie, like Charlie, kept a reflective journal, designed by the NCETM. Flicking through the pages, Laurie talks me through his notes from a maths lesson he observed in the host school of one TRG meeting:

'Maths Mastery: it's effective because of a shift away from looking for the right answer, to exploring why an answer is the answer, exploring the Maths behind it and really understanding it. Some of the more articulate students said that it was like now they don't have to just get the answer – that's not the important part. The important part is now showing how you got there, how you thought about it. That's what they said. I liked that feedback from them. Teaching Mastery is all about teaching thinking. You're teaching them to think through the journey of Maths, the process, and explain their thinking and challenge their thinking.' [Laurie, maths subject leader, interview, June 7th, 2018]

For Laurie, the early exploration phase of the change was key to overcoming his initial resistance to the change. It was during this time, he reflects, that he got to see for himself the differences that employing Maths Mastery could make. In making these reflections, Laurie draws my attention to notes in the booklet. He particularly draws my attention to differences he noted in the ways that students responded to approach – their reflections – and the approach’s focus on developing ‘thinking’. The impact of his involvement in the TRG centres around the effects he saw and noted in students’ learning as they interacted with Maths Mastery materials. His buy-in and reflection on his buy-in are mediated by the teaching materials he observed in usage in 2016-2017 and his interactions with the reflection booklet. Laurie expands on his explanation of his gradual shift in perception of Maths Mastery. He tells me that he saw further encouraging outcomes of using Maths Mastery in his own classroom:

‘Children were soon able, in an ‘area’ topic, to achieve the Year Four objective and then move on to the Year Five objective in a natural extension, brought on by asking, for example, ‘How could we work out the area?’ and ‘What is area?’. They tried this out as the counting of squares within a shape, but then one student noticed, when they were asked to explain and offer a different way of doing this, like we do in Maths Mastery, that one side multiplied by another made the answer. They found it out for themselves, which is so powerful. The class then tried this out on different shapes, testing the theory, and checked the answers by counting squares. The next question was ‘Have we spotted a pattern?’ which again goes into Year Five objectives, but naturally and not in a planned way. They could go further with their skills, think better, than they had before. That was really powerful for me.’ [Laurie, maths subject leader, interview, June 7th, 2018]

In exploring Maths Mastery, Laurie repeatedly interacted with Maths Mastery documents, using them as a lens through which to view students' abilities to complete the task and makes before/after comparisons. This process results in a sense that Laurie has completely bought into the approach. At the end of a staff meeting which I observe him jointly leading with Frances early in fieldwork, he addresses the other teachers in the school:

Laurie sums up the staff meeting to the assembled teachers. 'This isn't just an idealistic approach, this is what's best for our kids.' [Laurie, maths subject leader, fieldnote, May 9th, 2018]

For Laurie, the school's period of exploration, where teachers and school leaders actively engage with the Maths Mastery resources, observe them in usage and try them out in their classrooms, reflecting on these through texts designed for the purpose, convinces Laurie of the benefits of the approach. Resistance to problematisation of existing practices and the establishment of a need for change is thus overcome through associations forged between textual and human actors, reinforcing notions of texts as key mediating technologies in actor-networks (Latour, 1999) and particularly in the case of education reform (Nespor, 2002; Nichols, 2006).

6.9 Conclusion to Chapter 6

In this chapter I have described how the *problematisation* of previous practices for the teaching of mathematics occurs during *literacy events* in which Highland School's leaders centralise and process a suite of government documents. Through examination of the *literacy practices* within literacy events surround teachers' classroom practices, an *assemblage* of government policy texts is seen to have authoritative agency in the establishment of teachers' practices in Highland School. This *assemblage* is established as an *obligatory passage point*

in the actor-network, through a combination of *intertextuality* and the reification of the *assemblage*'s sense of authority by school leaders' and teachers' *matter-of-fact* treatment of these texts. Thus, the *intertextual assemblage* becomes an authoritative *node* in network through which previous classroom practices for the teaching of maths are problematised; they are viewed through the lens of the revised assessment, curriculum and progress data texts and found in need of change.

Following this problematisation of a need for change, this chapter has described the initial explorative treatment of Maths Mastery as a potential solution to the problem, through multiple *textually mediated* encounters with Maths Mastery texts by school leaders and teachers. During this period, the approach is established as the method to be adopted through leader/teacher actors' multiple encounters with a suite of texts replicating a version of Maths Mastery iterated by the NCETM. These texts are positioned by school leaders and teachers leading the implementation of the approach as an expansion of an already authoritative *intertextual assemblage* of government texts.

In the next chapter, I describe how associations between actors weaken links between existing ideas around teachers' classroom practices and strengthen links between teachers' classroom practices and the Maths Mastery approach.

7. *Interessement*: In establishing this change, how are teachers' ties to existing practices weakened and ties to the new approach formed and strengthened?

7.1 Introduction to the chapter

In the previous chapter, I described the *problematization* of existing practices for the teaching of mathematics in Highland School and how Maths Mastery is positioned as a 'solution' to an identified need for change. In this chapter, I delve deeper into moments, briefly mentioned in Chapter 6, where the reorganising of the actor-network of classroom practices into the Maths Mastery approach becomes visible. I detail how texts and people champion the approach in further *literacy events* aimed at training in-school 'experts' in Maths Mastery. I describe how associations of actors within these events weaken links between existing actors and strengthen links to Maths Mastery actors, linking to Callon's (1986) second moment of translation: *interessement*. This addresses the research sub-question: *In establishing this change, how are teachers' ties to existing practices weakened and ties to the new approach formed and strengthened?*

7.2 Setting the scene for describing *interessement*

In answering the second research sub-question, I describe parts of the actor-network where the weakening/strengthening of ties to existing/new practices become visible. Particularly, I draw on *literacy events* in which certain school leaders and teachers (Joss, Frances, Laurie and Charlie) tasked with leading the introduction of Maths Mastery receive textually mediated training in the approach (see **Table 11**).

Table 11: Maths Mastery training drawn upon in this chapter

Training	Provider	Date observed	People trained
NCETM Maths Mastery Specialist training Sept 2017- June 2018	NCETM	June 5th 2018	Laurie
Maths Hubs for Early Years teachers	NCETM	May 1 st 2018	Joss
TRG meeting	NCETM	May 2 nd 2018	Laurie, Frances, Charlie

From an ANT perspective, shifts in allegiance are not viewed as a short-term or one-off act, but rather as an ongoing process throughout the establishment of a change in the actor-network (Callon, 1984). In this light, whilst these people have already been involved in exploring Maths Mastery from October 2016, establishment of their affiliation to the new approach is seen as ongoing at the time of fieldwork. This is particularly the case as their training continues at the same time as they begin to ‘pass on’ training already received to other teachers in the school. Thus, in answering my second research sub-question, I draw together documentary, observational and interview data from moments throughout fieldwork where development of these participants’ allegiance to Maths Mastery is foregrounded. I particularly draw on data from *literacy events* where the juxtaposition of old and new practices is made visible in the activity of the actor-network. Through these events, I speak to how associations between material and human actors destabilise teachers’ pre-existing practices and reify Maths Mastery as the desired basis for teachers’ classroom practices.

7.3 Maths Mastery ‘specialist’ training is textually mediated training

In September 2017, Wallace, a senior leader at the school, signs Laurie, now the school’s maths subject leader, up to a National Centre for Excellence in the Teaching of Mathematics

(NCETM) training course which will train him to become a certified specialist in Maths Mastery teaching. Laurie tells me that he volunteered for this course when Wallace nominated him as maths subject leader when the previous maths leader left the school. Mastery Specialists spearhead the NCETM Teaching for Mastery Programme across the country (Blausten et al., 2020). Teachers who train as Mastery Specialists are given a year's intensive training in the principles of teaching for mastery, as well as in skills relating to professional development leadership. In the following year, they further develop teaching for mastery in their own schools and share the approach with neighbouring schools by leading Teaching for Mastery training sessions such as Teacher Research Groups (TRGs). Laurie began this training in September 2017 and has attended three of four training days by the time fieldwork begins.

Training sessions are run by teachers considered to be expert in the approach by merit of their own training with the NCETM; they have achieved Mastery Specialist status and have developed the approach within their schools. In this sense, the training forms a self-sustaining, self-reinforcing training structure; the Maths Mastery approach is passed on from teacher to teacher. In interview, Toni, a Maths Mastery Specialist who delivers NCETM specialist training and runs TRGs, tells me about this structure:

'So we had this great training and then I supported our Year 1 teacher in implementing it and I thought it was really good. Alongside that – the training – were just opportunities coming up with the Maths Hub...I had another member of staff in school who was developing it as well and we were rolling it out in school in terms of 'what is Mastery?'. That dialogue was going on. And so then we worked with another 5 schools while we were still training to say 'Let's work together and further our understanding'. The second year, we had a group of 6 schools. Once we were trained,

every term we did Teacher Research Groups and now run these Specialist courses too. [Toni, Maths Mastery Specialist, interview, June 18th, 2018]

Toni points out that the way in which the training is structured foregrounds a system of teachers learning from other teachers. This system affords potential for actors which constitute NCETM training – texts, people, resources, websites, and so on – to expand throughout the network exponentially, as more and more teachers become involved in ‘passing on’ the approach.

Communication of the approach is centred around textual materials, which set out the approach in written form. One example of these is textbooks:

‘They [the NCETM] said ‘We’re looking for two schools to trial these Maths textbooks in your area’, of which I thought, I’m not a fan of textbooks, because I think you need to understand a lot more. But I thought, if this is the way we’re going, I’d like to be involved. Actually it was something very different to textbooks that we’d seen before. The quality of training was high. I went as Maths subject leader with our Year 1 teacher – and it was really fantastic training. Training and resources. But it was more about understanding pedagogy; lots of talking about learning possible through the books than the books themselves, really.’ [Toni, Maths Mastery Specialist, interview, June 18th, 2018]

Textbooks form a large part of NCETM Maths Mastery training (Blausten et al., 2020), with Maths Mastery textbooks such as a series entitled ‘Maths No Problem!’ designed specifically to map Asian approaches to Maths Mastery onto the 2014 National Curriculum for schools in England (this is discussed further in section 7.4). Foregrounding Maths Mastery textbooks in discussions of practice is not an automatic and immediately accepted activity for Toni. She

had to learn how to engage in a new *literacy practice*: to engage with discussions of pedagogy mediated by Maths Mastery textbooks.

The courses Toni now runs continue these textually mediated literacy practices, centralising in professional discussions not only textbooks, but many other kinds of texts: presentation slides, journal articles, handouts, audit tools, and so on.

7.4 Global domain texts iterate and reiterate the Maths Mastery approach

NCETM training can be seen as a series of *literacy events*, in which teachers' meaning-making around Maths Mastery centred around discussions mediated by global domain texts: texts circulated (in a geographical sense) nationally. To best describe the lived experience of the four-day Maths Mastery Specialist training that Laurie attends, I draw in detail on an example from June 2018. This is a necessary jump forwards in time: the first three days of training occur before the time of fieldwork, however on 5th June 2018 I join Laurie on his final day of training as an NCETM Maths Mastery Specialist.

It is a warm day and the car park of the secondary school hosting the training is full to the brim. Laurie has given me a lift to the training day and we have chatted about maths and the training along the way. He has prepared me for the format of the training as every day of the four day course has followed the same structure so far: NCETM-trained 'experts' run four sessions within the day. Each session is centred around presentation slides, projected onto a large screen at the front of the room and available in handout copy on tables. Sessions begin with course trainers explaining a Maths Mastery concept, then delegates are given table discussion tasks using handouts and resources to explore each concept.

As we walk in to the final training day of Laurie's Maths Mastery Specialist training programme, several other attendees have already arrived and sit dotted around at circular tables kitted out with course handouts, paper notepads, pencils and water. A large screen at the front of the room displays a slide deck with the title of the course, corresponding to a handout version of the slides on the delegates' tables. Toni's table at the front of the room contains a variety of Maths Mastery textbooks and other reference texts. [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

In descriptions of an actor-network there is *only* the local (Latour, 2005), as ANT eschews clear distinctions between macro and micro segmentation of society. However, we may speak to actors which traverse national/international geographic spaces as *global domain* actors, or those which are created and used locally as *local domain* actors (Clarke, 2002). Toni bases the training on Maths Mastery texts which are published and promoted nationally or internationally: textbooks, NCETM classroom resources, journal articles. These are *global domain texts*, in the sense of their geographical expanse of circulation.

Global-domain texts iterate key concepts underpinning the Maths Mastery approach. Toni, for example, uses a series of textbooks called 'Maths – No Problem!'. These books are published nationally and are available internationally through the company's website and other online retailers. On the textbook publishers' website the textbooks are advertised as:

developed by top authors and advisers in the field and backed by decades of research, [the series] has everything you need to successfully teach mathematics using the mastery approach. [extract from www.mathsnoproblem.com, accessed June 5th, 2018]

The textbooks contain explanations and mathematical exercises relating to each aspect of Maths Mastery, portable to different contexts. These textbooks, for example, are present in all

team planning meetings focused around classroom practices for maths in Highland School (see for example a year group planning session described in Chapter 8.7). In their immutability and portability, these texts facilitate the representation of key ideas from the global idea of Maths Mastery (as determined by the NCETM and other national publishers/researchers/ policy-makers of the approach), within a variety of meetings and training sessions run by different NCETM specialist teachers. In this way, the influence of the Maths Mastery approach continues at a distance from its creators (Hamilton, 2009).

Intertextual links within global domain texts increase the visibility of Maths Mastery concepts within training events. Global domain texts not only iterate Maths Mastery concepts in a portable, stable mode of communication, but also reiterate the same content across different texts. One example of this is multi-text reiteration of a central concept to the Maths Mastery approach: its ‘5 Big Ideas’ (for full explanation, see Chapter 5.3). The 5 Big Ideas set out five pedagogical ideas which teachers should employ in their teaching using this approach (variation, fluency, mathematical thinking, structure and representation, coherence). This concept forms a central part of Maths Mastery Specialist training (Blausten et al., 2020) and is included in the same pictorial form in several global domain texts. On the fourth and final day of Laurie’s ‘Specialist’ training, the first of the morning sessions has been underway for half an hour. I sit with Laurie at a table with other delegates, who are engaged in discussion each school’s development of Maths Mastery:

*Laurie explains to the three teachers from other schools at the table that Highland School is focusing on developing ‘variation’ and ‘fluency’. Toni, who is leading this training discussion, comes to the table and joins the conversation. She reminds delegates of the resources available around the ‘5 Big Ideas’ on the NCETM website. Laurie and the others get out computer/phones, go onto the website and find a diagram called ‘Teaching for Mastery’ published there [see **Figure 12**]. They begin*

to talk about the skills that make up 'variation' and 'fluency' and how they are approaching these with teachers in their schools.' [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 2018]

The website that trainee specialists look up contains a diagram which represents the 5 Big Ideas (see **Figure 12**) and an associated explanation:

A central component in the NCETM/Maths Hubs programmes to develop Mastery Specialists has been discussion of Five Big Ideas, drawn from research evidence, underpinning teaching for mastery. The diagram below is used to help bind these ideas together. [Extract from NCETM website <https://www.ncetm.org.uk/>, accessed June 5th, 2018]

As the teachers at the table continue to talk about these 5 mathematical concepts, they point at the website diagram on their phones and laptops. Laurie gets a folder out of his bag which contains presentation slides and handouts from previous days of the course and flicks through to find further identical representations, which he has annotated with notes. In the folder too is his TRG reflection booklet, which also contains the same visual representation (see **Figure 13**). This replication can be seen as a further form of *intertextuality* within the actor-network (Street, 1982); different texts contain, in part, identical content, unifying the suite of texts representing the NCETM version of Maths Mastery. This form of intertextuality affords potential for core elements of the Maths Mastery approach to gain greater visibility and associative agency within the network; they are reiterated multiple times in multiple textual actors, increasing the possibility of encounter with other actors in the network.

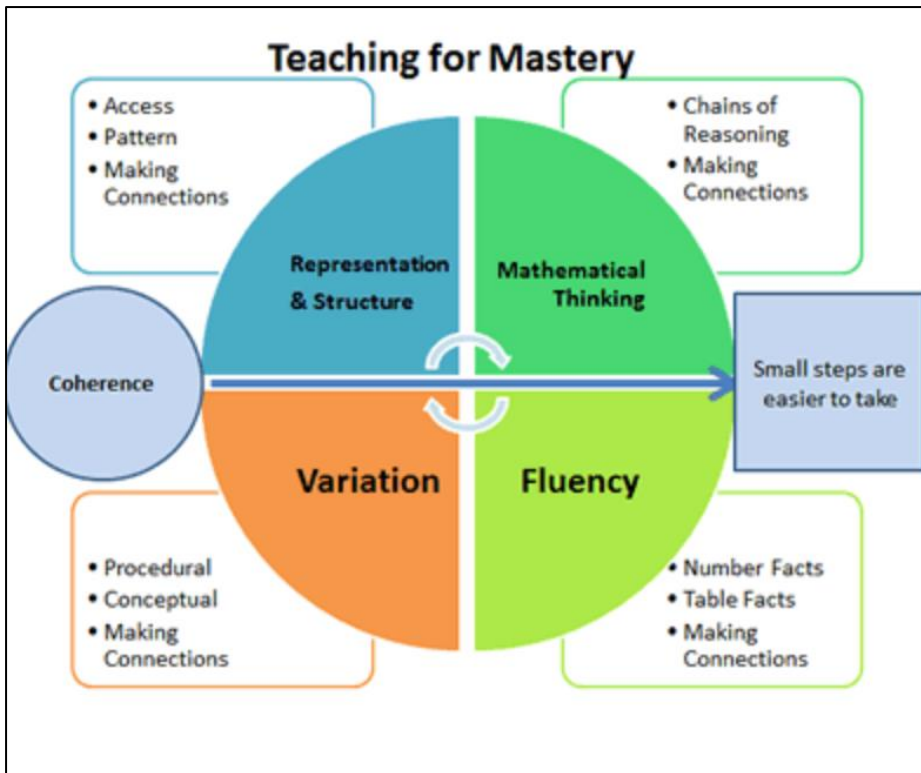


Figure 12: Diagram published on NCETM website setting out 5 Big Ideas for teaching using the Maths Mastery approach, accessed June 5th, 2018.



Figure 13: Extract from a page in the TRG reflection booklet.

7.5 Localised versions of global domain texts mediate destabilisation of delegates’ allegiance with current practices

Course trainers also draw on localised versions of global domain texts in delivering training. These texts are created by Toni specifically for usage on training: presentation slides, handouts and activity resources. In creating these texts, course leaders select parts of global texts for discussion:

'...we were given those [the presentation slides, by the NCETM], but we use them with the understanding that you can do what you like with them, within reason. So we have adapted them, chosen a focus.' [Toni, Maths Mastery Specialist, interview, June 18th, 2018]

Toni makes choices around the elements of the Maths Mastery texts she feels are worth focusing on in the training programme:

'Every year we put new things to focus on in because new priorities come up. Even this year, we have our Maths Hub conference and the Director of Primary for NCETM came to speak about some of the successes that are being seen now in schools taking on board Maths Mastery. We thought: that's really important to put in this year, on our first session, because a lot of people have got a greater understanding of what Mastery is and some of what was needed when we first did the course; there's a lot of people who are a little bit further on their journey now, so we don't need that. We need to focus on different aspects of the approach instead. So the training slides – the presentation does need to keep evolving and kind of changing.'
[Toni, Maths Mastery Specialist, interview, June 18th, 2018]

In so doing, Toni performs *localising moves* on the content of global texts (Hamilton, 2011), not by changing the selected content – which is often directly quoted – but by embedding selected content in contexts drawn from priorities emerging from local school and delegate

needs; knowledge of delegates' prior learning, for example, and schools' journeys along the way to adopting the Maths Mastery approach.

Through localisation of global content, Toni imbues the Maths Mastery approach, as reified within the local texts, with power/authority by linking it to identified local needs:

In a break from the training sessions on Day 4 of Laurie's Maths Specialist training day, Laurie talks to the other teachers on our table, who are from a school who have just joined the Maths Hub that Laurie attends. They are not part of the MAT and they ask Laurie to explain how the TRGs work as they are not yet part of these. Laurie explains that they are 'organic', deriving their focuses from the needs of the teachers in the TRG, identified together with the TRG leaders: people who have completed the specialist course and are acting as Maths specialists within the Hub. Toni has come over to the table and is listening to Laurie's explanation. She points out how useful the approach that Laurie is explaining is to developing the Mastery approach, as each TRG can focus on elements of the approach which are most pertinent to the schools taking part. Toni points out that teachers running the sessions have been on local courses such as this one they are attending today, who understand local needs and can support teachers in the TRG to find the right resources for developing the group's thinking. She says, 'For example, we have been in schools and noticed that we could do with some work on teaching fractions using Mastery, so we will be going through that with you today.' [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Relevance of the approach to perceived local issues (in delegates' schools) is communicated through the localisation of global domain texts. Toni structures presentation slides, for example, around a perceived local need to focus on the teaching of fractions (see **Figure 14**).

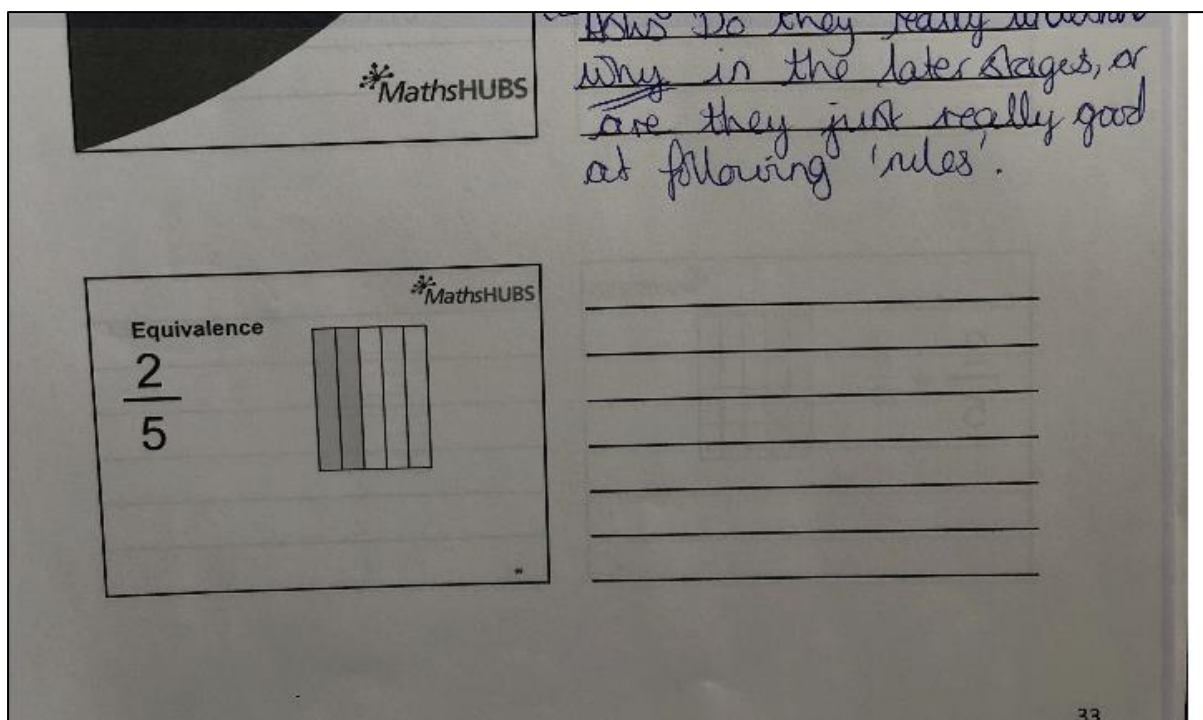


Figure 14: Example presentation slide handout from Maths Mastery specialist training day, focused on fractions, June 5th, 2018

Localised texts also contain associations between existing and new actors in the network which juxtapose existing classroom practices with the Maths Mastery approach in a way that paints the former in a negative light and Maths Mastery practices in a positive light.

Presentation slides on Toni's Specialist training course include examples of existing practices, juxtaposed with further slides detailing the Maths Mastery way of thinking about different mathematical concepts. Slides presenting existing classroom practices often hold these up for examination through a humorous light using exaggerations of practices. For example, popular existing ways to teach calculations are highlighted (see **Figure 15**).

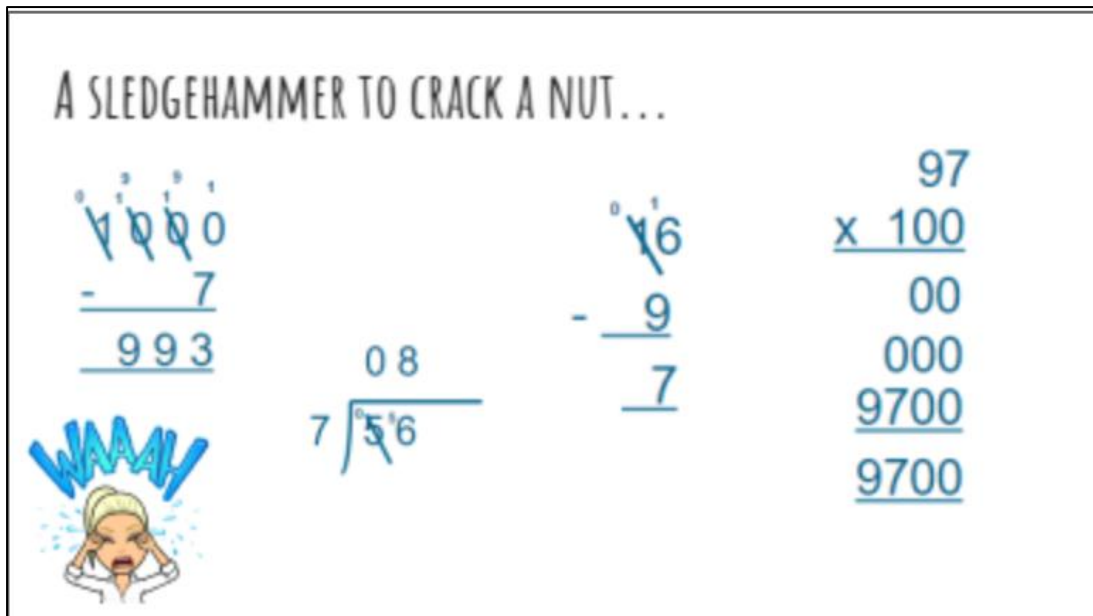


Figure 15: Presentation slide created by NCETM Maths Mastery Specialist Toni, Maths Mastery Specialist training course, June 5th, 2018

In response to this slide, delegates laugh and make jokes about how they feel like the graphic of the teacher crying. The slide highlights faults in current practices, through a ‘discourse of derision’ (Ball, 1990, p.18). The texts highlight faults in a previous system, weakening teachers’ ties to current practices, whilst the new system is praised (Hamilton, 2011). Subsequent slides contain Maths Mastery rationale for a different approach to teaching mathematical concepts such as calculative concepts (see **Figure 16**).

CPA - OVERVIEW

- Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths.
- Developed by American psychologist, Jerome Bruner.
- A gradual and systematic approach which builds on a child's existing understanding
- Effective and more efficient way of teaching abstract concepts
- Provides children with a conceptual understanding of maths.

Figure 16: Presentation slide created by Maths Mastery Specialist Toni, Maths Mastery Specialist training course, June 2018

Derision has been replaced by positivity and theoretical detail. These slides detail theoretical bases of elements of the Maths Mastery approach to calculations and praise, through positive language; the approaches to which the delegates are introduced are presented as 'effective', 'more efficient', 'gradual and systematic'. Power inequalities in the network are enacted through the presentation slides. The 'old system' cannot answer back; it is marginalised through derision and through the dominance of the discourse of Maths Mastery and the way it is positioned in a positive light.

As Maths Mastery pedagogy gains authoritative power in training courses, delegates begin to reframe their thinking around maths pedagogy, drawing frequent comparisons between old/new ideas:

Delegates offer common misconceptions that they are aware of in each topic, drawing on personal experiences in the classroom, the marking of books, test results analysis.

Some reflect on what they have done in the past in that they have recognised

misconceptions but have not focused, as they intend to do now, on adding in the understanding behind these misconceptions. [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

These interactions involve deliberate efforts on the part of delegates to change their current thinking about the teaching of maths to the Mastery approach:

As Laurie works to understand a concept, he makes notes on the slide deck handout and refers back to previous slides, to the provided textbook and an article recommended for pre-reading by the course leaders before coming to the final day of training. He says to me, 'I need to get my head around this, change my own thinking.'
[NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Laurie, and other teachers in the room, use localised texts to actively work to destabilise their own ties with current practices and strengthen their ties to the practices of the Mastery approach. In so doing, localised versions of global domain texts further instigate *interference* within the actor-network (Latour, 1999), bringing the goals of actors in the network in line with the Maths Mastery approach.

Interessement is thus partly established through localised versions of global domain texts (Hamilton, 2011). In this is reflected the kind of shaping of local meaning generation by “global forces” that ethnographers of literacy as a social practice have highlighted (Pahl & Rowsell, 2006, p. 11). Information, priorities and ideas (about practice) which circulate in geographically expansive ways – nationally, internationally – are seen to enter into ‘local’ networks (of practice) such as a school’s classroom practices (Nichols, 2006).

7.6 NCETM ‘experts’ sponsor certain literacy practices

Textual immutable mobiles may travel well within a network, but they need someone to speak for them to activate their influence (Law, 1994). In NCETM training events, ‘experts’ running each course are *literacy sponsors*: they champion certain *literacy practices* through which teacher delegates make meaning in relation Maths Mastery texts (Barton, 2007).

Textually mediated destabilisation of ‘old’ practices is facilitated by course leaders who guide delegates into certain *literacy practices* at each training event. This is largely achieved through trainers modelling juxtaposition of old and new practices in response to localised texts:

When asked to respond to a slide detailing negative examples of SATs preparation in schools, delegates contribute thoughts and their own practical experiences of the SATs, drawing on how they ‘used to teach’ and what they see in other people’s classrooms as well as what they now do and what they now they are using Maths Mastery practices. [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Through texts centralised to the discussion, course leaders guide teachers to see existing practices through the lens of desired Mastery practices.

A further *literacy practice* with which course trainers destabilise teachers’ affiliation with ‘old’ practices involves the structuring of pedagogical discussions around practical tasks.

These tasks involve in-depth reading and response to a Maths Mastery text often involving small group discussions between delegates and writing on an individual copy of the text. In an afternoon session during Laurie’s Maths Specialist training, Laurie and other delegates are set tasks such as: solving problems contained within a *global domain* Maths Mastery textbook; evaluating and annotating an example *local-domain* Maths Mastery lesson plan;

and making notes on handout copies of *local-domain* training presentation slides. In an interview two weeks after the course, Toni tells me how this process of working through example materials is one that she went through herself as part of her own school's efforts to take on board the new approach:

'After the Shanghai teachers visited, at my school we all sat down and discussed and really thought about the understanding behind concepts and how to achieve this with students. We read the example materials and tried things out and watched the NCETM videos to help and discussed these.' [Interview, Toni, NCETM Maths Mastery Specialist, June 18th, 2018]

Toni continues, explaining the aim of these tasks:

'We like to get people thinking about what these materials are saying. Get them to realize that here's really one concept that comes from the wider objective and this is all small steps, the variation, some models and images; here's your stem sentences. So it's not a lesson plan, but it's really upskilling teachers, through the stuff we get them talking about. So it's trying to upskill people so they read the materials and they think 'Oh, right, I understand now, why that's important to teach, or why I should teach that before I should teach something else'.' [Interview, Toni, NCETM Maths Mastery Specialist, June 18th, 2018]

Through these tasks course leaders hope to influence teachers' thinking around the approach; how the different elements fit together, how teachers should understand different parts of the approach and the benefits of the approach.

To achieve these aims of the practical tasks, Toni shows delegates how to achieve certain *literacy practices*. Before each task, course leaders guide delegates' thinking and discussions, through modelling and questioning:

Toni shows delegates how to represent the fractional concepts in different visual ways, talking through an entire example lesson using a slide deck and pointing out the required thinking expected at each stage. Delegates are given opportunities to try parts of the lesson out as if they were the students, working through example problems. Toni and her training colleague point out different things about the approach as the delegates work: they discuss key required thinking in order to work out the problem in a textbook, for example. [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Delegates are shown how to engage with, and think about, the content of different texts, before they have a go themselves. Toni guides delegates' interactions with the Maths Mastery materials, using the texts to highlight various aspects of the approach and making direct comparisons to current practices:

Toni, running the session, models how to teach a concept using the Maths Mastery approach. She says out loud: 'I really have to train myself to do this,' as she models a concept again, writing on a whiteboard. She repeatedly phrases her explanations as: 'I used to.... And now I insist on.... That has made a difference to the children's understanding.' [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Here, Toni models a way of engaging with Mastery texts which is based in making comparisons, between 'old' and 'new' ways of teaching and thinking about the teaching of maths. Course leaders also highlight positive elements of the Maths Mastery approach by asking questions around the benefits of that which they are modelling:

Delegates work through the new practice as set out in the slide decks, articles and textbooks provided on tables (all centred around the mastery approach). As they work

through the practical tasks, Toni and her colleague continually ask teachers to reflect on how this compares to how they currently teach and ask questions incorporating the language of the Maths Mastery approach: 'Can you see how this achieves variation? How do you think this helps children in their thinking?' [NCETM Day 4 of 4 Maths Mastery Specialist training day, fieldnote, June 5th, 2018]

Toni guides delegates in finding the benefits of the Maths Mastery approach; how the Mastery teaching strategies they are exploring can assist them in helping students to 'achieve' an aspect of the approach or 'helps children in their thinking'. Course leaders thus act as facilitators of the mediating influence of the Maths Mastery texts, guiding delegates into a positive positioning of Maths Mastery in relation to their classroom practices.

The efforts of course leaders to destabilise previous approaches to the teaching of mathematics in favour of the Mastery approach is key to the change to the existing actor-network. The existing network of classroom practices of Highland School's teachers is likely to already be constituted by associations involving other, potentially competing, priorities and problematisations (Callon, 1986): a different way of teaching maths, or a perspective on teaching which challenges the assumptions made in the Mastery approach.

The process of *interessement*, then, becomes one of building 'devices which can be placed between them and all other entities who want to define their identities otherwise' (Callon, 1986, p.208). In this case, these devices can be seen as localised versions of global domain texts and facilitated *literacy practices*, which guide delegates towards the Maths Mastery approach and away from current practices. The process of learning how to be an in-school specialist involves and also requires specific associations between texts and people: *literacy practices*, found within *literacy events* (Heath, 1982). It is through associations between people and texts that network activity strengthens its constituent actors' links to Maths

Mastery and weakens links to current practices. We can thus see how effects of power are created in the network (Nespor, 2002); how Maths Mastery gains purchase and begins to reconfigure the network of teachers' classroom practices.

7.7 Associations between texts and specialist trainees strengthen elements of the new approach within the actor-network

As ties with existing classroom practices are weakened, teachers who are training as Highland School's Maths Mastery specialists make choices around elements of the approach their school will focus on. During this selection, certain texts limit and direct the agency of the teachers making these selections, effecting a simultaneous narrowing and expansion of the actor-network.

To describe this, I move from an example of Laurie's ongoing Specialist training (begun in September 2017 and observed in June 2018), to a Maths Hub meeting in early May 2018. In a Maths Hub meeting on 1st May 2018, Joss, a senior leader at Highland School, is receiving training for using Maths Mastery in the Early Years Foundation Stage (EYFS). As the course progresses, Joss makes decisions around changes to current practices needed in the EYFS:

I am in the meeting room adjacent to the staff room, sitting in on a maths training morning. The day is a sunny one and the patio windows to the balcony of the training room are cast open. The focus of the morning is the dissemination of training by a Maths Specialist who attended NCETM training to other Hub members. As the teacher leading the session talks through her presentation slides, she asks delegates to try out activities contained within them and respond to ideas listed on the slides. Delegates, including Joss, take notes on handouts and in notebooks. One discussion task involves delegates at each table reading an article, sharing their thoughts,

focusing at first on the activities in the article and sharing why they thought this was good practice. Tables create a mind map of the key points of the article, as requested by the trainer. Each group then uses the mind-map to discuss and make notes on how the ideas from the article could work in their own school context. They explain how they could adapt the ideas in the article to make them work in their own schools and point out the differences in each others' classes and school environments. [EYFS Maths Hub, fieldnote, May 1st, 2018]

In this case, the article provided by the teachers running the training session acts as a mediating lens through which current practices are viewed. Teachers then create their own, related texts, firstly summarising the points of the article in a mind-map, then considering these points in relation to their classroom practices in their own schools. They then create a further text, using their mind-map points to evaluate and consider how these points might play out in relation to current practices in their own school. Teachers make choices around what would work, what would be of importance, within each school, in relation to different classes and classroom environments. Joss takes this activity one step further and makes notes in a notebook (see **Figure 17**) of specific actions and changes that she intends to lead within the EYFS teaching team.

Specifically, Joss notes actions related to concepts within the Maths Mastery approach discussed in the article and through the mind-map task: 'visualising numbers in different ways' links to the 'variation' part of the approach, for example. She also notes adaptations to specific practices already in place to achieve this variation: 'change numbers on pots', for example, refers to an activity in which students interact with numbers using plant pots, already in place, which will be adapted to suit the variation element of the Maths Mastery approach. From reading, analysing, summarising, discussing, Joss makes plans for future classroom practices based on the ideas that the article has provided.

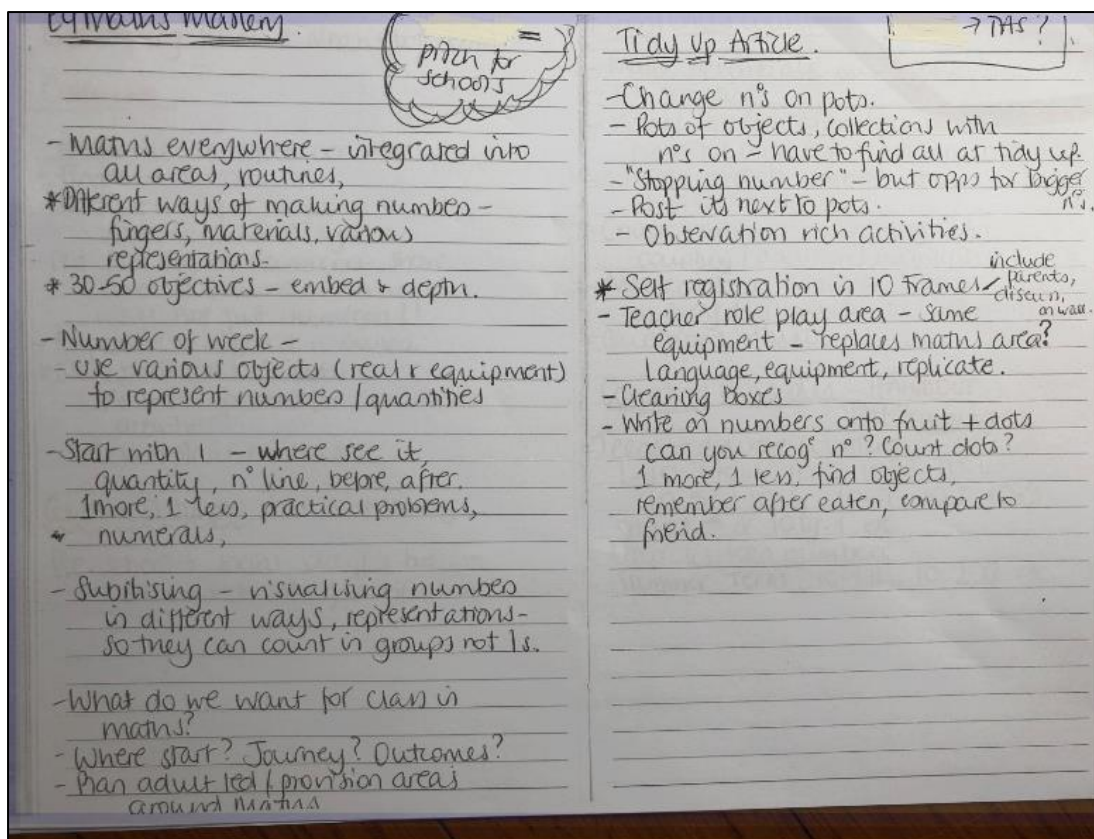


Figure 17: Extract from Joss' notebook on EYFS Maths Hub training course, May 1st, 2018.

Crucially, Joss' notes do not refer to every element in the article or discussed in the mind-mapping activity. The article she reads and discusses delineates the parameters of her note-making, from within which Joss makes choices, selecting what she feels will be useful to her class, her team. Joss' notes also contain an element of uncertainty. Some adaptations to current classroom practices for the teaching of maths recommended in the article are noted as areas for consideration: 'replaces maths area?', rather than set out as a definite action. Indeed, Joss identifies in her notes many questions for consideration around the adaptations to practice: 'What do we want for class in maths? Where start? Journey? Outcomes?'. Elements of the Maths Mastery approach are not immediately accepted into her current practices, or her team's practices through her guidance.

Deliberation and selection around aspects of Maths Mastery to take forward into teachers' classroom practices at Highland School are most apparent in instances where teachers interact with an audit tool developed by the NCETM as a resource to be used in all training scenarios. The audit tool is designed by the NCETM to support teachers in evaluating – auditing – and planning for implementation of the Maths Mastery approach. It is structured around elements of Maths Mastery that the NCETM has deemed valuable to its initial implementation. The same audit tool is used across all meetings and training sessions, an *immutable mobile* which carries NCETM choices of prioritised elements of the Maths Mastery approach into the reflective discussions of teachers and school leaders (Latour, 2005). The elements prioritised by the NCETM reflect the content of NCETM-run Mastery Specialist training courses, reinforcing the content delegates have encountered in various *literacy events*.

One instance where I observe the audit being completed is in a TRG meeting on 2nd May, attended by Laurie, Frances and Charlie. Just as the original creators of the audit tool made selections about which elements of the Maths Mastery approach to highlight and prioritise through inclusion, teachers interacting with the tool make subsequent choices and selections, noting these on the tool as areas completed or as areas of focus (see **Figure 18**).

In this audit, teachers highlight an action to be taken around the whole school area of focus of increasing the amount of students achieving the standard of 'working at Greater Depth', making links to the whole school priority which provided impetus for looking at the Maths Mastery approach. Charlie, Frances and Laurie jointly discuss the audit tool, selecting what they feel it is important for Highland School to focus on in terms of adopting Maths Mastery, whilst excluding other elements from their discussion.

Teachers have access to high quality resources to support lesson planning (e.g. text books, schemes of work)	Any print resources being used have the aim of developing teacher pedagogical subject knowledge at their heart. They are mathematically coherent, highlight common misconceptions and show clear and appropriate representations.							✓
Any comments on teaching resources:								
Lessons are crafted with care, are discussed with other teachers, and draw on evidence from observations of pupils in class.	Teachers have a clear focus on what children will learn in the lesson, not just what they will do in the lesson. As part of lesson planning, teachers reflect with colleagues on what they have noticed about children's learning in class. They talk to each other about 'key difficulty points' (areas of the topic which children tend to find challenging) and how best to present these ideas.							✓
Lesson designs set out in detail well tested methods to teach a given mathematical topic	Once teachers have identified 'key difficulty points' they plan to address these carefully in teaching. For example, they may know that children sometimes think a shape divided into 4 is always divided into quarters, and so would teach 'divided equally' and 'not divided equally' (the concept and the non-concept). They would look at images of each and identify that only those 'divided equally' into 4 are quartered.							✓
Teachers include a variety of representations need to introduce and explore a concept effectively	In the above example, teachers would explore several different ways of 'dividing equally into 4', starting with shapes (e.g. divided across, down, diagonally). They would then extend to look at equally dividing sets of objects into 4, equally dividing continuous quantities into 4 (e.g. liquid) to explore the concept in depth.							✓
Teachers set out related teacher explanations and questions to pupils	Teachers have identified what the potential misconceptions are, and carefully plan 'hinge questions' to test for these in children.							✓
Any comments on lesson design: Year One have planning spent time embedding "3 planning" & time discovering & making different representations								
Teachers are clear that their role is to teach in a precise way, which makes it possible for all pupils to engage successfully with tasks at the expected level.	Teachers use clear pre-planned language (e.g. 'this is the whole, this is the part of the whole' in a lesson on fractions), have fully thought through the models and explanations they will use, and believe that this will enable all children to develop as mathematical thinkers and so succeed.							✓
Pupils work on the same tasks and engage in common discussions.	There is little in the way of differentiation as we know it.							✓
Concepts are often explored together to make mathematical relationships explicit and strengthen pupils understanding of mathematical connectivity	For example, in lessons, the teacher and children will highlight several different approaches to solve the same calculation (e.g. $29 + 19$ could be solved by partitioning, or by $29 + 20 - 1$, or by $30 + 20 - 2$ etc) which would be discussed as a whole class. The Chinese call this 'active argument'.							✓
Precise questioning during lessons ensures that pupils develop fluent technical proficiency and think deeply about the underpinning mathematical concepts.	Teachers plan questions to build depth as well as fluency, e.g. how can we use the idea of 'some difference' in subtraction to solve $82 - 64 = 78 - \underline{\quad}$ without having to calculate that $82 - 64 = 18$							✓
Any comments on teaching methods: Year One needs more evidence to show greater depth.								

Figure 18: Extract from Charlie, Frances and Laurie's audit tool at their joint TRG meeting, May 2nd 2018

Through collective deliberation, the Highland School Mastery representatives make inclusions and exclusions through their selection of focus areas. Specifically, these teachers choose to focus on three of the NCETM's 5 Big Ideas: variation, fluency and coherence (see Chapter 5.3 for explanation). These selected areas of focus are taken back to Highland School by Charlie, Laurie, Joss and Frances. They do this in different ways:

'I'm going to discuss this with SLT.' - Frances

'I'm going to study each year group's planning tool with year group teachers and see what will work best.' - Laurie [TRG, fieldnote, May 2nd, 2018]

Charlie teaches her own class using the approach and offers guidance to others through reflections on her experiences. Frances and Laurie run staff meetings which train teachers in

the selected aspects of the approach. Laurie and Joss discuss actions planned with senior leaders of the school, feeding into school development planning.

The audit tool provides a frame for the teachers' thoughts. It is a *black boxed* representation of the NCETM version of Maths Mastery (Latour, 1999): the processes of its creation, of what has been included/ excluded from other iterations of Maths Mastery, are hidden from view at the point where Highland School teachers use it. By *black boxing* the change to Maths Mastery into short paragraphs next to evaluative statements, the audit tool provides the parameters for agency in relation to Maths Mastery, within which the trainee specialists make decisions around the new approach. The audit may thus be seen as a "a key mediating mechanism between local interactions and system goals" (Hamilton, 2009, p. 221). This mechanism effects teacher agency, remodelling it through "material arrangements, systems of measurement" (Callon and Law, 2005, p.718). The audit tool becomes an artefact at the centre of a nexus of practices. It determines the direction of the change to teachers' classroom practices.

Associations between the audit tool and selected teachers training to be in-school specialists can thus be seen as key moments in which *interessement* is established: moments in which some Maths Mastery terms of concepts (not included in or selected from the audit) are excluded from the actor-network and others are included and reified in textual (audit) form as the basis for further *literacy events* focused on developing the new pedagogical approach back in Highland School. Teacher agency during the establishment of *interessement* can thus be explicated as distributed amongst the many actors and associations which constitute it (Kamp, 2017), tied to interlinked texts and *literacy practices* which activate (elements of) these.

7.8 Champions are created for the Maths Mastery approach in Highland School

Through processes of *interesement*, network activity creates non-human and human champions for the new approach. An NCETM TRG booklet, nationally published textbooks, an NCETM audit tool, presentation slides all champion the approach as they circulate within the network. The former two of these champion an English -based version of Maths Mastery. The latter two, a localised selection (to a social group in the geographical region of Highland School) of this English -based version. The texts thus champion the approach whilst narrowing and focusing the network. Out of associations with such texts, Charlie, Laurie, Joss and Frances also become champions for Maths Mastery, and also further narrow and focus network activity; they select aspects for Highland School teachers to focus on.

A further (textual) champion of the approach is the School Development Plan (SDP), introduced earlier (see Chapter 6.7). Following the above interactions with the NCETM audit tool in May 2018, Laurie, Frances and Charlie edit the SDP, which is always kept in Highland School as a working document. Editing aligned targets for school development in maths teaching with the three chosen areas of focus. As the SDP contains frequent references to teachers' names – those responsible for actioning or leading certain points – and other references (names of schools hosting TRGs, for example), I found the document difficult to anonymise whilst maintaining clear visibility of its key points. **Table 12** therefore offers my summary of each column in the mathematics section of the SDP which was current on May 20th 2018 (sections edited from the September 2017 version are bolded).

Table 12: My summary of mathematics section of 2017-18 School Development Plan, as edited on May 20th 2018

Mathematics School Development Plan 2017-2018	
Objectives and success criteria	Actions/Notes on progress by June 2018
Continue to embed Maths Mastery in the EYFS. Joss to lead using NCETM training.	Training booked to look at assessment and tracking in relation to depth and mastery
Continue to embed Maths Mastery in key stage 1. Frances and Charlie to support through in-house TRGs, modelled on NCETM TRGs	Concerns raised by team around new non-setting approach. Agreed to consult with MAT specialists and year group/phase leaders.
Key stage 2 to trial three of the Big Ideas, focusing on variation, fluency and coherence. Staff meetings and impact groups based on NCETM training. Laurie to lead.	Staff meetings booked around variation, fluency and coherence for all staff
Maths hub and TRGs to continue.	TRGs booked
Embed new calculation policy	Staff meeting held
All staff to use new assessment systems – develop understanding of ‘working at greater depth’ and Maths Mastery	Sessions booked for staff to observe and analyse Shanghai teaching practice

Decisions around what to include in the SDP are made through professional discussion between its creators, as Wallace, a senior school leader, explains in interview:

‘We’ll reflect on this year’s school development plan and the action points for each of the subject areas and we have teams within... curriculum teams that work together. I guess that’s one of the benefits of having such a big staff, that actually you haven’t got just one person working on their own as English subject leader, for example... So we have a team of people working together to make up those different areas. The same with the Maths team. You know, we’ve got somebody leading on something with maybe a more key stage 2 focus, key stage 1 focus, and then some people looking at mastery together as well. So it’s different elements of that. And I think because of that, as long as you’ve got a very core central team that are part of your school development plan and who know what you’re working towards, as long as you can do

that, you've got all of those perspectives feeding into that... [Wallace, senior leader, interview, June 20th, 2018]

The SDP is a working document, in the sense that as priorities or reflections on practices arise, the aims and planned actions of the SDP change. The version edited in May 2018 formalises, in textual form, the aspects of the Maths Mastery approach selected by the team championing the approach in the filling in of the NCETM audit tool. Present also are previously mentioned assessment frameworks, a calculation policy (discussed in Chapter 8.4) and NCETM-run TRGs, which are centred around a TRG reflection booklet. Thus, the SDP becomes a further *intertextual node* in the network (Latour, 2005), one which connects several texts into a single representation of the Maths Mastery approach in Highland School. This intertextual *node* in the actor-network has a specific function: to provide a bridge in the translation of Maths Mastery into classroom practices, between talking about change and enacting change. The SDP not only contains intended changes to classroom practices, but also associated actions and notes on progress act together, activated by the teachers championing the new approach, to move plans for change into multiple enactments of change: staff meetings, TRGs, sessions where teachers work together on an aspect of Maths Mastery. These also include actions to address resistance identified within the network of the change: an action to consult with MAT specialists and year group/ phase leaders to determine a solution for addressing resistance around how mathematics classes are organised. The SDP, as created and used by Maths Mastery champions, is thus positioned by its creators as a pivotal actor and intertextual node in processes of *interessement*, around which the phased rollout of Maths Mastery is organised.



Figure 19: SDP display in the staffroom

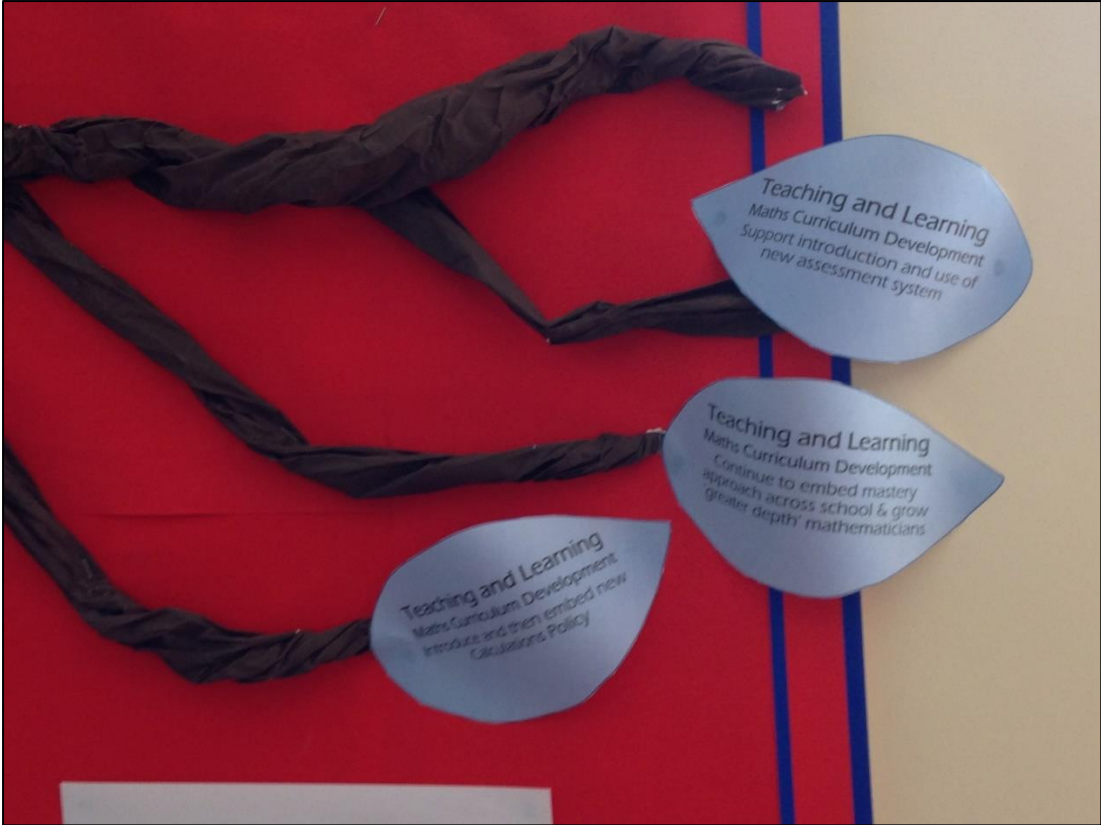


Figure 20: SDP display in the staffroom – mathematics section

Once created, the SDP acts as a textual champion for the aspects of Maths Mastery that teacher champions have chosen to focus on in Highland School. It is used as the basis of discussions around classroom practices, particularly with year group and phase leaders. School leaders also extend the influence of the SDP as a textual champion by harnessing the visual nature of written texts in the creation of a large display in the staffroom with points from the SDP printed onto leaves (see for example **Figure 19** and **Figure 20**).

The staffroom tree is displayed on entrance to the staffroom, which is also the entrance to training rooms and teacher planning areas. The tree thus acts as a more continually prominent representation and textual champion of the aims around the implementation of the Maths Mastery approach (and other priorities) than the formal document which it replicates and summarises. Its visual nature and prominence in the staff room can be compared in the way it acts within the actor-network to the notion of a ‘sign’ in the network: “the ways in which words, gestures and objects are given meaning and convey meaning in relation to other objects, words and gestures” (Plum, 2017, p.3). The SDP acts as a textual sign aimed at aligning teachers’ classroom practices to the localised version – the selected aspects – of Maths Mastery being promoted in Highland School. Thus, this large, bright text serves as an actor in association with which teachers may ‘sign in’ to the action of the change to Maths Mastery (Plum, 2017); an actor which makes *interessement* visually prominent: these are the expected new practices in the teaching of mathematics writ large, further strengthening ties between classroom practices and the new approach.

7.9 Conclusion to the chapter

In this chapter, I have described how associations between human and non-human actors produce *interessement* (Callon, 1984): the weakening of links to current practices for the

teaching of mathematics and the strengthening of links to the new teaching approach.

Interessement occurs within textually mediated *literacy events* created with the purpose of training teachers in the ways of the new approach. A prevalence of *immutable mobiles* representing and carrying the approach within these training events iterates and reiterates Maths Mastery actors within the network. Localised versions of global domain texts mediate destabilisation of delegates' allegiance with current practices. The ways in which these are created and used by course trainers creates a sense of relevance and benefit around Maths Mastery. Further associations between texts and specialist trainees strengthen the authority and effects of power surrounding Maths Mastery actors within the actor-network, whilst also narrowing the approach through textually mediated discussions of central actors such as an NCETM audit tool.

Aspects of the advocated approach travel across 'global domain' (political/ commercial) documents to the local school site (Nichols, 2006), through intermediary *literacy events*. Essential to this journey are champions of the approach in the form of texts and people. A series of linked textual actors is formed which are used or created in the process of adopting the approach, and which will go on to form the infrastructure of the change. In the next chapter, I describe this gradually increasing *intertextual hierarchy* (Smith, 2005), detailing how it comes to form the infrastructure of the change. I also describe how teacher champions and textual champions associate in order to achieve buy-in to the change and to overcome moments of resistance within the actor-network.

8. How are actors enrolled into the new pedagogic practice?

8.1 Introduction to the chapter

This chapter addresses the third research sub-question: *How are actors enrolled into the new pedagogic practice?* This question speaks to Callon's (1984) third moment of translation: *enrolment*, in which further actors are enrolled/ not enrolled into the ways of the new practice, expanding/ destroying/ changing parts of the network. To answer this question, I describe the associations of actors which establish the change more widely in the classroom practices of teachers at Highland School; how the ideas contained within the Maths Mastery policy initiative travel further into classroom practices and how teachers other than those initially trained in Maths Mastery in Highland School are convinced to change their practices.

8.2 Setting the scene for describing *enrolment*

Between October 2017 and April 2018, Phase 2 of the rollout of Maths Mastery at Highland School begins. By October 2017, Laurie, Frances, Joss and Charlie have been training with the NCETM in Maths Mastery pedagogy for 13 months (since September 2016). Whilst these leaders of the new approach still continue their own training in Maths Mastery (further along the journey than others), they begin passing on some of the training. They are *spokespersons* (Callon, 1984) for the approach. They train all teachers in Maths Mastery (through regular staff meetings) and offer further planning and teaching support to teachers in EYFS, Year 1 and Years 3-5, who begin using Maths Mastery in their classroom practices within this period. In-school training is achieved through a series of meetings and training events, over several months, to promote the approach as the way of teaching mathematics (see **Table 13**).

Table 13: In-school training events: October 2017 - April 2018.

In-school training event	Date	Run by	Teachers in attendance
Introduction to Maths Mastery staff meeting	Oct 2 nd 2017	Laurie, Frances, Joss and Charlie	All teachers
Our Journey to Maths Mastery staff meeting	Oct 16 th 2017	Laurie, Frances, Joss and Charlie	All teachers
Introduction to Variation staff meeting	Nov 13 th 2017	Laurie, Frances	All teachers
Modelling Maths Mastery lessons	Nov 2017 – Jul 2018	Laurie, Frances, Joss and Charlie	EYFS, Y1, Y3, Y4, Y5
Leading weekly planning meetings	Nov 2017 – Jul 2018	Laurie, Frances, Joss and Charlie	EYFS, Y1, Y3, Y4, Y5
Joint teaching and discussions of Maths Mastery lessons (expert-novice pairing)	Nov 2017 – Jul 2018	Laurie, Frances, Joss and Charlie	EYFS, Y1, Y3, Y4, Y5
S planning staff training at training day	Jan 3 rd 2018	MAT maths leader	All teachers
Planning for depth staff meeting	Jan 15 th 2018	Laurie, Frances	All teachers
Year group leader meetings focused on Maths Mastery usage in classrooms	Jan-Feb 2018	Laurie	EYFS, Y1, Y3, Y4, Y5 year group leaders
Our Journey to Maths Mastery (developing on meeting from 16 th October)	Apr 2 nd 2018	Laurie, Frances, Joss	All teachers
Year by Year Planning Guidance staff meeting	May 8 th 2018	Laurie	All teachers
Maths Mastery and ‘depth’ staff meeting	May 14 th 2018	Laurie, Frances	All teachers
Feedback on Maths Mastery so far	May 21 st 2018	Laurie, Frances	All teachers
Fluency, variation, coherence staff meeting	Jun 11 th 2018	Laurie, Frances, Joss, Charlie	All teachers
Developing Greater Depth and Understanding within a Maths Mastery approach staff meeting	Jun 18 th 2018	Laurie, Frances	All teachers
Maths Impact staff meeting	Jun 25 th 2018	Laurie, Frances, Joss, Charlie	All teachers
Whole school reflection and planning staff training day	Jul 9 th 2018	Wallace, Sam	All teachers

These events may be seen as *literacy events* in that, like NCETM training events discussed in Chapter 7, they centre around acts of reading, writing and discussing texts. As in previous chapters, describing the associations of human and non-human actors (Latour, 2005) which characterise the *literacy practices* of teachers in *literacy events* (Heath, 1982) gives insights into the negotiations, inclusions, exclusions, adaptations within the actor-network that establish the change to classroom practices.

8.3 An intertextual hierarchy is a network effect of the actor-network

Out of the *literacy events* detailed in **Table 13**, a series of interlinked documents is gradually created as people discuss and agree ideas around Maths Mastery and write these down. In **Table 14** I have listed these texts in columns which make clear the geographical space in which they were created and intended to circulate, continuing the flat ontology of ANT in speaking to how information circulates and travels across geographical boundaries within an actor-network (Law, 1994). These geographical/ circulatory spaces are as follows: texts created and circulated in the global domain; those created and circulated within NCETM regional training events; MAT texts; Highland School texts; teaching team texts; classroom texts.

Whilst I partition the texts into the location of their creation, it is to be noted that texts do not act merely within this locality, nor in isolation. Each text is a (new) *immutable mobile* in the actor-network (Latour, 2005), carrying agreements made in relation to the Maths Mastery approach into further *literacy events*. Texts in right-hand columns of the table are thus created out of discussions of other texts which precede and often contain references to one or more of the texts on which they are based (a practice described in the remainder of this chapter).

Table 14: Table showing texts created and used during in-school discussions of Maths Mastery April-July 2018. Table created by author, July 9th 2018.

<i>Global domain texts</i>	<i>Versions of global domain texts localised for/ on NCETM courses</i>	<i>MAT-created texts</i>	<i>Highland School documents</i>	<i>Teaching team documents</i>	<i>Individual classrooms</i>
UK national curriculum 2014	NCETM training course slide decks	Mathematics policy, consisting of:	School Development Plan (SDP)	Weekly collaboratively-planned lesson slide decks	Lesson slide decks annotated during the lesson
UK national assessment framework 2016	NCETM training course hard copies of presentation slides with space added for delegates to make notes (and annotated versions per in-house spokesperson)	MAT Maths policy outline document + MAT Landmarks document + MAT Progression in Calculations document + MAT 'Basics' document, setting out minimum expectations for learning in each year	SDP tree display in staffroom	Weekly collaboratively-planned lesson plans	'Live marking' assessment in pupil work books
NCETM online texts (website)	NCETM TRG reflective booklet		Year by year planning guidance	Weekly collaboratively-planned lesson resources	Completed lesson resources
NCETM audit tool	NCETM training course handouts and activity sheets		Staff training slide-decks and handouts	Team slide decks containing presentations of Maths Mastery trials in classrooms	Annotated lesson plans
Maths Mastery pupil textbooks and teachers' guide books	Completed TRG reflective journal booklets – one per in-house spokesperson		Reasoning icons	Displays of reasoning icons adapted for the year group	Working wall collects language and class ideas around the learning
Nationally-published planning guides, such as White Rose 'small steps' guidance	Completed NCETM audits (completed by in-house spokespersons)		S plan planning format		
Resources published nationally (non-Maths Mastery, already in school)					
Resources published nationally (Maths Mastery based, new to the school)					
Journal articles used on NCETM training courses					

Through a series of textually mediated and textually productive discursive events, Maths Mastery moves from global domain initiative into classrooms. The global conceptualisation of Maths Mastery is *translated* into teachers' classroom practices (Law, 1986). Throughout the translation process textual immutable mobiles can be seen as *enrolled* as actors in network activity which seeks to establish Maths Mastery as the basis of classroom practices (Callon, 1986). In turn, they may be seen to *enrol* other actors into the ways of the new pedagogy: Laurie, Frances, Charlie and Joss facilitate teachers' discussions in these events, which they base on certain textual immutable mobiles (Latour, 2005) which they enrol to represent and carry aspects of the Maths Mastery approach into teachers' discussions.

This translation may be considered in the light of how texts associate with one another, how they reference, continue or reshape other texts as they are created and used by teachers. The *intertextuality* between texts binds individual texts to one another, so that multiple texts may act through the work of one (Barton, 2007). Reading the table left to right thus gives a sense of an *intertextual hierarchy* (Smith, 2005): textual actors in the network are tied to earlier texts associatively, through intertextual references. Although some texts from the classroom and team planning meetings make their way into circulation within staff meeting texts (I give examples of this later), there is indeed a strong sense of the linear about this hierarchy, in that *global domain texts* inform the creation of classroom texts, but rarely, in this case, does travel occur in the opposite direction.

However, examining textual actors within the hierarchy alongside the *literacy practices* of their creation reveals a pattern of localisation of the policy initiative (Hamilton, 2011). In a weekly year group planning meeting in June 2018, Laurie, Highland School's maths subject leader, shows me his subject leader folder, full of documents pertaining to Maths Mastery:

Laurie talks me through the documents created during the process of the adoption of the mastery approach. After national documents are MAT-based policy documents, which set out minimum expectations for student attainment and teaching methodology. These MAT-wide texts were created through discussions involving maths specialists from different schools within the MAT and MAT leaders and trained in-MAT specialists; discussion in which focus areas within the Maths Mastery approach were agreed in relation to MAT and school priorities. Several documents then looked at making the approach right for Highland School specifically, Laurie tells me, fitting the approach to the aims and needs of their school, its students and teachers. [Laurie, maths subject leader, fieldnote, June 4th, 2018]

Associations of actors in *literacy events* – in which texts representing Maths Mastery are read and new ones created – effect localisations of the approach (Hamilton, 2011). In Chapter 7.5, I described how NCETM course trainers select aspects of Maths Mastery to focus on in relation to perceived needs in local schools. In Chapter 7.7, I described how trainee Maths Mastery specialists from Highland School perform further localising moves (Latour, 2005), based on the selection of Maths Mastery presented to in an NCETM audit tool. In this chapter, I explore the intertextual hierarchy to describe further localisations of Maths Mastery and the network effects of actor *enrolment* that this produces (Callon, 1984).

8.4 The nature of intertextuality: school maths policy

Texts written and circulated at MAT and school ‘level’ contain a similar, prevalent character of intertextuality: a connecting of government policy texts, Maths Mastery texts and texts/metaphysical actors representing existing practices.

At the beginning of the 2017-2018 school year in which in-school training in Maths Mastery commences, Highland School’s maths policy has two core components: a ‘Landmarks’ document and ‘Basics’ document. The ‘Landmarks’ document (see **Figure 21**) sets out what maths leaders in the MAT have previously agreed is the essential knowledge and skills students should achieve by the end of each school year, a localisation of the National Curriculum document. The ‘Landmarks’ document also draws on key performance indicators (KPIs): a tool from the 2014 national curriculum for setting student attainment expectations by year group.

Year 1- Landmarks	
Key Objectives	
<p>Number and place value</p> <ul style="list-style-type: none"> Counts to and across 100, forwards and backwards, beginning with 0 or one, or from any given number Counts, reads and writes numbers to 100 in numerals; counts in multiples of twos, fives and tens Given a number, identifies one more and one Less <p>Addition and subtraction</p> <ul style="list-style-type: none"> Represents and uses number bonds and related subtraction facts within 20 <p>Fractions (including decimals)</p> <ul style="list-style-type: none"> Recognises, finds and names a half as one of two equal parts of an object, shape or quantity 	<p>Measurement</p> <ul style="list-style-type: none"> Compares, describes and solves practical problems for: <ol style="list-style-type: none"> lengths and heights eg long/short, longer/shorter, tall/short, double/half; mass/weight eg heavy/light, heavier than, lighter than; capacity and volume eg full/empty, more than, less than, half, half full, quarter; and time eg quicker, slower, earlier, later. Tells the time to the hour and half past the hour and draws the hands on a clock face to show these times <p>Properties of shape</p> <ul style="list-style-type: none"> Recognises and names common 2-D and 3-D shapes, including: <ol style="list-style-type: none"> 2-D shapes eg rectangles (including squares), circles and triangles; 3-D shapes eg cuboids (including cubes), pyramids and spheres.
Summary Statements	
<p>With reference to the KPIs. By the end of the year:</p> <ul style="list-style-type: none"> a child should be fluent with whole numbers and counting A child has a developing knowledge of addition and subtraction using concrete objects and pictorial representations A child can describe and compare different quantities such as length, mass and capacity/volume. A child is beginning to recognise simple fractions A child is beginning to tell the time Children should read and spell mathematical vocabulary at a level consistent with their increasing word reading and spelling knowledge 	

Figure 21: Extract from MAT Landmarks document

The ‘Basics’ document (see **Figure 22**) sets out minimum expectations for learning in each year, also drawn from the National Curriculum by MAT maths subject leaders.

These texts work in unison to constitute the MAT mathematics policy: the ‘Landmarks’ document sets out broad expectations for skills and knowledge for each year group and the

‘Basics’ document sets out the minimum expectations of attainment within this (the elements that teachers must ensure are securely learned). They form an intertextual *node* in the existing actor-network (Latour, 2005): these documents and the ideas they contain are so often associated with one another that the links leaders have forged between them strengthen and they together signify an element of the network. Together, these texts translate content from the aforementioned *assemblage* of government texts (see Chapter 6.3). These texts remain as *obligatory passage points* with which other actors in the network of classroom practices must associate (Law, 1986).

MAT-wide document

Year 1

Basic skill	Year Group aim
Counting	Count and recognise numbers to 100 Count in 2's 5's 10's
Place Value	Tens and ones 1 more 1 less
Bonds	Bonds within 10 (+ -) Bonds within 20 (+ -)
Frac / Dec/Pec	$\frac{1}{2}$ and $\frac{1}{4}$ (of an amount/shape)
Halves/Doubles	To 10 and within 10
Rounding	Rounding to 0 or 10
Measures (Key facts)	O'clock and half past Sequence of time Days/Months Heavy or light Long or short Full or empty
Vocab	(see vocab booklet)

Figure 22: Extract from MAT Basics document

The ‘Landmarks’ and ‘Basics’ documents are also positioned by MAT maths subject leaders as *obligatory passage points*: teachers are required to use these texts as a basis for teaching

and evaluation of student progress: to ascertain whether students have achieved the ‘basics’ and ‘landmarks’.

After fifteen months of training in Maths Mastery by the NCETM, which has also been attended by other maths subject leaders in the MAT, Laurie and his MAT subject leader colleagues meet in January 2018 to review and edit the MAT policy for the teaching of maths. They leave in place these two core policy texts, without alteration. They add a further document, expanding the *intertextual node* that makes up the policy: a document for usage by teachers in the MAT called ‘Progression in Calculations’ (see **Figure 23**).

‘It was written by a few of us in the MAT working together looking at the key things that needed to go into it – what worked for us as a MAT.’ [Laurie, maths subject leader, interview, June 7th, 2018]

This document is aimed at supporting teachers in designing teaching activities aligned with Maths Mastery.

During a week spent observing Laurie in June 2018, he reflects on the time in January that year that was spent developing the Progression in Calculations document:

Laurie explains how the need for a new calculations policy was identified as the school began to adopt the Maths Mastery approach, to reflect the new methods being introduced for the teaching of maths, whilst taking into account the elements of existing maths teaching which were going well. It is shaped around progression in key concepts using the Maths Mastery approach. ‘It goes through the different representations – concrete, etc – and fluency and how this is built into mathematical concepts.’ [Laurie, maths subject leader, fieldnote, June 6th, 2018]


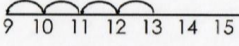
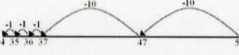
Progression in Calculations				
Objective and Strategies	Concrete	Pictorial	Abstract	Mental
Counting back	<p>Use counters and move them away from the group as you take them away counting backwards as you go.</p>  <p>$12 - 4 = 8$</p>	<p>Count back on a number line or number track</p>  <p>Start at the bigger number and count back the smaller number showing the jumps on the number line.</p>  <p>This can progress all the way to counting back using two 2 digit numbers.</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p>	

Figure 23: Extract from MAT Progression in Calculations document, created by Laurie and other MAT specialists in January 2018.

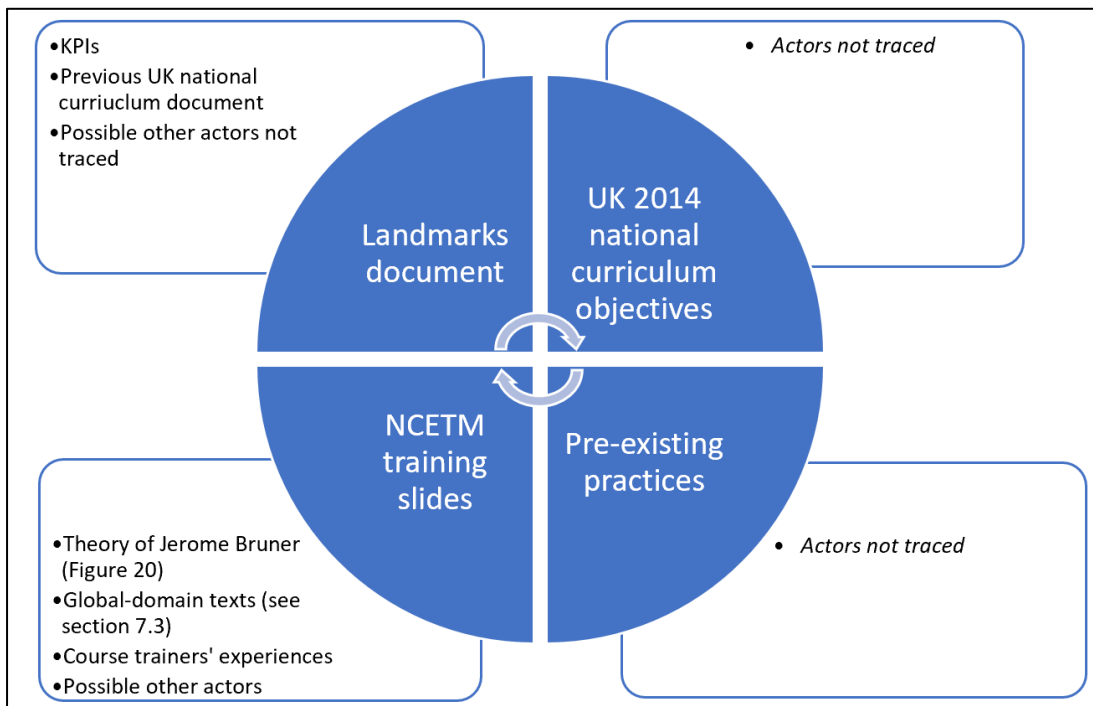


Figure 24: Textual and metaphysical references within the Progression in Calculations document: diagrammatic model created by author

The Progression in Calculations document contains references to several textual and metaphysical actors (which I interpret into diagrammatic form in **Figure 24**). Central segments of the diagram contain textual or metaphysical actors which *enrol* Laurie and his colleagues in creating the document (Callon, 1984). Arrows denote that these texts and ideas associate in unison, interweaving in discursive creation of the new MAT policy. Outer boxes detail trace associations of these central actors (traced within the actor-network by the author, during fieldwork). The associations of actors in (the creation of) this new policy text make visible certain effects of power and agency within the network (Nespor, 2002).

The first of these is a continuation of effects of power imbued to government policy texts. The national curriculum (in original form and in interpreted form in the ‘Landmarks’ document) *enrols* Laurie and his colleagues, acting as a basis for creation, continuing the sense that this is an *obligatory passage point (OPP)* in the network (Law, 1996).

The second effect of power made visible here pertains to Maths Mastery, which is imbued with a sense of authority in the network through association with the national curriculum *OPP*. The Progression in Calculations document is structured around objectives from the English 2014 National Curriculum, with Maths Mastery teaching strategies listed next to each objective. The two are presented as inherently related. Thus, intertextuality strengthens associations between Maths Mastery and the national curriculum *OPP*. The new approach is established as required pedagogy in its inclusion now in this extension of school maths policy. For the Progression in Calculations document is created as a tool in the process of *enrolment* into new (Maths Mastery) ways of teaching maths (Callon, 1984), through which to enrol teachers and further material actors – the texts and resources teachers create in planning lessons – into the new approach. This imbues Maths Mastery with effects of power in relation to teachers’ classroom practices and loses sight of ‘matter-of-concern’ treatment of Maths Mastery other *literacy events* (see 6.6).

However, whilst Maths Mastery become integrated into a powerful policy *node* in the network, it is not the entire global domain conceptualisation of Maths Mastery that makes it into this policy text, or further texts, nor does the addition of Maths Mastery exclude existing policy texts from the policy node. Laurie and his colleagues localise the approach as they create the Progression in Calculation document. They select aspects of the approach – concrete, pictorial, abstract pedagogical strategies based in fluency, variation and coherence Maths Mastery concepts (see 5.3 for explanation) – for inclusion. These *spokespersons* for the new approach (Callon, 1984), whilst *enrolled* as actors in expanding the influence of Maths Mastery, simultaneously, and somewhat conversely, are imbued with effects of power (Nespor, 2002); they have the ability to limit and select which parts of the global domain concept of Maths Mastery may continue to circulate within the actor-network. They are given this power by senior leaders in the school:

‘So we have a team of people working together to make up different curriculum areas. The same with the Maths team... as long as you’ve got a very core central team that are part of your school development plan and who know what you’re working towards and can drive that, as long as you can do that, you’ve got all of those perspectives feeding into that... the development should be quicker from that perspective. That does work.’ [Wallace, senior school leader, interview, June 20th, 2018]

One of the outcomes of this effect of power is that these *spokespersons* in turn give agency to other local (MAT/school) actors. The creation of the Progression in Calculations document is also mediated by a metaphysical actor in the network: existing classroom practices embodied in the ideas and memories of Laurie and his colleagues, in the sense of, as Laurie explains above, ‘the elements of existing maths teaching which were [already] going well.’

Inclusion of these embodied ideas for practices in a policy text is a deliberate attempt by *spokespersons* for the new approach to build buy-in: to *enrol* teachers into the new pedagogy (Callon, 1986). Continuing our conversation about the Progression in Calculations document, Laurie tells me that he and other leaders of Maths Mastery continually try to build ‘buy-in’ to persuade other teachers of the benefits of the new approach, by starting with aspects of existing practice that are valued:

‘Everyone’s doing a lot of it [Maths Mastery] already.’ Laurie explains that there are some elements that need ‘a big rethink’ of classroom practices, but ‘we have such a lot of great stuff going on in classrooms already and we want to build on that’.

[Laurie, maths subject leader, fieldnote, June 6th, 2018]

One of the ways in which spokespersons such as Laurie approach teacher ‘buy-in’ is through deliberate juxtaposition of existing and new (Maths Mastery) practices in new documents (such as the Progression in Calculations) which represent Maths Mastery to teachers. These juxtapositions take a different approach to the associations of old and new practices to the course trainers seen in Chapter 7. In those associations between old and new practices, NCETM course trainers chose a discourse of derision which cast existing practices in a negative light and Maths Mastery practices as their antidote (see Chapter 7.7). What Laurie and his MAT colleague attempt in the Progression in Calculations document are juxtapositions which rather express the worth of some existing practices and demonstrate how these fit already with Maths Mastery pedagogy. They imbue existing practices with agency in their inclusion in maths policy.

8.5 Moments of persuasion: *enrolment* through a blend of ‘old’ and new practices

During in-school training, further texts are created in which ‘old’ and new actors in the network of classroom practices come together. One example which highlights this is the case of a text called ‘Year by Year Planning Guidance’ and training using this text (a staff meeting on 8th May 2018).

Created over a series of meetings in January and February 2018 between Laurie (maths subject leader) and year group leaders, the Year-by-Year Planning Guidance document breaks down the school’s curriculum for mathematics into ‘units’ of focus for each year group. It sets out an overview of the contents to be taught in each unit, as well as supporting resources to be used in making decisions around how each unit is to be taught. The planning guides are created in Google Slides, a presentation programme. A similar slide can be seen at the beginning of each unit, or ‘cycle’ of learning (see **Figure 25**).

Number – Place Value

Planning Resources

CYCLE 1 – (Weeks 1 – 4) **MAT Assessment**

National Curriculum Objectives

- count in multiples of 5, 7, 9, 25 and 1,000
- find 1,000 more or less than a given number
- count backwards through 0 to include negative numbers
- recognise the place value of each digit in a four-digit number (1,000s, 100s, 10s, and 1s)
- order and compare numbers beyond 1,000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1,000
- solve number and practical problems that involve all of the above and with increasingly large positive numbers
- read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of 0 and place value

LANDMARKS
Number – Place Value

- * Counts in multiples of 25 and 1,000.
- * Counts backwards through zero to include negative numbers.
- * Orders and compares numbers beyond 1,000.
- * Rounds any number to the nearest 10, 100 or 1,000.

BASICS
Number – Place Value

- * Counting backwards through zero to include negative numbers.
- * Ones, Tens, Hundreds, Thousands.
- * Multiply and Divide by 10 and 100.
- * Rounding to the nearest 10, 100 or 1000.

[MAT logo removed]

Figure 25: Extract from Year by Year Planning Guidance document, accessed June 2018

This introduction slide highlights to teachers the national curriculum objectives covered in each unit of work, ‘landmarks’ to be worked towards, ‘basics’ and ‘planning resources’.

These intertextual references to other texts reinforces expectations that teachers’ practices will be based on the content of these texts. This furthers effects of power already imbued to government and MAT policy, whilst simultaneously associating these *assemblages* with ‘planning resources’.

Clicking on the ‘planning resources’ rectangle opens another slide in the same document (see **Figure 26**), on which can be seen links to several texts and material resources already used within the school, existing actors in the network of classroom practices. Alongside these are listed new Maths Mastery-centric resources. Explanations next to each resource link detail what each resource is good for.

Number – Place Value

MAT Assessment National Curriculum

CYCLE 1 - (Weeks 1 - 4)

White Rose Maths

Good for:

- * Question resources
- * Reasoning and problem solving
- * A range of question presentations
- * Concept break down

National Centre for Excellence in the Teaching of Mathematics

National Curriculum Resource Tool

Good for:

- * Small Steps progression
- * Teacher CPD – running commentary
- * Representations

Good for:

- * Securing and GD exemplar questions

I SEE MATHS

Good for:

- * Reasoning examples for every objective
- * Highlight variation for fluency.

MATHS NO PROBLEM

Good for:

- * Small Steps progression
 - lesson progression
 - use of numbers
 - representations

[MAT logo removed]

Figure 26: Extract from Year by Year Planning Guidance document, accessed June 2018

The inclusion of these ideas around practices in a planning guidance document for teachers activates the agency of teachers' ideas and opinions around classroom practices within the actor-network. They are given the ability to circulate and influence localisation of the approach.

These metaphysical actors (in the sense that they are ideas) are agentic in that they effect changes to the ways in which Maths Mastery policy enters the existing network of classroom practices: at year group planning 'level', Maths Mastery begins to look different to its global domain conceptualisation(s). The representation of the Maths Mastery approach that teachers are asked to use when planning their lessons is neither exactly the approach that Laurie encountered in his training, nor exactly/ wholly the approach that is recommended in any of the documents or existing policies that the teachers already use:

'In the document we rearranged the order of the national curriculum learning objectives to an order which year group leaders felt worked better for progression of learning, based on their experiences of teaching that age range. The topics we had used from the national planning document weren't in this order that we have now. We then linked these to the National Curriculum: which National Curriculum objectives will be met in these, and then to parts of the MAT's 'landmarks' and to sections of the small steps document and resources from different places.' [Laurie, maths subject leader, interview, June 7th, 2018]

Or rather, to be more specific, *some* existing practices are included by Laurie within localised Maths Mastery *immutable mobiles*. It is *spokespersons* who give agency to these metaphysical actors from the existing actor-network. *Spokespersons* are imbued with effects of power to do so by senior school leaders. They use these power effects to select ideas which fit well with the elements of the Maths Mastery approach they are promoting within the

school. *Spokespersons* such as Laurie can therefore be seen as dominant actors in the network, imbued with effects of power through which they can effect network changes (Nespor, 2002), can select which actors become *enrolled* in the ways of the new approach (Callon, 1986).

Laurie is indeed conscious of the impact of effecting the agency of year group leaders' ideas around valued resources/ practices in the creation of these planning guidance documents. Inclusion of existing actors in the network of practices is established through discussions between Laurie and year group leaders, as Laurie reflects upon in conversation with me:

Laurie explains how he created the Year by Year Planning Guidance document in discussion with year group leaders. 'There's no point in me creating planning guides for other year groups, or resources or whatever; I need the teachers of those year groups and their expert knowledge of the students, the phase they teach, their development and what they can do. Then we can work together to create something meaningful, something that starts from the good stuff already in place and moves into Maths Mastery... It means that they [teachers] are more likely to implement this, if someone in the year group has sat down with me over the 2 weeks, to really think it through, to link it to what they already use.' [Conversation with Laurie, maths subject leader, fieldnote, June 6th, 2018]

Year group leaders lead year group team planning meetings at Highland School. In the conversations out of which the planning guidance documents emerged, Laurie attaches importance to year group leaders' opinions on valued existing ideas around classroom practices for the teaching of mathematics, shaping them to fit the Maths Mastery approach. The intended impact of this discursive creation of the planning guidance documents is teacher

enrolment, planned to be achieved through the association of the old and the new, the familiar and the unfamiliar, valued classroom practices and those intended to be valued.

Laurie ensures that the deliberate translation and localisation of the new approach is highlighted to the teachers who are asked to use them. Laurie runs a staff training meeting to introduce the new documents to teachers as tools to support them in planning mathematics lessons. It is May 8th and I join all teachers in one of the Year 4 classrooms to attend an after-school meeting. This meeting is one a series of staff training events focused on Maths Mastery (see **Table 13**) and is run by Laurie:

In a staff meeting with all teachers, Laurie clicks through the Year-by-Year Planning Guidance document. He explains the order of each and how the order has been carefully considered in light of feedback from year group leaders to enable students to gradually build up knowledge. [Staff meeting, fieldnote, May 8th, 2018]

Laurie also makes explicit the links between existing and Maths Mastery actors that he and the year group leaders have made:

Laurie spends a few minutes explaining how the document links the national curriculum objectives, including the non-statutory guidance, to the MAT 'Landmarks' and planning resources already considered important and useful in school. He flags up useful places to look for teaching activities, including resources teachers are already using which fit with the Maths Mastery approach and new ones focused specifically on Maths Mastery techniques. He demonstrates how the document breaks down each of the topics to be covered over the year in this way, so that everyone can see. He says 'how the national curriculum, Landmarks and Basics align and possible places to look for resources for teaching'. [Staff meeting, fieldnote, May 8th, 2018]

The document is positively received:

There is a murmur around the room as teachers turn to each other and respond to this. Someone pipes up that this 'Looks really useful'. Others thank Laurie for his work on this. All feedback that I can hear is positive and several teachers exclaim excitedly to one another about how helpful this is going to be.' [Staff meeting, fieldnote, May 8th, 2018]

In this way, blending of existing approaches to the teaching of maths with the Maths Mastery approach is an intentional association of actors as part of a planned process of *enrolment*. It presents the new as familiar, already known; a strategy to be 'bought into' because it's already 'what we do around here'.

The character of intertextuality that is generated in gradual localisation of the new approach thus not only imbues Maths Mastery with a sense of authority within the actor-network of classroom practices, but also effects changes to Maths Mastery which are used by *spokespersons* to *enrol* teachers into the ways of the new approach: whilst teachers' practices begin to align with Maths Mastery, Maths Mastery may also be seen to align with the existing network.

Through the association of existing and new actors, both textual and those embodied within the teacher (ideas, experiences, opinions, brought to bear on decisions in the creation of new texts), the global domain initiative of Maths Mastery and its core concepts are subject to vulnerability through interpretation. This echoes the findings of studies of attempts to determine professional practice through texts (Mulcahy, 2011; Tummons, 2016), studies which highlight the necessity of viewing teaching and teacher practices as organic and performative rather than pre-determined or pre-determinable.

8.6 ‘Depth’: a new metaphysical actor in the *enrolment* of teachers into the new approach

Localisation of Maths Mastery at Highland School ‘level’ appears to gradually perform into being a new actor in the network (Fenwick, 2011). That is, a metaphysical actor in the form of a localised conceptualisation of ‘depth’.

In discussions around Maths Mastery, school leaders instigating the approach, particularly in their reflections of the initial decision in 2016 to adopt the approach, closely associate Maths Mastery with achieving the new national assessment standard of ‘working at greater depth’ (see Chapter 6.5). However, as the approach is translated into further documents and discussions within teaching teams at the school, the 2016 Assessment Framework definition of ‘working at greater depth’ is increasingly ‘*black boxed*’ (Latour, 1999) – its original form and content hidden from view – and a new conceptualisation of ‘depth’ is produced.

This is made visible in two staff meetings in May and June 2018 and in teachers’ practices between these two meetings. The first of these staff meetings is held on May 14th 2018. It is run by Frances (a year group leader helping to lead the rollout of Maths Mastery) and Laurie, who names the session: ‘Maths Mastery and ‘depth’’. Prior to the meeting, all teachers have been introduced to Maths Mastery in association with the 2016 Assessment Framework standard ‘working at greater depth’ in staff meetings on October 2nd 2017, January 15th 2018 and April 2nd 2018 (see **Table 13**). In preparation for the staff meeting on May 14th, Frances and Laurie have asked teachers in phase one and two of the rollout of Maths Mastery (see Chapter 5.5) to take photographs of classroom practices in action which they believe show Maths Mastery pedagogy being used to help pupils achieve the ‘greater depth’ assessment standard (see for example **Figure 27**).

In the staff meeting, Laurie and Frances guide teachers into visual *literacy practices*, in that they help teachers to attach meaning to these photographs associated with both Maths Mastery pedagogy and the national assessment standard of ‘working at greater depth’.

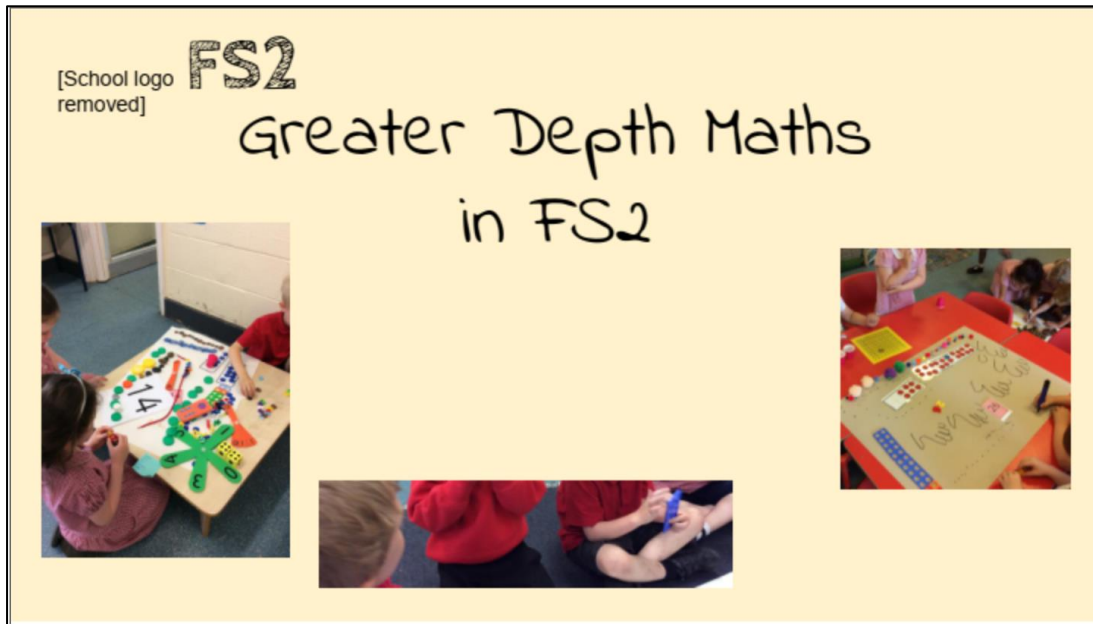


Figure 27: Staff meeting slide made by Early Years Foundation Stage teachers (FS2 denotes ‘Foundation Stage 2’ – students aged 4-5). Photographs show students doing Maths Mastery activities planned by EYFS teachers.

Whilst slides for each year group are headed with the words ‘Greater Depth Maths’, echoing the language of the 2016 Assessment Framework, the ways that teachers talk about ‘depth’ is not centred directly around this 2016 text, but around teachers’ interpretations of Maths Mastery concepts they have received training in. Jamie, a year group leader in the EYFS, talks through the slides from her year group, including the above slide:

Jamie explains the photos on the slide: ‘Children were making number pictures using resources which the children can be seen using in the photos.’ Jamie talks through how her team approached this through the concept of variation. She explains how the children were told that they could use any of the resources set out for them, which

were resources they were already familiar with. The students made numbers and then discussed them, saying things, Jamie tells the other teachers in the meeting, like 'Look, this number is double that one.' Jamie explains an example of students making 26 as a group, using 5 hands and 1 finger and how as a team, they felt that this was showing greater depth: 'They represented it in different ways... We used language like 'Show how you know' and 'Can you think of another way to show this?' to help them to think further.' [Staff meeting, fieldnote, May 14th, 2018]

Jamie's explanation of the 'greater depth' her team have represented in the presentation slides foregrounds associations with the Maths Mastery concept of 'variation' (see Chapter 5.3 for explanation), which they received training in on November (see **Table 13**). This is confirmed by Laurie and Frances' reactions to Jamie's presentation of the slides. Laurie and Frances praise the EYFS team:

Laurie interjects: 'To see this basis of variation and greater depth is really exciting... Extraordinary.' Frances adds to this, talking about variation and how it's 'brilliant to see the representation that is going along with that.' A Year 6 teacher exclaims: 'Leave us with something to teach them Jamie!' [staff meeting, fieldnote, May 14th, 2018]

'Greater depth' in this case is associated directly with 'variation' as represented within texts created by teachers in the school.

Teachers capture what they mean by the term 'greater depth' – sometimes shortened to 'depth' – in photographs, used in presentation slides, such as those in the staff meeting above, in displays around the school, and in discussions of teaching approaches.

After the staff meeting, teaching teams proudly put up displays of these photographs of 'depth' on large boards in Highland School's corridors and classrooms. These displays offer

up, to anyone passing by, exemplifications of what the idea of depth looks like. I pass by the EYFS classrooms on 22nd May and stop to look around and talk to the teachers:

I join Meri, a teacher in the EYFS, in her classroom. A large maths display on one wall of Meri's classroom has printed words declaring 'Maths is everywhere – inside and outdoors!'. Photos, quotes from the students about the activities in the photographs and accompanying printed explanations of the 'depth' of learning in each photo make up the rest of the display. [Fieldnote, May 22nd, 2018]

Joss, a senior leader in the EYFS who is leading the introduction of Maths Mastery in this key stage, talks to me about the displays in each classroom:

'We now teach different ways into a problem. So how the number one comes first, then others up to five and teachers ask constantly 'Can you show me another way of making...?'. They make groups of different objects representing each number and present them in a variety of ways so they really get to understand the concept of two, the concept of three. In the Mastery approach we use, the students work through trial and error and counting and by being asked to notice things, for example, that $2 + 2$ is double two. It's about making them think in ways they didn't before – think for depth.'
[Joss, a senior leader, fieldnote, May 22nd, 2018]

In talking about these representations of 'depth', Joss uses them to problematise existing (previous) practices in relation to the benefits of the new approach. The old (the 'before') and the new (Maths Mastery) are set alongside each other through the lens of an idea of 'depth' captured and represented in the photographs. Joss associates this idea of 'depth' with the Maths Mastery approach, however, this term also has become something more: a less tangible concept of being able to 'think for depth', which moves somewhat beyond Maths Mastery concepts exemplified in global domain and MAT texts, to an indistinct idea

represented in the photographs of students involved in mathematical activities. Depth is brought into being by the teachers and their practices, a discursive representation and interpretation of the practices that they ask the students to take part in.

This less tangible notion of depth as ‘depth of thinking’ is conceptually different to the original definition of depth within the national assessment document. The latter highlights a standardised set of skills and knowledge by which students may be assessed as ‘working at greater depth’ (see **Figure 6**). The former refers to an idea, without concrete definition, but to do with being able to process mathematical ideas in different ways, linked (albeit quite ephemerally) to the Maths Mastery concept of ‘variation’. Through its conceptual differences, this new version of ‘depth’ becomes a new metaphysical actor in the network.

This new metaphysical actor gains agency within the actor-network. It begins to be foregrounded in discussions of planning, whilst the 2016 Assessment Framework standard descriptor is backgrounded:

In June 2018 [after the above staff meeting], I join the Year 1 team in a teaching team planning meeting. Before the team begins planning the next week’s maths lessons, Charlie, one of the Year 1 teachers involved in initial training and rollout of Maths Mastery, shares photos of some students ‘thinking at depth’. Benny, a student teacher in the Year 1 team, then shows photos he took in a maths lesson that morning and talks through an example of different ways of students halving a circle, identifying how one student surprised him by showing ‘depth of thinking’ in that topic, which he hadn’t expected. [Year 1 planning meeting, fieldnote, June 12th, 2018]

Photographs act centrally in the gradual evolution of the teachers’ own definition of ‘depth’, mediating teachers’ reflections on what they understand as depth – that it is to do with thinking and learning – backgrounding the prescribed definition represented within the

assessment document, or within the Maths Mastery concepts defined in global domain and MAT/school texts. This apparent switch in what is foregrounded and what is backgrounded in discussions mists previous associations between Maths Mastery and national standardised assessments. ‘Depth’ has shifted away from national policy and into textual representations of teachers’ ideas around what learning at depth looks like. The prescribed version of ‘working at greater depth’ diverges, existing in the network both in its 2016 Assessment Framework form, and in a new, less defined form, the product of a process of *enrolment* based in associations between “organisations, individuals and artefacts” (Edwards, 2011, p.38).

Another example of disassociation of ‘depth’ with national policy and the growth of a new conceptualisation of the term is a further training meeting run by Laurie and Frances on June 18th, which they call ‘Developing Greater Depth and Understanding within Maths Mastery’. This is held in a Year 6 classroom after school. During the staff meeting, Frances guides teaching teams in making links between the motivations that drive them in teaching maths, ‘depth’ and the Maths Mastery approach:

Frances introduces what he calls a ‘think task’. He says: ‘Why do we do what we do? Why do we adapt what we do? Draw on the large sheet of paper I have put out on your tables and use sticky notes to add ideas to each circle. Your focus is: Why are we developing our teaching of Maths in this way?’. [staff meeting, fieldnote, June 18th, 2018]

Rowan, a Year 6 teacher, interrupts:

Rowan interjects: he agrees that Maths Mastery is a good thing and says ‘I just wanted to raise the point that we are historically a school whose SATs results in Maths have been very good, but this isn’t necessarily about results. [It’s about]

deeper learning: it's about how students understand Maths and that is the shift.'

[Staff meeting, fieldnote, June 18th, 2018]

Rowan sees 'depth' as something *apart* from results, as disassociated with nationally standardised tests (which are based on the assessment descriptors from the 2016 Assessment Framework). As the actor-network expands, the term 'depth' becomes an actor in and of itself: a meaning which remains undefined in clear terms, but here has something to do with "deeper learning" and which is used to justify Maths Mastery. The term 'depth' is reappropriated, redefined, contextualised through discussion, into something the teachers at Highland School can buy in to.

That the new 'depth' actor *enrols* teachers into Maths Mastery is made visible as teachers in the staff meeting continue with their 'think task'. Alex, a teacher in Year 1, highlights how he believes that maths teaching should have an 'end product' and I explore this in conversation with him during the task:

'I suppose really it's got to have an end product. You've got to achieve something... You've got to have a result really. Do you know if they've done it, understood it, yes or no? ... in Maths Mastery now we do these little interventions straight away and we use variation of how we teach things. Years ago, the interventions would be like 15 minutes once a week: separate. Now you do it straight away and the variation helps, which is good. It's the way it should be. You get that depth of understanding for everyone. Before, you couldn't really.' [staff meeting, fieldnote, June 18th, 2018]

Alex links his desire for an 'end product' in maths to the knowledge of whether students have understood the concept being taught. The discursive constructions and representations of 'old' and new practices are played off against each other in Alex's reflections. Maths Mastery approaches are seen as most beneficial to all students. Alex sees the approach as helping

students to understand mathematical concepts deeply: with “depth of understanding”.

Through activities asking teachers to discuss and make record of the motivations which they associate with mathematics teaching, and the links they articulate between these and the Maths Mastery approach, *spokespersons* for the approach develop further bonds between the teachers and the new ‘depth’ actor which strengthen buy-in to the new approach.

Changing the original intertextual node which *enrolled* actors initially into the change, by reappropriating the term ‘depth’ into a new actor in the network, thus generates further *enrolment* of teachers into the change. The term becomes seen as theirs, rather than something done to them by government policy, imbuing teachers with a sense of agency in relation to their classroom practices in terms of their ability to effect changes to the network through their interpretation of ‘depth’. For teachers’ interpretations, reified in photographs and photo-based texts, weaken associations between ‘depth’ and government policy documents and strengthen associations between ‘depth’ and combinations of existing and Maths Mastery practices.

Spokespersons for Maths Mastery harness and activate the agency of the new metaphysical actor as a tool to effect *enrolment* of the teachers, texts and artefacts of classroom practices into the Maths Mastery approach. They achieve this by arranging opportunities for classroom practices to relate to ‘depth’ in real time examples:

‘A big thing for staff this year was seeing the impact [of using the Maths Mastery approach] on students that they know. So we’ve done an in-house TRG [Teacher Research Group] this year [starting in January 2018 and ongoing in June 2018]. I [Laurie] went and taught and they [teachers involved in phase 2 of the rollout] watched and evaluated. And then we saw it [Maths Mastery being taught] in a different lesson and we evaluated somebody else and then they’ve seen me teach my

class because they wanted to see it in a class where it's been happening all year. Then they could see where the impact is, on students' real learning. And because it was students that they knew, they were a little bit blown away by what the students were capable of. Because they were just like, 'How can so and so do that?'. Because they've been given the opportunity to and they've been taught to think at depth; they've not been taught how to just follow a process to get to some statements. They said, 'But so and so couldn't do this in year 2' and I was like 'But they can do this now.' And that was a big buy-in. A massive buy-in.' [Laurie, maths subject leader, interview, June 7th, 2018]

Laurie reinforces the new 'depth' actor through opportunities to see in action how Maths Mastery-based classroom practices might help children to 'think at depth'. Rather than focusing on how the approach may help pupils to reach the new assessment standards, Laurie suggests that teachers might buy in to approaches that they can see for themselves might impact positively on students' abilities to think in maths, in what they are able to do now that they couldn't do previously.

The metaphysical 'depth' is a network effect (Latour, 2005); an effect of the ordering of the actors in a network. This effect is a crucial actor in processes of *enrolment*. Like the school development plan (see Chapter 7.8), 'depth' acts as a 'sign' representing a *translation* of Maths Mastery which affords teachers a way of 'signing in' to the ways of the new pedagogical approach (Plum, 2017). Its unsharpened, vague definition does not appear to matter in terms of the agency of 'depth' in the network, but rather its agency depends upon the notion that it is 'owned' by teachers in the school; something that is 'theirs' that they can buy-in to, which engenders trust in the policy initiative by aligning teachers' goals with a localised conceptualisation of 'depth' (Gorur, 2011), whilst itself remaining a *black boxed* actor with its origins, creators and even its exact definition hidden from view. Thus, to some

extent, the success of Maths Mastery in entering the existing network of practices relies upon the creation of a new localised actor, which serves as a key actor in securing the *enrolment* of other actors into the new approach.

8.7 The intertextual hierarchy as the infrastructure of the change

In the above examples, text-based artefacts are used by spokespersons as instruments of change. As mediators of discussions around classroom practices, they *enrol* teachers into the change of approach. Texts, the spokespersons who position the texts in the actor-network, and the teachers who read, use and create them, thus establish the Maths Mastery policy initiative as a *centre of translation* (Law, 1994): an *assemblage* of interlinked, largely text-based actors, which defines, or redefines, other elements of the actor-network.

The agency of texts to *enrol* teachers into the ways of the new approach relies on the ways in which spokespersons position them as mediators in discussions about classroom practices. This can clearly be seen in the way that spokespersons lead year group planning meetings. In May 2018, two days after Laurie and Frances' first staff meeting on 'depth', I join a Year 1 teaching team planning discussion in which a team of four teachers is planning for the following fortnight's maths lessons. Frances, the year group leader of the team and a leader of the Maths Mastery approach in Highland School, sets out the resources the team will be using for the session:

On the central table, Frances spreads out one of the large pieces of blank sugar paper, 'Ready for group thinking about Maths.' Frances directs everyone's attention to the items on the table and files open on the screen on his PC: a nationally-published planning guidance document called 'Small Steps'; a nationally-published

Maths Mastery textbook called 'Maths No Problem'; a giant sheet of plain sugar paper; post-it notes; felt-tipped pens; National Curriculum Programmes of Study print-out; a school-based Year by Year Planning Guidance document created by Laurie and year group leaders (including Frances). [staff meeting, fieldnote, May 16th, 2018]

Frances centralises *global domain texts* and *local domain texts* (school 'level' texts) which contain information on the Maths Mastery approach in the discussion, continually drawing teachers' attention back to them. This ensures that the plan that evolves for the team's teaching of maths is developed through the mediating lens of the Maths Mastery texts. This lens is sharpened in focus using specific texts from the intertextual hierarchy to structure teachers' discussions in a way which sculpts the resultant plan around one of Highland School's Maths Mastery areas of focus: coherence. The NCETM define coherence as:

Coherence: Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all students and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts. [Extract from NCETM website, accessed May 16th, 2018]

Frances uses an 'S plan' planning format to reinforce this concept. Frances explains to me that the concept of the S plan was introduced to him by one of the MAT's Maths specialists in May 2017 and that at Highland School they have been trying it since a staff meeting in January 2018 (see **Table 13**). He suspects that its usage in relation to Maths Mastery in Highland School came from maths training the original MAT specialists undertook in Shanghai. The S Plan is a method of planning which begins by drawing a giant 'S' shape on a large piece of paper. The aims of the teaching unit are written at the end of the S. Mid-points

and smaller steps in learning are then mapped and the plan gradually expanded with methods of teaching and linked classroom resources (see **Figure 28**).

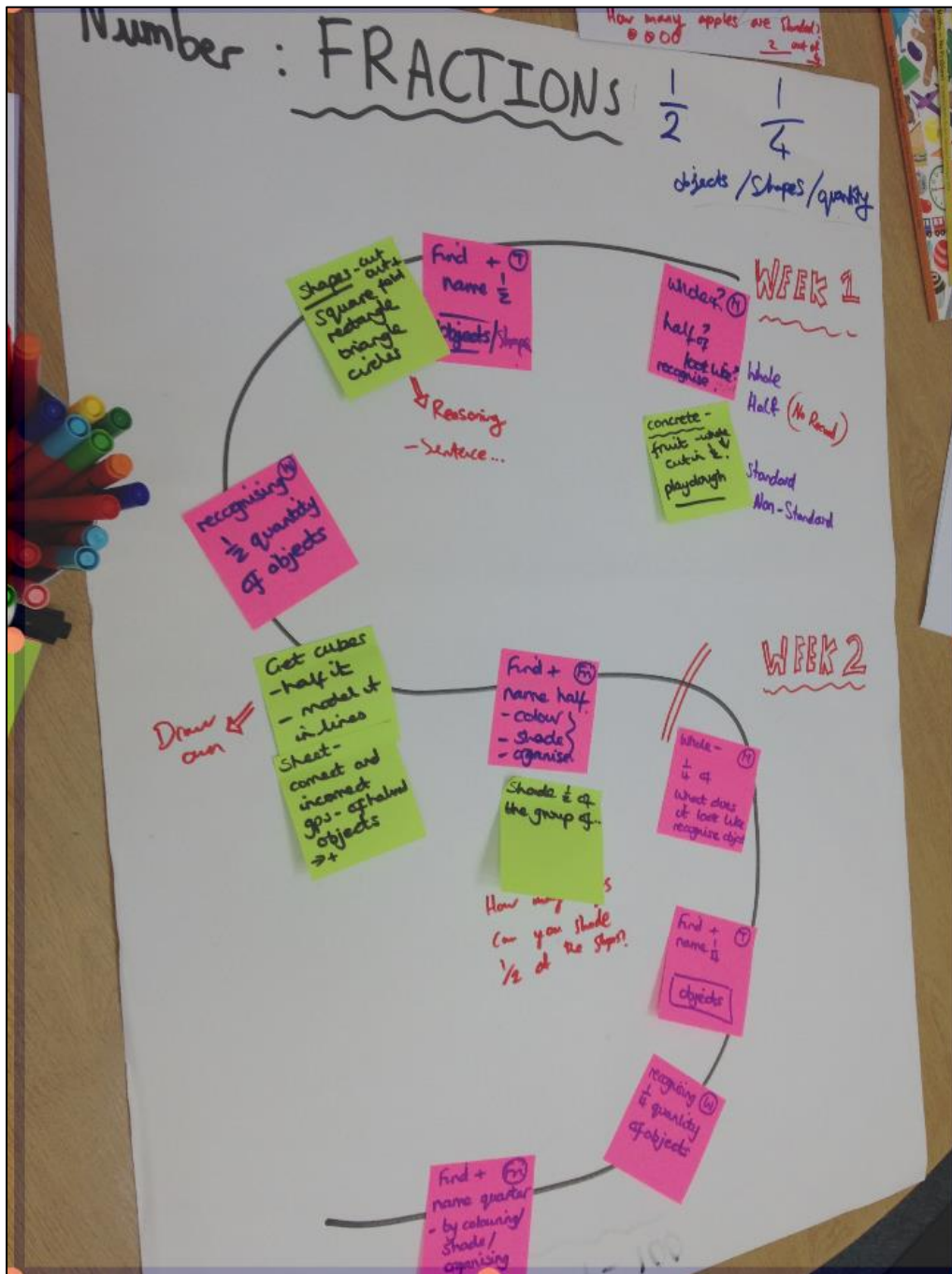


Figure 28: Photograph of completed S plan from Year 1 planning meeting, May 16th, 2018

I observe Frances, Benny, Charlie and Alex planning using the S Plan format.

Frances splits the S shape into two halves and asks teachers to use the national curriculum print out to write the agreed objectives for the end of the unit. These focus on finding and naming halves and quarters of shapes and numbers. Frances asks what the mid-point of learning in the unit will be. [Year 1 planning meeting, fieldnote, May 16th, 2018]

At this stage of breaking down the learning into the small steps of the coherence concept, two teachers within the team – Charlie, an early-career teacher involved in leading the rollout of Maths Mastery, and Alex, an experienced teacher – disagree:

Charlie suggests doing one week on halves and then a further week on quarters. Alex suggests perhaps doing one week on objects and shapes with both halves and quarters, followed by a week on quantities. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Frances uses global domain texts (see **Table 14**) to deal with conflict around this first step towards coherence:

Faced with two ideas, Frances refers to a ‘Small Steps’ document, a nationally-published guidance document for the teaching of maths which supports the Maths Mastery approach. ‘What do they do? Let’s have a look.’, he asks. [Year 1 planning meeting, fieldnote, May 16th, 2018]

In this way, Frances uses the S planning format to activate the agency of texts which support the Maths Mastery approach. Frances draws teachers’ attention to a global domain text – ‘Small Steps’ – which MAT leaders have chosen to adopt to help teachers to plan lessons using the Maths Mastery approach. This document, as stated on its publisher’s website, is part of an approach which supports teachers in planning for Maths Mastery:

'Most primary schools in England now use our free small-step, mastery-based schemes of learning.' [Excerpt from White Rose website, accessed May 16th, 2018]

Teachers pick up and use other texts which Frances has provided – global domain texts and localised versions of Maths Mastery – to help address the conflict:

Frances reads out the ideas within the booklet. Alex looks in the 'Maths No Problem!' textbooks and shows everyone a related page of exercises for the students to tackle. Benny, a student teacher in the year group, checks the Year by Year Planning Guidance and the resources linked within it. Charlie suggests an activity from her TRG booklet [see Chapter 7.4). Together, they combine these ideas and add to the plan. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Frances continually brings teachers back to the Maths Mastery idea of coherence (coherence-related ideas underlined):

Frances asks Alex to use a sticky note to write 'small steps' in learning as the team discusses how the aims of the unit each week will be achieved. He asks: 'What do we need to do first? What will the students need to be able to do and to know first? How will students apply their learning in a range of contexts?' [Year 1 planning meeting, fieldnote, May 16th, 2018]

The S plan, in associations with other texts (from different 'levels' of the intertextual hierarchy) are activated by Frances. These texts mediate teachers' thinking and decision-making around the idea of coherence:

Everyone offers ideas and Charlie checks the White Rose 'Small Steps' planning resource. Frances conducts the conversation with questions to each suggestion and eventually the small steps along the way to achieving the learning objective are written down on pink sticky notes and added to the 'S' shape... The S plan takes shape

as the teachers add to it, as elements are agreed upon during discussion. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Once coherence has been planned for, the S plan continues to take shape through discussions mediated by texts. Teachers refer back and forth to texts representing Maths Mastery in making their decisions:

Frances asks teachers to use green sticky notes to add in the approaches to teaching which will support students in learning each small step. Charlie brings into the conversation an activity from the Teacher Research Group [TRG] she attended recently, explaining her notes from her TRG reflective handbook step by step to the others, who agree that it sounds like a good idea. Alex suggests a ‘concrete activity’ from the Progression in Calculations document, linking this to his own experience of teaching the topic in the past. Charlie comments that White Rose ‘have included money too’ and a discussion ensues around whether or not they will include this in the quantities section of each week. Benny refers to activities in the White Rose planning document and in the Maths No Problem book. Frances pencils in arrows on the National Curriculum non-statutory guidance document, bringing everyone’s attention to relevant sections of this as they arise in discussion. They discuss points where students may struggle, drawing on their own experiences of having taught fractions before, and additional repetition or activities which may be needed at these points. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Many texts representing Maths Mastery – some global-domain, some MAT or school-based – are used in unison as mediators of the teachers’ discussions. They are *enrolled* in unison by Frances as a way of, in turn, enrolling teachers in professional discussions around maths (Callon, 1986).

Frances continually checks, and encourages teachers to check, their grasp of the Maths Mastery practices the group are discussing, through questioning and challenging teachers' ideas:

Frances asks questions to clarify the planning decision with the others. The others ask similar questions in response:

Frances: 'But that's...?'

Alex: 'Yes. So then you do...'

Frances: 'I can't see that as following a Mastery approach.... Can you explain?'

Charlie: 'Is it like this?' [Shows example in White Rose planning document]

Alex: 'Yes. That would work.' [Year 1 planning meeting, fieldnote, May 16th, 2018]

Here, Frances challenges Alex's idea, asking for clarification of the practice as applicable to the Maths Mastery approach they are using to structure their practices around. Charlie, another spokesperson for the approach, offers support in bringing Alex's teaching practice in line with the approach, through reference to a document from the intertextual hierarchy.

Practices are constantly checked by Frances and agreed practices recorded on the plan:

Frances listens to responses from others, summarising conclusions back to them. As agreement of each teaching method is reached, he phrases the ideas out loud in notable form, asking one of the teachers to write the idea on a green sticky note or to add it directly to the plan. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Frances also uses the plan to guide teachers in translating their plans into enacted classroom practices. This S plan is used by the team, under Frances' direction, as a basis for translating planned practices into lesson slides to be used as the structure for each maths lesson by the

teachers. In order to be of most use in expanding the plan into lesson slides, Frances ensures that teachers have first noted physical resources needed for different parts of the teaching sequence, on the S plan:

Frances moves the conversation on to discussion of potential activities which will bring to life the planned learning. For each activity, a similar discussion is had, covering:

- *Activities done in the past and their pros and cons*
- *What the students will get out of the activity in relation to the learning focus*
- *Resources available in school*
- *Resources which can be brought in from home*
- *Resources which will need to be made*
- *The logistics of making/sourcing resources – who will prepare what*

As decisions are arrived at, Frances writes these on the plan. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Frances and the S Plan thus combine to further effect. Not only do they combine to act as an anchor for textually-mediated meaning-making around Maths Mastery, but this relationship facilitates teachers' translating of the agreed Maths Mastery practices for the teaching of this unit of work into professional action: their classroom practices.

The S Plan remains central to the discussion, mediating the conversation and decisions. It acts as a centrifugal repository for decisions made through associations between teachers and texts from the intertextual hierarchy. In this way, the S Plan acts as an anchor within the actor-network. It centres discussions around the new approach. The S plan format and

accompanying Maths Mastery texts can thus be seen as a textual infrastructure (Hamilton, 2011), a foundation of structure and content for aligning classroom practices with Maths Mastery.

However, whilst Frances guides teachers towards Maths Mastery through the mediating lens of texts representing the approach, teachers' previous classroom practices are also allowed space within the discussions and resulting plan, continuing the blending of previous and Maths Mastery practices:

Frances applies to Alex for his knowledge of what 'the tricky parts of teaching this' are. Alex offers thoughts on this: that the quantity part of this is often what students struggle with, as it is 'abstract and continuous'. [Year 1 planning meeting, fieldnote, May 16th, 2018]

The open-ended format of the plan does not rigidly restrain discussions to the new approach, but rather mediates teachers' discussions in a way that allows opportunity for drawing on their own ideas from previous practices, whilst remaining focused on developing a sequence of lessons structured according to Maths Mastery pedagogy:

Teachers write ideas down from the small steps document, expanding these with their own ideas. They discuss, debate and move around the sticky notes in terms of position on the 'S', drawing on tricky parts of the topic they have seen when teaching fractions previously. [Year 1 planning meeting, fieldnote, May 16th, 2018]

Approaches are not copied verbatim from *global domain texts*, but rather filtered through previous experiences into localised summary in note form. Charlie adds in a worksheet used before. Alex changes concrete tasks suggested in various documents to familiar ones using fruit and playdough. Other activities are noted word for word from documents. The S plan becomes a blend of familiar and unfamiliar teaching ideas. Thus, whilst multiple texts

representing Maths Mastery mediate teachers' discussions, aligning their evolution of lesson plans with the new approach, teachers' experiences and opinions of previous practices are also given space to exert influence within the actor-network. The intertextual hierarchy thus can be said to act as an infrastructure for the change of approach, but perhaps not a rigid infrastructure; there is room for localisation, for the existence and movement of existing actors within the reordering of the network.

8.8 Network resistance during enrolment

The nature of the textual infrastructure is such that the Maths Mastery approach is positioned as the required foundation of classroom practices, whilst also acknowledging the value of certain existing practices. This nature is drawn upon as a source on which to draw to overcome resistance to the change.

Most teachers appear to become enrolled in the approach without observable resistance. Their professional discussions and practices (discussed in the next chapter), guided by spokespersons and texts which mediate discursive meaning creation, is clearly aligned with the new approach in the lessons and discussions I observe. However, there is some open resistance to Maths Mastery. Alex, an experienced teacher in Year 1, initially strongly resisted the change to the Maths Mastery approach and, in particular, one aspect that the team leading the change at Highland School had chosen as a focus: 'live-marking', a process which involves the teacher marking students' work within the maths lesson, giving in-the-moment feedback:

'If you'd have asked me two years ago, that was the year I had a tricky class and I was about to just jack it all in. The Maths – it was the Maths really that nearly tipped me over the edge. It was just crazy: 'We've now got to walk round and mark them

quickly. How am I going to that, I've got 30 kids?' It was really hard and I just thought, shall I go back to what we did last year? ... And when it first came in – this Maths – I thought 'I've got no way of recording'. Because I'm not doing all the live marking, I've got no way of recording who's done what.... [Alex, interview, May 15th, 2018]

To overcome Alex's initial strong resistance to the live-marking part of Maths Mastery, Frances and Charlie highlight similarities between pre-existing and Maths Mastery practices, through the use of texts from the intertextual hierarchy. Alex continues:

Frances and Charlie have been on the TRGs [Teacher Research Groups] and came back and showed me examples [from their TRG reflection booklets] and talked about how we're doing a lot of it already... I think we've been doing live marking for a long time, but just didn't call it that. We used to do a lot more whiteboard work before the Maths Mastery but I think you could sit there and you'd have the books and you'd say 'yep, yep, yep, pass them down... right you need to do a correction... I've got my next group now'. So we probably did do it, but it wasn't called that. I think I prefer the live marking now actually, if I'm honest.' [Interview with Alex: May 15th, 2018]

Frances and Charlie use their TRG booklets in conversation to exemplify to Alex how Maths Mastery methods are similar to practices that Alex already employs. They thus draw positive comparisons between how Alex is already teaching and the new approach. The texts representing Maths Mastery in the network are thus drawn upon to encourage Alex to see that Maths Mastery isn't totally 'new', but rather can incorporate and adopt existing practices. The TRG is used as a tool to mediate this comparison. Maths Mastery is positioned by Alex and Charlie, championing the approach, as the required direction of change of practices, but one that will not be all that much of a change, and a positive adoption.

Further resistance occurs within staff meetings. At a staff meeting run by Laurie, Frances, Charlie and Joss on 25th June, which they entitle ‘Feedback on Maths Mastery so far’, one Year 6 teacher interjects:

‘I’m going to be controversial. We get good results in tests as a school, so why should we change? I’m not saying that I don’t believe that this is the way to go as I get what you’re saying, but why should we change if we get good results anyway?’ [staff meeting, fieldnote, June 25th, 2018]

The teacher’s resistance centres around the fact that Highland School has historically performed well in standardised tests, despite a dip in higher levels of attainment 2016, and therefore that the school is judged externally to be doing well in its teaching of maths. Resistance here questions the need for change in a way which also questions the *problematization* of current classroom practices as the basis for change.

Laurie and Frances respond to this teacher’s resistance by drawing on texts from the intertextual hierarchy:

Frances thanks the person for their thoughts and says that it is important to have challenge to ideas, especially when changes are being made. Laurie adds to this that what has driven them as leaders of this change, ‘and what seems to be coming across in your discussions’ is that (he clicks on the Slides deck and a red box containing a sentence appears. He reads this sentence out loud): ‘We believe that all students can think deeply and reason around Mathematics so that they are able to apply their knowledge throughout their lives in real and meaningful contexts’. Laurie explains that this is a quote from the creator of Maths No Problem: ‘We believe that what we’re doing is right for the students in our school. It is evidence-based and creates lifelong learners.’ [staff meeting, fieldnote, June 25th, 2018]

Laurie and Frances' response to resistance is framed directly within the *global domain texts* used within the initial stages of the change process. Their reference to a quote from the author of a national 'level' student textbook is done in a way in which the author and their book are treated as gurus, whose words are treated as an almost faith-based rationale for Maths Mastery. Use of this textbook quote mimics processes established during *problematization* and *intersement* stages of the translation process, foregrounding *matter of fact* treatment of certain *global-domain texts* to establish the need to strive for (a localised connotation of the term of) 'depth', and associating the Maths Mastery approach as a way of achieving this.

Laurie and Frances thus use global domain texts from the intertextual hierarchy in combination with a network effect of a new metaphysical 'depth' actor to silence resistance: they reinforce the reasons for the change through actors in the network already established as powerful, and refocus teachers' opinions of the change on a localised version of 'depth' as a motivation for buy-in. Texts forming the intertextual hierarchy thus take on an additional role: to provide not only an infrastructure for the change, but also a way of stabilising it, of maintaining – of forcing – *enrolment*.

8.9 Conclusion to the chapter

In this chapter, I have described how an *intertextual hierarchy* (Smith, 2005) is produced in the network as a result of intertextual *literacy practices* in a series of *literacy events* focused on developing teachers' knowledge of Maths Mastery. Teachers' and school leaders' *literacy practices* in these events create a form of intertextuality that is key to the *enrolment* of actors into the ways of the new approach. Maths Mastery is imbued with a sense of authority within the actor-network through association with statutory maths policy. This authority is made palatable through *spokespersons'* activation of existing actors' agency and the gradual

creation of a new metaphysical actor: a localised understanding of ‘depth’: teachers ‘buy in’ to the approach as they feel it fits some of their existing practices and they can ‘own’ the meaning of ‘depth’. In this chapter, I have thus shown how *enrolment* relies on processes of *translation*; localisation of the original policy initiative and the performing of transformations on a global-domain initiative (Hamilton, 2011).

In the next chapter, I follow the associations of actors into teachers’ classrooms. I describe how Maths Mastery is *mobilised* (Callon, 1986) into teachers’ classroom practices in a way which prevents actors from following their own proclivity in favour of the new pedagogical practice.

9. How is the new approach mobilised into teachers' classroom practices?

9.1 Introduction to the chapter

In this chapter, I answer the question: *How is the new approach mobilised into teachers' classroom practices?* Callon (1986) defines this final stage of the translation process (*mobilisation*) as actors acting – or not acting – within the changed parameters, either stabilising or failing to sustain the network. In what follows, I describe how, at the time of fieldwork, teachers at Highland School actively use Maths Mastery approaches in their classroom practices. First, I describe how cloud-based technologies facilitate *mobilisation*. Next, I describe how stabilising effects on the actor-network are produced through teachers' use of repeated phrases which become *tokens* in the network, increasingly reifying aspects of Maths Mastery in relation to teachers' classroom practices. I then describe how teachers, *spokespersons* and texts associate in ways which reframe classroom practices into the Maths Mastery approach. Finally, I detail variation within the actor-network.

9.2 Setting the scene for describing *mobilisation*

At the time of fieldwork, the gradual rollout of Maths Mastery was coming to the final four months of Phase Two (see **Table 10**). Teachers in the EYFS, Year 1 and Year 4 have been supported in their development of Maths Mastery for 20 months, through: in-school staff meetings; planning meetings guidance by *spokespersons* for the approach (Laurie, Frances, Joss and Charlie); team teaching (whereby a *spokesperson* teaches alongside the teacher training in the approach); and documents giving lesson planning support (see **Table 14**). Teachers in Year 3 and 5 have been supported in their development of Maths Mastery since October 2017. Teachers in Years 2 and 6 have attended staff meetings about Maths Mastery but are as yet not required by school leaders to implement the new approach.

When I join the school in April 2018, I observe teachers in the EYFS and Years 1,3,4 and 5 at Highland School actively using Maths Mastery approaches as the basis of their classroom practices. They use the lesson plans, slide decks and resources that I see created in planning sessions (see 8.7 for example) as focal points for the teaching of their lessons.

In this chapter, I draw on data from observations of practice in classrooms, as teachers implement the training they have received and the lessons they have planned in planning meetings (described in Chapters 7 and 8). I draw on observational and documentary data from the weeks I spent ‘deep hanging out’ with participants (Geertz, 1998) (see **Table 1** for fieldwork schedule). This data is supplemented by interview data in which participants expand upon observations and documentary data.

9.3 Cloud-based technologies facilitate *mobilisation*

Lessons planned together in teaching team planning meetings (see 8.7 for example) travel into teachers’ individual classrooms via a suite of Google software. Teachers use this software to create lesson plans, slide decks and resources. They then use these online documents as focal points of lessons.

One morning on June 26th 2018, I sit in a Year 4 classroom at breaktime. An interactive whiteboard at the front of the room displays a slide deck – a set of presentation slides created in Google Slides software – ready for the maths lesson after break. The class teacher, Sam (who is also a senior leader at the school), describes a suite of Google software used at Highland School:

‘We have a shared Google Drive, where we store school policies, lesson plans, resources, etc. Each year group has their own folder within the Drive and there are

others for different subjects, school events, and so on. The important thing is that everyone [all teachers at the school] can access everything, at the same time. And you can create documents – Google Docs and Google Slides and their versions of Microsoft Excel and the like – directly on the online platform. And you can do that from any computer, anywhere. So, when we plan, we can all work on the same document at the same time, having conversations about things and planning and checking that we’re all thinking along the same lines. And then we can all access the same lesson plans and slide decks in our classrooms, to teach what we agreed.’ [Sam, senior leader, fieldnote, June 26th, 2018]

Teachers can edit and use the same document at the same time as other teachers and access each document from any internet-connected device. They are in this sense *collaborative* technologies, aimed at facilitating the working together of members of a workplace team. In the actor-network of classroom practices, this functionality gives immediate and sustained access to all teachers to the same *immutable mobiles* in the network (Latour, 2005): policy texts, lesson plans, lesson resources, etc. Teachers use these collaborative technologies to bring localised versions of Maths Mastery generated in planning sessions directly into the classroom, with ease. For example:

Sam teaches his mathematics lesson after breaktime. Sam’s lessons reflect the structure of other lessons in his year group: a slide deck containing the lesson objectives, activities, questions for the class and tasks for students to tackle is displayed on the interactive whiteboard and used by Sam as the basis for discussions in the lesson. [Year 4 classroom, fieldnote, June 26th, 2018]

All teachers in the same year group use the same slide deck (that they have planned together) in their lessons, accessed through a ‘shared drive’: a Google platform for storing files in a

way that multiple users can have simultaneous access. The shared drive is accessible on all internet-connected devices within and beyond the school. Year group teams follow the slide decks they have created as the structure of their lessons.

I observe a clear example of this over the following fortnight, which I spend with teachers in the EYFS (Jamie, Meri and Joss – also a senior leader). The three classrooms in Reception (one of the EYFS year groups) are open plan, joined to each other with large open archways, rather than doors. On 9th July I am principally following Meri, an early career teacher in the year group, but I can easily move between classrooms to observe other teachers:

In a Reception class, moving back to her PC and sitting in a chair in front of the interactive whiteboard, Jamie, a year group leader, clicks on the computer mouse and a new slide appears on the screen. She asks students to name a rabbit pictured on the slide and jokes with the students about football teams that they and she support as they suggest football team names for the rabbit. She uses the pointing stick to point at the learning intention written on the slide. 'We are learning...'. Students echo this back in unison. '...to count back...' – students echo – '...using a number line.'
Students echo. [Reception classroom, fieldnote, July 9th, 2018]

The slide deck provides the sequence of teaching activities within the lesson. Teachers' use of the slide decks supports consistency in the structure and content of lessons:

From the adjoining classroom, I hear Meri conducting the same lesson, using the same language, although the lessons are now at slightly different points. [Reception classroom, fieldnote, July 9th, 2018]

Whilst the pace at which the classes work differs slightly, the slide deck acts to delineate teachers' practices to the Maths Mastery approaches agreed in conversation together. In this way, the shared access function of the cloud-based technologies is a central actor within the

network in terms of bringing Maths Mastery into the classroom. It facilitates the delineation of teacher agency into the ways of (localised versions of) Maths Mastery by enabling the same document to form the basis of all teachers' classroom practices.

The use of slide decks is a deliberate *literacy practice* within the classroom. School leaders require slide decks to be created and used as the basis for the structuring and content of lessons. This practice is reinforced by middle leaders. The next morning, as per every morning that I observe, Jamie leads her teaching team in a run-through of the day's lessons using the slide decks they created together as the basis for the meeting:

'Every morning at 8:30, the whole team meet to run through the day and to explain to each other the slides mostly. We all use the same.' [Jamie, year group leader, fieldnote, July 10th, 2018]

Throughout the day, if teachers ask questions during the day to clarify upcoming lessons, Jamie repeats this process:

The teachers and TAs come into the room and Jamie pulls up the slide deck for mathematics after lunch. Jamie talks through these and shares a number line resource she has found online. She explains the resources that everyone will need to get out, which are pictured on the slides. [Reception classroom, fieldnote, July 10th, 2018]

Highland School leaders thus further lend effects of power to the Maths Mastery approach within the network of classroom practices by activating the agency of the Google documents representing the teaching team's localised version of the approach.

The use of slide decks in lessons is a visual *literacy practice*, in which teachers use slides as visual hooks on which to hang their classroom discourse. After explaining parts of the maths lesson to teachers and TAs, Jamie teaches this to her class. The children sit on a carpeted area facing the interactive whiteboard, on which is displayed the slide deck for a maths lesson:

Jamie picks up a pink plastic pointing stick, pointing at different pictures or words on each slide as she talks to her class. The same is happening in Meri's classroom and their colleague's classroom. [Reception classroom, fieldnote, July 10th, 2018]

The slides serve as memory prompts to Jamie of the Maths Mastery approaches agreed in planning sessions. Jamie introduces a variation-based game to students, using pictures and numbers displayed on the slide:

The next slide introduces a game: 'Can you guess my number?' Jamie reads, 'It is more than ____, but less than ____.' She asks students to talk with a partner about different ways that they could work this out. Students give suggestions after their discussions and Jamie praises their efforts, pointing out images on the next slide which represent different ways to approach the same problem. [Reception classroom, fieldnote, July 10th, 2018]

Here, Jamie uses the slides to guide and focus students' discussions on mathematical concepts in a manner that has been prescribed by the Maths Mastery dominant discourse. On further slides, she employs the interactivity of some of the visuals – an interactive dice, which can be clicked on and 'rolled' on the screen, for example – to motivate students to take part in the lesson activities:

'I'm going to put Man U the rabbit on number 8 on our number line (on the displayed slide) and I'm going to choose somebody to roll my dice. Manu U will jump back that many.' The class fall silent and some sit up straighter. [Reception classroom, fieldnote, July 10th, 2018]

Jamie then asks questions centred around the number line, rabbit and dice displayed on the slide; questions which ask students to engage in the focus of the lesson.

Jamie chooses a student who comes to the front and rolls a dice. It lands on 3. Jamie asks the class, 'What number will Man U land on?' Some responses are given. 'You think 5? You think 6?' She takes five thoughts, some of which are the same as others. 'Why do you think that?' she asks and students give explanations for their thoughts. 'Let's check.' Jamie moves the rabbit back 3 spaces on the number line. 'So we can say: 3 less than 8 is 5. [Reception classroom, fieldnote, July 10th, 2018]

Throughout the lesson, Jamie bases her teaching activities, questions and discussions on the slide contents:

She clicks on a slide and there is the same task with a different character. The naming exercise is repeated and Jamie tells the students some facts about the animal on the slide as they name it. This time, the number line on the slide does not begin at 0 on the left hand label, but at 4. Jamie points this out, asking students: 'What do you notice?' The lesson continues, with slight changes to number lines. Jamie challenges misconceptions by asking questions relating to the visual of the number line: 'Which direction are we going in?'. She brings in variation: 'How do we know? Is there another way we could work this out to check?' [Reception classroom, fieldnote, July 10th, 2018]

Similar *literacy practices* can be seen throughout the school. Laurie and Sam teach the same year group (Year 4) and I see the same practices going on in both classrooms. An example from three and a half weeks prior to my observation of Jamie and Meri's EYFS lessons best describes this. At first, the classes begin in a similar way to that of Jamie and Meri, using a slide deck as a focus for classroom discourse:

Students are asked to talk about the discussion point – often a brief sentence or image – on the slide in pairs and at a signal of clapping a rhythm, snap their focus back to

the whole class discussion... Laurie talks through a slide asking students to think about working with Roman numerals and linking this to different methods they know [see **Figure 29**]. ‘Consider this question with your partner and justify your answer in different ways,’ he asks the class. [Year 4, fieldnote, June 15th, 2018]

Do Part Part Whole and Bar Models still work?

XL	
	XV

If you can solve these, draw some for your partner.

Figure 29: Example key stage two teaching team planning slides, used in each classroom with the students.

The slides provide a focus for classroom discussion, rooting teacher and student discourse in the Maths Mastery activities contained in the slides. Images on the slides often aide thinking, further ‘signs’ in the network (Plum, 2017), this time guiding students towards thinking about mathematical concepts in terms of Maths Mastery approaches to variation or fluency. Images remind students of the various methods they know to segment a number (circle partitioning and bar-model partitioning methods seen in **Figure 29**). Words introduce a think point and a task, acting as reminders of these as they discuss the task in pairs. Laurie reminds the class as they work of the need for variation, one of the Maths Mastery concepts Highland School is focusing on:

Laurie asks the students to find more than one way to partition these. As the students work on these problems on their whiteboards, Laurie repeatedly calls out a reminder to find more than one way: 'You know that one way is not how we work.' [Year 4, fieldnote, June 15th, 2018]

The slides thus act as reminders to students of known mathematical methods, whilst also reinforcing the teachers' expectation that students will work within the school's focus on the variation element of Maths Mastery.

The teachers in this year group extend the use of the slide decks into students' independent classroom work through the use of laptops – one per student. The laptops are agentic artefacts in the network (Latour, 1999), facilitating students' access to teachers' lesson slides which are shared with them via Google Classroom, a collaborative learning space to which teachers and students can upload and simultaneously work on different documents. In mathematics lessons, students use Google Classroom to record and share ideas on the Maths Mastery activities they work on:

Frequent talk partner and student collaborative tasks centre around the information on the slides. Students access the slides on Google Classroom. Google Classroom is connected to Laurie's PC and he has sight of the work going on at each student laptop. He is able to comment on the work in progress happening on individual computers and project the online classroom onto the main classroom whiteboard screen. Each slide presents a new Maths Mastery task for the students to discuss and think about. [Year 4, fieldnote, June 15th, 2018]

Students and teachers interact with slides simultaneously, both in the virtual Google Classroom space and the real-time space of the classroom, in discussions with a partner and then feeding back their ideas as a whole class. Localised versions of Maths Mastery

pedagogy thus enter classroom practices via online *immutable mobiles* facilitated in their journey by teachers' use of collaborative technologies.

The functionality of the suite of Google software – its simultaneous viewing and editing functions – also facilitates teacher-student evaluation of, and reflection on, learning in Maths Mastery terms. Teachers give immediate feedback on students' mathematics work, often switching the main classroom screen to a view of a pair's online work to talk through their edited slides and offer further aspects of maths for students to think about:

Laurie projects the online classroom onto the main classroom whiteboard screen. On the main whiteboard can now be seen students' completed versions of the tasks, stored in Google Classroom. Laurie and students talk through specific examples of students' tackling of the tasks. [Year 4, fieldnote, June 15th, 2018]

Centring evaluative/ reflective discussions on projected completed versions of tasks on slide decks maintains the lesson's focus on the Maths Mastery approach, as agreed in the year group's team planning meeting.

These *literacy practices* are echoed by other teams in Highland School. The ability to simultaneously access and use slide decks creates a sense of consistency within classroom practices for the teaching of maths, which are structured on the same slide deck. In this way, collaborative technologies facilitate slide decks as *immutable mobiles* in the actor-network, carrying Maths Mastery into the classroom where it is used to anchor all teachers' practices.

However, the influence of cloud-based immutable mobiles is reliant upon other material actors, such as correctly functioning hardware and internet access. Where this fails, breakdowns in the actor-network make visible the associations of actors on which cloud-based immutable mobiles rely for circulation and influence (Latour, 1999). To best describe this, I draw on an example from early in fieldwork: a Year 1 maths lesson on April 30th.

I join Alex, an experienced teacher in Year 1, in a morning maths lesson, Alex sits on a chair at the front of a carpeted area of the classroom, on which the class sits cross-legged, looking at the interactive whiteboard. Google slides on the interactive whiteboard contain the content and progression of the lesson. Alex clicks through each slide, which holds activities and key knowledge facts and interactive games to be played together or with a partner, such as a 'doubling machine', which students echo with their own print-out version in a clear plastic wallet and a whiteboard pen. Occasionally, the slides don't work in some parts of them, or the internet disconnects, especially when Alex is introducing the 'doubling machine' game which asks students to double using different methods. On realising this, Alex immediately switches the task to working using individual whiteboards and individual print-outs of the 'machine' in plastic wallets. [Year 1 classroom, fieldnote, April 30th, 2018]

The influence of the slide deck on Alex's classroom practices is interrupted when hardware or internet connection fail. For the lesson to continue in the same vein as planned (in line with a team-agreed Maths Mastery pedagogy), Alex needs to *enrol* another actor: a printed lesson resource. Cloud-based collaborative technologies rely upon hardware, software, working internet and people to sustain their influence.

9.4 Repeated phrases are *tokens* within the actor-network

In discussions around Maths Mastery, Laurie, Frances, Charlie and Joss select elements of Maths Mastery for the teachers of Highland School to focus on in making the change to classroom practices in maths lessons (see Chapter 7.7). The elements selected are NCETM conceptualisations of variation, fluency and coherence. These concepts are established as

foundational to the school’s approach to Maths Mastery. They become prominent actors within the network.

Spokespersons establish coherence as prominent through the use of the S planning format (as seen in Chapter 8.7). The focus concepts of variation and fluency are established as foundational to teachers’ classroom practices in a different way: through spokespersons’ creation and circulation of key phrases, or ‘reasoning icons’. Created by one of the teachers, a ‘reasoning mat’ (see **Figure 30**) is used in each classroom.

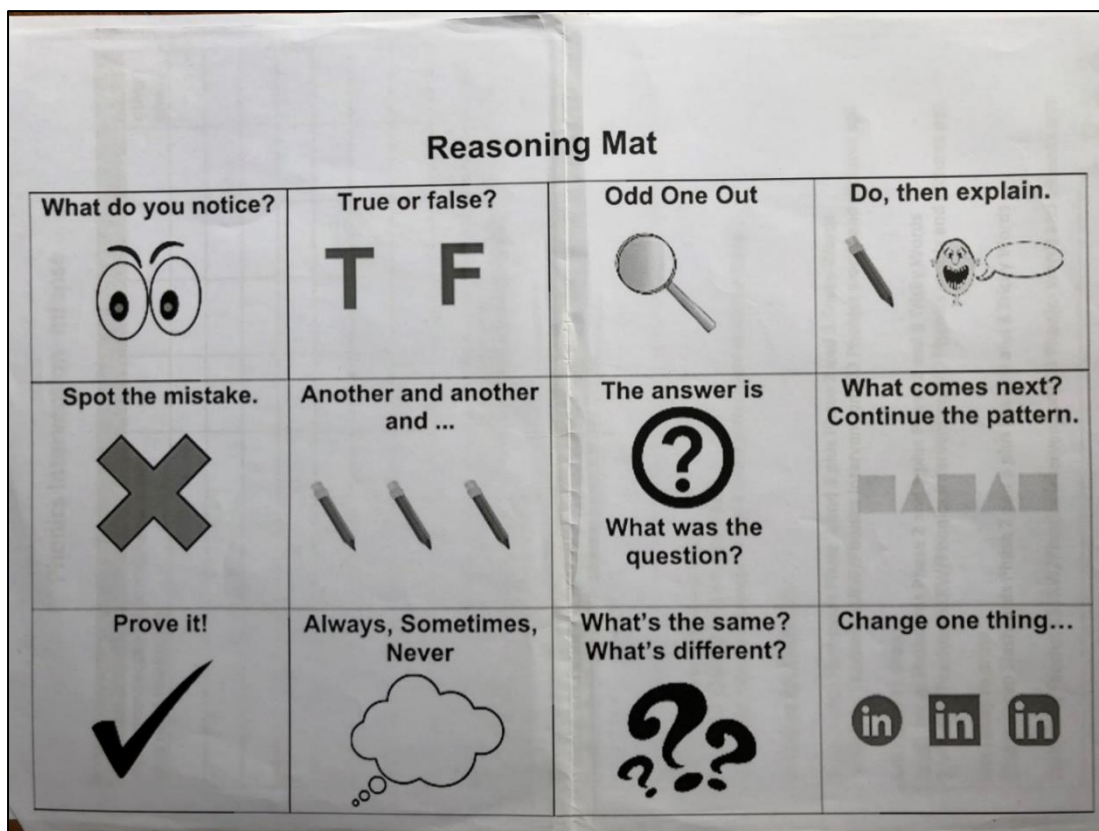


Figure 30: Reasoning Mat

This resource – an A4 piece of paper – was created by a teacher in another school in the MAT, to guide teachers and students in reasoning in relation to mathematical problems. It

was shared during an NCETM Specialist Training Day that Laurie attended in September 2017 and Laurie shared it in subsequent training sessions he ran for staff in Highland School.

Table 15: Table showing how each element of the reasoning mat correlates to the Maths Mastery aspects of variation and fluency, drawn from definitions of variation and fluency I accessed from the NCETM’s website in June 2018.

<p>Variation definition: <i>‘Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.’</i> [Extract from NCETM website, accessed July 2018]</p>	<p>Fluency definition: <i>‘Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics’</i> [Extract from NCETM website, accessed July 2018]</p>
<p>Reasoning mat phrase Correlation to NCETM conceptualisation of variation</p>	<p>Reasoning mat phrase Correlation to NCETM conceptualisation of fluency</p>
<p>Another and another and... <i>Variation of ways to respond to a given problem</i></p>	<p>What do you notice? <i>Consideration of contexts and representations of mathematics</i></p>
<p>The answer is... What was the question? <i>Alternative angles to approach a problem</i></p>	<p>True or false? <i>Quick and efficient recall of facts</i></p>
<p>Prove it! <i>Proving solutions to problems in a variety of ways</i></p>	<p>Odd one out <i>Moving between different representations of the same mathematical content and reasoning with these</i></p>
<p>Always, sometimes, never <i>Considering variations of aspects of a problem in terms of aspects that always relate to the problem, those that sometimes relate and those that never relate</i></p>	<p>Do, then explain <i>Drawing attention to procedures</i></p>
<p>What’s the same? What’s different? <i>Considering similarities and differences between mathematical concepts</i></p>	<p>Spot the mistake <i>Recall applied to identification of error</i></p>
<p>Change one thing... <i>Playing with variation in maths</i></p>	<p>What comes next? Continue the pattern <i>Efficiency of recall to predict next in pattern</i></p>

The ‘reasoning mat’ is based around NCETM conceptualisations of aspects of the Maths Mastery approach: variation and fluency. In **Table 15**, I set out how each element of the

reasoning mat correlates to the Maths Mastery aspects of variation and fluency, drawn from definitions of variation and fluency I accessed from the NCETM's website in June 2018.

The reasoning mat is a further *translation* of Maths Mastery in textual form which carries aspects of the NCETM version of Maths Mastery further into classroom practices (Nichols, 2006). In this translation, elements of the *global-domain* NCETM approach are translated into phases that teachers can quote within the classroom. This translation transforms the key concepts that the phrases connote into specific forms of classroom activity, asking pupils, for example, to support answers to tasks with mathematical workings through the 'Prove it!' phrase. This echoes the work of Gaskell and Hepburn (1998) who suggest that "the path of the token is a product of the power of the originator of the idea and the frictions and resistances ... that it encounters" (p.6). In this case, key Maths Mastery concepts travel throughout the actor-network of classroom practices at Highland School and as they circulate, they simultaneously alter the associations of actors in *literacy events* which reshapes the actor-network of classroom practices as a whole, and become reshaped by their movement through the network.

The reasoning mat is positioned by *spokespersons* leading the approach as a central actor in maths lessons. They establish its centrality partly through repeated, multiple encounters between teachers and the reasoning mat. They introduce the reasoning mat in a series of staff meetings. On June 11th, I attend a staff meeting run by Frances, Laurie, Joss and Charlie focused on variation, coherence and fluency:

Laurie hands out a 'Reasoning Mat'. Teachers thank him and some teachers (from year groups fairly new to the approach this term: Years 2 and 6) exclaim that this will be 'really useful'. Teachers start discussing in small groups how they use/ could use the resource in class. [Staff meeting, fieldnote, June 11th, 2018]

Laurie, Frances, Joss and Charlie guide teachers in making connections between the reasoning mat and other texts representing Maths Mastery in the school, centring teachers’ discussions around these connections.

In a further staff meeting on June 25th, run by Laurie and Frances, these two *spokespersons* talk through a slide (see **Figure 31**), asking teachers in Phase 1 and Phase 2 of the rollout of Maths Mastery to reflect on their change to practices so far. In their explanation of the reflective task, Frances and Laurie juxtapose the reasoning mat with the NCETM’s 5 Big Ideas poster visually on the slide.

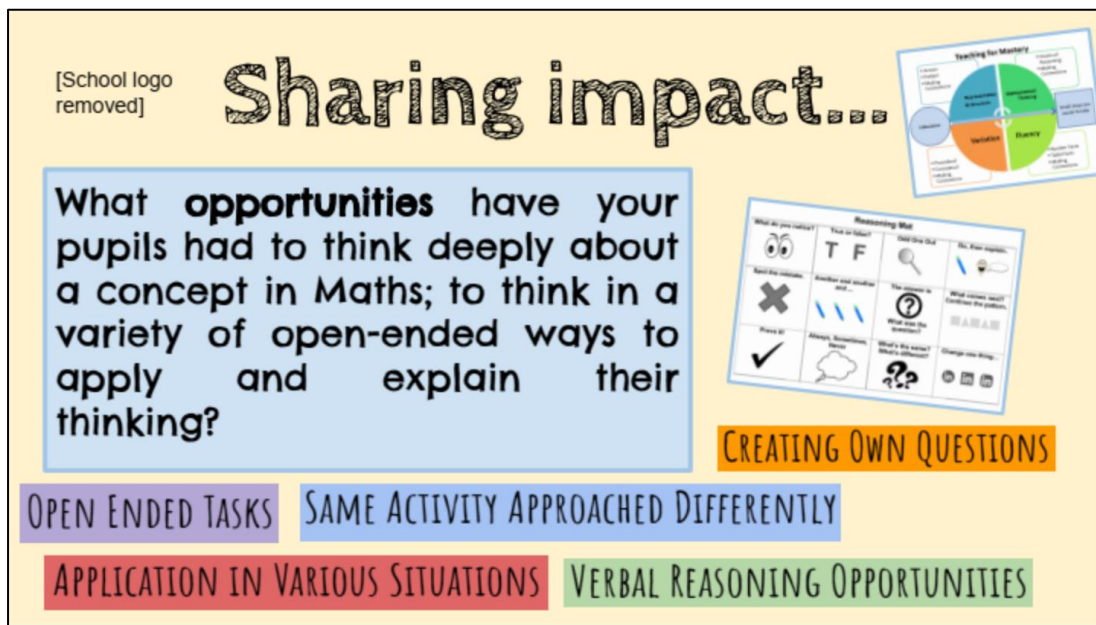


Figure 31: Staff meeting slide central to discussions between teachers around their practices with Maths Mastery so far.

The reasoning mat is thus brought into association with other central actors such as the Big Ideas poster (see Chapter 7.4), strengthening the centrality of the reasoning mat in the actor-network.

Senior leaders in the school ask teachers to display and use the reasoning mat in their classrooms, extending the agency of this text. In each classroom, teachers display the reasoning mat and have laminated copies of the mat for students to use available in the room. In the Year 1 teaching team, each teacher translates the reasoning mat into the same (repeated in each classroom) wall display:

On a maths display in a Year 1 classroom, key phrases are written, which are used in classroom discourse in this and other classes:

- *Change one thing (pictures of a circle, a rectangle, a rectangle with rounded edges)*
- *What's the same? What's different? (???)*
- *Do, then explain... (picture of cartoon face and speech bubble, alongside a pencil)*
- *Prove it! (tick symbol)*

[Year 1 classroom, fieldnote, July 3rd, 2018]

Teachers refer to the wall display and/or the reasoning mat in their classroom discourse.

When I spend time in the EYFS, Meri, a teacher in the year group, tells me:

'I try to look over my shoulder at them to use when I am talking to the students.'

[Meri, Reception teacher, fieldnote, July 4th, 2018]

The displays and reasoning mats translate the focus aspects of Maths Mastery into teachers' classroom practices. In Reception, I observe Jamie teaching maths:

Jamie picks a volunteer and they explain their work. 'Prove it!' challenges Jamie. The student talks through the thinking behind their idea. This process is repeated with several students. [Reception classroom, fieldnote, July 6th, 2018]

In a similar vein, Laurie, maths subject leader, uses the phrases to continually shape classroom discourse around a mathematical problem:

Laurie clicks onto the next slide in the lesson slide deck (also in usage in the other classrooms in the year group, which I pop into during the lesson). The slide asks students to ‘Change one thing in this statement to make it correct.’ Laurie takes some proffered ideas from the class, then asks, ‘What else could you do?’ [Laurie, maths subject leader, fieldnote, June 12th, 2018]

Laurie then sets students a discussion task, based around the idea of ‘changing one thing’. When students’ discussions stray from the requirement to ‘change one thing’ about the problem, Laurie repeats the phrase as a question:

‘Are you changing one thing? What else could we do?’ [Laurie, maths subject leader, fieldnote, June 12th, 2018]

These key phrases are not only used by teachers in reference to physical documents – wall displays or a sheet of paper displaying the reasoning mat –, but also occur without such documentary support. In Year 6, a year group new to training in the approach and not yet required by school leaders to teach using Maths Mastery pedagogy, Rowan, year group leader for the year group, talks to me in a break in teaching about the ways that maths is taught by teachers in his team:

Rowan talks through an example maths lesson from his year group, pointing out how it was an open-ended opportunity for students to explore a concept, meeting a year group objective, but taking it further. He talks through how asking students to ‘prove it’ makes them ‘go further in their thinking’. [Rowan, Year 6 year group leader, fieldnote, 24th June, 2018]

Similarly, Alex, a Year 1 teacher, tells me about his maths lessons during over morning coffee break:

He says that they use a lot of, ‘Can you show me another way...? Another and another and...’ to encourage different ways of thinking about the same learning. He tells me that teachers all try and be precise with their language. [Alex, Year 1 teacher, fieldnote, 2nd July, 2018]

As well as in the classroom, teachers use the phrases in professional discourse with other teachers:

Meri, an EYFS class teacher, asks for clarification on the maths lesson from her year group leader, Jamie. Jamie sits down with her at the PC, clicking through the slides. “Here, they have to prove it using a number line.” [Meri, Reception teacher, fieldnote, July 10th, 2018]

Lesson slides contain the phrases as prompts on how students should complete the given task (see **Figure 32**).



Figure 32: Extract from a lesson slide deck in key stage 2

Through such further textual translations – translations which conserve the exact wording of the phrases from the reasoning mat –, these phrases become hooks for teachers’ professional discourse within the classroom, effecting a Maths Mastery-aligned change to professional and classroom discourse.

Using the phrases as hooks for the shaping of teachers’ classroom discourse and practices in mathematics lessons is again an intentional move by spokespersons, who highlight the school’s focus on developing teachers’ usage of Maths Mastery as through the development of a common language for classroom practices in maths:

‘Our complete shift in our approach has been driven by a change in vocabulary.’

[Frances, year group leader involved in leading the change to Maths Mastery, fieldnote, July 3rd, 2018]

Similarly, Joss tells me:

‘We talked together with year group leaders and teams to make everything consistent, even things like the language we use for maths.’ [Joss, senior leader involved in leading the change to Maths Mastery, interview, June 21st, 2018]

Teachers dub this the school’s ‘Maths voice’. As students work independently in a Reception lesson that I observe in July 2018, Jamie tells me about how well the students are working, pointing out students who are ‘using their Maths voices’:

‘Those who went to the school’s Nursery come up with Maths voices, so they talk using the same phrases that we use, like ‘I can prove this by...’. It’s all about a lot of training them into routines and keeping the language going.’ [Jamie, year group leader, fieldnote, July 3rd, 2018]

Through teachers' usage of the resource as a required classroom *literacy practice*, the phrases act as textual mediators of teachers' practices in the sense that they *delegate* for core content from global-domain versions of Maths Mastery (Latour, 1999), representing these central aspects of the approach in teachers' classrooms. This representation and mediation shape the way in which lessons are delivered and the ways in which students are guided to think about the mathematical content, garnering alignment of practices with the new approach. The phrases become part of teachers' language, sculpting their practices around these linguistic representations of Maths Mastery concepts. In this way, the phrases act as *tokens* (Latour, 2005) within the actor-network: quasi-objects repeatedly occurring in the associations of actors within the network. In ANT, a token is described as "a moving actant that transforms those who do the moving, because they transform the moving object" (Latour, 1996, p. 379). Teachers' repeated use of the phrases, transformed into displays, discourse, a reasoning mat, slide decks, and so on, maintains and expands the phrases' presence within the actor-network. Teachers' active usage of these phrases in their classroom discourse signals what Barton highlights as the importance of language usage in constructing thought, language being a central actor in "the mental models people construct of the world" (Barton, 2007, p. 73). Following this idea, instances of dialogic use of the key phrases without supporting textual prompts suggests a level of integration of the tokens into teachers' mental models for the teaching of mathematics. Teachers' thinking is "fragmented into the same array of cognitive orientations" (Nichols, 2006, p.189) that the phrases represent. Thus, teachers' agency, traced through their speech and actions, is shaped by the tokens.

The *tokens*, then, provide a path in the actor-network via which the policy initiative is given opportunity to influence teacher agency. As they move throughout the actor-network, these *tokens* are strengthened and reified by the network as they are translated into different textual forms, used in teacher discourse. In turn, they work to establish the new approach through the

Maths Mastery concepts they carry and signify. This co-constructive relationship between the phrases and teachers' usage of them produces a coactive practising of selected elements of the Maths Mastery approach. The key phrases become key *nodes* in the network of the change to classroom practices (Latour, 2005), bringing individual teachers' proclivities in line with Highland School's version of Maths Mastery and mobilising the new approach.

9.5 'Team teaching' as a tool for *enrolment*

One of the ways in which *spokespersons* deliberately *enrol* teachers into the ways of Maths Mastery is by working to change *literacy practices* in the classroom. As well as the use of the key phrases discussed above, they use what they call a 'team-teaching' approach to constantly centralise visual representations of Maths Mastery in the classroom. 'Team teaching' is a term widely used in education but can connote different practices. The style I observe Laurie, Frances, Joss and Charlie using is a positioning of *spokesperson* as 'expert' and teacher as 'novice'.

This relationship is made most visible when the expert-novice association is more pronounced: in the case of Frances (a year group leader) training Benny (a student teacher) in Maths Mastery. To describe this, I take us back in time to May 18th 2018, two days after I have joined the Year 1 team in their weekly planning session (see Chapter 8.7). I join Frances and Benny in a Year 1 classroom for a maths lesson I observed being planned. The lesson is one of a series on fractions, this one focusing on finding half of a shape:

Benny takes the lead in the lesson, sitting at the front of the class, next to the interactive whiteboard, which displays the lesson slides which were created with the teaching team in building on their S plan [see Chapter 8.7]. Frances sits to the side, at a table. The students sit on the floor facing Benny. Benny clicks through the slides on

the interactive whiteboard. The slides ask students to find half of the shape presented on each slide [see **Figure 33** for example]. The students work on individual whiteboards to draw each shape and to show half by splitting the shapes using lines. Benny asks for different ways that they have shown a half on each shape. [Year 1 fractions lesson, fieldnote, May 18th, 2018]

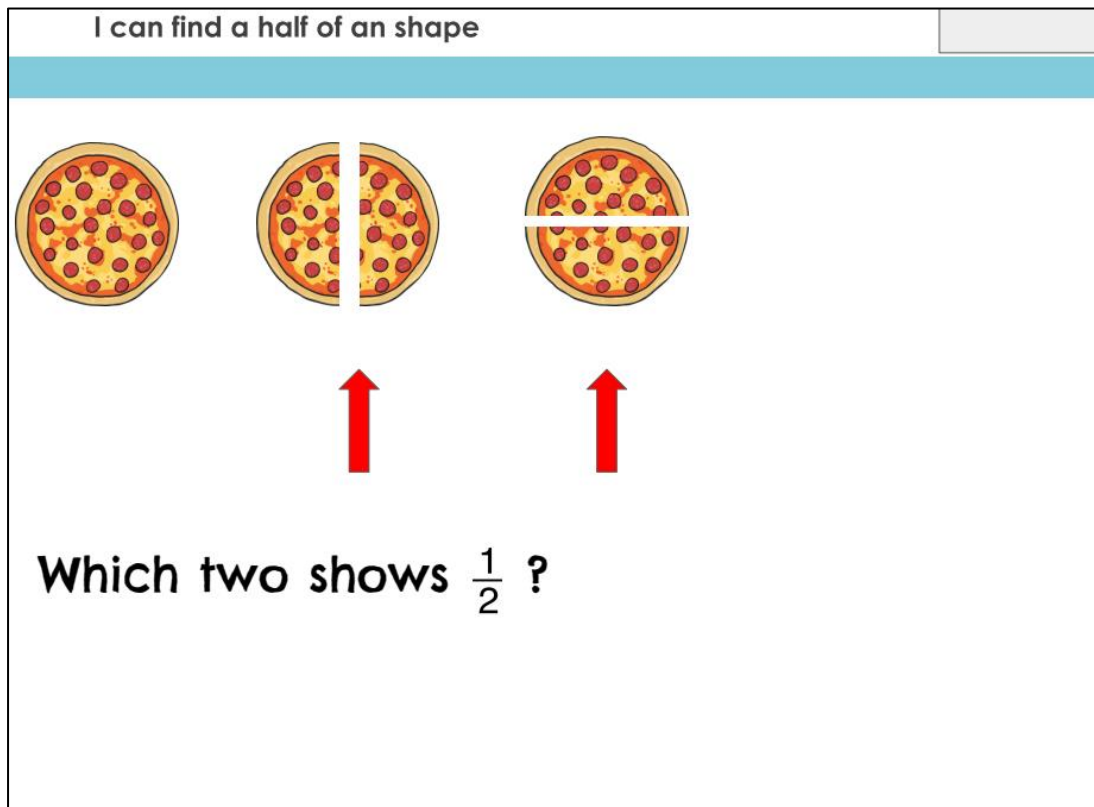


Figure 33: Key stage one lesson slide from sequence of lessons planned by the year group's teaching team

Through this discussion, Year 1 pupils encounter variation in ways that standard shapes such as rectangles, squares and triangles can be halved equally. Benny's lesson directly follows the teaching structure and activities that he and his teaching team planned together. The slide deck *enrols* Benny into this structure and content.

Frances is Benny's in-school mentor during his period of training to be a teacher. He is also part of a team of teachers and school leaders leading the introduction of Maths Mastery in the school, as well as year group leader for this year group. He is an actor within this particular scenario who is imbued, through these various positions within the network, with *effects of power* over the determining of Benny's classroom practices. As Benny teaches using the slides, Frances, occasionally interrupts:

Frances interjects as Benny explains the next activity. He re-explains the activity to students, reading out loud 'stem sentences' on a slide that Benny did not read out: "It is showing ____ parts" and "Another way is..." He nods to Benny. Benny continues, re-explaining the task again, echoing the way in which Frances has done this. [Year 1 fractions lesson, fieldnote, May 18th, 2018]

Here, Frances interrupts to ensure coverage of the slides. Through reading out part of a slide that Benny missed out, Frances reiterates aspects of Maths Mastery pertaining to fluency and variation: fluent recall of the divisions of shapes into halves (asking pupils to repeatedly identify how many parts the divided shape now has) and asking them to show half of a shape in different ways. In response to this interruption, Benny reteaches that section of his lesson, echoing Frances' explanation. Frances reinforces a required *literacy practice* in the school: the centrality of the slide decks containing agreed Maths Mastery approach.

Throughout the lesson, Frances models to Benny how to activate the content of the slides into classroom practices. He praises Benny's use of the language of Maths Mastery:

Frances comments to me as an aside that Benny is getting really good at showing the language of Maths Mastery to the students, of teasing out learning and understanding from a perspective of depth. [Year 1 fractions lesson, fieldnote, May 18th, 2018]

If Benny forgets to stress this in a response to a student, Frances interjects, highlighting the example of ‘depth’ (according to the notion of depth that has emerged within Highland School: see Chapter 8.6) and modelling to Benny the praise of students for achieving this. For example, in one activity, Benny asks students to work on individual whiteboards to draw lines on shapes represented on lesson slides to show them split into two halves:

When it comes to a circle shape, represented by pizza images, one student draws on her individual whiteboard a diagonal line to note a half on one of the pizzas.

Everyone else has drawn the line either vertically or horizontally. Benny asks her to come up to the interactive whiteboard the lesson slides are shown on and use the interactive whiteboard pen to show the class what she has done. The student smiles and comes up to the board. She first draws a diagonal line from top left of the circle to bottom right of the circle. Then she pauses and says: ‘Or you can do...’ and draws another line from top right to bottom left. She draws more lines, signalling that the lines can be drawn from any point on a circle as long as there are two equal halves.

[Year 1 fractions lesson, fieldnote, May 18th, 2018]

Benny thanks the student and goes to erase the lines from the board. Frances interrupts him:

Frances points to the lines. He gets excited, saying, “Wow! Let’s look at this one.

That’s depth! Let me get my camera!”. He asks Benny to explain to the students why *this is an example of ‘depth’.* [Year 1 fractions lesson, fieldnote, May 18th, 2018]

In this instance, Frances associates ‘depth’ with ‘variation’, continuing the school’s appropriation and morphing of the term (see Chapter 8.6). As Frances retrieves his camera, Benny praises the student’s work more specifically than previously:

Benny praises the student for showing different ways of approaching the problem, for “proving it” and for “showing it in different ways” using their understanding of circles. [Year 1 fractions lesson, fieldnote, May 18th, 2018]

Benny’s response to the student is now framed in the variation and fluency whole school focuses of Maths Mastery, prompted by Frances. Frances reinforces this association to Benny, giving agency to the metaphysical actor of ‘depth’ that has been produced through localising moves as the initiative is translated from global initiative to teachers’ classrooms (Hamilton, 2011; Nichols, 2006).

This is an extreme example of an expert-novice *spokesperson*–teacher association in that Frances mentors Benny as a student teacher. However, less extreme but similar interactions were present in other team-teaching scenarios I observed during fieldwork. Through this *literacy practice*, in which experts reinforce the centrality of textual actors carrying agreed Maths Mastery pedagogy (slide decks), *spokespersons* have opportunity to *enrol* teachers into aspects of the Maths Mastery approach, such as a localised ‘depth’ discourse (Callon, 1986). They highlight examples of the new notion of ‘depth’, building the tangibility of the term. They reiterate Maths Mastery focuses and reshape teachers’ classroom discourse around these. This in-classroom *enrolment* strengthens *mobilisation* of the approach (Callon, 1986): teachers reframe their classroom practices into the ways of the new approach.

9.6 Photographs as technologies of *mobilisation*

A further *literacy practice* which supports *mobilisation* of the new (localised) version of Maths Mastery into teachers’ classroom practices is teachers’ patterned usage of photographs in professional discussions around Maths Mastery. As *immutable mobiles* created within the

network; photographs are *network effects* (Latour, 2005). But photographs also become *mediating technologies* (Latour, 1999) in that they represent and transport classroom practices identified as showing Maths Mastery pedagogy beyond the classroom walls and into professional discourse in other places.

In the lesson that Frances and Benny taught together (see section 9.5), Frances photographed what he identified as an example of a pupil working at ‘depth’. In conversations between the Year 1 teaching team in one of the school’s planning rooms later that day, Benny talks through the medium of these photos:

Benny shows photos taken in today’s mathematics lesson and talks through the example of halving the circle. “...she is a total mastery success. She doesn’t grasp a lot of things in a rote learning way and might, under the old system, have been viewed as ‘lower ability’, but now I can see she can think at depth.” [Year 1 teaching team planning meeting, fieldnote, May 18th, 2018]

The photographs represent a construction of success in learning that Frances (and now Benny) have built in relation to a localised conceptualisation of the Maths Mastery approach. The rather vague new metaphysical actor ‘depth’ is made more concrete through these photographic representations.

The photographs are used to circulate this conceptualisation of Maths Mastery-based success wider within the network. Benny shares these photographs with the whole school, in a further reflective staff meeting on June 25th, led by Frances and Laurie and which they name ‘Maths Impact staff meeting’. In the staff meeting, Frances asks teachers to reflect on successes in teaching and learning relating to their trials of the Maths Mastery approach:

Frances explains that there has been a shift in their approach to the National Curriculum at the school, from EYFS into key stage one and begins to talk through

examples of Maths Mastery from key stage one, using examples from different lessons on slides. He asks Benny to talk through the example of the work of an “at greater depth student who you wouldn’t expect”. [Staff meeting, fieldnote, June 25th, 2018]

Benny talks through the example using photos of students’ work, which he has made part of a slide deck (see **Figure 34**):

Benny says, “I was ready to move on, but this student said, ‘There’s another way to make half of the circle’ and Frances pointed out the value of this.” He shows a photo of the student next to the interactive whiteboard, making half of a circle by drawing a series of diagonal lines through it, extending the examples on the slide he has just displayed. Benny explains what happened in the lesson and why this makes this student ‘at greater depth’. [Staff meeting, fieldnote, June 2018]

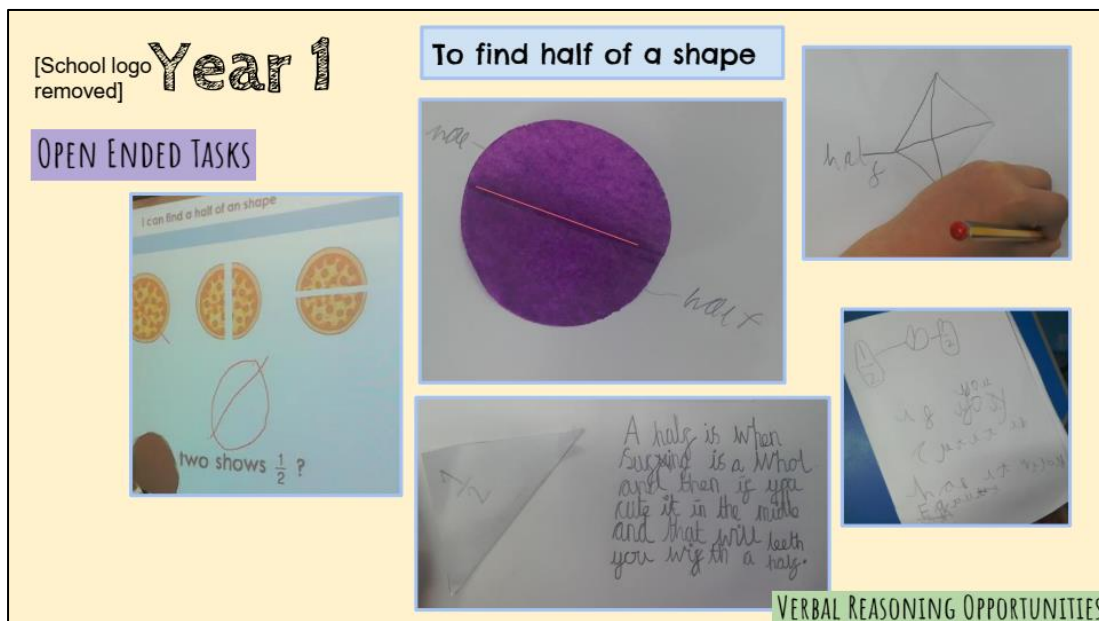


Figure 34: Extract from staff meeting slide deck: students' work from Benny's lesson, teaching using the Maths Mastery approach

Through this staff meeting, a few weeks after the jointly taught lesson, the photographs of the ‘moment’ that ‘depth’ was constructed by Frances and photographically reified to Benny

continue to frame Benny's meaning-making around his classroom practices. Now part of a further *translation* into a new text – staff meeting slides – the photographs continue their journey of immutable mobility throughout the actor-network, exemplifying the example of 'depth' and mediating more discourse about classroom practice for the teaching of maths within the school.

The photographs, like other Maths Mastery texts already described in the network, rely on the work of *spokespersons* for their existence and agency. It is Frances who photographs the 'moment' and who asks Benny to talk through the photographs in a staff meeting. The taking of photographic examples of 'depth', of 'variation', 'fluency' and 'coherence' is a central process in team-teaching throughout the school, which is a regular part of the school's performance development system. In the same staff meeting in which Benny presents his fractions example of 'depth', other teachers share photographs of moments in team-teaching situations:

Frances passes the conversation on to Charlie, another Year 1 teacher, and the teacher she has been team teaching with on this project, who teaches in Year 3. They talk through what they did, using slides containing photos of students' work and students working. [Staff meeting, fieldnote, June 25th, 2018]

The photographs then mediate teachers' reflections and discussions of Maths Mastery. For example, Alex, a Year 1 teacher, talks of some team-teaching he did with Charlie:

Pointing at photographs of students learning (identified in brackets) which are contained within a slide on the interactive whiteboard, Alex tells the group: 'Charlie and I taught together and it was great because by talking to her, I could see the learning and the successes we were having better'. Because we'd taught this first (points to a photograph showing students working with fruit to make different

fractions) in a concrete way, the students could then do it with numbers (points to a photograph of students working with numerical representations of fractions). 'It's about being able to develop it through the Maths voice (points to a photograph of a lesson slide containing some of the phrases from the 'reasoning mat'), making the students explain how they did it really lays open their thinking. Even the ones slower at grasping the concept, did so, through talk, by the end of the lesson... there was so much variation, in a good way. So much depth of thinking.' [Staff meeting, fieldnote, June 25th, 2018]

Here, Alex uses photographs to structure his presentation of students' learning, using these to point out what he sees as successful examples of 'variation' and 'depth of thinking'. He references the 'Maths voice' used in the school (represented by the key phrases on the reasoning mat discussed in section 9.4).

The photographs are products of the 'team teaching' method *enrolled* by school leaders as a method of developing classroom practices. They *mediate* teachers' reflections about what is of value/ successful in classroom practices (Latour, 1999), further mobilising the school's version of Maths Mastery in the actor-network. The mediating agency of photographs is extended through teachers' creation of photographic displays of 'Maths Mastery learning' in classrooms and school corridors (see Chapter 8.6), exemplifying the approach to teachers, students, parents, visitors to the school and acting as potential *mediators* for myriad further conversations about the teaching of maths at Highland School.

In this way, *spokespersons*, imbued with effects of power by school leaders, in turn imbue other actors – online texts and photographs – with agency in the network. As material *artefacts* in the network, photographs *mediate* professional discourse (Latour and Woolgar, 1986), *enrolled* by spokespersons and then teachers as *technologies of mobilisation* (Latour,

1999; Callon, 1986). Examination of the role of these material actors in the actor-network thus makes visible how a certain localised and narrowed form of Maths Mastery is imbued with effects of power within an existing actor-network of practices; how power does not necessarily exist as “intrinsic capabilities or potentialities of managers and leaders but rather enactments of ... a field of practices constituted and enacted contingently by people and objects in complex networks” (Mulcahy and Perillo, 2011, p.122).

9.7 Variation exists within the actor-network

In the Early Years Foundation Stage (EYFS) and Year 1, all class teachers who took part in the research use the (selected, localised versions) of the Maths Mastery Big Ideas (see Chapter 7.8) for the focus of lessons. They mark students’ work in lessons using a Maths Mastery approach that spokespersons trained them in: ‘live marking’ (see Alex’s explanation in Chapter 8.7). Within lessons, they use Maths Mastery student textbooks and resources as recommended in the Year-by-Year Planning Guidance documents (see Chapter 8.5). In key stage two, the same is true of all teachers in Years 3, 4 and 5. This is part of the planned establishment of the change in a staged approach (see Chapter 5.5). Year 2 and Year 6 teachers are trialling activities from the Big Ideas in a more ad-hoc fashion and are planning to move to the approach over the next two years, once students who began their mathematical education under the old curriculum have left the school. This is planned variation within the actor-network and the policy initiative-led change to classroom practices thus can be seen to be established, *mobilised* into teachers’ classroom practices.

A *network* in ANT and *literacy practices* in LS are viewed from a state of perpetual motion; they are tied to, part of and performed into being by associations of people, things, ideas, beliefs within the social world. In this sense, the *actor network* of classroom practices is always establishing itself. Holding a certain set of (now Maths Mastery-based) practices together is a matter of temporary stabilisation (Latour, 2005), a stabilisation that is frequently threatened by, and must learn to encompass, associations of actors which challenge the patterned ways of ordering which are holding the network together in its current form.

In Highland School, variations exist in classroom practices in teachers' different *literacy practices* with Maths Mastery texts. However, the textual infrastructure that is both a *network effect* and a central series of *nodes* in the network hold the school's version of Maths Mastery-based classroom practices in place; the overall network structure can encompass some variation and flex.

For example, in the final week of fieldwork, in mid-July 2018, I visit and observe in many classrooms. In a Year 1 classroom, Alex is teaching maths:

Alex uses slides as the basis for his teacher talk and students' activities. Slides contain content planned for in the teaching team and tasks based on the reasoning mat. After 5 minutes, Alex stops the students briefly, clicks on the next slide and shows how learning now moves on to a specific learning objective: 'I can make doubles with numbers up to 20.' He talks through a worksheet by clicking on a link on the slide, also available in hard copy on students' tables. He points at sections of the sheet shown on the interactive white board. He gives a tip to the class, to notice that on a particular problem, they are likely to have missed something out... As the first student finishes their task, Alex directs them to the challenge on the slide, to be done on the

carpet on a whiteboard after tidying up their area. Alex explains the task to the class.

[Year 1 teaching, fieldnote, July 12th, 2018]

Alex's usage of the lesson slides follows a directive pattern, in which students encounter the problems contained within the slides through a sequence of instructions from Alex.

By contrast, Charlie, another Year 1 teacher, makes use of the same slides to ask questions and open up Maths voice-based talk opportunities for students around each problem. She then annotates the slides, capturing the students' responses:

'Using your maths voice, who can explain this part?' Charlie asks, pointing to sections of the task on the slide. 'Talk to your partners first.' Charlie moves around the pairs of students, who are seated on the carpet in front of the interactive whiteboard on which the lesson slides are displayed. She asks pairs questions: 'Why is that true?', 'How else could you do it?'. She records some ideas, writing directly onto the slides using the interactive whiteboard pen. [Year 1 teaching, fieldnote, July 12th, 2018]

Teachers' *literacy practices* with slides – the ways in which they read and talk and write with the same text – differ.

On the one hand, variation in teachers' usage of the same slide decks is perhaps to be expected. Teachers are not automatons and there is likely to always be differences in how they deliver agreed lesson content. Practices prescribed by policy initiatives have been described as 'shifting assemblies of practice' (Mulcahy, 2011, p.1), enacted differently in different places. The impact of affective actors – metaphysical actors embodied in humans – on the assembling of actors has been explored as influential on the resultant shape of actor-networks (Gorur, 2011), with arguments made for attending to affective elements of practices as crucial to revealing 'infrastructural shifts' in the enactment of policy (Mulcahy and

Morrison, 2017, p.749). The presence of variation in the way teachers activate Maths Mastery into their practices is perhaps, therefore, not surprising.

However, this variation does not destabilise the Maths Mastery-based nature of classroom practices at the school. Lessons are still structured around localised Maths Mastery content – teachers teach the same content using the same general approaches, as set out in the lesson slide decks. They use key phrases as a ‘maths voice’, live marking, S planning. They discuss their practices in Maths Mastery terms. Maths Mastery has become ‘how we do things around here’. The network maintains itself, held together by an *intertextual hierarchy*, cloud-based technologies, *spokespersons*, photographs, metaphysical actors, teachers, school leaders, hardware, software. All of these actors and their ways of ordering provide a certain structural tension to an elastic network. This structural tension maintains the network’s character and shape whilst also allowing for elasticity in the form of diversification of *literacy practices* within the network.

Network elasticity is required for the successful (albeit temporary) stabilisation of the network. It is perhaps through such elasticity that final *enrolment* of teachers into the new approach occurs:

‘We’re having a look at it and making it our own. It has to work for us.’ [Rowan, year group leader, interview, June 28th, 2018]

‘I like to work with the slides in my own way. The other teachers in my team do it slightly differently too, but it’s the same stuff, the same content, the same approach, the same language, just played with differently.’ [Laurie, maths subject leader, interview, June 7th, 2018]

Thus, the structural actors provide the parameters for teachers’ practices. These actors, in association, can be seen to structure the establishment of comparative, rather than identical

practices (Tummons et al., 2018); teachers may use the lesson slides and other texts simultaneously in different ways, but their lessons follow the same slide decks and resources as the other teachers in their year groups. The ways in which these structuring actors associate, then, *mobilises* a localised version of Maths Mastery into teachers' classroom practices whilst also maintaining a sense of teacher agency within these parameters; they have room to 'play differently' with the approach.

9.8 Conclusion to the chapter

In this chapter, I have described how Highland School teachers use the Maths Mastery approach as the basis for their classroom practices in the teaching of mathematics. This suggests a successful *mobilisation* of the initiative (Callon, 1986): actors act within the parameters of the new approach. This mobilisation is reliant upon the work of several central actors, imbued with agency and effects of power by their associations with other actors in the network (Nespor, 2002). Cloud-based technologies facilitate the agency of online interlinked textual *immutable mobiles* representing and carrying the school's localised version of Maths Mastery into classrooms. Repeated phrases representing elements of the NCETM's global domain initiative act as *tokens* within the network, aligning classroom and professional discourse with the initiative. This alignment is reified by textual and photographic artefacts within the network, whose agency is initiated and extended by *spokespersons* in carrying ideas around what Maths Mastery-based classroom practices should/could look like into professional discourse. *Spokespersons*, imbued with effects of power by school leaders in terms of acting from an authoritative position within the network, are central actors in determining the associations which bring about *mobilisation*. Continued *enrolment* of teachers into the approach, however, relies upon the parameters set up by these central actors

as being somewhat elastic; as also being able to afford agency to teachers' individual preferred ways of teaching.

In the next and final chapter of this thesis, I discuss what the findings add to the current picture of how policy is established in schools. I discuss the relevance of the central actors and the ways that they are seen to produce change. I explore what the thesis tells us about notions of power and agency in relation to policy-led change in schools. I conclude by reflecting further on what an ANT-LS perspective offers to the field of study.

10. Conclusions

10.1 Introduction to the chapter

In the last four chapters, I have described how a policy initiative is translated into an existing actor-network of teachers' classroom practices. I have spoken of the work of complex associations, negotiations, and inter-reliance between a network of actors which establish a policy-based change to teachers' classroom practices. As I have described the *translation* of Maths Mastery into teachers' classroom practices, I have explicated some of the central actors in producing the change as well as those which help to create *network effects* of power and agency.

In this chapter, I bring together findings developed through this empirical study and explore the implications of these in relation to current perceptions of how policy is established in schools. I first set out the original and substantial contribution of this thesis to the field of study. I then offer food for thought around drawing conclusions in relation to an ANT account. Finally, I discuss the findings of my thesis in four concluding sections. In the first section, I discuss the relevance of policy-led change viewed as *translation* to wider discussions of education policy. In the second section, I explore what can be learned from this thesis' focus on *literacy practices* in relation to policy-based change to a network of classroom practices. In the third section, I explore what this thesis reveals about notions of power and agency in policy-practice relationships. In the fourth section, I reflect on recommendations for further research.

10.2 Original and substantial contribution

10.2.1 Contribution to knowledge

As explored in the literature review (see Chapter 2), the study of education policy is a vast field, within which there are relatively few non-linear perspectives of the relationship between policy and teachers' practices (see Chapter 2.4). By removing the linearity of top-down/ bottom-up perspectives, the non-linear approach used in this thesis affords a view of policy and practices as actors within the same actor-network, influencing and being influenced by their respective, mutually entangled, constituent actors. From this perspective, I trace how government policy is *translated* from policymaking into the activity taking place in classrooms (Callon, 1986). In so doing, I provide schools, policy makers and academics an example of how a government policy initiative interrupts and changes existing classroom practices by becoming part of the network of practices in a school, via both human and non-human actors (see section 10.4 for further discussion of this contribution).

Importantly, this view reimagines notions of power and agency in policy-practices relationships. Rather than qualities held by people or policies, power and agency in this thesis are viewed as *effects* of the ordering of many actors: actor associations constituting education reform in its enacted form. By laying bare the actor associations through which policy gains influence, we may interrogate – and possibly interrupt – notions of oppressive policy power/ suppressed teacher agency in education reform (see section 10.6 for further discussion of this contribution)..

To support such an interrogation, this thesis employs underexplored concepts such as the role of *textual immutable mobiles* and *network tokens* as part of the *literacy practices* within a school (Latour, 2005; Street 1984); concepts which offer a view of the associative activity through which policy establishes itself within existing iterations of classroom practices. I explore textual immutable mobiles, for example, as artefacts of change which *blackbox* the discursive activity of reform and position people in relation to the changes they represent and carry (see section 10.5.1). Intertextual associations are interrogated as a creating *obligatory*

passage points in the network, reifying statutory policies and lending associated non-statutory policy initiatives a sense of requirement by association (see section 10.5.2). In this way, this thesis lays bare how intertextual *assemblages* support a back-door method of government control of teachers' classroom practices, through the ways in which non-statutory and statutory policies are associated.

Conversely, this thesis also describes how associations of actors in an existing network of practices influence policy in enacted form: how policy is localised by existing actors (see section 10.5.2). I show how, in entering networks of classroom practices, policies may be shaped by processes of *enrolment* and *mobilisation*, in which network activity is aligned with the reform taking place (Callon, 1986). This thesis reveals how the efforts of *spokespersons* to achieve teacher 'buy-in' is significant to *enrolment* and *mobilisation* (see section 10.5.3), shaping *literacy practices* which in turn shape existing actors or produce new ones – a new notion of 'depth' or new key phrase *token* – designed specifically to promote and sustain a localised version of policy, of which teachers can feel they have ownership.

The above contributions have implications relating to policy enactments and teachers' practices. Policymakers, teachers and researchers of policy-practice relationships can learn how policy-based education reforms take root in teachers' practices; how elements of pre-existing practices and those contained in the policy initiative are accepted, rejected, adapted or built on. This thesis may thus inform professional and academic discussions around future policy enactments, or potentially be used to interrogate and interrupt current enactments of policy.

10.2.2 Theoretical contribution

An ANT-LS perspective offers much to the study of how policy-based change to teachers' classroom practices is established in schools. In the literature review (see Chapter 2.5), I explored dissatisfactions with top-down and bottom-up perspectives of the relationship between government policy and teachers' classroom practices and argued for significant change to the way that this relationship is viewed. The ANT-LS approach employed in this thesis offers a way forward with this issue in several regards.

Firstly, an ANT-LS approach provides a framework for viewing policy-led change in education from within the social mechanisms, structures, strategies, establishments, and discussions which act to produce the change. Much policy-led change has been posited as accomplished “at the discursive level of social action” (Hamilton, 2011) in that it is useful to see policy in the action that occurs in association with it (Kamp, 2017). An ANT-LS perspective opens up our view of this action to afford potential to see the work of action involving people, texts, discussions, materials, places, and so on. Viewing policy as a situational, relational, and dynamic process enables a view of (changes to) teachers' classroom practices as “collective and distributed” (Fenwick, 2016, p.3); we may describe the actors involved in producing the action of policy-led change. Associations between actors can be interrogated by tracing the associations between multiple actors and the ways in which they meet, connect and disconnect to perform policy-led change to teachers' classroom practices.

Secondly, a profession saturated with texts, deeply associated with and governed by government policy-making requires opportunity to view the complexities of the relationship between different policies and influences effecting teachers' classroom practices. A non-linear approach to the policy-practices relationship (see Chapter 2.4) offers opportunity to view how meaning and value generated in relation to policy is given durability and scope to circulate

further in the network through setting such meaning and value down in texts (Rowe, 2022). An ANT-LS approach affords potential to take this non-linear view further in scope, offering the researcher tools for describing associations of actors which perform policy-led change: to describe ways in which policy may gain legitimacy within an actor-network of teachers' classroom practices.

By interrogating the social orderings that produce policy-led change, we can also see the mechanisms of power and the production of agency; how a policy takes root in teachers' practices and actors which are agentic in producing and performing these practices. Through this view, we may seek to better understand the relationships between people, texts, stuff and things that 'do' policy (Gorur, 2011): how actors entangle in repeated patterns of *literacy events*, *literacy practices* and *intertextuality*. Describing the multifarious actors and their ways of associating within networks of classroom practice offers a view with which to potentially interrupt current mechanisms of power and agency, forging alternative ways forward.

10.3 A partial account

It is to be noted that writing a 'conclusions' section to an ANT-LS account is wrought with complications. The early ANT theorists with which I align my study seek to maintain the flat ontology of the actor-network (Latour, 2005), rendering problematic the act of drawing out conceptualisations of the field based on empirical data, or implications for the wider field of study. I therefore offer the following conclusions in the sense that my aim is not to achieve objective authoritative 'knowledge', but rather thoughts around what an ANT-LS perspective can offer to the field, illustrated through this particular study.

In the following conclusions, I foreground two types of central actors. Again, this is problematic to an ANT-LS account, in that by so doing, I omit less prominent actors of the

actor-network (Nespor, 2002), which nevertheless may impact the network effects discussed in this chapter. It is thus important here to acknowledge the presence of (potentially many) other actors present in the network of classroom practices at Highland School: physical objects such as pens, paper, computers; other people not signed-up as participants in the study (teaching assistants, the students, parents, governors); and more abstracted actors such as funding, timetables or the possibility of random life events impacting different teachers or text creations.

In foregrounding two central types of actors – texts and teachers – I aim to discuss in depth the relevance and value of tracing how these actors associate in establishing a policy-led change to a network of classroom practices. This level of detail cannot, in the scope of the word count of this thesis, be achieved for all actors. The conclusions that follow are not thus meant as a complete ‘truth’ which provides authoritative guidance for the implementation of change, but rather, to draw on a common discourse amongst ethnographers, a partial truth (Clifford, 1986), partial connections (Strathern, 1991) which exemplify key parts of the actor-network. I thus offer up these parts of this actor-network in the sense of offering thoughts with which to engage through ‘interested interaction’ (Jensen and Lauritsen, 2005) in the hope of connecting the perspective of this study with wider discourses around the relationship between policy and teachers’ classroom practices.

10.4 Policy-led change as translation

In this thesis, I have traced how a policy initiative enters a network of teachers’ classroom practices through the ANTish notion of *translation*. The main value of this approach lies in the view that *translation* affords of the different actors and associations which influence the establishment of network change. In this section of my conclusions, I explicate further the value

of *translation* in research focused on the relationship between government policy and teachers' classroom practices. I discuss central actors in the actor-network described in this thesis and valuable insights we can gain into the policy-practice relationship from a view of *intertextuality* and the work of *spokespersons* in key moments in *translation*.

The term *translation* as used in this study refers to Callon's (1986) notion of *four moments of translation*. Whilst data is collected in a complex process of following the actors during fieldwork (Latour, 2005), applying Callon's notion of *four moments of translation* to fieldwork data has offered a way of making sense of the data in a way which describes the establishment of change. Through each *moment*, we can view how the policy initiative gains credibility within the school: how it merges with, is adapted by, and in turn causes adaptations to, teachers' existing classroom practices.

Whilst each *moment* describes part of a journey of change, this approach differs greatly to the change processes discussed in top-down perspectives in the literature (see Chapter 2). This is because, unlike top-down perspectives of the policy-practice relationship, and unlike the bottom-up perspectives which often seek to point out negative impact of top-down models, ANT removes tiered categorisations of society. There is only the local (Latour, 2005). In ANT terms, 'local' and 'global' pertain to intended geographical reach of the circulation of actors (Law, 1994). For example, a global domain actor such as a government policy text is intended to be circulated amongst all English schools. Whereas a reasoning mat created in Highland School is a local domain actor in the sense that it is intended to circulate within Highland School. Local domain actors, as we have seen in the actor-network described in this thesis, may come to contain traces of global-domain actors and, in turn, may influence and (re)shape global domain actors as they associate with them. Government policy, systems of policy, teachers, books, computers, worksheets, displays (and so on) entangle one and the other, each acting upon and being acted upon, influencing and being influenced by other actors, circulating and

associating on the same plane. We can thus step outside of policy-following or policy-rebellion perspectives (see Chapter 2). Through Callon's ANTish notion of *translation*, policy-based change to teachers' classroom practices can be viewed as a new social ordering: the creation of a new 'social' which we can trace by describing how local domain and global domain actors entangle.

Through descriptions of key moments in *translation*, I have described how associations of existing and new actors combine and (re)order to constitute the change to classroom practices at Highland School: how elements of pre-existing practices and those contained in the new policy initiative are accepted, suppressed, adapted within the actor-network. From within these descriptions emerge actors which are central to the actor-network, and which offer insights into policy-led change in schools. Particularly, I have described the work of texts as artefacts of policy-led change and of spokespersons working within a co-dependent relationship with textual actors.

10.5 Literacy practices and actor-network change

This thesis traces how a policy initiative enters an existing actor-network of classroom practices through a series of *literacy events* (Heath, 1982). In each of these events, certain *literacy practices* (Street, 1984) shape the associations of human and non-human actors, producing meaning-making around classroom practices. The ways in which Maths Mastery policy enters these practices produces changes to the actor-network of classroom practices. In this way, changes to actor-networks of classroom practices can be seen to rely in part on changes to workplace literacy practices (Gowen, 1992). Tracing these *literacy practices* in *literacy events* focused on the introduction of a new policy initiative reveals insights into how policy-based

change to an actor-network is established. In the following three sub-sections of section 10.5, I explore these insights, drawing together key findings from the thesis.

10.5.1 Textual immutable mobiles as artefacts of change

In relation to teaching, the idea of textual *immutable mobiles* (Latour, 2005) is under-explored in the literature. This thesis describes important ways in which textual *immutable mobiles* are created, circulated and used within *literacy events* in ways which (re)shape an actor-network of classroom practices. Textual actors *black-box* and categorise the activity of discussions, people, ideas and things that go into the creation of policy. They thus represent and carry content and meaning agreed in *literacy events* as a “stable network of associations” throughout the actor-network (Law and Singleton, 2004, p.4). In this way, they may be seen as artefacts of policy-led change.

This thesis has shown how textual *immutable mobiles* position people in relation to the content they carry. *Problematization* is initiated through the positioning of school leaders in relation to policy texts whose content is statutory for schools to follow (national curriculum, assessment policy texts and pupil progress data reporting). Their positioning in relation to these texts produces a *repositioning* of school leaders’ views of existing classroom practices and identification of a need for change. Further texts shape the network by positioning people in relation to their format: the National Centre for Excellence in the Teaching of Mathematics (NCETM) audit tool and the NCETM-recommended ‘S Plan’ planning format shape the ways in which school leaders and teachers begin to talk about how to teach mathematics.

Textual *immutable mobiles* also matter in that they carry Maths Mastery information across geographical spaces in a way that people cannot. Whilst people tend to transport content and meaning in a way which renders original forms of meaning vulnerable to interpretation and

bias, texts hold stable the representation of information and key messages associated with the policy initiative. They hold their shape in associating with other actors and thus are actors which continue to carry meaning throughout the interactions of the actor-network without their form or shape being altered (Law, 2009). Through this immutability and mobility, they iterate and reiterate the Maths Mastery approach to teachers in Highland School. In initial stages of exploring Maths Mastery, textual *immutable mobiles* facilitate teachers' multiple encounters with the same information in a suite of *global domain texts* (Clarke, 2002), increasing the visibility of Maths Mastery pedagogy in the actor-network of classroom practices.

In this way, textual *immutable mobiles* can be seen to not only carry meaning into professional discussions aimed at agreeing approaches to classroom practices, but also act upon the generation of meaning around practices within these discussions; they *mediate* (Barton, 2007) the discussion. In the case of Highland School, texts *mediate* teachers' discussions around the teaching of mathematics by acting to centre these discussions around an English version of Maths Mastery pedagogy. *Global domain texts* reify certain messages and pedagogies contained within this English version, whilst localised MAT and school 'level' texts position teachers favourably towards the new approach in the ways that they blend 'old' and new actors (discussed further below). 'S' planning formats *mediate* discussions by providing a structure for thinking about the teaching of mathematics in a way which complements the Maths Mastery approach. An audit tool *mediates* the meaning-making of teachers and school leaders leading the change to classroom practices, providing parameters for discussions around the development of Maths Mastery in the school. The ways in which texts *mediate* teachers' meaning-making around classroom practices for the teaching of mathematics at Highland School supports the findings of other studies which position texts as characterising other actors (Ceulemans et al, 2012), working to shape educational practices and teachers' professional identities (Hamilton, 2009). Viewing the ways in which the format and content of texts *mediate*

professional discourse thus sheds some light on how different texts and ideas about education come to gain credence in schools. This is particularly pertinent to study of *education* reform, as a profession that is accepted to be full of texts of many varieties (Braun et al., 2011).

10.5.2 Intertextuality provides an infrastructure by which policy enters existing practices

One of the key aspects of this ANT-LS account of a policy-led change has been in telling of how texts relate to other texts in the doing of change. I have employed the LS notion of *intertextuality* (Barton, 2007) to extend the ANT idea of *immutable mobiles*. This has been achieved through a description of how textual *immutable mobiles* interact with other actors within *literacy events* (Heath, 1982) in which people read (and interpret) often multiple texts simultaneously and write new texts based on their collaborative, discursive usage of textual actors.

Policy texts are used in unison with other texts in *literacy events*. The ideas they carry into each literacy event are woven together, through discussion, into new texts. In each new reading and writing event, Maths Mastery actors become part of, are adapted by, or are excluded from, the network of change. Each new text is subsequently used in further literacy events as the *mediating* basis of professional discourse aimed at planning for, reflecting on, or evaluating teachers' classroom practices for the teaching of mathematics. A chain of interlinked texts – an *intertextual hierarchy* (Smith, 2005) – gradually expands the actor-network, acting to establish the new approach as part of teachers' classroom practices.

This is important to our view of the establishment of change in education in several ways. Firstly, in that an ANT-LS account supports us in *unblackboxing* each *immutable mobile* (Law, 1984), affording a way to describe associations of actors that go into the creation of texts. This

serves to demystify policy texts accepted as *matters of fact*, repositioning them as *matters of concern* (Latour, 2005) to be interrogated as to the situation and circumstances of their creation.

Secondly, tracing *intertextuality* affords a view of how texts carrying the ideas of the new approach are connected. In Highland School, *assemblages* (Law, 1994) of interlinked texts build and strengthen connections between statutory policy and the non-statutory Maths Mastery policy initiative. Repeated interrelations between within and between certain texts form intertextual *nodes* in the network (Latour, 2005), reifying connections between statutory and non-statutory policy. The Maths Mastery initiative is imbued with *network effects* of power and agency through such associations (Nespor, 2002). It is thus possible to see how the ‘non-statutory’ nature of initiatives like Maths Mastery falls away as it enters schools with powerful (textual) allies in its wake, which position the policy initiative as authoritative in relation to classroom practices through associations with statutory policy. This suggests that the ways in which such non-statutory government-sponsored policy initiatives enter schools rather positions them as softer methods of government control of teachers’ practices, tied to wider government agendas of accountability and performativity towards centralised educational goals.

Through tracing how texts link to each other, this thesis also describes a powerful *network effect* of this intertextuality: an *intertextual hierarchy* (Smith, 2006) which *translates* the policy initiative from *global domain texts* representing global domain policy initiative into teachers’ classroom practices. Change to classroom practices can thus be viewed as multiple enactments of interrelated actor associations (Ceulemans et al, 2012) or multiple discursive acts of ‘doing’ (Fenwick, 2012).

In describing this *intertextual hierarchy*, this thesis demonstrates how teachers and school leaders perform *localising moves* on the global domain policy initiative (Latour, 2005). Maths

Mastery policy is *translated* through *literacy events* in different domains: in the domains of the policymaking and policy-doing of national agencies, regional trainers, Multi-Academy Trust leadership teams, school leadership teams, wider teaching teams, year group teaching teams, individual teachers in individual classrooms. Throughout these *literacy events*, localisations of the global domain approach occur which combine existing or ‘old’ actors in the actor-network with Maths Mastery actors, shaping new connotations connected with Maths Mastery contexts (for example, Maths Mastery ideas are exemplified to teachers using examples drawn from existing practices, blending the global domain approach with existing pedagogies). This localisation of information contained within and carried into the actor-network by global domain texts reveals a certain vulnerability of any text-based policy; vulnerability to interpretation and adaptation. This supports the findings of other studies which problematise policy aimed at standardising practices as represented in textual form (Hamilton, 2009; Tummons, 2016).

Tracing localisations of global domain initiatives adds to research in the field of policy-based education reform in terms of how such localisations of global reforms play out over a series of *literacy events*. The intertextuality described in thesis demonstrates how ideas and content contained within policy initiatives take root in teachers’ practices through a combination of ‘old’ and new actors. In Highland School, new metaphysical and material actors are produced through a series of interlinked *literacy events* which produces an *intertextual hierarchy*. Through these processes is created a new localised conceptualisation of ‘depth’ and photographs representing localised conceptualisations of global domain Maths Mastery practices. These *network effects* serve to *enrol* teachers and further texts into the ways of the new pedagogical approach by creating a sense of relevance and value between Maths Mastery and existing classroom practices.

Tracing policy localisation through the *intertextual hierarchy* also demonstrates how certain fidelities to the approach set out in *global domain texts* played out through repeated key phrases which act as *tokens* (Latour, 2005) within the network, connotative of the Maths Mastery concepts which sit behind them. A further underexplored area in relation to education, the notion of *tokens* is useful in tracing the elements of policy which do/ do not become part of the actor-network and a mechanism by which a common approach to teachers' classroom practices is established in a school. Key phrase *tokens*, along with other texts in the *intertextual hierarchy* not only *mobilise* the new policy initiative into teachers' classroom practices (Callon, 1986), but also helps to create structural tension within the actor-network by the ways in which the key phrases constantly bring classroom discussions back to aspects of Maths Mastery pedagogy. This structural tension helps to maintain the new shape of the network. The actor-network is thus sustained through the intertextual hierarchy and through specific ways of interacting with these texts (explicated in the section 10.5.3).

10.5.3 Literacy practices with textual immutable mobiles

As well as affording a view of how texts position people in relation to them, an ANT-LS account of change in education enables a detailed view, conversely, of how people position themselves in relation to texts. In this thesis, I have shown how teachers are positioned in relation to texts in certain ways by *spokespersons* for the approach (Callon, 1986), who create *literacy practices* with Maths Mastery texts. In this study, spokespersons for the new approach are appointed by Highland School's leadership team with the express purpose of training to become specialists in the new approach and *enrolling* others into the change (Callon, 1986). Spokespersons act as champions of the change, key to the successful expansion of the actor-network. The ways in which they achieve network expansion offer interesting insights into relationships between people, texts and the establishment of change in education.

Perhaps paramount is data speaking to how *spokespersons* activate texts within and across the *intertextual hierarchy* as textual champions in the actor-network. Spokespersons *guide* teachers' interactions with texts. They centralise Maths Mastery texts in discussions of practice, actively reinforce relationships between documents within the intertextual hierarchy. They encourage teachers' questions to be answered through the use of texts from the intertextual hierarchy, and model this in their own answering of questions. They accept, encourage and model challenge to Maths Mastery ideas, referencing the intertextual hierarchy in resolving challenges. They use the format of texts to shape the ways in which teachers think about and plan for mathematics. *Spokespersons* also *enrol* collaborative technologies to facilitate *mobilisation*: the alignment of teachers' classroom practices with the Maths Mastery approach. Through these shared literacy practices, spokespersons *enrol* texts in ways which guide teachers to think within the parameters of the new approach (Callon, 1986). They build relationships between pre-existing and Maths Mastery actors, structuring discussions in a comparative manner, juxtaposing 'old' and new (Maths Mastery) practices, drawing on either a discourse of derision (Ball et al., 2012) or a discourse of how existing and Maths Mastery practices complement each other.

Guided interactions with texts structure how teachers interact with concepts from Maths Mastery, strategically building buy-in to and usage of the new approach. Through these *literacy practices*, *spokespersons* and texts together *enrol* teachers into the new approach; practices are gradually aligned with Maths Mastery pedagogy and teacher buy-in achieved. Tracing these *literacy practices* extends the idea of *spokespersons* as 'active mediators' between the policy initiative and the people doing the policy (Hamilton, 2009), providing explication of *how* this active mediation is shaped.

To exert influence, the *intertextual hierarchy* relies upon spokespersons to champion and drive forward the approach (Callon, 1984), in this case through the *literacy practices* spokespersons

generate in *literacy events* focused on the Maths Mastery approach. Thus, whilst texts can be seen to *mediate* and shape the discourses of spokespersons, spokespersons for Maths Mastery make the texts significant within the actor-network, imbuing them with agency. The relationship between the textual infrastructure of the change and the spokespersons who activate them may thus be seen as co-influential.

The associations between the people and texts within the actor-network of the change can also be seen as binding; texts rely on spokespersons to activate them and the work of spokespersons is delivered through, and shaped by, the medium of textual champions. The establishment of policy-based change to classroom practices can thus be seen to be distributed amongst co-dependent actors. Much in the same way as professional knowledge is positioned as a “collective endeavour” (Plum, 2017, p.3) in an ANT-based study of the practices of nursery school teachers, whereby knowledge is distributed between human and non-human actors acting as a network, the establishment of change in teachers’ classroom practices in Highland School can be seen as a collective endeavour of people, texts and the stuff and things that facilitate the associating of these actors. It follows that in considering the role of texts in the establishment of change, we must not ignore the central role of the people that use them (Tummons et al., 2017). Nor is it wise to consider only the people involved in making change happen, without explicating the texts that may shape their professional activity. Rather, what an ANT-LS approach offers is a way to view the interrelations of people and texts (and other actors in the network such as the collaborative technologies that facilitate this relationship) and how, in co-dependency, they come to constitute a change to classroom practices.

10.6 Power and agency as network effects

Tracing the establishment of a policy-based change to teachers' classroom practices as a process of *translation* also has value in the perspective that this affords of power and agency within the policy-practices relationship. In top-down and bottom-up perspectives discussed in the literature review, power and agency tend to be positioned as qualities owned or not owned by people (see Chapter 2). In an ANT-LS account, as discussed in the theoretical framework of this thesis (see Chapter 3.2.4), power and agency are positioned as *network effects* (Nespor, 2002): the product of associations of human and non-human actors within an actor-network. This view affords potential for *unblackboxing* power and agency to view how effects of power and agency are performed into being (Law, 1994). As *network effects*, we can see how power is distributed amongst the ordering of multiple actors (Gorur et al., 2017), laying bare the social orderings in each situation through which such things as policy or politics gain influence. Within the actor-network described in this thesis, several ways in which actors repeatedly associate offer insights into the ways in which effects of power and agency are performed.

One way in which effects of power are imbued to the Maths Mastery policy initiative is through school leaders' treatment of certain government policies as *matters of fact* (Latour, 2005), or rather required ways of 'doing' educational practices. Not all government policies are treated as such. Perhaps predictably, the types of government policy which are treated this way, and which form the basis of *problematization* of existing practices (Callon, 1986), are statutory policies which hold schools publicly accountable, to government-prescribed educational aims, for their practices: assessment policy, policy around student attainment goals and systems of measuring and reporting student attainment in mathematics. As discussed in section 10.5.2, intertextual links between these statutory policies and the non-statutory Maths Mastery policy initiative imbues Maths Mastery with proxy effects of power in the network of classroom practices.

For the new policy initiative enters the existing network of classroom practices with powerful textual allies. Power is connoted to expanded intertextual *nodes* in the network (Latour, 2005) – *assemblages* of statutory national policy and textual representations of the global domain conceptualisation of Maths Mastery – through positioning these *nodes* as *obligatory passage points (OPPs)* in the network (Law, 1994). These *nodes* form “especially dense connections that can be fruitfully explored to illuminate the workings of power and network development” (Hamilton, 2009, p.59). The density of these connections grows as further actors in the network associate with these policies (teachers, further texts as the *intertextual hierarchy* expands, and so on). This strengthens the influence of the new policy initiative within the actor-network.

It is through close relationships between Maths Mastery and performance and accountability related policies that a sense of requirement comes to characterise the new approach and the actors which constitute it. Maths Mastery documents in the *intertextual hierarchy* serving as the infrastructure of the change to Maths Mastery are gradually treated in a similar accepting manner by teachers and school leaders through repeated encounters with *OPPs* which form associations between the new approach and government policies to do with school performance and accountability. This echoes discourses of performativity found in bottom-up perspectives of the policy-practice relationship (Ball, 2013), whereby school leaders and teachers are positioned as trapped in a circuitous discourse of performance and accountability; “behind ‘policy’ stands a shadow of an omnipotent state, administration, or bureaucracy issuing detailed regulations of individual and collective life” (Dean, 2005, p. 260).

The Maths Mastery policy initiative initially gains effects of power in the network due to associations with statutory government policy. However, maintaining network changes instigated by Maths Mastery requires an adaptation of these intertextual associations. Initial *intertextual nodes* connecting Maths Mastery to national assessment policy wording ‘at greater depth’ are adapted to foreground associations between Maths Mastery and a localised

conceptualisation of ‘depth’ (a *network effect* brought into being by textually-mediated discussions between spokespersons and teachers). To maintain/ gain further influence in the network, Maths Mastery relies on being connected (by spokespersons, intentionally) to what teachers at the school believe to be educationally worthwhile (Biesta, 2014): their values and beliefs about education. Associations with regulatory government policies are not enough to sustain the influence of the Maths Mastery policy initiative. This, spokespersons report, may in fact overwhelm or deter teachers from changing their classroom practices at anything more than a surface level. This suggests that warnings of ‘towing the line’ of educational reform spills over into practice (Ball, 2003) in a way which becomes the norm of classroom practices (Day, 2002) can perhaps be reimagined: policy’s ‘power’ can be seen as assembled through a change in tack in the associations of the policy initiative, away from performance and accountability-based government policies, to more abstracted notions of teachers’ values and beliefs about education.

In this shift, we see the growth of the alignment of teachers’ classroom practices with the Maths Mastery policy initiative as reliant not just upon intertextual associations, but upon people for the expansion of its influence within the actor-network. Power is constructed by the way that spokespersons and teachers position themselves in relation to texts that carry information concerning the policy. Spokespersons promote the policy initiative, making deliberate choices in how it is represented within the actor-network; they influence the ordering of the social (Law, 1994) in multiple ways. They select and delete aspects of the Maths Mastery policy initiative to promote it within Highland School. They associate pre-existing actors in the network with Maths Mastery actors. Through these associations, teachers’ ties to Maths Mastery are strengthened and buy-in to the change increased. The old and the new become co-existent through intertextuality, working in unison, strengthening ties between them. These associations can be seen as repeated acts of localisation – or *localising moves* (Hamilton, 2011)

–, through which emerges the *intertextual hierarchy* which forms the infrastructure of the approach. It is through spokesperson-led localisation that the policy initiative gains further influence –localisation forms a textual infrastructure for the change to classroom practices, which is used by spokespersons to counteract resistance and variation in the actor-network.

Localisation is deliberately achieved by spokespersons in order to *enrol* teachers into the new approach. Echoing Hamilton (2011), this “demonstrates how complex policy reform is 'choreographed'” (p.68); in this case, by spokespersons leading the change. The policy gains power by the ways in which it is circulated within the actor-network, echoing Nichols’ (2006) study of the introduction of de Bono’s ‘Thinking Hats’ pedagogy, in that the policy initiative gains influence only through the ways in which it “circulates through multiple social spaces in ways that are both random and consciously driven by powerful social institutions” (p.174).

Exploring the intertextual infrastructure of a policy-based change to classroom practice also reveals something of how the agency of different actors is produced. Also viewed as a *network effect*, agency can be unpacked in a similar way to notions of ‘power’. In an ANT-LS account, we may speak to the agency of any actor; of texts, of teachers, of technological devices of ideas. Agency is not a quality to be owned as a human-bounded act (Nespor, 2011), but rather a “relational effect” (Law, 1994, p.100), an effect of the organisation of the network, just as notions of power discussed above. ANT-LS offers a way of stepping outside notions of agency which bind the term to something that exists within people. It offers us a way of seeing how agency is produced in different textually mediated *literacy events* in a *translation* process. Agency can be seen as recursive, in that combinations of agencies of different actors combine to produce the agency of each actor: the agency imbued to a suite of texts and a group of teachers in one particular situation also produces the agency of the teacher in that moment.

For example, spokespersons' use of texts imbue these texts with agency, activating them in professional discourse. Tracing the agency of texts reveals a deep reliance on the choreographing moves of spokespersons, whose guidance determines the ways in which texts within the intertextual hierarchy may be agentic. Spokespersons introduce *literacy practices* with which teachers must approach different textual artefacts of change. They guide teachers to centralise Maths Mastery texts in discussions of classroom practices. They position the *intertextual hierarchy* as an evaluative lens to teachers' current practices and to overcome resistance to the change. Spokespersons ask teachers to take photographs representing a localised conceptualisation of 'depth', or to use key phrase *tokens* to reify selected elements of the new approach throughout the network. They thus make these *mediating technologies* (Latour, 1999) agentic in specific ways. Through these *literacy practices* with texts, spokespersons also determine some of the ways in which teachers must be agentic in relation to their practices, *mobilising* the approach into teachers' classroom practices (Callon, 1986).

In this way, spokespersons gradually shape the actor-network into the (Maths Mastery-based) parameters for teachers' agency. Teachers refer back and forth to texts in the hierarchy in making decisions about their practices, discourse and in creating new texts. Teacher agency and the textual infrastructure which is gradually produced and which sustains the new ordering of actors (into the Maths Mastery approach) become synonymous, bound together. We can see this most in agencies produced at a number of active spaces, conduits and breakages within the network (Fenwick, 2010). In a classroom where collaborative technologies break down, for example, a teacher finds alternative ways of continuing within the parameters of the approach, drawing on other textual actors in the *intertextual hierarchy*. Teachers remind each other of lessons ahead and reflect on learning in lessons past using presentation slide decks which carry agreed new practices into their discussions. The agencies of texts and teachers thus entwine:

teachers' agency is gradually confined to the parameters of the policy initiative through the ways in which spokespersons guide and model teacher-text interactions.

In a similar way, *spokespersons'* agency is effected through the choreographing of National Centre for Excellence in the Teaching of Mathematics (NCETM) specialist trainers, who similarly guide spokespersons' interactions with the policy initiative through a series of linked textually-mediated *literacy events*. Their guidance combines with agentic texts to set the parameters for spokespersons' view of, and discourse relating to, their current classroom practices. However, spokespersons are also imbued with agency in performing *localising moves* on the policy initiative (Hamilton, 2011). This agency is produced through school leaders' initial treatment of the policy initiative as a *matter of concern* rather than as a *matter of fact*. Through a trial period, the parameters of spokespersons' agency are widened in scope, allowing for the following of their own collective proclivities, in that localisation takes place with others, through discursive agreement in *literacy events*.

The agency of texts, teachers and *spokespersons*, along with effects of power within the actor-network, can thus be seen as brought into being by, and reliant upon, the associations of actors within the actor-network. From this perspective, the agencies and effects of power imbued to different actors or *assemblages* of actors at different times matters in to the shape of the network as a whole. This perspective may be used to interrogate notions of oppressive power or suppression of teachers' agency found in top-down and bottom-up perspectives of the policy-practices relationship discussed in the literature review (see Chapter 2), illuminating how power and agency are assembled in the ongoing establishment of the network.

10.7 Avenues for future research

This thesis has demonstrated a potential theoretical and methodological approach with which to interrogate policy-practices relationships in education. This approach may be used to explore how current policy directions, globally and nationally, are taken up and enacted by schools; how they are *translated* from policymaking contexts to the activity of classrooms. This is particularly pertinent to policy *initiatives*, which arrive in schools through myriad pathways rather than in one policy document. Tracing the influence of such initiatives on classroom practices allows for greater visibility of the ways in which schools take up these ideas as part of their daily practices. One such policy initiative which is of relevance to today's educational practices is that of sustainability policy. With global (UN) policy direction centred around Sustainable Development Goals, there is growing interest internationally in the links between education and sustainability (see for example Fazio, 2022). Tracing how global domain ideas are translated into localised practices will be key to understanding how education may (or may not) work in the service of sustainability.

It will also be useful to develop the theoretical framework of ANT-LS, following ANT's Latourian trajectory and its assimilation into a wider philosophical framework of 'modes of existence' (Latour, 2013); a framework which examines different and connected ways of being, thinking and knowing in the modern world. As a profession which may be seen as inherently implicated in the workings of other fields – in politics, in economics, in science, in morality, to name but a few (education for sustainability being a prime example of this) –, it would be useful to examine how education crosses with, and perhaps becomes mistaken for, other modes of existence, through policy enactment.

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Appendices

Appendix 1: Example fieldnote

In the year group's teacher planning session, Frances directs everyone's attention to the items on the table and files open on the screen on his PC – the MAT maths plan for the year group; MAT Fractions: 'Small Steps Breakdown' document; nationally-produced Maths lesson ideas books; a giant sheet of plain sugar paper; post-it notes; felt-tipped pens; National Curriculum Programmes of Study print-out of the section entitled: Number, Fractions.

Frances reads out the print-out of the National Curriculum learning objectives to be covered (there are 2 objectives on the print-out) and puts this print-out at the top of the sugar paper so that everyone can see it. The objectives read as follows:

- Recognise, find and name a half as 1 or 2 of 2 equal parts, shape or quantity
- Recognise, find and name a quarter as 1 of 4 equal parts, shape or quantity

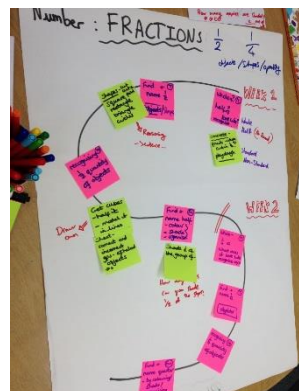
Frances applies to Alex for what 'the tricky parts of teaching this' are. Alex offers thoughts on this - that the quantity part is often what children struggle with, as it is 'abstract and continuous'. Frances reads out the non-statutory guidance from the same print-out and asks the others where they think they should start with these things in mind.

Charlie suggests doing one week on halves and then a further week on quarters. Alex suggests perhaps doing one week on objects and shapes with both halves and quarters, followed by a week on quantities. In both situations, the second week is presented as the more difficult. Faced with 2 ideas, Frances refers to the nationally-produced Maths lesson ideas booklet, and the 'Small Steps Breakdown' document which details ideas for small steps in learning. 'What do they do? Let's have a look.' He discovers that the first suggests one week of half of shapes and objects and then quantities towards the end of the week, then a second week exploring quarters in the same way. Everyone agrees that this will be the way forward.

Frances asks Alex to use a sticky note to write a small step for this: 'What do we need to do first? What will the children need to be able to do and to know first?' Everyone offers ideas and Charlie checks the lesson ideas booklet. Frances conducts the conversation with questions for each suggestion and eventually the small steps along the way to achieving the learning objective are written down on sticky notes and added to form an 'S' shape on the 2 week unit plan on the sugar paper...

[Fieldnote: May 2018]

Linked photograph:



Appendix 2: Card sorting task

<p>Adhering to the Teaching Standards</p>	<p>Working collaboratively with other teachers and members of staff, with parents and pupils</p>	<p>Drawing on knowledge I gained experientially and practically, through the practice of teaching</p>
<p>Constantly improving my own knowledge by keeping up to date with recent research in the subjects I teach and the ways in which to teach</p>	<p>Assisting the progression of the economy in the future</p>	<p>Derived from a set of personal skills and attributes:</p> <ul style="list-style-type: none"> • communication skills • empathy • passion for the job • creativity and innovation • social responsibility • ‘honing’ skills: self-awareness, self-reflection and self-development
<p>Adhering to the National Curriculum</p>	<p>Maintaining the welfare of the pupils I teach</p>	<p>The ability to reflect on my teaching, learn and adapt practice</p>

<p>Effective use of assessment and feedback</p>	<p>Maintaining the culture and ethos of the school in which I teach</p>	<p>Modelling and teaching morality – teachers should be role models, modelling and teaching how to be a good human being</p>
<p>Accountability: Ensuring that children reach national expected standards at the end of the key stage in which I teach</p>	<p>Meeting the needs of the local community by adapting what and how I teach</p>	<p>Being able to adapt my teaching to suit individual pupils’ needs in order for them to achieve my high expectation</p>
<p>Enacting policies defined externally</p>	<p>Blank</p>	<p>Blank</p>
<p>Planning effective lessons</p>	<p>Working on the focuses the school leader has defined</p>	<p>Blank</p>

The card sort task in relation to the literature focused on potential influences on the formation of teachers' practices (the initial focus of my study):

Card/ document/photo	Included due to debates in the literature around the theme of:
<ul style="list-style-type: none"> • Accountability: Making sure the pupils I teach achieve end of key stage attainment targets and above • Assisting the progression of the economy in the future • Enacting policies defined externally • Effective use of assessment and feedback 	<p>Market influence (Ball, 2008; Fenwick, 2016; Lipman, 2009)</p> <p>Increased accountability (Kogan 1989; Edgington 2016; Ball 2003) and managerialism (Inglis 1989; Whitty 2008; Troman 1996; Evetts 2009; Hoyle and Wallace 2009), highlighting the perpetuity of shifts of perception of 'professionalism' over time, linked to economic and social changes.</p> <p>Knowledge evolution (Ball, 2013; Furlong, 2013)</p>
<ul style="list-style-type: none"> • The ability to reflect on my teaching, learn and adapt practice • Being able to adapt my teaching to suit individual pupils' needs in order for them to achieve my high expectation • Derived from a set of personal skills and attributes: <ul style="list-style-type: none"> ○ communication skills ○ empathy ○ passion for the job ○ creativity and innovation ○ social responsibility ○ 'honing' skills: self-awareness, self-reflection and self-development • Effective use of assessment and feedback 	<p>Influence of the self, self-awareness, self-reflectivity, adaptability and personal beliefs and identity (Beijaard and Vries, 1997; Biesta, Priestley, & Robinson, 2017; Buchanan, 2015; Carr, 1989; Clandinin, Connelly, & Schon, 1986; Evetts, 2009; Fenwick, 2016; Kelchtermans, 2005; Kind, 2016; Nespore, 1987; Nias, 1987; Pajares, 1992; Pollard, 2010; Taylor, 1997)</p>
<ul style="list-style-type: none"> • Drawing on knowledge I gained experientially and practically, through the practice of teaching • Constantly improving my own knowledge by keeping up to date with recent research in the subjects I teach and the ways in which to teach • Adhering to the Teaching Standards • Teaching children the national curriculum • Enacting policies defined externally 	<p>The professional knowledge debate: Influence of practical, experiential knowledge of teaching (Beijaard & de Vries, 1997; Clandinin & Connelly, 1996; Eraut, 1994; Fenstermacher, 1994; Jones and Moore, 1993); debates around the influence of externally defined required knowledge and generalized technical knowledge (Ceulemans et al., 2012; Sachs, 2000; Tummons, 2014); influence of empirical studies on practice (Biesta, 2010); and of the debate itself (Day, 2002; Fenstermacher, 1994; Hamilton, 2009; Kemmis, 2005; Nias, 1987; Sachs, 2000)</p>

<ul style="list-style-type: none"> • Maintaining the culture and ethos of the school in which I teach • Meeting the needs of the local community by adapting what and how I teach 	<p>Influence of context: (Clandinin and Connelly, 1996; Flores and Day, 2006; Gewirtz et al., 2021; Nespor, 2002; Talbert and McLaughlin, 1996; Weber and Mitchell, 1996)</p>
<ul style="list-style-type: none"> • Working collaboratively with other teachers and members of staff, with parents and pupils • Maintaining the welfare of the pupils I teach • Derived from a set of personal skills and attributes: <ul style="list-style-type: none"> ○ communication skills ○ empathy ○ passion for the job ○ creativity and innovation ○ social responsibility ○ ‘honing’ skills: self-awareness, self-reflection and self-development 	<p>Influence of social interactions (Beijaard & de Vries, 1997; Eraut, 1994; Evetts, 2009; Fullan, 2014; Gipps, Hargreaves and Mccallum, 2015)</p>
<ul style="list-style-type: none"> • Modelling and teaching morality – teachers should be role models, modelling and teaching how to be a good human being • Maintaining the welfare of the pupils I teach 	<p>Issues of morality in education - (Biesta, 2009; Buchanan, 2015; Carr, 1989; Day, 2002; Hargreaves, 2000; Inglis, 1989; Kelchtermans, 1996; Pajares, 1992)</p>

Appendix 3: Interview Schedule

In order to aid analysis through the gaining of pertinent and sufficient information, potential questions and subsequent questions to illicit more information were created in order to encourage participants to give rich descriptions (Kvale 2007) of the aspects making up their understanding of teacher professionalism, their interplay and their perceived source.

Main question	Purpose	Possible subsequent questions	Purpose
Talk me through your representation of influences on your practices	To generate rich description of the influences perceived to be in place around the formation of teachers' practices and the interplay between them	<p>You have placed X here, <i>at the centre/ near to Y/ connecting with X,Y and Z, etc.</i> Tell me about this.</p> <p>Tell me about the relationship between these two...</p> <p>What were you thinking about when you did this?</p> <p>Which elements would you say sum up for you what it means to be a professional teacher? Is there a way to be an unprofessional teacher?</p>	<p>Expression of relationship between elements</p> <p>Detail and illumination through examples</p> <p>Unpacking view on teaching as a professional practice.</p> <p>Exploration through negative example.</p>
<p>What guides you in your teaching/ in how you act as a teacher?</p> <p><i>For example, documents, people, the building, the classroom, things inside the classroom</i></p>	Identification of guiding influences.	How do you experience/ what is your experience of... (pick an aspect mentioned or something from the representation)?	Uncovering power relations/ interactions between identity and actors in the network

How has your understanding of your practices changed over the course of your career?	Exploring potential actors in the assemblage over time	<p>What happened to bring this change about?</p> <p>How did you feel when...?</p> <p>What did you experience when...?</p>	Expansion of detail around fluidity of professional expectations/ influences effecting their practices
Tell me about how leaders in the school affect your understanding of teachers' practices?	Exploring potential actors in the assemblage over time and space	<p>What do leaders in your school do with X? (pick aspect of representation)</p> <p>How do you experience this? What do you think about this?</p>	Exploring mobilisation of actor-networks and interplay with assemblages
What about influences from outside the school, such as the LA or the government or research?	Exploring potential mobilisation of actors within the network	<p>What are the key policies you use to inform your practice? What is it about them that influences what you do? How do you feel about this?</p> <p>Are there any policies or documents or government guidance which you have seen but which have not influenced how you act? What caused these to be discarded?</p>	

As participants are sharing information about their own opinions and beliefs, which may or may not contradict guidelines around professionalism imposed by their institution or by government policy/ curriculum, interviewees may experience anxiety at the end of the interview. Kvale (2007) points out the importance, therefore, of debriefing participants. The following was used as the basis for debriefing:

We have reached the end of the interview. The key points mentioned have been... (summarise). Did I mention everything? (Response dialogue) Is there anything we haven't

covered about the influences on your practices that you would like to talk about or anything you would like to say more about? (Response dialogue) How did you experience this interview? (Response dialogue) I am now going to turn off the recording device. Would you like to know any more about the project? (Response dialogue) Thank you for taking part.

Appendix 4: Question Stems to prompt interviewee response development

- You mentioned... would you please try and say more about that? – probing question, asking for elaboration, around themes identified in literature/policy and new themes introduced by the participant
- Do you think that's a good thing? – probing question, asking for asking for opinion on an aspect
- Could you describe that X? – probing question, asking for extension
- Was this...? – specification question
- (Repetition of phrase used) + (pause) – to encourage explanation (the use of silence here is key)
- Can you give an example of X? – probing question, asking for description through examples

Appendix 5: Control and interpretation-based questions

- You said... are you able to say more about this/ to describe this? – check understanding and extend description
- Because of....? – offering chance to confirm/ oppose understanding to clarify participant's intended meaning
- What were you thinking about when you... i.e. put X next to Y? – clarification through explanation of thought process
- Can you give an example of X? – clarification through example
- It was a significant change to – summarising back to validate researcher understanding of participant's intended meaning
- What did you mean by? – direct request for clarification
- So, you mean....? – direct request for clarification

Participant Information Sheet

Title: Exploring formations of teachers' practices

You are invited to take part in a research study into the formations of teacher identity and the teacher's role as it is now (which is, for the purposes of this project, named 'teacher professionalism'). Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by Ruth Tromans as part of her PhD research project at Durham University: Exploring the formation of teachers' practices*.

The purpose of this study is to investigate how teachers' understanding of their practices has been formed, tracing influences in order to give a detailed picture. This is intended as an in-depth, on-the-ground view of teachers' practices, offering a practitioner-based angle to national and international debates around the topic and, in a time of rapid change for the teaching profession, offer food for thought to school leaders and policy advisers when considering policy developments in this area.

If you agree to be in this study, you agree to take part in an audio-recorded hour-long 1-to-1 interview with a short card-sorting pre-interview task, which will explore what you think about your practices. In addition, the researcher may also ask to spend time observing in your school, taking 'fly-on-the-wall' notes on the daily professional life of teachers. As a teaching professional herself, the researcher is sensitive to when and where notes should not be taken and is additionally happy to be requested to not take notes on specific occasions. Where the researcher would like to spend time observing in your classroom, this observation is solely for the purposes of the study and does not offer evaluation of teaching and learning. Anonymised copies of documents such as planning documents may be requested.

All responses you give and other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. Whilst interview responses may be quoted in the final report, there will be no way to connect your name to your responses at any time during or after the study.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

If you have any questions, requests or concerns regarding this research, please contact me via email at ruth.tromans@durham.ac.uk

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: 29/01/2018)

Miss Ruth Tromans

* This research project is supervised by Dr Jonathan Tummons (jonathan.tummons@durham.ac.uk) from the School of Education at Durham University.

Declaration of Informed Consent

- I agree to participate in this study, the purpose of which is to investigate how teachers' understandings of their practices have been formed, tracing influences in order to give a detailed picture. This is intended as an in-depth, on-the-ground view of teachers' practices, offering a different angle to national and international debates around their practices and, in a time of rapid change for the teaching profession, offer food for thought to school leaders and policy advisers when considering policy developments.
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study without penalty of any kind.
- I have been informed that data collection will involve the use of audio-only recording devices and anonymised observational notes and I consent to this.
- I have been informed that all of my responses will be kept confidential and secure, and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. Ruth Tromans, School of Education, Durham University can be contacted via email: ruth.tromans@durham.ac.uk
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the School of Education Ethics Sub-Committee, Durham University via email to ed.ethics@durham.ac.uk.

Date	Participant Name (please print)	Participant Signature
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I certify that I have presented the above information to the participant and secured his or her consent.

Date	Signature of Investigator
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Leazes Road
Durham City, DH1 1TA

Telephone +44 (0)191 334 2000 Fax +44 (0)191 334 8311
www.durham.ac.uk

Durham University is the trading name of the University of Durham

Appendix 7: Initial coding list

ACTOR:agenda
ACTOR:assessments_internal
ACTOR:audit_tool
ACTOR:budget
ACTOR:building_layout
ACTOR:assembly
ACTOR:CK:2014_national_curriculum
ACTOR:CK:childrens_interests
ACTOR:class_whiteboard
ACTOR:classroom_display
ACTOR:classroom_resource
ACTOR:clock
ACTOR:colleagues
ACTOR:collective_teacher_values
ACTOR:data
ACTOR:development_matters
ACTOR:diary
ACTOR:emotional_check_in_training_resource
ACTOR:exercise_book
ACTOR:external_training_resource
ACTOR:forest_schools
ACTOR:funding
ACTOR:furniture
ACTOR:glow_maths_resource
ACTOR:governors_meeting_document
ACTOR:ipad
ACTOR:LA
ACTOR:LB_expectations_doc
ACTOR:leader
ACTOR:lesson_objectives
ACTOR:lesson_structure
ACTOR:Letters_and_Sounds
ACTOR:logo
ACTOR:'marvellous_mistakes'_resource
ACTOR:MAT:branding
ACTOR:MAT:policy
ACTOR:MAT:system
ACTOR:MAT:views_on
ACTOR:MAT_leader
ACTOR:maths_basics_document
ACTOR:maths_hub
ACTOR:MATHS_MASTERY:government_policy
ACTOR:MATHS_MASTERY:live_marking_procedure
ACTOR:MATHS_MASTERY:MAT_landmarks_doc
ACTOR:MATHS_MASTERY:Maths_no_problem_text
ACTOR:MATHS_MASTERY:maths_voice_concept

ACTOR:MATHS_MASTERY:morning_task_sheet
ACTOR:MATHS_MASTERY:mp_resource
ACTOR:MATHS_MASTERY:pre_and_post_teach_procedure
ACTOR:MATHS_MASTERY:reasoning_icons
ACTOR:MATHS_MASTERY:S_planning
ACTOR:MATHS_MASTERY:trgs_resource
ACTOR:MATHS_other
ACTOR:maths_trg_workbook
ACTOR:mini_whiteboards
ACTOR:national_assessments:end_of_key_stage_doc
ACTOR:national_media
ACTOR:national_standards_doc:at_greater_depth
ACTOR:national_test_doc:phonics
ACTOR:national_testing:moderation_doc
ACTOR:national_testing:SATs_doc
ACTOR:mp_resource
ACTOR:mp_trainer
ACTOR:mp_website:videos
ACTOR:nctl_doc
ACTOR:NLS_doc
ACTOR:NLS/NNS_doc
ACTOR:notebook
ACTOR:NPQH_doc
ACTOR:NPQML_doc
ACTOR:NPQSL_doc
ACTOR:ofsted_framework
ACTOR:parent_workshop_doc
ACTOR:parent
ACTOR:PCK:knowledge_of_child
ACTOR:PCK:curriculum:content
ACTOR:PCK:curriculum:progression_doc
ACTOR:PCK:external_training_doc
ACTOR:PCK:external_training:Pie_Corbett
ACTOR:PCK:knowledge:from_peer_professional
ACTOR:PCK:knowledge:child_development
ACTOR:PCK:phonics_doc
ACTOR:PCK:self
ACTOR:PCK:song
ACTOR:PCK:talk_partner
ACTOR:PCK:theoretical_source:growth_mindset
ACTOR:peer
ACTOR:PGCE_doc
ACTOR:phone
ACTOR:photos
ACTOR:planning_doc
ACTOR:plastic_wallets
ACTOR:policy:external

ACTOR:policy:governmental
ACTOR:policy:national:teacher_standards_2012
ACTOR:policy:SEND
ACTOR:post-its
ACTOR:planning
ACTOR:professional_experience
ACTOR:professional_literature
ACTOR:professional_reading_material
ACTOR:'progress'
ACTOR:pupil_numbers
ACTOR:QCA
ACTOR:refreshments
ACTOR:restorative_practice_resource
ACTOR:room_lay_out
ACTOR:safeguarding_routines
ACTOR:school_terms
ACTOR:school_values_list
ACTOR:school_website
ACTOR:schools_direct
ACTOR:SDP
ACTOR:self:practice
ACTOR:Shanghai_maths_doc
ACTOR:SIP
ACTOR:'slow_writing'
ACTOR:small_steps_document
ACTOR:specialists
ACTOR:staff_training
ACTOR:staff_training:first_aid_requirement
ACTOR:star_in_the_jar
ACTOR:stem_sentences
ACTOR:supply_teacher
ACTOR:TA
ACTOR:table_groupings
ACTOR:team_teach_system
ACTOR:tech:camera
ACTOR:tech:Chromebooks
ACTOR:tech:communication_software
ACTOR:tech:email
ACTOR:tech:Google_calendar
ACTOR:tech:Google_Drive
ACTOR:tech:huddles
ACTOR:tech:IWB
ACTOR:tech:PC
ACTOR:tech:professional_websites
ACTOR:tech:slide_deck
ACTOR:tech:social_media
ACTOR:tech:TED_talk

ACTOR:tech:tracking_programme
ACTOR:tech:views_on
ACTOR:tech:websites
ACTOR:textbook
ACTOR:timetable
ACTOR:TLR_points
ACTOR:to_do_list
ACTOR:training_gap_task
ACTOR:training_handouts
ACTOR:training_task
ACTOR:vocabulary
ACTOR:walkie_talkie
ACTOR:wall_display
ACTOR:wall_display:English
ACTOR:national_maths_resource
ACTOR:working_wall
ACTOR:workload
ACTOR:year1team
ACTOR:YGL:Frances
BEHAVIOUR:LEADERSHIP:praise
BEHAVIOURS:classroom:celebrating
BEHAVIOURS:classroom:exploring_alternatives
BEHAVIOURS:classroom:on_own:instant_adaptation
BEHAVIOURS:classroom:organising
BEHAVIOURS:classroom:planning_actions_in_the_moment
BEHAVIOURS:classroom:TT:acting
BEHAVIOURS:classroom:TT:assessing
BEHAVIOURS:classroom:TT:being_playful
BEHAVIOURS:classroom:TT:challenging
BEHAVIOURS:classroom:TT:checking
BEHAVIOURS:classroom:TT:comforting
BEHAVIOURS:classroom:TT:directing
BEHAVIOURS:classroom:TT:explaining
BEHAVIOURS:classroom:TT:human_response
BEHAVIOURS:classroom:TT:linking
BEHAVIOURS:classroom:TT:modelling
BEHAVIOURS:classroom:TT:motivating
BEHAVIOURS:classroom:TT:praise
BEHAVIOURS:classroom:TT:questioning
BEHAVIOURS:classroom:TT:reinforcing_LB
BEHAVIOURS:classroom:TT:restorative_practice
BEHAVIOURS:classroom:TT:scaffolding
BEHAVIOURS:classroom:TT:summarising
BEHAVIOURS:classroom:with_colleagues
BEHAVIOURS:classroom:with_colleagues:celebrating

BEHAVIOURS:classroom:with_colleagues:challenging
BEHAVIOURS:classroom:with_colleagues:checking
BEHAVIOURS:classroom:with_colleagues:demonstrating
BEHAVIOURS:classroom:with_colleagues:directing
BEHAVIOURS:classroom:with_colleagues:discussing_children's_needs
BEHAVIOURS:classroom:with_colleagues:joking
BEHAVIOURS:classroom:with_colleagues:life_chat
BEHAVIOURS:classroom:with_colleagues:planning_actions_in_the_moment
BEHAVIOURS:classroom:with_colleagues:questioning
BEHAVIOURS:classroom:with_colleagues:reflecting
BEHAVIOURS:classroom:with_colleagues:reiteration
BEHAVIOURS:classroom:with_colleagues:safeguarding
BEHAVIOURS:classroom:with_colleagues:shaping_the_environment
BEHAVIOURS:classroom:with_colleagues:sharing_tasks
BEHAVIOURS:classroom:with_colleagues:supporting
BEHAVIOURS:LEADERSHIP:calming_others
BEHAVIOURS:LEADERSHIP:challenging
BEHAVIOURS:LEADERSHIP:'check_that_everyone_is_ok'
BEHAVIOURS:LEADERSHIP:directing
BEHAVIOURS:LEADERSHIP:encouraging_reflection
BEHAVIOURS:LEADERSHIP:evaluating
BEHAVIOURS:LEADERSHIP:growing_as_a_leader
BEHAVIOURS:LEADERSHIP:'handle_this_carefully'
BEHAVIOURS:LEADERSHIP:impact_of
BEHAVIOURS:LEADERSHIP:informing
BEHAVIOURS:LEADERSHIP:linking
BEHAVIOURS:LEADERSHIP:organising
BEHAVIOURS:LEADERSHIP:'professional_discussion'
BEHAVIOURS:LEADERSHIP:questioning
BEHAVIOURS:LEADERSHIP:safeguarding
BEHAVIOURS:LEADERSHIP:sharing_own_values
BEHAVIOURS:LEADERSHIP:strategising

BEHAVIOURS:LEADERSHIP:understanding_in_order_to_lead
BEHAVIOURS:LEADERSHIP:working_with_other_leaders
BEHAVIOURS:shared_professional_spaces:appreciation
BEHAVIOURS:shared_professional_spaces:parent_communication
BEHAVIOURS:shared_professional_spaces:planning
BEHAVIOURS:shared_professional_spaces:preparing
BEHAVIOURS:shared_professional_spaces:reflecting
BEHAVIOURS:shared_professional_spaces:with_colleagues:appreciation
BEHAVIOURS:shared_professional_spaces:with_colleagues:challenging
BEHAVIOURS:shared_professional_spaces:with_colleagues:checking
BEHAVIOURS:shared_professional_spaces:with_colleagues:debating
BEHAVIOURS:shared_professional_spaces:with_colleagues:discussing_childrens_needs
BEHAVIOURS:shared_professional_spaces:with_colleagues:explaining
BEHAVIOURS:shared_professional_spaces:with_colleagues:humour
BEHAVIOURS:shared_professional_spaces:with_colleagues:life_talk
BEHAVIOURS:shared_professional_spaces:with_colleagues:modelling
BEHAVIOURS:shared_professional_spaces:with_colleagues:negotiating
BEHAVIOURS:shared_professional_spaces:with_colleagues:planning
BEHAVIOURS:shared_professional_spaces:with_colleagues:questioning
BEHAVIOURS:shared_professional_spaces:with_colleagues:sharing_tasks
BEHAVIOURS:shared_professional_spaces:with_colleagues:solving
BEHAVIOURS:shared_professional_spaces:with_colleagues:suggesting
BEHAVIOURS:shared_professional_spaces:with_colleagues:supporting
BEHAVIOURS:TT:classroom
BEHAVIOURS:with_parents

