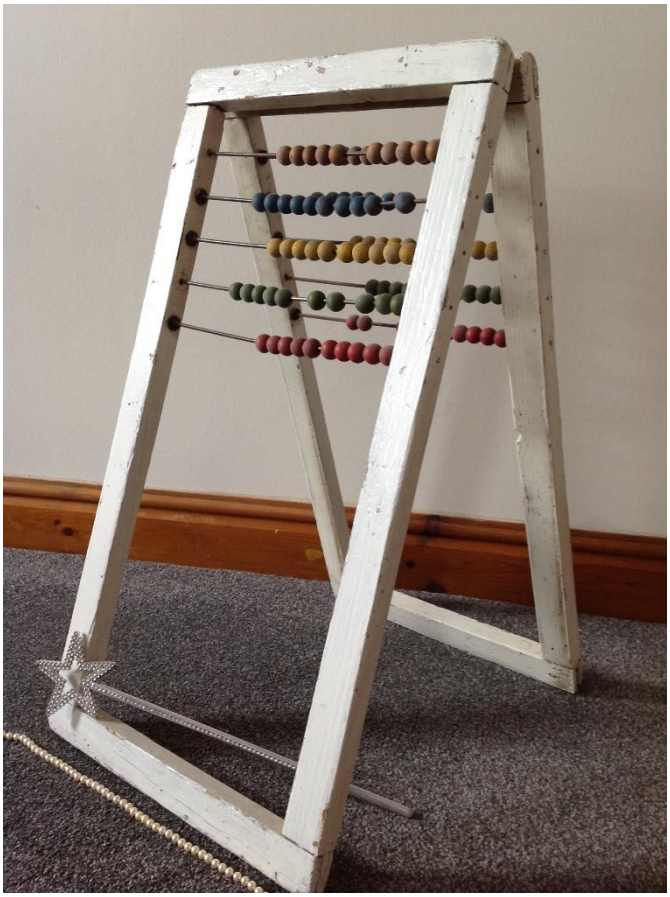

An Exploration of ‘Evental Learning’: a New Pedagogical Approach to the Teaching and Learning of Mathematics.

Clair Bowen

Clair Bowen

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List of Abbreviations:

Abbreviation, context and meaning.	First mentioned
Event – when Event is spelt with a capital E, the discussion is referring to Zizek's notion of Event (2014)	P7
NC - National Curriculum 2013	P8
DfE – Department for Education	P9
SATs – Statutory Assessment Tests	P9
ITT – Initial Teacher Training	p11
BCU – Birmingham City University	P11
PISA - Programme for International Student Assessment	p12
OfSTED - Office for Standards in Education	P15
SEND – Special Educational Needs and Disabilities	P20
OECD - Organization for Economic Cooperation and Development's	p21
CPD - Continuing Professional Development	p23
Gov UK – UK Government	P25

EYFS - Early Years Foundation Stage	P25
KS1 – Key Stage One	P25
KS2 – Key Stage Two	P25
NCETM - National Centre for the Excellence in the Teaching of Mathematics	P27
EEF - Education Endowment Foundation	p31
ZPD - Zone of Proximal Development theory	P34
TAF - Teacher Assessment Frameworks	P37
MKO - More Knowledgeable Other	P43
BERA - British Educational Research Association	P58

Chapter 1 – Introduction

> ‘Do you have problems you want to solve? Oceans you want to navigate. Patterns in the starry spheres of your life that you wish to understand. Then you can be a math explorer, since you were born with the human capacities to inquire and to reason. Dream of the sun, the moon and the world that you will discover. Imaginative, creative and unexpected enchantment awaits’ (Su 2020 p31).

I have learned during my career, that the emotional responses of feeling successful at learning mathematics and having a sense of being good at maths, originate from influences and practices of previous maths learning experiences. This stems from encounters with maths content both at school and at home where opinions and attitudes towards maths are shaped and formed when we are young. The way that a maths teacher teaches maths, or how a parent makes an attempt to support a child with their maths homework, is individual, and often responsive to the relationship they themselves have had with maths. Parents and teachers could be perceived by children as what Vygotsky might refer to as a more knowledgeable other (Vygotsky 1978) as discussed in 2.3.3 and able to support them when engaging with maths learning activities at school and at home. This becomes more complex when methods of teaching and learning maths change through educational reforms and methods. Parents do not always know the new techniques or approaches which can lead to confusion, anxiety and a disharmonious maths-learning environment at home. Maloney *et al* (2015)

and Su (2020:09) show that parents with negative attitudes towards maths may actually have a maths anxiety that has gone unnoticed and unrecognised, which could then be passed on to their children. Boaler (2013), offers the phrase 'learning without thought', developed within a research data collection interview with female maths students who talked about learning maths as 'purely remembering', whereas learning within other subjects' time to think is allowed, enabled and encouraged. According to research (Wolf 2009, Kirsten & Billman 1997, Illeris 2003, Watson *et al* 2003), the process of learning occurs over time with regularity, familiarity and structure and therefore my interpretation of the process of learning is part of a connected series of moments that accrete over time and involve a positive emotional connection.

Throughout this thesis I have based my ideas on Zizek's notion of Event (2014) and whenever I refer to Zizek and Event, I will use a capital E. I have reconceptualised Zizek's 2014 work on Event in the context of learning mathematics at primary school level in England and have developed my notion of a new pedagogical approach to teaching maths in England which I have called evental learning. I claim that evental learning can complement and support maths learning within the endorsed approach currently used in schools, called Teaching for Mastery. Whenever I refer to evental learning I will use small case letters. When I refer to Human Flourishing, I am taking the ideas of Su (2020) whose ideas on learning maths through an emotional connection to it, resonate closely with my doctoral claim and applies directly to my notion of evental learning.

The originality of this thesis is that the 'Event' of evental learning, and the interpretation of Zizek's notion of Event (2014), involves a Vygotskian vision of learning which is created through social interaction which allows children the space and time to develop fully their processes of metacognition, socialisation, personal experiences and emotion which then act together to support meaningful learning .

My conceptualisation of evental learning calls for an emotional connection to maths and an awakened awareness in pupils of how they actually like to learn maths best. Moreover, By applying the ideas developed by Zizek and Su, through the constructivism lens of Vygotsky, creates an opportunity to look at maths pedagogy differently by investigating and exploring the extent of the impact of learning on maths pupils. My application of the concepts of 'Event' and 'Human Flourishing' acknowledge that learning has occurred, what it means for them as a maths pupil and how the conscious ability to support one's own learning in maths could affect attitudes towards it.

My central doctoral claim is that if maths pupils were allowed more time and space to awaken their awareness about how they learn through what I have called 'an evental learning approach' then the required maths syllabus could still be delivered through the currently endorsed approach of the time, known as Teaching for Mastery, but maths learning would be more likely to be sustained, appreciated and enjoyed by the pupils. Moreover, I believe that these benefits could be experienced across all subjects and learning – both formal and informal, in and out of school. My evental learning approach

is detailed throughout the whole thesis but is based on a requirement to move away from the neoliberal such as Maths Mastery, Singapore Maths and White Rose, which encapsulate Teaching for Mastery principles. Evental learning focusses instead on the principles of metacognition and self-regulation enabling the maths pupil to consciously become aware of what they are learning how they learn best and why it has to be learnt so that maths and learning in the real world become interconnected.

1.1 Rationale for the study

> Thom's (2018) slow teaching approach calls for school aged pupils to be allowed time to consider and process what they are being asked to learn as the delivery of the curriculum content is slowed to give an emotional space to think, so supporting the development of a more positive relationship between learner and something that is to be learnt.

> Teaching is communication. How we speak, how we act, how we express ourselves in the classroom is vital. It can be the difference between building positive relationships and inspiring a deep love of learning, to a complete breakdown in how our classrooms and learning function.
>
> Thom (2023)

This thesis seeks to investigate the problem of learning maths and the extent to which the voice of the recipient of learning maths in English primary schools is acknowledged, valued, and listened to by all connected to maths pedagogy. I subscribe to the view that the current English primary national maths curriculum (2013) is too full of content to be covered thoughtfully and argues that not enough time is allowed in the classroom for pupils' self-reflection and self-regulation.

I wanted to explore how useful it was for pupils' voices be acknowledged, valued and listened to as I believe this to be the biggest gap in current and existing maths pedagogy and research. To do this I critically interrogate Bruner's (1976) concept of Mastery and identify how aspects of his learning theory have been interwoven into the current preferred approach to teaching maths, within the English primary education, using the Teaching for Mastery (2016) programme. I will offer ideas and thoughts garnered directly from some primary maths pupils, about their experiences of maths content delivery from the National Curriculum (NC) (2013) in England and re-purposed into the Teaching for Mastery approach.

The rationale of my study is to capture the voice of the maths pupil and raise an awareness and understanding of the importance policy makers, school leaders and maths teachers to get maths pedagogy right, within the primary school offering.

The DfE National Curriculum Programme of Study for mathematics (2013) state in their purpose of study paragraph, that pupils should gain an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.
To demonstrate why giving the maths pupil a voice, is important to me, a maths educator for 30 years, I want to now introduce you to Saayah. Saayah is an archetypal child in Year 6 who struggles in her understanding of maths. I have included Saayah in this rationale section of my thesis, as she is typical of the many children currently sitting in maths classrooms in England who have formed the opinion that they 'hate maths'. As a result of many negative maths experiences throughout her primary schooling years, Saayah now lacks confidence in her ability to self-regulate her learning through the many gaps and holes in her learning that have accumulated in her maths learning journey so far. This is often due to her lack of conceptual or procedural knowledge which has gone unnoticed and therefore not addressed by her teachers. Because of this, I would argue she is no longer able to recognise and have a positive orientation towards maths and neither therefore is she able to appreciate the beauty of maths, which the Department for Education (DfE) state clearly as their vision within the maths programme of study (2013). I now present the vignette of Saayah' s story. I present her the same way as I present my participants later on in my study, so that the non-expert reader can get a direct sense of the 'problem' that I am addressing within my research.

Saayah is ten years old and is a year six pupil at an English primary school. She is approaching the time in her school career when she will be required, under the English education system, to demonstrate her mathematical understanding through the completion of a Statutory Assessment Test (SATs) test. The result of this test will determine how she is categorised by her secondary school maths teachers as her performance data at KS2 will be used to predict her final GCSE grade in maths. Saayah is aware of this and this knowledge has caused her some anxiety as she dreams of becoming a primary school teacher. She is fully aware of the entry requirements set by University to enable her to join the appropriate training course. She has become self-aware that for the past few years of her primary schooling she has started to struggle to make progress in maths. Saayah has anxiety about the KS2 SATs grade that she will achieve later this year as well as in five years' time when she takes her maths GCSE. As a current year six maths pupil, she doesn't like it; she doesn't understand when the teacher is explaining and she has lost the confidence to ask for help. This had led her to 'know' that she 'can't do maths.'

It wasn't always like this for Saayah. She doesn't always remember negative feelings associated with learning mathematics in school. In fact, a positive maths memory stands out for her when she was in KS1. She remembers being able to successfully complete a practical maths activity as part of a cross curricular topic she was engaged in and was singled out for praise by the teacher. She really enjoyed the activity, the praise and the subjective feeling that she was good at maths. These conscious and

positive attitudes towards maths however were short-lived and a pivotal moment in Saayah's mathematical career occurred within her KS2 years. Maths lessons became less fun. Maths became a discretely taught subject rather than within a cross-curricular and practical topic based strategy that she had experienced in KS1 and it became apparent to her, through pressure from school and home, that she must learn her multiplication tables in order to progress further. Learning them by rote was the preferred teaching strategy employed by the teacher and as such, maths, as a subject, became a challenge, a chore and a bore. Learning by rote did not come easily to Saayah. She did not understand why she had to learn in this formal structured and unconnected way when in the past she had had enjoyed learning maths through a more practical, cross-curricular strategy and had been able to understand what she was learning and why.

Saayah wants to be a primary school teacher, but she knows that she must overcome barriers to mathematics in order to take a step closer to achieving her dream. Saayah aged ten, feels alone and unsupported both at school and at home. Saayah is consciously aware that success in maths is up to her. She knows that she must draw on her own levels of resilience and determination to learn what is required. What she doesn't know, is how to do it. After the past few years in KS2 her self-confidence and self-worth in mathematics has decreased at such a rate that both home and school identify Saayah as having a mathematical barrier. Saayah is unable to self-regulate and she unable to recognise that her struggle in maths is more about the teaching methods employed than her own ability to make progress in her mathematical understanding.

Saayah' experiences begin to explain how many primary pupils' experiences of maths teaching and learning in English schools has often led to the point where they see maths as too difficult and full of obstacles to learning rather than subject that they enjoy and can do well in. The pressure of having to gain conceptual understanding through a teaching strategy that did not suit her, led to the development of feelings of maths anxiety for Saayah, low engagement and a tendency to demonstrate low-level disruptive behaviour. Her year six teacher hadn't seemed to notice or acknowledge the signs of maths anxiety and Saayah felt that her teacher was not helping her. The emotional impact of Saayah' s experience of maths was overpowering her ability to learn the processes of maths. Saayah had been exposed to a strategy to remember mathematical processes needed to complete a mathematical problem correctly in a test that did not suit her. Saayah had not been taught to learn.

1.1.1 Personal motivations/background

The following personal and professional reflections provide insights into the influences that have shaped my professional identity as a maths teacher and teacher-educator. They inform the rationale for my research and ontologically and epistemologically explain the emergence of the research questions for this study.

In the early nineties, I began my teaching career in England. This coincided with the first iteration of the National Curriculum (1989) followed in the late nineties by The National Strategies (DfE 1999), which prescribed reform for improvement in the core subjects of Maths and English. As a primary school maths teacher and later as a school leader, I wanted to fit in to the profession and be deemed by others as successful, so more accepted government approaches and directives and consequently conformed to the policy edicts of the time. However, I always considered the view of the maths pupils I taught to be important although I realised that there was no place to really hear them within the boundaries of how English primary school curriculums were organised and delivered at that time and now.

In 2015, I took up the post of senior lecturer at Birmingham City University as a teacher educator for primary school mathematics in England. Soon after this, I started my Ed.D studies, which gave me an opportunity to critically reflect on my professional identity as a teacher and teacher-educator. In my role as teacher-educator, I was looking forward to sharing my experiences of teaching and learning maths with the next generation of maths teachers and the opportunity to reimagine maths delivery with creativity. However, as my role in university as a maths tutor became clearer and through my work in schools as an Initial Teacher Training (ITT) teacher-educator, the expectations of me, from others, began to unsettle me. My move into a teacher-educator identity had allowed me to think more critically about teaching and learning in mathematics. Not least, my own developed awareness of how institutionalised I had become when working in school, was now destabilising my thinking and positioned me differently. I now faced a dichotomy of being required, as a directive from ITT to deliver a message to pupils which supported the newly Teaching for Mastery approach, endorsed by the DfE (2016), as the only way that maths can be learnt, but also knowing that here was a golden opportunity for me to engage with trainee teachers about to enter the teaching profession, on the merits and values of such an approach. I saw this as a good opportunity to encourage the trainees to critically evaluate the different approaches that can be used to teach maths.

Around the time of joining Birmingham City University (BCU), the NCETM (National Centre for the excellence of Teaching Mathematics) was driving the latest approach to teaching maths, called Teaching for Mastery. This meant that Schools were being strongly encouraged to accept it as the new way to teach and learn maths. The National Curriculum 2013 (NC) talks of maths as an interconnected and creative subject to provide:

> '…a foundation for understanding the world' (NC2013:99)

This was an approach which I welcomed, however, in my experience it was not always apparent in the delivery of primary maths in schools in England. I increasingly began to feel that as an ITT maths teacher-educator I had to be essentially a conformist and a suppressor of the creativity that the maths National Curriculum (2013) had indicated in their vision and that I had so looked forward to exploring with my teacher trainees. Instead, I found myself delivering following a prescriptive Teaching for

Mastery approach that had been introduced to improve performance within the Programme for International Student Assessment (PISA) world rankings, as highlighted by Blausten (2020) (I will discuss this programme further in 2.1.3). Central to the thesis is the idea that learning maths should not be primarily about performance in international initiatives such as PISA (2023).

The opportunity for discussion and dialogue with those directly experiencing the delivery of maths (the pupils themselves) was not part of the PGCE or BA with QTS curriculum which I found myself working within. They focussed instead on ensuring that trainee teachers had adequate subject knowledge with little recognition that dialogue with pupils was also an important part of teaching and learning any subject. Maths lecture time for both teacher training courses became more concerned with subject knowledge acquisition including content within lectures about whether a trainee teacher can themselves successfully complete a long multiplication problem rather than engage in the pedagogy of teaching long multiplication. This has become even more central to the ideology of ITT with the introduction of the core content Framework (2019). This document details the curriculum that must be delivered to trainee teacher by the provider and is content and skills driven. Over the time I have worked within ITT, my own educational philosophy has been challenged and I realised that ITT is more concerned with meeting the DfE requirement of having adequate core subject knowledge irrespective of the processes used to gain it than whether pupils should or could find maths learning enjoyable. It also made me question the role of the maths teacher within teacher training and the Core Content Framework agendas.

1.1.2 Wider educational issues e.g. social /cultural attitudes to Maths in UK

> Negative attitudes to maths set in early in the UK – some would say between the ages of seven and nine, when many children's interest and attainment dip, in most cases never to return.
>
> (The Guardian Teacher Network 2012)

The quote above provides the stimulus, incentive, and motivation for my research as much research states that maths is a subject which many people can feel negative towards. This could include maths pupils and maths teachers and whilst the attitudes of maths teachers toward maths teaching is worthy of further research, central to this thesis, is the importance of an emotional connection which may lead to an enjoyment of learning maths for young maths pupils. This is important as Vordeman (2011) found that by the age of nine, individuals may have already formed negative attitudes to maths which, for many, remain with them for the rest of their lives. Jones (2012) agrees, adding that negative attitudes to maths, once fixed, impact on individuals' level of interest and then later on their attainment. Worryingly, Jones (2012) also argues that England has one of the lowest rates of

continuing to study maths post sixteen within the UK and the reasons for this may be due to issues of attitude and motivation. To counter this, Ernest (2015), offers hope through the system of education that negative attitudes can be changed if a number of contributing factors were in place:

> effective knowledge and capabilities rest on freedom from negative attitudes to mathematics, and build on feeling of enablement, empowerment as well as enjoyment in learning and using mathematics (Ernest 2015:190)

How pupils learn in mathematics is an area for further research and study and I now want to explore wider educational issues and ideas about attitudes towards learning maths that link to motivation and gender issues. These are pertinent to the requirements of evental learning which considers the need for an emotional connection to mathematics in order for individuals to feel successful mathematicians.

Luch (2016) maintained that children are naturally curious about learning and in order to learn they need to be fully connected, using all of their senses as well as looking for opportunities to explore, question, test and discover. Luch (2016) further argues that that such opportunities support children to be motivated by processes of learning that they can control and initiate. Rotter, back in 1966, looked at motivation in two ways, internal and external. Although his research is dated, it remains relevant and pertinent to this discussion, as it is connected to reasons of attitude formation towards mathematics. It is based on the social learning theory of personality and relates to problem solving and the level of which an individual is able to accept a situation they find themselves in. For example, a person with what Rotter calls an' internal locus of control' will make a judgement on their own performance in a test in terms of how they perceive their own capabilities. He argued that If they did well, they would praise themselves, if they failed, they would drive themselves towards greater improvement next time. However, an individual with an external locus of control would look to blame other factors that were out of their control if their performance was perceived less well by others. They would do this rather than look toward self-reflection and self-regulation. Further research by Revelle and Scherer (2009) argue that personality is a clear and determined combination of behaviours, cognitive development, and aspirations which may develop over time. Whilst Bergner (2020) says that an individual personality is a combination of a way of thinking, feeling, and behaving. None the less, internal and external locus of control is an interesting aspect to consider within the discussion of motivation and the possible consideration of attitude of boys and of girls which forms in the formative schooling years and may last for life.

There is also a gendered aspect to attitude to maths – which is not a focus of this research but is important to note, nonetheless. From their 2011 paper on gender differences and metacognitive skills, Liliana and Lavinia (2011) state that self-perception of academic ability in mathematics tends to be lower in girls. Similarly, Niemivirta (1997) reported that male pupils use more superficial learning strategies than females and Bidjerano (2005) indicated that girls rely on and use their skills of self-

monitoring, goal setting and planning much more often than boys (Liliana and Lavinia 2011). In their 2011 study on anxiety from a metacognitive perspective, Bahrami and Yousefi (2011) found that girls are more prone to anxiety than boys because of their metacognitive ability to connect more deeply with their own emotions. They argue that girls should be given strategies that help them to control their metacognitive worrying thoughts. This would modify their negative and positive metacognitive beliefs about worry. Although discussing gender at this point, it is worthy of note that I found no significant gender difference when working with my participants.

1.2 Thesis Overview

Key theoretical concepts that underpin this thesis include theories of thinking and the mind, metacognition as well as habitus and. Principally The theory of Event from Zizek (2014) and the theory of Human Flourishing from Su (2020) will provide a substantial grounding whilst the ideas of Freire (1996) support the discussion on the place and value of critical pedagogies of resistance within primary maths teaching in England. The data which I collected is from the maths pupil directly as my intention for this thesis was to capture and represent the voice of the maths pupil.

1.2.1 Aims of the research.

The rationale discussed above for the research has been translated into the following research questions.

1.2.2 Research Questions

1. How can a more developed understanding of their own process of learning, which I am calling evental learning, support primary maths pupils in English schools to experience and understand learning more effectively and consciously?
2. How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum in England?

1.2.3 Organisation and content of the chapters

Chapter 1 provides the Introduction and rationale for the study which have emerged out of my personal motivations and professional background. I also use this chapter to introduce wider educational issues of social and cultural attitudes to maths in England which are developed throughout the thesis. The chapter then moves on to the thesis overview where the aims of the research and the research questions are presented.

Chapter 2 is the Literature Review where 'big' concepts such as neoliberalism, habitus and metacognition are operationalised and applied. The history of the development of neoliberal is critically evaluated, the key characteristics of the Global Education Reform Movement and New Public Management are discussed primarily drawing on Ball and Biesta. I consider influences on English Education policy, including the National Curriculum, the professional standards, the formation of OfSTED and the introduction of league tables. I discuss how these influences have devalued the teaching profession and given rise to the centralisation and standardisation of curriculum and pedagogies through fragmentation of the sector via academisation. In this chapter the influence of international neoliberal initiatives such as PISA is reviewed and how all of the above has relevance to my study.

Chapter 2 also conducts a comprehensive Policy overview in order to examine development of English primary National Curriculum and how it confirms to neoliberal principles. I specifically look at the current primary maths curriculum and its centrality to the National Curriculum and educational reforms. This leads on to an examination on the current delivery approach of maths in primary schools in England through the Teaching for Mastery approach. I look this programme's history and characteristics and how it confirms to neoliberal principles. Chapter 2 considers key theoretical concepts including theories of thinking and the mind, theories of teaching and learning including concepts of metacognition, habitus and socialisation. The theory of Event from Zizek and the theory of Human Flourishing from Su are used to underpin my theoretical framework alongside Freire's (1996) critical pedagogy of resistance, I consider how my notion of evental learning could challenge and destabilise neoliberal concepts of education and learning but also how it complements the Teaching for Mastery approach and why this is important.

Chapter 3 addresses the interpretivist methodological approach that I took for my study. The methodological choices examine the established habitus of a traditional primary school maths lesson and expectations of the learner and juxtaposes it with the opportunity for the maths pupils who partook in this study to become co-researchers. Their thoughts and words became the qualitative live data which could then be discussed and analysed.

Chapter 4 is presented as a series of seven vignettes which represent the dual role of the participants for this study. They were both maths pupils experiencing the delivery of the maths curriculum as well as my co-researchers. What they understand to be good maths learning is presented as accurately as possible with due consideration to my position as an adult researcher recording their words. The pupils' discursive accounts confirm the complexities and extensiveness of the problem of learning

maths as well as an opportunity for maths teachers to listen to and act on the ideas of the maths pupils who are directly experiencing the way that maths is currently delivered in classrooms.

Chapter 5 draws some conclusions based on the study focus as well as offering recommendations for future practice and research.

Chapter 2 – Literature Review

2.1 Neoliberalism

In an era of globalisation neoliberal thinking has infiltrated English education from the 1980s onwards (Davies and Mansell 2007). Neoliberal discourses manifest through an intensification of standards-driven policy and reform fuelled by the "technology of performativity" (Ball 2003, p. 216). Performativity agendas, pursued by successive government and policy driven reform has led to an increased emphasis on standardised testing programs, prescribed curriculums and the drive to meet professional teaching standards. These agendas have relied on politico-media discourses that assume an unproblematic connection between higher levels of performance in standardised tests, teacher quality and educational improvement whereby achievement in standardised tests functions as a substitution for teacher quality (Nichols and Berliner 2007) presuming a 'perfect match between educational 'input' and educational 'output'' (Biesta 2012:585). A consequence of this situation is that it is not 'academic knowledge and theory' (Brass 2014:119) which underpins notions of educational excellence but rather 'professional standards, free market competition, data-driven decision-making, and entrepreneurialism' pupil performance and by implication teacher performance.

2.1.1 A brief history and critical evaluation of neoliberal ideas in English education

Salmieri (2018) argues that the reforms and transformations within education are linked to neoliberalism and can be articulated using an historical, sociological and political analysis. New Public Management is a set of outlooks and legislative positions that have been adapted from business to public service, to make the public sector more 'business-like' and to improve its efficiency by using private sector management models (Salmieri, 2018). In England growing state intervention across a number of government administrations has focused regulation, standardisation, inspection, assessment, evaluation and fixing of procedures, which have created the conditions that have enabled the marketisation of education in the UK and globally (Salmieri 2018).

However, this is not the case in all education systems across the world. Carter (2019) argues that Biesta developed three purposes of education to be applied to all education systems across the world and states that using these three purposes individuals can develop their application of knowledge and skills to being proficient towards a specified outcome such as a job or a qualification. Individuals learn the skills of socialisation and are able to become part of existing orders and traditions relating to ways of thinking and behaving in a range of contexts. The individual can then understand themselves as unique and develop a sense of self largely through interaction with others through the activation of personal agency, self-identity and self-awareness. In "Receiving the Gift of Teaching: From 'Learning From' to 'Being Taught By'" (2013b), Biesta distinguishes between ''learning from and 'taught by', arguing that in many current education systems, not least the UK where Biesta is based, the role of the teacher has been reduced to a "disposable and dispensable 'resource'" (2013:249)

Maintaining that for an "understanding of teaching in terms of transcendence, where teaching brings something radically new to the student" (2013:249), the main role is to teach pupils actively, rather than merely facilitate student learning.

Governments wedded to neoliberal principles prefer 'evidence-based practice' and randomised controlled trials arguing that they should underpin any educational research (Haynes, Goldacre, Service & Torgerson, 2012). This argument is used by neoliberal politicians as a way to evaluate whether public policy is working and is deployed across many different employment fields including social work and public practice as to rate its success is part of the governments agenda and mandate to measure their own effectiveness. (Davies, Nutley & Smith, 2000). Ball, (2003) and Biesta (2007) have all questioned the evidence-based approach, arguing that scientific and educational enquiry takes a linear, top-down approach to educational improvement where ideas and approaches that become endorsed by the government of the time are promoted to schools as the preferred method to use with a premise that OfSTED will want to make inspection judgements about its effectiveness and impact on learning and progress. In pedagogic terms in England, governments have repeatedly favoured a transmission model of Teaching and Learning which is bound up in archaic notions of the teacher as the active fount of all knowledge and the pupil as the passive receiver of knowledge as administered by the teacher (Griffin 2016).

Due to successive governments' reliance on New Public Management (NPM) tools, the current English education system relies heavily on outcomes. Current policy means that schools are subject to the dominant neoliberal educational discourse which is informed by Government, policymakers and the media leading towards what Hall (1988) described as 'the horizon of the taken for granted' (Griffin 2016:44). However, Biesta (2007) suggests that a neoliberal approach takes the view of the teaching professional as someone who 'administers a treatment' and 'intervenes in a particular situation' (2007:03). Biesta (2007) also argues, therefore that discursive fields will emerge around dominant neoliberal concepts/principles thereby setting the limits within which new/alternative ideas are permitted to evolve and develop. Pupil performance is largely measured exclusively through

standardised tests, such as SATS, external exams. However, many academics are more interested in questioning the purposes and functions of education. (Biesta 2017, Ozoliņš 2017, Webster 2017, Schofield 1999, Winch 1996, Young 2013). For example, Winch (1996) asserts that society needs a clear understanding of the purposes of education as how individuals learn affects who they are and become for the rest of their lives, whilst Biesta 2010) has largely centred on the relationship between education, democracy and citizenship as well as the theory and philosophy of education; vocational education; adult education and lifelong learning; teachers and teaching; policy analysis; and the theory and philosophy of educational and social research. Biesta (2009) stated that education has three purposes which are namely qualification, socialisation and subjectification and later in 2013, Biesta stated that the application of these purposes gives some insight into the 'multidimensionality of educational purpose' (Biesta 2013a:128). His influential text, 'The Beautiful Risk of Education' (2013a) is an exploration of seven educational concepts namely creativity, communication, teaching, learning, emancipation, democracy and virtuosity, and is a continuation of Biesta's 2010 critique of the use of the measurement of educational outcomes designed to compare the performance of education within and across countries.

2.1.2 Neoliberal Influence on English Education policy.

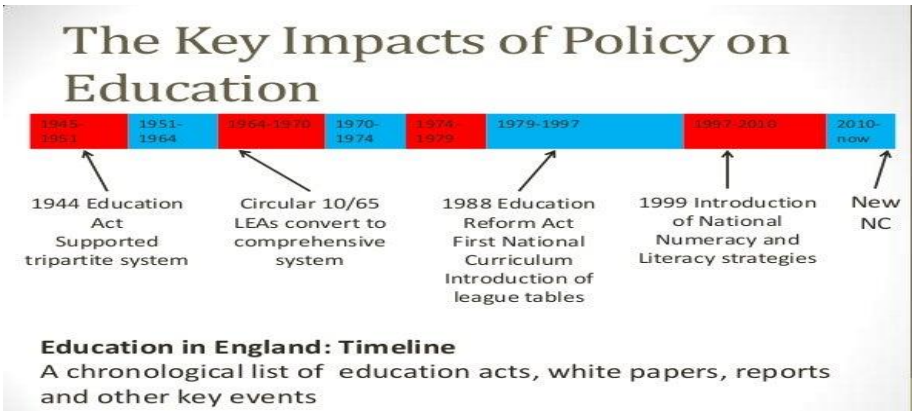


FIGURE 3 POLICY OVERVIEW

Figure 1 above and appendix 1contains a table showing English education policy development covering the period I am discussing in this thesis. In 1976, James Callaghan delivered what is now referred to as the Ruskin Speech (Appendix 1). This was intended to protect the comprehensive system of education in England, but it also introduced the idea that British education was no longer fit for purpose, moreover there was explicit criticism of the teaching profession who were characterised as both resistant to change and too progressive.

Several of the themes that he advocated continue to shape contemporary state education in England (Simmons, 2008). A decade after the speech, In1988 the Education Act was published (Appendix 1) and a National Curriculum was introduced. An official regulatory body, called the Office for Standards in Education (OfSTED), which led a country wide approach towards universal standards (Coffield, 2017) and a universal curriculum to be followed alongside discussion of what are the correct teaching methods to use.

In 1992, league tables were established for all state schools. In his own lecture at Ruskin College, Labour leader Blair in (1996), sought to restore the electoral fortunes of the Labour party through an emphasis on education. Over time, Blair's administration continued the drift to neoliberalism with the introduction in 1997 and 1998, of the National Strategies (Appendix 1). In this period ministers started to make judgements against a set list of standards and talked of schools/teachers/pupils need to meet national target. The standards sought to impact on a range of different curriculum areas due to poor performance pre-1997. In Key Stage 2 national assessment tests in English in 1995, only 49% of pupils nationally attained at level 4 or above. Poor performance of pupils from disadvantaged and ethnic minority backgrounds was often tolerated. In 1998 there was a gap of 52% between the level 4+ results for pupils from deprived households and those for all other pupils. By December 2010 after the National Strategies initiatives, standards were transformed with English attainment above 80%. Writing attainment rose 8% in the final five years of the National Strategies. Minority ethnic groups had closed the performance gap; by 2010 the proportional poverty gap had narrowed to 29% – an improvement of 21% (The National Strategies 1997–2011 A brief summary of the impact and effectiveness of the National Strategies (2011)). The setting of national targets was indicative of the neoliberal reconceptualisation of the education system as a single entity and as a fundamental component of national economic competitiveness (Ball 2013). However, concerns began to grow as standards in English and Maths were not improving (Education and Training Foundation, 2015). For example, in 2013, over one hundred educational academics wrote an open letter to the education minister. They were objecting to the narrowness of teaching and learning content within the National Curriculum, stating that it consisted only of lists of spellings to learn, maths facts and rules, which they argued, would hinder the development of children's ability to think and lacks inclusivity and have a negative effect on their ability to problem-solve and work creatively.

As part of an increasing consumer culture encouraged by the marketisation of the education system, pupil / participation and parental choice were highlighted in government policy. Ball (2013) argues however that choice and voice are part of the move from a producer to a consumer culture and more are about creating citizen-consumers than offering any real choice (Clark *et al* 2005, Ball 2013). An example of this is seen within Special Educational Needs and Disabilities (SEND) provision in England in the SEND Code of Practice (2015) which dictates that parents and carers must be fully involved in the planning, assessment, appraisal and evaluation of provision that is offered to their SEND pupil by the school, thus making schools much more accountable to parents as consumers. Aiming to please the consumer became even more apparent as part of the school's work when league tables were introduced in England. Public discourse began to centre around unhelpful ideas about what was deemed by OfSTED inspection judgements as 'good' and 'bad' schools emerged and the information became available to parents, national and local press (Warmington and Murphy 2004). DfE (2010) research (Underperforming schools and deprivation: a statistical profile of schools below the floor standards in 2010) showed that a discourse centred around failing and underperforming schools and Fresh Start Schools governed by Super-heads had emerged. Labour also further diversified the state sector which resulted in a range of faith schools, grammar schools, grant-maintained schools, City Technological Colleges, Specialist schools and of course academies which weakened the role of Local Education Authorities.

Researchers (Bernstein 2000, Puttick 2015) have argued that the reforms instigated since 1992 have consistently positioned state education as primarily concerned with rules, reproduction of knowledge, tests and exams Accordingly, a dichotomy has arisen between ensuring the provision of a more diverse education state system whilst also maintaining consistency of standards (Courtney *et al.,* 2017). Ozga (2008) described these neoliberal government prescribed regimes of audit, inspection, evaluation and testing and the use of measurement and comparison increasingly used in schools from 1988 as governing by numbers. Whilst Ball (2003) argues that with these policy reforms came an increased focus on quantitative measures presumably to ensure universality of delivery in English schools and the desire to strengthen the link between education and employment.

The subject of my thesis required me to interrogate the principles of neoliberalism as I am championing for a new approach to learning that does not require a financial output as an incentive to success. Evental learning requires a mindset where time and discussion are pre-requites for deep learning in mathematics. My thesis accepts that the notion of the business of education being already firmly embedded in schools, but it suggests that learning can only happen in one way through one prescribed format of delivering the subject matter, content and knowledge required to pass a test. The essence of my thesis rejects this in favour of learning through an emotional connection which takes time and requires a slowing down of national curriculum content and delivery. As discussed in 2.3.1 emotional intelligence and awareness of how to learn maths is also an important aspect when considering evental learning.

2.1.3 Influence of international neoliberal initiatives e.g., PISA

The Organization for Economic Cooperation and Development's (OECD) Programme for International Student Assessment (PISA) is a triennial survey that aims to evaluate countries state education systems worldwide by annually testing the skills and knowledge of a selected group 15-year-old pupils. PISA tests three 'domains', reading, maths and science. Each survey has a particular focus. The questions asked require pupils to demonstrate knowledge, apply learning and solve problems through analysis and logical thinking. PISA avoids emphasis on the assessment of factual recall and information retrieval and focuses more on knowledge application. Nor does PISA test how well a student has mastered a school's specific curriculum. In 2015 the focus was science and in 2018 the focus was on reading. Of key importance to this thesis is the focus for PISA testing and its influence on the English primary maths curriculum offer. In 2022 there was a focus on mathematics, with an additional test on creative thinking, but due to the pandemic, this was postponed. In 2023, thirty-eight Organization for Economic Cooperation and Development members (OCED) and over fifty non-members participated in the tests, demonstrating that interest in the PISA rankings remains. The importance of PISA to global governments cannot be overestimated. As, Schleicher (2015), the OECD's chief education analyst, says:

> the knowledge economy no longer pays you for what you know... it pays you for what you can do with what you know. (PISA webpage 2015)

For PISA schools are selected to be nationally representative and include school size and type, whether independent, maintained, special, middle, secondary, single sex or mixed and by region, whether urban or rural, language and attainment. The identity of the schools participating are not disclosed.

In 2012, the United Kingdom (UK) was twenty-sixth in the PISA rankings for maths performance. In 2013 the revised fourth edition of the National Curriculum for England and a revised maths programme for study, was introduced and made statutory in 2014. In 2015 the UK had risen to nineteenth in the PISA rankings. In 2016 a new approach to teaching mathematics was endorsed by the government called Teaching for Mastery. It was not a statutory approach, but many materials and schemes of work were produced and sold to schools as the preferred approach of the time. In 2018 the UK was placed thirteenth. In the most recent data, released in December 2023, the UK was ranked fourteenth. Singapore, which has used a long and well established Mastery approach to teaching mathematics, have consistently been at the top position of the PISA rankings and remain so in December 2023. The introduction of a new approach for maths teaching in England was more of a political act linked to the globalisation and marketisation of England within the world. The government

took the approach in order to raise its PISA ranking position, but neoliberal ideals did not require them to take the whole maths curriculum Singaporean ideology. Instead, attempted to make the Teaching for Mastery approach fit into the existing National Curriculum for maths, which had only just been updated the previous year. PISA ranking data suggests that the maths position of England has risen since the introduction of Teaching for Mastery (nineteenth in 2015, Teaching for Mastery introduced in 2016, thirteenth in 2018), therefore it could be summarized that market forces have assisted England to raise their position in the PISA rankings. However, in 2023 the data shows that the UK has fallen one place since the last PISA test pre-pandemic, with the overall maths score dropping by thirteen points. The UK does however remain statistically above the OECD average. The reasons for the one place drop in the PISA Rankings 2022 from 2018 may be many and varied but perhaps it is a sign that the approach to maths education in schools in England may be in need of a re-think.

2.1.4 Consultification

The following critical discussion of neoliberal influence in all areas of education provides the context for my research as the pupils' lived experience of learning maths is influenced and shaped by the policies and institutional directives of the schools they attend. Specifically, the increasingly neoliberal marketised policy landscape in UK and globally has led to an increase in commercial products designed to support teaching and learning (Van den Berg, C.*et al.,* 2020). Coffield et al (2004) demonstrate the extent to which manuals, multimedia formats, in-service packages, publications and workshops are all commercially advertised and promoted to support teaching and learning. This has led to an increasing commercialisation of education (Ball, 2004a) underpinned by neoliberal principles of finance and economic growth as discussed in the previous sections in this chapter. Coffield *et al* (2004) stated cited in Griffin (2016);

> fortunes are being made as instruments, manuals, videotapes, in-service packages, overhead transparencies, publications and workshops are all commercially advertised and promoted vigorously. (2004:62).

Coffield (2004) cited in Griffin (2016), argues that this neoliberal shift has given rise to concerns that such commercial involvement presents a danger 'of mindless and atheoretical empiricism' (2004:62). I interpret Coffield's (2004) cited in Griffin (2016), phrase to mean that all concepts originate in experience and that all concepts are about or applicable to things that can be experienced and this has no connection with theory. I further interpret, through the Marxist lens of Zizek, that Coffield's (2004), cited in Griffin (2016), ideas serve as a warning to education that they are opting for buying and selling education through packages, products and publications, and ignoring what the theoretical underpinning has uncovered. This has led to the growth of what Revell (2000) describes as private sector, 'edu-business involvement in education with its industry and political economy of

textbooks and knowledge construction' (p.129) which is driven by external educational consultancy. The 'Consultification of Education' theory (Van den Berg *et al* 2020) describes a situation where learning and teaching is transformed into a product to be bought and sold. Opportunities for education consultants to be brought into schools to lead workshops and staff training sessions, with the purpose of reducing staff workload, means that educational consultants now play a major role in the delivery of educational products reflecting policy changes especially in core subjects like maths. This can be seen in other primary curriculum subjects such as the introduction of schemes of work such as Little Wandle to teach phonics in English, Jigsaw to deliver messages on good mental health and well-being, as part of the PSHE curriculum and the 5-E Model to support delivery of a constructivist approach to teaching science.

Increasingly, in addition to providing materials for pupils, school budgets are being spent on the outsourcing of Continuing Professional Development (CPD) to educational consultants. Carr (2006) argues that the whole ideology of educational theory is no more than an expression of a widely felt need to ground beliefs and actions in knowledge that derives from 'some authoritative, external and independent source' (136) .This desire for certainty has been especially prevalent in the emergence of prescribed learning style theories and metacognitive approaches that seek to develop pupils' understanding of how and when best they learn (Howard-Jones *et al* 2009). This has resulted in the emergence of a 'competition state' (Ball, 2009) where training, consultancy and continuing professional and educational development packages are sold, for profit, 'as a retail commodities' (2009:84). Moreover, commercial packages, such as the Maths mastery programme under consideration in this thesis often treat teaching and learning as a very structured process with standard methodological steps to work through to achieve a predetermined result (the shortcoming of this approach will be discussed later) as they are a key area of interest in this these).

Ball (2021) talks of education reform as a policy epidemic and an unstoppable flood. Not surprisingly, many state schools in England have developed a close relationship with commercial providers of learning and teaching packages as they have become overwhelmed with the need to meet government prescribed performance outcomes. n effect the impact and importance of the teacher-pupil relationship, which is undeniably difficult to quantify, has been eschewed in favour of the easily measurable. Melville (2019) interprets Ball's ideas of performativity as a system of classifying he performance of teachers and pupils through comparison, judgement and measured through a neoliberal approach to performativity by government.

The Consultification of Education (Van den Berg *et al.,* 2020) argues that the use of off the shelf schemes has reduced the level of autonomy for teachers on the promise of easing teacher's workload, reduce planning time and increase time that maths teachers can spend directly working with maths pupils through the social activity of learning. This process of consultification (Van den Berg *et al.,* 2020) has also helped diminish the freedoms that schoolteachers might once have had to work with pupils, to get to know them on an emotional and academic level and to teach them. Increasingly, teachers are not trusted to teach how they would like to and instead they are held to exemplars of

best practise and standards against which all teachers get judged (Ball 2021). Whilst the considerations of easing workload and reducing planning time are important, maths teachers must still grapple with these elements of their position as they are held accountable for the improvement of performance of their maths pupils.

The combination of different education policies and legislation in England, since 1976 and successive and different government ideals has become a modelling of the internal and external relations of schooling and public service provision on those of commercial and market institutions (Ball 2021). New relations of power in the way policy is made involves the increasing subordination of education to the economic and rendering of education into the commodity form (Ball 2021). Education is increasingly for profit and parents are targeted as the primary consumers. They are sold personalized learning approaches by schools who are expected to compete for parents to send their children to them, and yet also to cooperate (Ball 2021). This is also a reorientation to economic global competitiveness as part of a global flow of policy based around a shift towards a knowledge based high skills economy. Inside classrooms, too often, teachers are caught between the imperatives of prescription and the disciplines of performance. Their practise is both to be in charge of the educational direction and also to take responsibility for learning and progress for all pupils (Ball 2021).

2.2 The Development of the English National Curriculum.

The Department for Education (DfE) is directly responsible for the curriculum that is delivered in English primary schools and there are government prescribed educational standards and regulations to be followed (DfE Professional Teacher Standards 2011). One visit to the DfE website will provide anyone interested in education in England with an endless list of policies and procedures that have to be adhered to and followed (Gov UK 2023).

The education system in England, is arranged from Early Years Foundation Stage (EYFS) from birth to five years, key stage one (KS1), from five to seven years, key stage two (KS2), from seven to eleven years. key stage three, four and five are within the secondary school education provision.

Phase	Key Stage	Ages	School/College Structure	
Early Years	Early Years Foundation Stage	0–5	Nursery schools, nursery classes in primary schools, children's centres, and registered child minders	
Primary	Key Stage 1	5–7	Infant school	These two are more commonly combined in a single primary school
	Key Stage 2	7–11	Junior school	

FIGURE 4 ORGANISATION OF PRIMARY EDUCATION IN ENGLAND (TIMSS 2015 ENCYCLOPAEDIA).

Primary school education, in England, is currently working within the fourth iteration of the National Curriculum (2013). Its aim is for all children, regardless of where they live, to receive the same subject knowledge and assessment of their learning and progress, at every stage of their education. Point 3.3 and 3.4 of the National Curriculum statutory document (2013) makes this point clear and reflects neoliberal principles of centralisation and standardisation that I have already introduced in 2.1.2:

‘Pupils of compulsory school age in community and foundation schools, including community special schools and foundation special schools, and in voluntary aided and voluntary controlled schools, must follow the national curriculum. It is organised on the basis of four key stages and twelve subjects, classified in legal terms as ‘core’ and ‘other foundation’ subjects…Schools are free to choose how they organise their school day, as long as the content of the national curriculum programmes of study is taught to all pupils.’

(DfE 2013 3.3/3.4)

	Key stage 1	Key stage 2	Key stage 3	Key stage 4
Age	5 – 7	7 – 11	11 – 14	14 – 16
Year groups	1 – 2	3 – 6	7 – 9	10 – 11
Core subjects				
English	✓	✓	✓	✓
Mathematics	✓	✓	✓	✓
Science	✓	✓	✓	✓
Foundation subjects				
Art and design	✓	✓	✓	
Citizenship			✓	✓
Computing	✓	✓	✓	✓
Design and technology	✓	✓	✓	
Languages[4]		✓	✓	
Geography	✓	✓	✓	
History	✓	✓	✓	
Music	✓	✓	✓	
Physical education	✓	✓	✓	✓

	Key stage 1	Key stage 2	Key stage 3	Key stage 4
Age	5 – 7	7 – 11	11 – 14	14 – 16
Year groups	1 – 2	3 – 6	7 – 9	10 – 11
Religious education	✓	✓	✓	✓
Sex and relationship education			✓	✓

2.2.1 The Current Maths Curriculum

For maths, as with every other subject within the primary school curriculum, the organisation of content and skills is delivered progressively as the maths pupil moves through the different key stages. For maths specifically, there are three aims of the maths curriculum that statutorily have to be contained within every planned and delivered maths lesson within primary maths education:

1. Become fluent in the fundamentals of mathematics, through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

2. Reason mathematically by following a line of inquiry, conjecturing relationships and generalizations, and developing an argument, justification, or proof using mathematical language.
3. Can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

(DfE National Curriculum 2013)

The focus of the maths National Curriculum programme of study (2013) in England, is that all maths pupils can initially develop their procedural and conceptual understanding of the number system to make connections so that they can solve problems using numbers that develop in complexity, for example, connections between multiplication and division with fractions, decimals, percentages, and ratio. The ostensible intention of the maths curriculum then is once the principles of number have been embedded, maths pupils can then deal with algebra, geometry, statistics and measures and should be encouraged to use the correct mathematical terminology throughout all maths lessons. In 2016 it was decided by the government that a new approach to teaching maths should be introduced into all primary schools. this was not statutory, but it was taken directly from the maths teaching practices of Singapore. Whilst not statutory, it was endorsed by the government.

2.2.2 Maths policy

Mathematics became more prominent on the government's agenda of education reform following the disappointing 2012 PISA rankings (Blausten *et al* 2020. However, the 2013 revised National Curriculum maths programme of study was introduced into schools with little time to embed into practice, but the expectation for impact on progress and standards was immediately expected.
At twenty-sixth place in maths, in 2012, England's results evidenced a three-year gap in maths attainment when compared to the results of Shanghai. This put pressure on the government to review maths provision in England and to establish England as a high performing country for mathematics. The government looked at the curriculum and modes of delivery in maths in Shanghai and as a result, the Teaching for Mastery approach was endorsed for use in primary schools in England to deliver the National Curriculum maths programme of study. Teaching for Mastery was developed for England by the National Centre for Excellence in the Teaching of Mathematics (NCETM) in 2016. Boylan *et al.* (2018) describe the role of the NCETM as an influential body involved in the development, refinement and deepening of schools' understanding of the Shanghai approach to Mastery The approach was subsequently endorsed by DfE and OfSTED. Nick Gibb, Schools Minister in 2016, in a Department for Education in England press release, described the changes in mathematical learning as:

> … a renaissance in maths teaching in this country, with good ideas from around the world helping to enliven our classrooms. Gibb (DfE 2016)

Achieving mastery means acquiring a solid enough understanding of the maths that's been taught to enable pupils to move on to more advanced material (National Centre for the Excellence in the Teaching of Mathematics NCETM 2017). Following the endorsement of Teaching for Mastery ideals produced by the NCETM, which organised all maths lessons into 5 Big Ideas, an uprising of many different published schemes of work were produced by different companies offering schools the Teaching for Mastery approach in the form of textbooks, worksheets and resources for maths teachers.

2.2.3 Consultification and maths

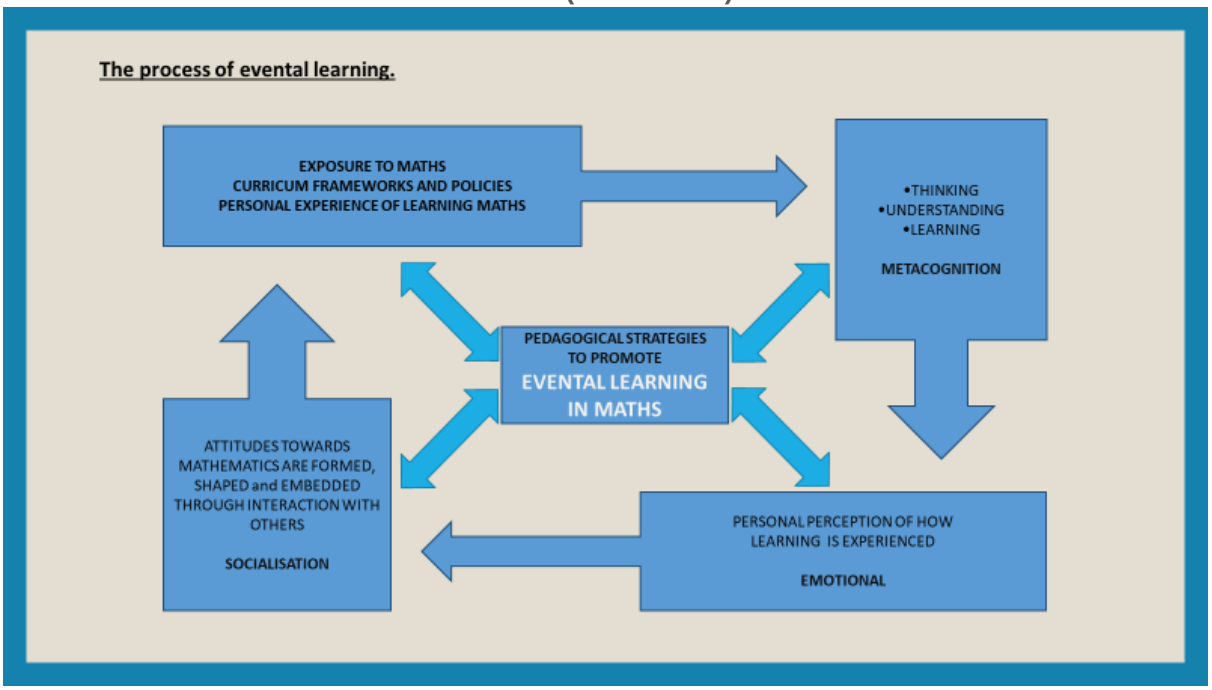
In 2016, the Conservative government viewed Teaching for Mastery as a much-improved approach to teaching maths than the previous National Strategies approach in 1997/8 (Appendix 1). It was developed as a product by several companies to sell to schools complete with lesson planning, resources, and consultants as a way of ensuring that maths pupils would be appropriately prepared for each key stage. This quickly saw the rise of many different schemes such as Singapore Maths, Maths no Problem amongst others. Schools could pick and choose and pay for a scheme endorsed by the DfE, OfSTED and the NCETM. In the process teaching maths in English primary schools has become ever more commodified and standardised, Wall and Perrin (2015) in their redefining the thoughts and ideas of Zizek (2014) would argue that this could be seen as a commodity fetish I interpret the term commodity fetish to indicate that the mathematics sector within primary school education, have demonstrated their compliance to the endorsed approach towards teaching mathematics in primary school through the action of the article being purchased. An example of the article being purchased for the purposes of this discussion could be the introduction of a scheme of work written within the NCETM principles of Teaching for Mastery, incorporating the 5 Big Ideas, further discussed in 2.2.5, as the main resource used to teach mathematics. The published scheme of work becomes more important to evidence the school's success in the teaching and learning of mathematics than the commodities being exchanged, for example the exchange relationship between teaching and learning and also more important than the social relations involved in the making and exchanging of them. I interpret this to mean that the opportunities for slowing the mathematics curriculum down and identifying the conceptual and procedural mathematical knowledge that needs to be gained, have been ignored in favour of delivery of endless content without a deep dive into the assessment of what has been learnt.

2.2.4 Evental Learning

My notion of evental learning calls for a re-think and an introduction of time within each maths lesson for the maths pupil to to enable maths pupils to utilise the five needed conditions for evental learning to impact on learning, of time to 1) think, 2) reflect, 3) consider, 4) discuss and 5) practice . I believe that the evental learning approach would enable the teacher to gain a deeper understanding of what has been learnt by each maths pupil and it would also allow each maths pupil to become more aware of how they learn mathematics best.

The flow diagram (below) offers my insight into the processes of what I am calling evental learning. It represents my application of the ideas of Vygotsky ('zone of proximal development', 1978 and 'more knowledgeable other', 1978), Zizek's ''Event (2014) and Su's 'Human Flourishing' (2020). Evental learning acknowledges the statutory requirements of the maths programme of study within the National Curriculum (2013), but it rejects Teaching for Mastery (and its defining principles) as the only approach to deliver primary maths education. Evental learning requires that pupils develop a personalised awareness of their own metacognitive processes which they use to think, understand and learn, either independently or with others through socialised learning alongside an emotional connection to mathematics. As the diagram shows, the evental learning approach requires four different components which are: (i) a personal experience of learning maths, which contributes to; (ii) the formation of attitudes towards maths and therefore, (iii) a connection with the processes of maths thinking and mathematical understanding which leads to; (iv) learning maths.

FIGURE 4 THE PROCESS OF EVENTAL LEARNING (BOWEN 2022)



2.2.5 Mastery as pedagogic approach

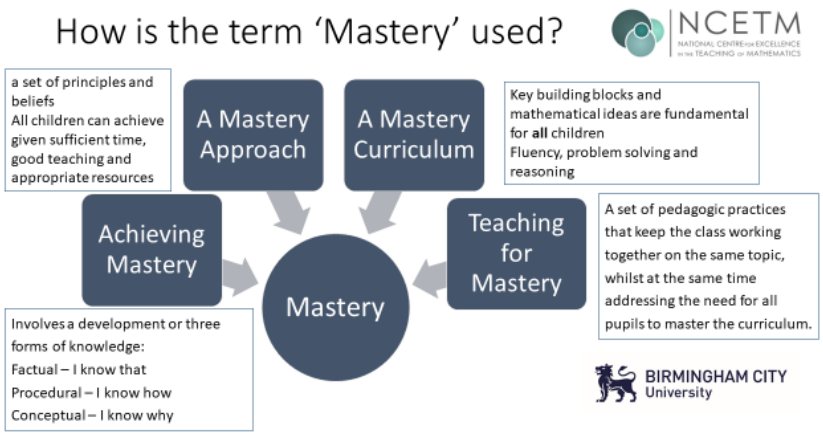


FIGURE 5 MASTERY. (BRUNER 1976 REIMAGINED BY NCETM)

In 2015, Little, described Mastery as the new buzz word in the classroom which replaced the previous emphasis on differentiation. The four iterations of mastery as shown in the diagram above, enable Mastery as a pedagogic approach to be defined by the way it is taught within each school setting. Walshaw (2007) argues that educational settings are social institutions that can be persuaded by a narrative introduced under the guise of promoting progress. Teaching for Mastery was the preferred approach as PISA rankings had evidenced this to be a successful approach to master mathematics learning in Shanghai and Singapore. Maths consultants, teachers and representatives of the NCETM talked to their counterparts in Shanghai and Singapore and as a result Teaching for Mastery was endorsed by the DfE, OfSTED and NCETM as the preferred approach to deliver mathematics in primary schools in England from 2016, as discussed in 2.1.3. This reflects how Mastery has been re-defined and understood, organised, planned and delivered to maths pupils in a very specific way which only considers one iteration of Mastery that Bruner (1976) originally theorised.

The NCETM in 2016 stated that Mastery, (Bruner 1976) can be achieved by focusing on the use of long term and working memory to support conceptual and procedural understanding. The Early Career Teacher framework (DfE 2022) has now introduced the term adaptive teaching to replace differentiation. This may present a new opportunity for maths teachers to re-examine their approach to teaching maths where mastery is the key skill. This may ensure that the National Curriculum requirements are being met but, in a way, where maths pupils remain feeling comfortable and part of the learning process. The discourses of accountability and improvement that underpin the rise of the Teaching for Mastery approach do not leave much space for teachers to explore their subject and be more expressive (Fielding and Moss, 2011), which is a key issue raised by this thesis. Through using evental learning pupils are given opportunities during maths lessons to demonstrate an emotional connectiveness to mathematics and to be given time and space to think, reflect and discuss their mathematical learning. Evental learning challenges and destabilises the content driven Teaching for

Mastery approach as it requires it to be slowed down in order for deep and sustained learning to occur. I assert that the ability of maths pupils to develop their conceptual and procedural understanding will not at all be adversely affected but instead it will be enhanced through taking a different approach to learning.

2.2.6 Teaching for Mastery as a product

It has been argued that teachers now rely on the commercialised products that they are required to each to in many schools in England leading to a loss of teacher autonomy and confidence overall (Priestley, M. *et al* , 2015)**.** However, the implementation of the Teaching for Mastery approach through the various commercial programmes that have been designed to deliver it is now in its eighth academic year in England.

Teaching for Mastery programmes/schemes of work seek, through their comprehensive guidelines and resources, to provide maths teachers with a sense of collective purpose and reassurance. Alongside the NCETM, the Education Endowment Foundation (EEF) regularly produce reports on a range of additional school improvement strategies related to curricula, for example in 2017 they focussed on improving mathematics in key stages two and three. The report recommends many of the features of the Teaching for Mastery approach.

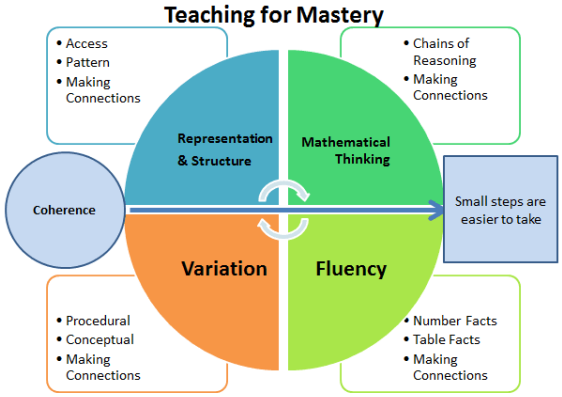


FIGURE 6 NCETM PICTORIAL REPRESENTATION OF TEACHING FOR MASTERY (NCETM 2017)

The Teaching for Mastery approach comprises a combination of elements within classroom practice and school organisation that give pupils the best chances of mastering maths (NCETM 2017). The NCETM produced a model for Teaching for Mastery comprised the 5 Big Ideas (Figure 1 above) arguing that by incorporating each of the 5 Big Ideas into the delivery of the maths curriculum, the opportunities to develop pupils' working memory to impact on conceptual and procedural fluency would increase.

The 5 Big Ideas that the Teaching for Mastery teaching approach support are:

1. 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.
2. Representation and Structure - Representations used in lessons expose the mathematical structure being taught, the aim being that pupils can do the maths without recourse to representation.
3. Mathematical Thinking - If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the pupil, thought about, reasoned with and discussed with others.
4. Fluency - Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics.
5. 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.

The National Centre for the Excellence in Teaching Mathematics NCETM (2016) uses its website home page to set out clearly its definition of Teaching for Mastery. The Teaching for Mastery approach aims for all maths pupils to experience the same opportunities to learn the maths related skills and discourages the traditional and embedded idea of differentiation where maths pupils were organised in different ability groups. The principle that no maths pupil should be left behind (NCETM 2016) is well established and interventions should be swiftly arranged and implemented so that pupils are caught before falling behind their peers. In their paper, called The Essence of Maths Teaching for Mastery (2016), NCETM state that the main lesson organisation should follow a prescribed format:

> Pupils are taught through whole-class interactive teaching, where the focus is on all pupils working together on the same lesson content at the same time, as happens in Shanghai and several other regions that teach maths successfully. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind.
>
> (NCETM 2016 webpage),

Didau (2016), writing at the time of the introduction of the Teaching for Mastery approach in schools, suggests that it out teachers under pressure to evidence that their maths pupils have mastered a concept, whereas they had actually just memorised it for a forthcoming assessment. Whilst the 5 Big Ideas of Teaching for Mastery are concept and procedural based, the five elements of my notion of

evental learning lean towards learning being an emotional process. Didau (2016), argued, that real conceptual understanding takes time to master and approaches such as Teaching for Mastery are so full of knowledge-rich content that teachers may assume that pupils have mastered new concepts, however, due to various organisational constraint in schools such as time pressures, resource issues and timetabling, there is no time to take into account individual pupils' performance as evidence of mastery and to acknowledge the difficulty of identifying and tacking possible misconceptions across different pupils. This is where the 5 elements of evental learning can offer an emotional relationship to learning mathematics which can be used by the maths teacher in conjunction with a need for maths pupils to acquire conceptual and procedural knowledge. Ciok (2018) states that teachers potentially are 'agents of change' as they are working within a profession where once they identify a problem, they can personally act to create changes which can impact on their pupils. Ciok (2018) suggests, however, that maths leaders and teachers have, due to government pressure, to improve the performance of maths pupils been deskilled by the adoption of the Teaching for Mastery approach and its associated resources/products, as a means of doing this.

However, research conducted by McAteer and Grinyer (2019) found that Teaching for Mastery had helped to change teachers' opinions to becoming more positive on teaching Mathematics and helped to reduce maths anxiety within primary school maths teachers. In this respect the associated resources and lesson planning can be seen as a positive influence because if teachers have maths confidence, then the chances of passing a positive emotional connection to learning maths and reducing an opportunity for pupils to become anxious about mathematics will be increased. A place for evental learning is apparent here, not only to support the learning of maths pupils but also to develop maths confidence in teachers.

Evental learning, as discussed in 2.2.4, takes this notion and challenges and de-stabilises it, arguing that for learning to occur in maths, the conditions for learning must be right. There must be a connection between teacher, pupil, learning environment and there must be an emotional connection to the maths concept to be learnt. Lindeyer *et al* (2013) argue that Signals and signs about how to behave in an accepted way within the environment that an individual finds themselves can be learnt from social interactions such as those developed within relationships built in a maths classroom. I am calling for an evental learning pedagogy to be used within Teaching for Mastery lessons to enable maths pupils to utilise the five elements of evental learning to impact on learning, of time to enable maths pupils to utilise the five needed conditions for evental learning to impact on learning, of time to think, reflect, consider, discuss and practice.

2.3 Key theoretical concepts

This section will give an overview of key theoretical concepts which underpin my study.

2.3.1 Theories of Cognition and the Mind

Thinking is a process which is hard to describe, as much of its meaning is internalised and hidden. The task of thinking is to bring together and 'rearrange the limits of the possible and the impossible' (Zizek 2014:143). Moreover, thinking is one of the most intriguing human activities especially as it cannot be directly observed (Von Glasersfeld (1995), cited in Walshe (2020)). This thesis posits that where traditional methods are challenged and maths education welcomes metacognition and emotion as additional drivers towards thinking, understanding and learning maths inevitably improves. Su (2020) talks of how learning about mathematics allows humans to experience humanity's most beautiful ideas (2020) in the pursuit of human flourishing when learning and loving maths. The ability to monitor and modify thought processes through self-regulation, self-awareness, critical analysis and problem-solving are all connected to metacognition in action (Sword 2021). However, when considering attitudes towards maths, thinking and learning, there is a problem, as the view of such emotional actions is not considered within education reform since 1976.

Piaget (1936) argues within his theory of cognitive stages of development, that the whole process of cognition is active and that thinking requires the rediscovery and reconstructing of knowledge across four stages of cognitive development. Piaget's (1936) third stage of cognitive development is called the concrete operational stage, and it occurs in an individual between the ages of seven to eleven years. This is when children start to work things out in their head rather than physically in the real world, demonstrating their capacity to formulate their own ideas and voice their thoughts and opinions powerfully and effectively. Within the Zone of Proximal Development theory (ZPD), (Vygotsky 1978), the social environment that pupils are situated within impacts on how they think and what they think about. In Vygotsky's ZPD, thinking is linked to metacognition, self-reflection and an ability to verbalise the act of cognition or learning. Drawing on these ideas of how thinking develops in a child, Sweller (1988) developed his 'cognitive load' theory. This theory argues that the short-term memory has a limited capacity for reflection and that overloading it reduces its effectiveness, as there is no room left in it for thinking about what one has experienced or what one remembers about what one has experienced.

Thinking and engaging in dialogue, for example, asking and responding to questions, affects the area of the brain known as the affective domain a which is an aspect of emotional intelligence according to Krathwohl *et al*, (1964). Beck (2012) argues that the learning process can be supported through the action of failing and developing the emotional intelligence and understanding of how it feels to fail. As Claxton (2019) in McCrea (2019) wrote:

> Good learning starts with questions, not answers. (2019:64)

In educational terms, the affective domain learning is reflected in learning objectives that highlight a feeling, an emotion, such as a degree of acceptance or rejection in the learner. For example, in the

research of Krathwohl *et al*, (1964) such learning objectives were expressed as interests, attitudes, appreciations, values, and emotions. Bloom (1956) had earlier stated that the brain has three domains, cognitive domain, the affective domain and the psychomotor domain. Mayer and Salovey (1997) developed his ideas and argued that each domain had a link to identifying and understanding how individuals learn, which if known about could impact on how knowledge was delivered. In this thesis I draw on the idea that these ideas on the affective domain focus the maths pupil on developing their awareness of their own interests, emotions, perceptions, tones, aspirations, and degree of acceptance or rejection of instructional content (Belanger & Jordan 2000).

The conscious act of thinking can lead to permanent change (Byers 2007 and Gravitz 2008) so that, in the case of primary maths, what a maths pupil once thought was a hard maths problem to solve, could be made easier if the pupil had time to think deeply about it and make an emotional connection to the act of consciously learning something new. Fernihough (2010) posits that the process of thinking helps individuals to consciously connect thoughts in order to actively create meaning, through the use of language. Specifically, this process requires an ability and confidence to ask questions.

> Thinking begins when you ask really difficult questions…
> (Zizek 2012, Englehart, K. on-line interview)

The affective domain is an area of interest for the work of Boaler (2016) who argues that teachers have the power to unlock learning potential by promoting what I have interpreted as an emotional can do or can't do it… yet mind-set. The right kind of questions can lead to pupils feeling an emotional connection to their mathematical learning and progress depending on the attitudes that have already formed.

Recently there has been a shift, dictated largely by the OfSTED agenda, which recognises that pupil voice has power. Dweck (2007) states that pupil voice is linked to mindset which is either fixed and growth. Growth mind-set as described by Boaler (2015) is an initiative which has gathered momentum in schools in England over recent years where reasoning, mathematical fluency and problem-solving skills are the three main aims of the National Curriculum 2013 maths programme of study. The alternative disposition is to have a fixed mind-set is when the individualised approach to learning displays an attitude that human traits are fixed and cannot be developed. The growth mind-set approach is less about power and more about partnership and teachers are now actively encouraged to enable maths pupils to feel comfortable to make mistakes as well as using talk to discuss their learning and to put forward their own ideas as part of an individualised approach to learning. It is pertinent to note that Dweck's (2007) work on mindset has been misrepresented and education policy have used growth and fixed mindset in a simplistic way. Dweck and Boaler (2007) embarked on further collaborations to explore how cognitive and affective domains of the brain may contribute further to wards the formation of attitudes towards maths for individuals. Boaler (2016) argues that

falling behind in maths can lead to attitude, safety, security and self-esteem issues for a pupil when learning and can possibly reinforce perceptions of their mathematical ability including an anxiety towards maths that once, established can last a lifetime. However, pedagogies such as 'scaffolding theory', (Vygotsky, 1978: Rosenshine, 2012) support maths pupils to work independently as well as collaboratively in the pursuit of learning something new. Success in the affective domain is strongly related to persistence, attitudes and level of success.

However, both the cognitive and affective domains together may impact on learning potential and are linked to power relationships within the classroom and the learning environment that the teacher provides for maths pupils. Bandura's (1997) social cognitive theory conceptualises the behaviour demonstrated as part of a wider connection using three aspects, namely, behaviour, personal factors and the environment that humans find themselves within. Bandura (1997) uses the term reciprocal causality to describe how:

> In this transactional view of self and society, internal personal factors in the form of cognitive, affective and biological events; behaviour; and environmental events all operate as interacting determinants that influence one another bi-directionally. (Bandura 1997:06).

Thus Bandura (1997) argues that the relative influence of behaviour, environment, and individual depends on which factor is strongest at any particular moment. These relationships occur in a complicated, multi-dimensional union in which individuals control their behaviours within the environment they find themselves in. In schools I would argue at this links to the rate of success of the teacher pupil relationship as both have to regulate their behaviour as situations arise and change their behaviour as a result. Research from Baker & Simpson, (2020) highlights the fundamental advantages of how a relational, compassionate and nurturing learning environment, initiated and controlled by the maths class teacher, can support successful relationships between maths teacher and maths pupil. Schools represent the wider society and have the power and influence capability to be places of possibility, positivity, opportunity and places of belonging. This is an important value that the institution of school represents, to enable young people to access the:

> world of unparalleled opportunities and boundless possibilities (Riley, 2017:11).

The distribution of power between teacher and maths pupil positions the maths pupil as the passive receptor of maths content and the teacher as the active provider of the maths content. The teacher is regarded as the expert, the pupil as the novice. It is the teacher who has the power to create the learning environment within the lesson. In this context, maths pupils are recipients of the 'Master' who is the maths teacher. However, Blair and Hindle (2019) argues that this juxtaposition of power totally

defeats the notion of growth mind-set and reduces freedom of individual learning method for the maths pupil to take.

The power imbalance between teacher and maths pupil is one of the main considerations when teaching or learning maths (or any other subject). It is the teacher who controls all aspects of the lesson including actual subject content as well as learning environment. The work of Jackson (1968), Dreeben (1976), and Valance (1973/74) on the 'hidden curriculum', a set of unspoken rules and structures that often work to enforce pupil compliance by preparing individuals to clearly understand and follow the expectations of society. Jackson (1968) argues, on a more positive note, that schools also deliver a hidden curriculum that exists along taught subject matter, which provides children with opportunities to develop shared values and create intergroup relations. The influence of the hidden curriculum and pupils' responses to it has a strong influence on how they fit in and enjoy school (or not). How much pupils fit in and enjoy school, in turn aligns with their achievement and self-esteem.

Su (2020) would interpret a sense of power imbalance between teacher and maths pupil as a part of the process of how successfully a maths pupil is able to develop and use their skills of self-regulation and reflection. If a maths pupil does not feel confident it may slow the process of learning down. Su (2020) states that when an individual can see their own learning identity as one who is capable of developing enough maths confidence to tackle maths problems, then this will enable an individual to understand and solve a mathematical challenge or problem. Su (2020) argues that the power of the teacher is to ensure that pupils feel safe, confident and happy to learn.

> Thinking abstractly, in this way, enriches meaning which enables a maths pupil to see the similarities and difference between things…building flexible thinkers can support the application of maths in an individual's everyday life, their work and their leisure.
> Su (2020:47)

Thinking, as the discussion above suggests, an individual's capability to plan, monitor, evaluate, and make changes to their own learning behaviours to provoke challenge more effectively. (Sword 2021). Greater depth is a term used by teachers to assess pupil's levels of mathematical understanding as part of the National Curriculum Teacher Assessment Frameworks (TAFS 2021). It is at the teacher's professional judgement where greater depth pupils are identified, and these pupils are offered more complex multi-step problems to solve. These are all typical and expected learning behaviours listed within the Teaching for Mastery discourse. Askew (2015) argues that the level of challenge offered to maths pupils is the responsibility of the maths teacher, who needs to be able to identify appropriate learning needs and next steps to ensure pupils are challenged appropriately:

> It is inevitable that some pupils will grasp concepts more rapidly than others and will need to be stimulated and challenged to ensure continued progression. (Askew et al., 2015:06)

Morgan (2022) director of NCETM argues that all maths pupils should have access to more challenging mathematical problems to solve and states that achieving greater depth should be within the grasp of all maths pupils:

> In classes where I have seen teaching for mastery working well, then all children get to what I would call 'greater depth'. What we should mean by 'greater depth' is that they've got a really secure understanding of the structures of the mathematics within that concept, so fluency and problem-solving capability are developing alongside.
>
> (NCETM interview 2022)

This thesis seeks to remind all connected with maths pedagogy that thinking is complex. It is not a linear process. The ideas of Zizek, Gravitz, Byers and Su, discussed above, are not found within any National Curriculum document or Teaching for Mastery programme as they do not reflect the neoliberal principles that so characterise current thinking around maths education in England. Their ideas are instead grounded in theories of learning and how they have the potential to reflect and encompass individual and cultural and social changes over time. Emotion and the role it plays in thinking and learning are also less easy to measure in neoliberal terms.

The next section moves to thoughts on metacognition. The discussion asks how maths learners might develop a more sustained connection to learning maths if cognitive aspects were considered and embedded into maths lessons which are planned and delivered by more knowledgeable others.

2.3.2 Theories of teaching and learning including metacognition.

The Cockcroft report (1982), the introduction of the National Curriculum (1988), the National Numeracy Strategy (1999), the Maths Hubs (2014), the Program for International Student Assessment (PISA) within the Organisation for Economic Cooperation and Development (OCED), reform of national testing and Teaching for Mastery (2016) have constantly shifted and revised theories of teaching and learning maths and notions of what successful maths learning should look like. The Teaching for Mastery approach is an amalgamation of these pre-existing initiatives around the teaching and learning of maths and is different to the concept of 'mastery' whose principles can be traced back to the work of Bruner (1960), who talked of a 'spiral curriculum' which involved information being structured so that mathematical concepts and ideas can be taught at a simplified level first, and then re-visited at more complex levels later on so to give greater opportunity for a learner to master a new skill by revisiting, revising and reviewing it.

Bruner (1960) acknowledged that many teachers implicitly use a spiral approach in their teaching but formalised it offering it as an opportunity for curriculum designers to deliberately design it into student learning. Bruner (1960) described three principles of the spiral curriculum: the cyclical principle where the learner is required through the organisation of the subject delivery to return to the same topic several times throughout the whole of their school career. The second principle is concerned with increasing depth so that each time the learner returns to the topic, it is at a deeper level where more complexity is explored. The third principle is when prior knowledge is utilised when a topic is returned to, so that the learner is able to build up from their foundations rather than starting from the beginning.

The spiral curriculum idea has become part of the current way of teaching mathematics in primary school. It is used with the intention that mastery of a concept can be achieved by iteratively returning to knowledge and facts that have been taught previously. Bruner's (1960) spiral curriculum links to Piaget's (1936) cognitive development theory as both Bruner (1960) and Piaget (1936) maintain that revisiting a concept within a subject over periods of time can support deep and sustained learning. Aligned to Piaget's 1936 theory of cognitive stages of development, is the idea that by returning to a concept after a period of time allows the cognitive load function of the brain to further develop and therefore be able to absorb ever more complex ideas/concepts. Prior knowledge is therefore gained through educators and curriculum designers consciously 'designing' in the appropriate prior knowledge required in order that pupils can learn and progress to each new stage of learning. By assessing prior knowledge, it is more likely that a pupil-centred approach can be used effectively by teachers. Spaced repetition, aligned to behaviour learning theory, is another advantage of using the spiral curriculum approach. It explains how committing knowledge to memory occurs best when the pupil can space out practice of a task over time iteratively as each time the pupil re-engages with a concept, as they have to recall it from their memory. The approach also highlights the open-ended nature of learning a reinforcing the idea that learning is a never-ending lifelong process.

Possible disadvantages of using the spiral curriculum approach include how planning the delivery of the curriculum can require lots of meetings for teachers to ensure appropriate coverage of statutory learning requirements. There may also be a risk of the whole process becoming too teacher-centred and more about filling the gaps in learning, including focussing on re-teaching content that wasn't taught well enough or was forgotten the last time the topic was taught than meeting the needs of individual learners. Drew (2023) states that the spiral curriculum approach to learning is juxtaposed to methods that involve learning something for an allotted number of lessons and then moving on to the next stage of statutory required learning content. When pupils are given the opportunity to re-engage with a topic repeatedly, they both consolidate prior knowledge in their memory and build on it over time. However, for Drew (2023) the spiral curriculum can be most successfully used within mathematics when the same content is returned to but with each re-visit, the challenges increase in complexity and prior contextual and procedural understanding is required to complete the next stage. My research aligns to Drew's idea that learning should be incremental. My concept of 'evental' learning suggests that learning should be slowed down in order to give the maths pupil time and

space to think, reflect, consider, discuss and then try out practical examples iteratively. Furthermore, I argue that Teaching for Mastery took the principles of the spiral curriculum but did not consider the huge amount of content that is required for primary schools to learn, contained within the maths programme of study.

Bruner (1960) explained three phases of learning which he called the acquisition of new information, the transformation of learning and the evaluation stage of learning. Piaget (1936), in 2.3.1 talks of four stages of cognitive development and Sweller (1988) in 2.3.1 developed cognitive load theory. It is therefore acknowledged within learning theory that learning is something that is constructed over time and forms the constructivist theory of learning.

'Evental learning' comes from the idea that the act of understanding one's learning is a cognitive process. It is the relationship between learning something and being able to apply what has been learnt to a situation or for a purpose. My research was with maths learners, and I wanted to know more about their consciousness of their own understanding as well as their views on why it might be important within mathematics. Skemp (1976), an established pioneer in mathematics education, states that there are two types of understanding, namely 'instrumental' understanding and 'relational' understanding which both are equally important and useful to support mathematical understanding. Instrumental understanding is employed as a strategy to support speed. It is often nicknamed 'rules without reasons' by mathematicians as the use of instrumental understanding can support a maths pupil to provide a correct answer without an explanation, particularly useful in a test situation where only the correct answer is required. Relational understanding requires a depth of knowledge of how concepts and mathematical ideas are connected and how they relate to each other.

To demonstrate relational understanding maths pupils need to have gained a deep understanding of the connections, patterns and relationships between numbers, concepts or problems to solve which employs metacognitive processes in the brain. Awareness of one's own level of understanding, a key aspect of the notion of evental learning under consideration in this thesis, can be complex, especially as the word understanding is often used in educational contexts without great consideration of what it might mean, look like and what processes have been undertaken to achieve it. Lave & Wenger (1991) had already considered this process to some extent and termed it' situated learning theory'. At the turn of the twentieth century, the maths research of Lerman (2000) reconsidered Lave and Wenger's situated learning theory and moved away from a traditional constructivist view that learning is an active constructive process.

Howard (2007) reviewed Bruner's ideas and stated that the fundamental ideas of the curriculum should be:

> …constantly revisited and re-examined so that understanding deepens over time (2007:01).

Alexander (2008) argued that comprehending the nature of metacognition would mean a careful consideration of how it links to self-regulated learning and motivation. Winne (2017) further demonstrates the importance of metacognition and self-regulation, which in their research encompasses three main stages of planning, performing, and reflecting to impact on effective pupil learning. I have explored above how and why it is important that metacognition processes enable maths pupils to gain something from the development of their understanding, which may manifest itself in the individuals being able to acknowledge to themselves as well as demonstrate to someone else that they have learnt something new.

The Sutton Trust Education Endowment Foundation Teaching and Learning Toolkit (EEF) produced a report on metacognition (2019). The report explores how metacognitively able pupils are aware of a range of strategies to help them to learn by engaging with material that is to be learnt, using questions within stimulating situations and developing their own sense of awareness of awareness. EEF (2019) state that when undertaking a learning task, the start of the process is to use existing knowledge that we can apply and adapt to a new learning situation, known as metacognitive regulation. Moreover, metacognitively able pupils are aware of a range of strategies to help them to learn by engaging with material that is to be learnt, using questions within stimulating situations and developing their own sense of awareness. Metacognition, therefore, exists as an ongoing cycle, which the EEF report (2019) says is unconscious and automatic.

However, Mannion and McCallister (2020) argue that there are problems with the way in which the EEF, defines its terms. Mannion and McCallister (2020) also state that teachers should have more knowledge regarding theories of metacognition, self-regulation, and reflection so that they can teach their pupils how to perform these skills. They argue that the report uses these terms interchangeably whereas they all have very specific and different meanings. The research on metacognition and motivation is relevant when considering gender differences and emotional relationships with mathematics which are central to this thesis.

Pupils like Saayah, the composite character described earlier, are aware of and can use a range of strategies to support their own self-regulation in terms of learning ability. This suggests that that successful self-regulated learning depends on the success of strategies that pupils use to learn. If pupils are able to take some ownership of their learning by having the opportunity to be involved in self-review and self-directed learning activities, then they are also developing some metacognitive understanding that they can use to support themselves to evaluate their own progress. As demonstrated in the vignette, Saayah had appeared to have lost her motivation as her metacognitive ability had been supressed by the negative signals, she felt that she was receiving through feedback from others (the teacher and her peers). By consciously seeking to explore how the quality of learning directly relates to how successfully the learner can consciously adapt to different contexts for learning, one can develop a more meaningful approach to their own learning, where they can take ownership and more control of it. This more conscious awareness of learning means it is experienced as a series

of pivotal, interconnected affective and cognitive events. The ideology of learning through an enhanced consciousness and awareness is evidenced through the ideas of Lerman (2000) who argued that, when considering how individuals learn maths there was a move in focus from an intellectual activity to learning maths through a collective and collegiate approach that had an emotional as well as a mathematically conceptual and procedural aspect. He called this a social turn in maths education and defined it as an emergence into mathematics education that saw meaning, thinking, and reasoning as products of social activity (Lerman, 2000). Lerman's (2000) research moved towards a new focus on the way maths pupils engage with maths content in mathematics lesson. Lerman (2000) described this shift in paradigm as a social turn" 'and characterised the social turn as:

> …the emergence into the mathematics education research community of theories that see meaning, thinking and reasoning as products of social activity (Lerman 2000:23).

2.3.3 Concepts of habitus and socialisation

My thesis seeks to find more out from maths pupils about what they understand about their experience and understanding of how they are currently being taught maths. I am interested in how opportunities for socialisation and discussion of mathematical ideas during a maths lesson in England could be better utilised so that the maths pupil develops their mathematical procedural and conceptual knowledge through a slowed down delivery of the maths curriculum content, giving time and space for the maths pupil to enable maths pupils to utilise the five needed conditions for evental learning to impact on learning, of time to think, reflect, consider, discuss and practice to make learning maths evental and worthwhile. Mousley's (2015) view on cognitive ability is that a negotiation between individual cognition and social activity is a way of describing social constructivism. Walker *et al* (2016) and argues that learning comes from participation in life rather than through conscious and deliberate teaching. Dwyer (2016) supports the idea that learning occurs over time with regularity and structure, when discussing the aspect of mathematical understanding known as 'intelligent practice. She writes:

> When using intelligent practice, all tasks are selected and sequenced carefully with purpose, offering appropriate variation so that when viewed together they reveal something about the underlying mathematical structure, concept or process. (Dwyer 2016:71).

The NCETM (National Centre for the Excellence of Teaching Mathematics), 2017, talk about relationships and offer the following guidance to maths leaders when organising whole school delivery of Teaching for Mastery:

> As well as the relationships between different mathematical concepts, the relationships and interactions between teachers and their pupils have been long established as key to effective teaching and learning…Lessons are designed to have a high-level of teacher-student and student-student interaction where all pupils in the class are thinking about, working on and discussing the same mathematical content. Challenge and the opportunity to deepen understanding of the key mathematical ideas is provided for all. (NCETM, 2017:42)

The idea of social constructivism, where knowledge is constructed through social interaction and dialogue is not a new one and has formed the bedrock of key educational thinkers such as Bourdieu (1984), Saldana (2013), Wacquant (2005, 2014) and Wade (2015). Piaget (1936) asserted that knowledge is not passively received but is actively constructed by an individual who produces knowledge internally.

Cognitive development theory (Vygotsky 1978) has had a significant influence on how children's development can be understood through their interactions with other people and the social environment, that is their successful socialisation into learning and learning environments. One of Vygotsky's key concepts, (1978), where a transfer of knowledge occurs primarily through supportive dialogue and discussion is the concept of the 'More Knowledgeable Other' (MKO) . Using MKO the teacher creates appropriate learning situations where subject meaning and understanding can be negotiated by questioning and adapting the lesson content to meet individuals' learning needs. This idea is supported by the early work of Salomon and Perkins, who in 1996, described self-regulated learning as a process, which is forward reaching. Their ideas focus on using learning methods within a culture of learning because learning environments impact on how effective any new learning might be. Reinforcing this idea White (2002) argues that the purpose of school and the learning environment that a school offers, should support the ability for an individual to flourish within a context of personal well-being. Walden (2015) specifically called a school learning environment:

> …a living venue for earning, for play and for social interactions (Walden 2015:06)

The consideration and importance of developing social interaction and environment has been an especial area of interest for Bourdieu (1984) who was a sociologist whose own ideas were influenced by Marxism. Bourdieu (1984) argued that the quality of knowledge, behaviour, attitudes, and cultural experiences gained by an individual can have a direct link to how successful they will become both educationally and socially. He argues that the degree of educational and social wealth an individual is perceived to have, is linked to concepts of power and the acquisition of cultural assets, otherwise known as cultural capital. Bourdieu (1984) argued that teachers would sometimes perceive cultural capital as intelligence, and this results back to links with social class and socialisation.

Bourdieu developed the concept of habitus by which he meant a culture that is associated with social class. Bourdieu explored the ideas of habitus and its existence in different contextual forms, arguing that schools are places where the concepts of individual habitus, institutional habitus and cultural capital co-exist and impact on learning. The experiences of Saayah, my composite character, has meant that to make a mistake in maths could have been a devastating experience for her. This is because she lacks the feeling of security within the maths learning environment and does not feel safe to make mistakes and to discuss and use them as a tool for future learning. The importance of the concept of habitus for my study is to remember that teachers may find it easier to relate to pupils from a similar social class to themselves which may lead to attitude forming and labelling. Boaler, (2016) states that when mathematics classrooms change to enable all maths pupils to believe that they can be successful in mathematics and teaching strategies ensure a high-quality personalised approach, maths teachers will have adopted an attitude to deliver maths content so that all maths pupils are socialised into learning in a variety of ways. Saaya's embodied cultural capital maths experience from a Bourdieu perspective (1984) is based on her previous negative encounters with trying to learn maths. These feelings have manifested as a fixed and negative mind-set and her emotional connection to maths is fear and failure. However, Mezirow (1991) argued that the action of mistake making was part of a process which he called 'transformative learning'. Research undertaken by Dweck (2007) and Boaler (2013) amongst others highlight that a mistake is part of the learning process, and this view has been accepted into maths pedagogy and it is established within maths classrooms in England today that making mistakes has become part of teachers' dialogue and expectation of maths pupils within the Teaching for Mastery approach.

Mezirow's (1991) concept of transformative learning is an interactive/collective process designed to enhance self-awareness and encourage pupils to use critical thinking and questioning to examine their underlying assumptions about the world and reflect on the accuracy of them. Teacher and pupil interactions can be interpreted as an opportunity to see 'understanding in action' (Seeger 2001). Kelly (2002) however, characterises learning as a process that has to be individual, complex, and to an extent, undefinable as it can be conscious or unconscious. Although Cole (2009) is critical of individualistic approaches to learning and claims they are too simplistic. He argues that it is in the system of social relations that we see individual activity. Clearly this is a hotly contested area. Lerman *et al* (2002) also maintained that maths pupils participate in mathematical learning partly through their own cognitive ability but also through the teaching approaches that they are offered in maths classrooms.

Additionally, the language of maths (that is the language used in the teaching of maths) and its relationship to the socialisation of leaners into effective practices and learning is an important one. Language in the classroom has to be understood and spoken by pupils if they are to comprehend its meaning and apply it in all contexts. Marking and feedback (verbal and written) is the usual way to communicate between teacher and maths pupil to check if understanding or learning has occurred (Morgan *et al* 2005). In a similar vein Gee's (2007) work suggests that oral and written feedback

between teacher and pupil also provides the chance for both to align themselves with the pedagogic strategies being used in the classroom. However, Saxe and Kirby, (2014) raise questions for the maths teaching community in England regarding the importance of the relationship between cognitive development and the teaching and learning cultures informing marking and feedback, which can be understood as the context. Their study compared two different approaches which they called dichotomous and intrinsic approaches. The dichotomous approach looked at the extent to which cultural context within an educational setting might affect cognitive development. The intrinsic approach looked at the practices within the institution. They concluded from their study that both approaches had limitations but were able to state that culture and environment is the source of knowledge and through experience, knowledge comes to reflect the environment in which it is developed or exchanged.
By 2017, thoughts on self-regulation had evolved from the early ideas of Salomon and Perkins (1996). The development of self-regulated learning theory (Winne 2017) states that when a learner is able to regulate their self-learning, their learning experiences contribute to their personal learning habitus (Reay 2004). I will refer back to the discussion of habitus and its place in learning mathematics throughout my findings in chapter 4. Conversely, Radford et al, (2018) argue that contemporary notions of the mind, thought, and consciousness are individual which makes learning a private and subjective enterprise which is an interesting additional aspect of social constructivism.

In 2022, Thom, also interested in social constructivism, calls for learning across all subjects of the curriculum to be slowed down to enable pupils to engage in more meaningful discussion and dialogue about the concept to be learnt. He argued that too often the curriculum content is crammed in as if being held to ransom by the constraints of the school timetable and that pupils retain more knowledge through a reduced content and an increased time for reflection and dialogue. In his book, A Quiet Education (2020) he calls for a re-think in how maths lessons are structured and argues that not every pupil will want to talk at the exact moment that the teacher requires them to talk and that the value of silence and a time for self-reflection is just as valuable to the maths learning process. This thesis supports this view and argues for a primary maths curriculum in England to be delivered at a slower rate where knowledge transfer is given time and space so that learning can be evental, worthwhile and sustained.

Aligning the ideas discussed in this section to current mathematics pedagogy is a complex task. In the next section I will be discussing how Zizek's (2014) notion of Event can be applied to metacognition and understanding in the maths classroom. Specifically, I am suggesting that the opportunity for meaningful learning (what I am calling evental learning) to occur can only happen if everything connects (for the learning individual) an instance of learning or event (Zizek 2014).

2.3.4 Zizek's theory of Event

The ideas of Zizek, one of the most interesting and important cultural philosophers working today (Johnston 2008) are complex and multi-layered. Zizek's ideas are challenging and difficult to

navigate. He believes that all individuals are ideological beings which can be problematic to contextualise in real life situations. He argues that capitalism is neither natural or inevitable but it is an abstract ideological construct that through artificially enforced parameters, individual accept as the norm. He links capitalism to power and control but argues that individuals are unable to escape from it as ideologies persist to infiltrate the belief systems of the way socialisation and acceptance operate. He explores popular culture and contemporary politics, and his ideas are not especially linked to education.

However, as Wall & Perrin (2015) recognise, Zizek does not offer ideas on transforming education or to address and put right the troubles in paradise that he talks of, but his ideas enable space for other researchers to synthesis and re-examine the meaning of maths achievement and what success in maths might look like away from the agenda of tests:

> …for Zizek, changing the coordinates of how we understand education takes time, risk, energy, and in ways we may not even be able to articulate right now.
> (Wall & Perrin (2015:57)

Wall & Perrin suggest that maths educators could take:

> action in their own professional space to reframe and disrupt the way they relate to and experience their professional life…How might we act differently if we started playing with alternative notions of education or learning in our specific educational contexts? If mathematics educationalists can experiment with new ways of constructing mathematical knowledge, it seems that it is only ourselves that is limiting what we do.
> Wall & Perrin (2015:57)

From my own experience as a teacher, maths pupils (and their teachers) are not encouraged to develop any level of what Zizek (2015) would call ‘conscious enlightenment 'as it is usually adults who determine the learning habitus of the maths classroom in line with school policy and vision on how maths should be organised and delivered. In this thesis I seek to apply Zizek’s concept of Event (2014) to current primary maths education in England using the theories discussed above as well as related ideas about subjectivity, the relationship of mind and body, and the nature of human freedom (Johnston 2008). Taken together these form a crucial aspect of my notion of evental learning and support my research questions. I suggest that learning a concept or idea within mathematics can be an Event (Zizek 2014) and I want to interrogate the way that maths is currently delivered to young maths pupils in England through the adoption and acceptance of the Teaching for Mastery approach. Zizek’s notion of Event (2014) gives me an opportunity to look through the lens of social and cultural domination and realms of power which exists in a centralised, standardised neoliberal education environment.

How can a more developed understanding of their own process of learning, which I am calling evental learning, support maths pupils to experience and understand learning more effectively and consciously?

How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum in England?

Zizek's, concept of Event (2008) originates from a philosophical stance where Zizek talks of the individual person as 'the self' and describes the self as disruptive, false and as a metaphor for the process of awareness and knowing. When Zizek talks of his ideas of 'self' as a concept I interpret his ideas to mean that an individual is only able to consciously see what is around them if they are awakened to the idea of really looking. I interpret Zizek to be saying that too often individual human beings are conditioned by cultural and environmental influences, to only see what others want them to see when talking metaphorically about issues of political or global nature. I interpret Zizek to offer that subordination of society has a danger in that individuals will go on to only accept what they see and are told and will not question it or interpret it differently to what is expected of them. Zizek uses the terms 'awareness' and 'knowing' and I interpret this as his plea for liberation of the unconscious human self to awaken and see what is really going on in society both at macro and micro level. Zizek's (2014) use of the terms awareness and knowing, lead him to develop his notion of enlightenment where he argues that everything can become more conscious and more purposeful through both perception and reality. Zizek claims that when individuals experience an enlightened awareness (2014:68) they will awaken their minds to the process of knowing. They might experience a flow of thoughts without consciously thinking, but deeper thinking involves complex thoughts and time to make connections that offer new, permanent insights, which can be built upon. By taking the notion of enlightenment, Zizek argues that when things happen globally, it can be seen as an Event which will impact forever on the world and the people within it. This is what I am focusing my thesis upon to see if young maths pupils have the ability to become aware of what they are learning an dhow they are being asked to learn it. By enabling the conscious awakening of how learning occurs, I am arguing that maths pupils may become enlightened, open-minded and able to think freely about maths in real-life contexts. I am claiming that if maths pupils were enabled to use the five elements of evental learning mathematics learning may have the potential to become more purposeful, and contextually realistic; allowing them to flourish as mathematicians.

Furthermore, Zizek (2014) argues that individuals will become so institutionalised that they will behave and think as the institution wishes them to as a force of power and influence. It becomes part of who they are in their embodied habitus:

> People talk of individualism but what kind of individualism is this?... Radical individualism serves as the ideological justification of the unconstrained power of what the large majority of individuals experience as a vast anonymous power, which without any democratic public control, regulates their lives.'
> (Zizek 2014:06)

This is what I am saying happens to teachers and pupils under the centralised prescribed National Curriculum that neoliberalist education policy has guided into English primary schools.

Zizek attests:

> bombarding the subject with impossible demands, obscenely enjoying the subject's failure to comply with them (Zizek 2014:182)

My study supports the Zizekian view above that the way teachers have been told to teach mathematics has been prescribed and transported from China without any consideration of possible cultural and environmental factors which may impact on how maths pupils respond to it. Through the Zizekian lens, my study of how maths pupils want to learn maths best, comes to life. As previously discussed in 2.2.5, currently maths pupils are taught maths through one preferred approach and all maths pupils are expected to make measurable mathematical progress. If maths pedagogy was allowed to develop within the classroom maths lesson so that maths pupils could experience learning maths through a range of different ways, then they may on a much smaller scale experience an Event whereby the impact of their learning would change forever how they continued to learn maths. Ordinarily maths pupils have no power in terms of how educational institutions organise and deliver their maths curriculums. They are the youngest members of society and are not recognised as a valuable contributory voice when educational policies and curriculums are formed. They learn maths in the way that adults dictate. My proposed new pedagogical approach to learning maths which I have called evental learning takes an evental form of learning in an attempt to readdress the balance. By offering maths pupils the preferred approach to teaching maths namely Teaching for Mastery but also using the five elements of evental learning, namely time to think, reflect, consider, discuss and practice, I argue that the ability to self-regulate and take greater ownership for learning may give the maths pupil more opportunities for self-reflection and development. The Convention of the Rights of the Child (UNICEF 1989) led to the views of the child becoming very important calling for young people under the age of eighteen to be actively involved in decision making, planning and discussion:

> Parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child (UNICEF 1989:04)

The connection of Event to my research is that I believe that by accepting the prescribed Teaching for Mastery approach to delivering maths is more about power and control based on the global neoliberal education preoccupation with scholastic attainment and position on the world stage, than it is about learning becoming a series of positive, meaningful and lasting 'events' in a primary school pupil's life who will then be in a position to build on those experiences of acquiring of maths knowledge for the rest of their lives.

2.3.5 Su's theory of Human Flourishing from Su.

Su (2020) offers a different way to view the teaching and learning of primary school mathematics with newly awakened eyes. He calls for maths learning to be tailored to learning needs and considers how playing and playfulness should be recognised as a central component of learning. His emphasis on play in supporting learning reflects the dominant feature of the current English Early Years Foundation Stage (EYFS) curriculum. It accepts that though play, ideas and concepts are formed which provides the foundations for learning in a more complex way as the child gets older. Su (2020) challenges teachers to consider play as a tool to support mathematics not only as a very young child but indeed throughout the whole of an individual's learning life. Su argues that play is fun and voluntary but also meaningful as maths pupils can be 'maths explorers. Specifically, he argues that what he calls 'maths play' must have two phases, an 'inquiry phase' and a 'justification phase'. During the inquiry phase, the maths explorer will engage in pattern exploration and will use inductive reasoning. It is about having fun with ideas, using dialogue and making claims. The justification phase encourages maths explorers to engage in deductive reasoning to provide a logical explanation for a conjecture, or in other words, to be able to describe what is going on, using mathematical language. Su (2020) writes about learning maths within an emotional context and states that this enables 'human flourishing'. My thesis is also calling for this kind of recognition that emotion plays a huge part in positive maths learning in primary education. This view is supported by the voices of my maths co-researchers. Consequently, Su calls for maths learning to be approached in a whole new radical and innovative way and so do I. Specifically, Su (2020) posits that:

> through societal shifts, brought about by the digital revolution and the transition to the information economy, there is a rapid transformation in the way we work and live which maths teaching needs to reflect. (Su 2020:06)

Su goes on to state that:

> society has not taken seriously its obligation to provide a vibrant mathematics education for everyone… outdated curricula and pedagogies prevent many pupils from experiencing math as a fascinating area of exploration, culturally relevant and important in all spheres of life. (Su 2020:07)

Whilst these are mathematical skills and can be seen in curricula, the useful and unique tool of using mathematical play is that Su's 'maths explorer' is asked to change their perspective so that they look at a problem from lots of different viewpoints. In this way, mathematical play builds emotional responses in learners, including hopefulness, curiosity, concentration and confidence in struggle. It also cultivates the skills of patience as it builds perseverance. Each of these emotional responses when engaged in maths, develops human flourishing and an opportunity to engage with an enjoy maths. As Su writes:

> we would teach math so differently if we thought of it as a playful sport and not as a performance sport. (Su 2020:62)

When learning maths, I, alongside others, including Su, say that maths education should be made to be lived and learnt through exploring and developing an emotional connection to it through making mistakes and trying out different and creative ways to solve a mathematical problem (Su 2020).

Currently, the reality of learning maths in primary schools in England, can be very different. Teaching for Mastery is delivered as a form of transactional knowledge transfer between a 'more knowledgeable other' (the teacher- guided by the off the shelf maths programme such as Teaching Maths for Mastery) and the 'less knowledgeable other' (the primary school maths leaner). However, I argue that learning is simply a transference of knowledge, and teaching and learning maths is not as straightforward as following a Teaching for Mastery approach. For example, the teacher-pupil relationship (see 2.3.3 Vygotsky 1978, constructivist learning theory), is crucial to the development of an emotional connection to learning of mathematics for as long as the maths pupil needs the additional scaffolding of support that the teacher would offer. When a level of scaffolding support is in place, the opportunity to feel confident and enjoy maths enquiry is possible. Without the additional scaffolding of support, at the time of need for a pupil, maths may become an area of the curriculum that feels uncomfortable, and this is when feelings of isolation and struggle may set in. To struggle in maths when the pupil feels isolated, is very challenging, however, to struggle as part of a learning process with scaffolding support available, may be new and exciting for any learner.

There are many aspects to the process of learning, including the emotional experience of struggling. However, as Su states:

> …the struggle to grow – to achieve internal goods – is a mark of human flourishing. (Su 2020:119)

Bibby *et al* (2008) suggest that perhaps struggle is not recognised by teachers, using the ideas of Vygotsky, to support his view that:

> The seductive imagery conjured by Vygotsky's metaphor of the 'zone of proximal development' leaves hanging the nature of the zone and obscures the space it occupies; it allows us to ignore the difficulties and resistances which the learner will encounter and develop. (Bibby 2008:38)

Bibby (2008) and Su (2020) both underline potential inflexibilities between the notions of the individual and the social. When teaching and learning maths, both must be considered. This ideology is summarised well by Su (2020) who states that:

> ….education is a social practice that builds, among many internal goods, the ability to think critically. (Su 2020:119)

The issue of struggle is pertinent to my research. I am acutely aware that traditionally English culture has a perception of mathematics which is not always positive. In discussion, during the data evaluation process of this piece of research, it became apparent that my notion of evental learning, which focuses on giving time and space for a maths pupils to think, discuss, reflect, consider and practice what they have been taught, is problematic and could cause policy struggle as it challenges the current Teaching for Mastery approach which is established and deemed to be successful due to its impact on England's PISA rankings (as discussed in 2.1.3). As my study progressed, I became aware that my notion of evental learning is actually a 'pedagogy of resistance' (Freire 1921-1997).

As I go on to argue below, it can work alongside Teaching for Mastery, but it could also fit well across any teaching strategy or approach. Pratt (2021) in his interpretations of Freire (1921-1997) argues that he was a pioneer of this ideological approach, and it fits well with my study as the focus of my work was to collect and represent accurately the voices of the maths pupils who are currently learning maths in English primary school classrooms. The mathematics programme of study is crammed full of knowledge acquisition content to be learnt and I wanted to know how maths pupils felt about learning maths. The next section will look at work and ideas of Freire in greater depth to draw comparisons with my study focus.

2.3.6 Critical pedagogies of resistance: Freire

Freire's (1968) ''Pedagogy of the Oppressed' was born out of witnessing the struggle of working-class people trying to make their way through a rigid and traditional education system in Brazil, which was not fit for purpose, primarily because the Brazilian education system was based upon social, political and economic factors which favoured the more affluent members of society. Freire wanted education to remove the power divide between the privileged class and the deprived groups of the society. In his view, all pupils should get equal access and equal opportunity in education, and there would be no social differences among the pupils. Social and cultural domination would not exist.

Traditionally the state Brazilian education system relied on a rigid transactional model of learning where learning was primarily a memory activity, controlled by the teacher. Freire (1968) defined it as a system in which teachers just deposited their knowledge in the heads of pupils and where learners

were expected to be passive in the classroom. Freire (1968) was keen to make clear in his critique of this system that pupils had no voice and therefore they had no choice. He called this the Banking Concept of Education and argued instead for creating knowledge through various activities like dialogue and problem-posing which involved a more pupil centred approach. Freire (1968) argued that the development of dialogue between teacher and pupil was a crucial stage in the learning process, and he argued for problem-posing to be at the heart of teaching and learning. Freire (1968) asserted that dialogue, critical thinking and communication are the prerequisites to gaining an education that is relevant and meaningful.

Critical Pedagogy highlighted the importance of pupils engaging actively in their learning process and find and develop an awareness of the processes of learning. This educational philosophy emphasised the development of critical consciousness and encouraged pupils to raise questions and challenge the beliefs and practices of those who hold power over them and make decisions which would directly impact on them. This approach links directly to what 'evental learning' is calling for, namely, to reconsider the primary maths National Curriculum in England and take a more holistic approach to learning that encourages maths pupils to think, consider, reflect, discuss and practice their mathematical skills. The central ideology of critical pedagogy is to engage pupils in learning and to make them active pupils.

The interplay of the ideas of Biesta, Ball, Freire, Zizek and Su that I have explored in this chapter, culminate as a complex combination of factors that, I argue, creates compliant individuals (teachers/pupils) who accept instructions from powerful sources (government policy/managers) through the imposition of a prescribed curricula delivered though commercial packages. This is compounded through what Ball (2003) would argue as the performativity of the process of teacher training and the emphasis on professional standards through adherence to the Teachers Standards (DfE 2011) and the Core Content Framework (2019), as discussed in 1.1.1. Through these means a culture of acceptance in English education since 1976 has been created and shaped, which inhibits the ability of primary teachers think about how maths could be offered differently.

2.4. Evental learning and Teaching for Mastery

This thesis proposes that evental learning can develop and enhance a positive and emotional experience of learning maths in primary schools in England. I argue in this section that by following my approach, maths pupils would be better supported in maths though an improved emotional connection to the subject. In addition, I argue that it would almost certainly support an opportunity for maths pupils to develop an enjoyment of maths and have more positive attitudes towards it. I

evidence through my analysis of the data, that maths pupils between the age of nine and eleven can articulate how they learn maths best as a subjective response, based on a developed awareness and the use of the processes of metacognition, socialisation, personal experiences and emotion.

Boaler (2013) states that if a period of reflection is allowed to pupils, new information can be learnt and stored in the long-term memory (Boaler 2013). Using this idea,evental learning can support the Teaching for Mastery approach as it requires space and time for the development of metacognitive processes in the maths pupil, engendering cognitive processes that contribute to a conscious awareness of how learning can be stored in the long-term memory. If, in addition to using Teaching for Mastery, teachers could build in time which allows content to be processed at an emotional level, the maths pupils will be more likely to be able to consciously think about how and what they are being asked to learn. Boaler (2015) maintains that instances of delivering knowledge, the space and time to think about it and the opportunity to discuss it and then to translate it into something meaningful, are crucial to the processes of long-term, sustainable understanding and learning.

Research on metacognition (EEF 2019) suggests that successful self-regulated learning depends on the success of strategies that pupils use to learn. If pupils were able to take some ownership of their learning by having the opportunity to be involved in self-review and self-directed learning activities, then they would also be developing some metacognitive understanding to support themselves to evaluate their own progress. Evental learning accepts this research and argues that learning needs a element of conscious cognitive awareness, which I have applied to the concept of Event in a Zizekian context as discussed above.

Teaching for Mastery and evental learning principles could translate what this vision, at national level, might mean in practice for teachers and maths pupils. Promoting mathematical fluency, conceptual understanding, rapid knowledge recall, as well as a life-long positive emotional connection to learning maths is important if attitudes towards maths are going to in English schools and society. Political ideas about education shift, change and evolve within different governments. I argue that It is therefore inevitable that Teaching for Mastery will be replaced by other approaches in the future which again will be endorsed by the DfE, OfSTED and the NCETM but the pedagogical approach that I am introducing called evental learning will always have learning processes of thinking, reflecting, considering, discussing and practice at the core of its erudition principles. What makes evental learning sit, without compromise, alongside any other approach is that it utilises the affective domain and consciousness in learning and does not rely on knowledge and skills acquisition alone.

The next chapter discusses my methodological choices and how the data was driven and directed by the maths pupils who were involved in the study.

Chapter 3 - Methodology.

3.1 Introduction

The methodological choices made in this study are purposefully fluid and are directed in response to the viewpoint of the maths pupils involved. Taking this approach enabled me to deploy a group a group of maths pupils become co-researchers in the study. Their thoughts and words then became the qualitative data which could then be discussed and analysed. I wanted my research approach to be the servant of my research questions and not its master (Thomas 2009). The two research questions were the dominant feature for investigation, as my study was concerned with capturing the live micro experience of individual maths pupils. Biggam, (2018) offers guidance to academic writing and argues that it is important to fully utilise a qualitative research study to get to the heart of what participants are trying to relay to the researcher. I have used his ideas in my study as I have tried to dissect the experience of pupils' learning and understand it at a deeper level than is normally possible by primary class teachers trying to assess the level of learning of their pupils.

A reminder of my research questions gives the reader the understanding that this study is attempting to understand how maths pupils like to learn maths and indeed whether my evental learning approach can be transferred across all areas of the curriculum as it utilises the affective domain and consciousness in learning:

1 How can a more developed understanding of their own process of learning, which I am calling evental learning, support primary maths pupils in English schools to experience and understand learning more effectively and consciously?
2 How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum in England?

3.2 Ontology, Epistemology and Axiology.

My axiological perspective is important to this study as it is taken from an interpretivist paradigm. I lean towards interpretivism within the process of lived experiences and how they might affect long lasting change. Values and judgement, whilst subjective, remain true for the individual in that lived moment. German philosopher, Dilthey (1833–1911) was interested in how individuals understand events and stated that this required an ability to organize and structure their thoughts. His idea was that thought could be characterised by becoming aware of the reality of a lived experience. He argues

that a lived experience is a theoretical representation, but it is also an opportunity for individuals to understand and relate to the values that are relevant to the purpose of learning. To consider lived experiences is very relevant to my approach as my data was collected in live lessons when the maths pupils were actually engaged in learning maths content that the Teaching for Mastery approach contained. My whole focus of this study rested on capturing the lived experiences for the maths pupils and how they were feeling about the way they were being taught maths as well as their ideas on how they would like to learn mathematics. Accurately capturing and reflecting their values and judgments were pivotal to the validity of my findings. Heron (1996) argues that values are the guiding reason for all human action. He further argues that researchers demonstrate axiological skill by being able to articulate their values as a basis for making judgements about what research they are conducting and how they go about doing it. I am influenced by Vygotskian social constructivism theory and Zizek's theory of Event (2014), both discussed in the previous chapter, and have conducted this study by using their and applying them to primary maths education in contemporary England.

The culture and language of primary maths education in England can be interpreted in different ways, as they are subjective aspects. Making judgements within an interpretive approach stems from the ontological perspective that values, roles and behaviours are socially constructed through culture and language, Saunders *et al* (2009). As an interpretivist researcher, I wanted my research to be based on the responses gained from the pilot study which focussed on the complexities of thinking, learning and understanding in mathematics and I wanted to work with children as co-researchers to give them a sense of belonging to the study. McPherson et al (2010) argues that when a strong connection to a place or subject is experienced, the notion of belonging is more likely to be strengthened and the experience may become enriched. Watson et al (2003) in their research, state that there are a number of factors which contribute to how successful a pupils will feel about their own mathematical understanding and one of these is the sense of. In their research project Deep Progress in Mathematics, Watson *et al* (2003) interviewed teachers and students about their perception of mathematics ability and attitude at the end of primary school and the transition to secondary school. They examined the role of the teacher in setting high expectations and belonging within a positive learning environment. They argue for the importance of giving pupils time to think and learn in order to develop a deeper level of mathematical understanding and confidence. Dieumegard *et al* (2011) argue that to study a lived experience of a learner requires researchers to adopt a second-person perspective in which they can understand and describe their lived experience through a relational process. Clark *et al* (2011) developed The Mosaic approach which focusses on lived experiences and they look at the reality as understood by the individual and their opportunity to use their reality, to flourish. These ideas are further developed when in 2017 a meta-analysis study by Chung *et al,* used data from 1,016 groups obtained from 26 studies, meta-analysed comparisons of the performance of friendship groups as opposed to acquaintance groups. Faber (2017) argues that although the effects found in the meta-analysis study were small, the evidence showed that groups of friends performed more productively than groups of acquaintances. These theoretical ideas based in the research findings of Dieumegard *et al* (2011) and Clark *et al* (2011), helped me to formulate how I might collect

the data and highlighted to me that working with a group of pupils may offer further insight into how maths pupils like to learn maths best.

Epistemologically, I am interested in the perceptions and interpretations of maths pupils as they experience what I perceive, with my own insider knowledge and bias acknowledged, to be an ideologically driven maths pedagogy approach, namely Teaching for Mastery. This study used participant observations and focussed group discussions as the data collection methods to notice if maths pupils could understand and be present at the moment of learning, through awakening their awareness of the Event (Zizek 2014) of their learning.

3.3 Insider-Researcher

A researcher's positionality within their study has great significance, as it affects their ability to conduct the research and to work within ethical considerations. For example, a study might call at times for the researcher to conduct research on areas where they already have expertise in the field (Unluer, 2012) which makes them an insider. However, Saidin & Yaacob (2016) state that insiders may be blindsided by some issues in their research as they do not consider certain issues as important as how outsiders would see them. Either way, the decision to adopt either an insider and outsider perspective depends upon several factors, including how well the researcher might already know the research settings or understand the type of experience that is being studied, (Salmons 2021).

An insider researcher is defined as someone who shares a particular characteristic, an outsider researcher which could be defined as someone who does not share the same characteristics mentioned above (Mercer, 2007). Bonner and Tolhurst (2002) state that an insider researcher has three distinct advantages as they have a deeper understanding of what they are focussing their research on. Secondly, they do not cause any disruption to the usual flow of activity and process within the organisation or institutions and finally they will most likely know the individuals within the institution, so the data collected is more likely to be valid and reliable.

Conant, (1968), Oakley, (1981) and DeVerteuil, (2004) argue that an insider researcher has an advantage if the study is about culture and way of life of certain community because of a deeper understanding of the participants. Van De Ven (2007) argues that the insider-researcher is a social scientist and must maintain their credibility in their role in the data collection. Adler & Adler, (1994) stated that the insider researcher will be more familiar to the group to be studied in contrast with the outsider researcher. Drever, (1995) supports this idea and argues that for a research study to be successful, the researcher must recognise that any information the participants share, depends on what the participants think about the researcher and what they think the research is about (Drever,

1995). Having insider knowledge, therefore, helps create a more trusted research environment as a researcher who already has a working relationship with the possible participants may more quicky develop an open communication and dialogue (Salmons 2021). This echoes the importance of what Cotton (2013) calls new ways of understanding experiences through knowledge exchange and argues for the use of alternative approaches to supporting communication and language needs. However, there are possible drawbacks such as the issues of familiarity and bias and pre-existing ideas which the research may overlook in the pursuit of justifying the ideas they already had. The insider researcher must remain mindful when conducting the research that they do not overlook the confidentiality and sensitivity of any data that is collected. There is an emotional connectivity which is significant to this study, as I see the researcher's role and responsibilities as an important factor in the quality, credibility, trustworthiness and validity of any research data that is collected.

It is clear that both insider and outsider research have their own advantages and disadvantages (Merton 1972). However, taking them all into account this study uses an insider research perspective as I am very familiar with both school schools which provided the research settings. I knew the staff and had worked with them in their other role as ITT tutor and the maths pupils had seen me many times during my visits as a teacher educator carrying out observations in each school. A useful reference to support my position as an insider-researcher is in the work of Poulton (2021) who also did some research within their own educational setting, recognising themselves a teacher-researcher. Like Poulton (2021) I had to acknowledge an attachment to the social group under investigation for my study. The data that I collected and present later in the form of vignettes will include some of my own experiences as a teacher-researcher,

3.4 Trustworthiness

Cohen, Manion and Morrison (2017) argue that qualitative researchers should be encouraged to align their methodological practices to engage trustworthiness techniques that can be assessed for quality and credibility. For this study, the issues of familiarity, trustworthiness and comfortableness need consideration as the data collected involved vulnerable members of society. For qualitative research the terms of familiarity, trustworthiness and comfortableness replace the idea of validity and reliability. Guba (1981) influenced Shenton (2004) who examined four aspects that contribute to trustworthiness namely credibility, transferability, dependability and confirmability. These four areas seek to ensure that the researcher demonstrates an accurate reflection of their data with consideration of contributing environmental factors. Familiarity has its potential inhibiting factors when conducting research in known settings. Describing the effect of familiarity, Unger (2007) argues that when things are done in the same way, the need to think about the action is no longer necessary. Drawing on these ideas for this research, both the staff and the maths pupils knew me in my teacher-educator role at the University, and there may have been an expectation of my position in school

being similar to previous visits to school, so bringing into the study important ethical considerations which I now consider.

3.5 Ethical Considerations.

Ethical dilemmas related to positionality and insider knowledge were crucial to this study as I was fully aware that insider-research requires insiders to unlearn the familiar or what is taken for granted by having an intimate understanding of participants, events, and context (Taylor 2011). Working with children as co-researchers, involves other ethical considerations regarding the issues of consent (Lewis and Lindsey, 2000). Riddle and Tisdall (2021) argue that knowledge of children gained through research has been provided and interpreted through an adult lens. Children's lives and lived experienced have been captured through an adult-centric view and filtered through adult perception and interpretation so my research is timely in working with children as co-researchers, aligning my work to the guidelines of the British Educational Research Association (BERA). I was aware of the ethical issues as my research was carried out in two primary schools and with individuals under the age of eighteen. I had to fully comply with school safeguarding and child protection policies as well as within BCU ethical guidelines. I drew on my extensive experience of working with children and although the questions asked during our focussed discussion groups were not scripted, I always followed the line of enquiry that my maths pupils had raised. I was careful to promote inclusion, in line with school policy, and ensured that all contributions were valued and respected.

Children are more vulnerable to unequal power relationships between adult researcher and child participant and so ethics can dominate debates about methodological concerns, (Punch, 2002). Kellert (2005) states that children have a limited position of power in an adult society and researchers need to be mindful of putting their own adult bias on any data collected from children working as co-researchers. Wiles *et al* (2008) discuss the responsibilities of the researcher in considering the ethical issues involved in managing anonymity and confidentiality to ensure that participants and location cannot be identified. This view is supported by Wybron (2015) in his report 'Pupil Power' where he investigated the possible impact of pupil power on pupil engagement levels. Although the pupils in his report were older than in my study, I use it as an example of how effectively pupils can express themselves if given the opportunity to work in partnership with school staff, set their own learning goals and undertake projects.

Wybron' s findings indicated a high level of satisfaction with the projects, appreciating the element of choice, the ability to speak freely, and the opportunity to draw on their personal talents. Using the Personal Validation approach (McNiff 2016) provided me with the opportunity to make judgements about my own behaviours within participant observation and focussed group discussions and to justify my values and respect the academic freedom that both settings had given to me. I ensured anonymity

of my maths pupils as well as the class teachers and the research settings. No participant withdrew from this study although they were given an opportunity to do so. Finally, the data arising from this research was anonymised and kept confidential. The BERA ethical guidelines state that:

> researchers should recognise the entitlement of both institutions and individual participants to privacy and should accord them their rights to confidentiality and anonymity. BERA (2018:21)

BERA (2018) also state the importance of an awareness of researchers to recognise and consider structural inequalities when working with children as co-researchers. The imbalance of power within a school has already been mentioned in the literature review and BERA (2018) state that attention should be given within the research to how inequalities may affect children and their relationships. It is important to acknowledge at this juncture the possibility of the presence of my own confirmation bias. I recognise that my own often critical view of the Teaching of Mastery approach may have subconsciously affected my behaviours and attitudes within the maths lessons and the focussed group discussions and also the behaviours and attitudes of the maths pupils as co-researchers. BERA ethical guidelines states:

> researchers should consider possible ethical and methodological reflections as this could lead to bias. BERA (2018:15)

In accordance with the BERA guidelines (2018), I consulted fully with the school and maths leads in each setting by explaining my research intent and the rationale for it. This ensured that all of my ethical decision-making was:

> an actively deliberative, ongoing and iterative process of assessing and reassessing the situation and issues as they arise. (BERA 2018:03)

In order to research with the pupils, consent was gained from the Head teacher of each of the two research settings as they, in their position at the school acted as gatekeeper in the safeguarding of children. BERA (2018) guidelines recognise that researchers in the field of education are motivated to further understand a range of educational issues and will aim to gather data from a range of perspectives. BERA ethical guidelines states that:

> researchers need to be fully accountable for their responsibilities to participants. BERA (2018:09)

The participants for my study were aged between nine and eleven years old and so it was my responsibility to remember that that even though they were willing to take part, as children as co-

researchers, their limited life experiences and limited research experience meant that they were unable to be fully informed about the implications of their participation.

In accordance with BERA (2018), I considered the areas of trustworthiness and confidentiality and sought to work in an open-minded and inclusive manner when conducting this research. Ethical approval for this research was granted by BCU and issues of assent and withdrawal from the research were included in the successful ethics application. Successful relationships in primary schools between teachers and pupils are based on trust rooted in mutual respect in accordance with the Teachers Standards (DfE 2011) and at the heart of the work of all involved at the school is that all of the pupils feel safe and happy. BERA ethical guidelines states that:

> all educational research should be conducted within an ethic of respect for: the person; knowledge; democratic values; the quality of educational research; and academic freedom. BERA (2018:05)

3.6 Approaches to Working with Children as Researchers

Developing and maintaining a credible relationship of mutual trust, integrity and trustworthiness was key to the validity of this study as there was a risk that the maths pupils might have felt self-conscious when asked to share their ideas, views and opinions. Therefore, the approach taken to working with children as researchers in this study was that selection of the maths pupils was done in consultation with their class teacher. The class teacher was present in every lesson and able to intervene if deemed appropriate. The professional relationship between the class teacher and myself allowed time to talk to each other if needed during the lesson, to check for issues like level of challenge, understanding and well-being.

Another consideration involved my acute awareness of the imbalance in power relations between the maths pupils and myself as an adult. It was also important for me to remain fully aware of my insider/outsider status, as discussed above. At the beginning of every maths lesson, I asked the maths pupils where they might want me to sit during the lesson and checked that they all felt comfortable with the seating arrangements. I was determined that all of my actions, words and behaviours presented positive messages about discussing, sharing and learning maths during the maths lesson that we were all experiencing together. At the start of the data collection period, I spoke to the maths pupils about what I was trying to find out and how their voices were very important. I introduced the idea of them being participants in the maths lesson as they still had to do their work for their teacher, but they also had another role. I introduced them to the term ‘co-researchers’ and

explained that as a researcher they needed to try to look at the lesson from an outside point of view. This was a new idea to them as they had only ever considered themselves to be maths pupils attending maths lessons and completing tasks. I was now offering them an opportunity to view their maths lessons as if they were watching from outside the classroom. I invited them to think about what they were being asked to do, but also to think about other ways they might have been asked or other ways they might have liked to complete the task or do the work. As my co-researchers, they became navigators of the data collection. I assured them repeatedly that all of their contributions were equally important and relevant to the research.

Any research carried out with children differs to research carried out with adults and this may attribute to societal position and influence (Punch 2002). With this in mind I was aware of the possibility of some hesitation for my maths pupil participants to feel confident to speak openly in a place, such their classroom, where, as Punch (2002) argues, conformity and rules normally have to be followed. The work of Clark *et al* (2011) sought to explore the possibilities of young people being able to articulate their thoughts and feelings and become active participants. Clark *et al* (2011) describe it as a methodological approach developed as part of evaluative research. This approach actively seeks to encourage young children to share their views and experiences to support the reviewing process of the services society offers to its citizens. Stokes (2015) did a study on research-based learning based in higher education (HE) institutions where pupils learn, within a role of co-researchers. The study revealed that this approach offered many benefits, as the HE Students became much more actively involved in curriculum planning and delivery which impacted on engagement, satisfaction levels, improved communication, created a sense of belonging to an institutional and the development of intellectual curiosity in the field of research. The research of Clark *et al* (2011) and Stokes (2015) demonstrate that working with children as researchers can be effective when the children see themselves as active participants and this is also seen by others. Clark *et al* (2011) and Stokes (2015) argue that treating pupils as co-researchers, with integrity and respect, supports engagement within and beyond the formal curriculum, furthering knowledge and understanding. This thesis builds upon these established research processes gained from working with children as co-researchers. It recognises the importance of the views from a child's perspective of their world and acknowledges the need for trustworthiness, when conducting research. It was also important to me that the pupils involved were researched with not researched on, and that they were given a chance to fully report their views and experiences (Anderson, 2005).
This study provided an exciting opportunity for my study to approach the methodology as a fluid data collection method; flexible and adaptable to move along in the direction of the ideas and opinions of the maths pupils I enrolled as co-researchers.

> Understanding the purpose of mathematics should not only help to improve motivation but could help in the actual formulation of concepts…For young learners, understanding the practical uses of mathematics could be sufficient to both motivate them and allow the necessity principle to be satisfied. Ashby (2009:62)

3.7 Pilot Study

The Pilot study is an essential requirement in research. It offers an opportunity to guarantee trustworthiness and value (Malmquist et al 2019). The importance of my pilot study was to test my intended qualitative data collection method of capturing the voice of the maths pupil during live mathematics learning opportunities. I worked with five children in year five in one school (not the same school as those ultimately used in the main study) and I spent three afternoons with them finding out more about their attitudes towards maths and their subjective views on how successful they felt they were in maths. I focussed on asking the maths pupils questions relating to the physical pre-requisites of a maths lesson. However, on reflection, my own bias which did not favour the Teaching of Mastery approach meant I asked the pupils leading questions relating to my perceptions of how it was delivered. I also asked questions about the accessibility and availability of resources, the type of activities they had to do either textbook or worksheet and whether they thought they had time to complete work set. However, the responses I gained indicated that the maths pupils were more concerned with the conditions for learning within their maths classroom and the content of the maths lesson than with the actual resources available.

Reflecting on the experience the pilot study supported me in understanding a deeper level of thinking, understanding and learning about the purpose and nature of my study. Through the ideas and opinions of the maths pupils in the pilot I realised that it was not the physical resources that I had to focus on but instead, I had to look at opportunities to explore how these maths pupils learnt maths. I realised that my study would be more useful if I attempted to learn more about the processes of procedural and conceptual understanding. In light of the findings of the pilot study, therefore, I was able to further develop my research questions and refine my thinking. I was very interested in the extent to which the responses of the maths pupils during the Pilot study focussed on their emotional responses to the learning. They talked about thinking, learning and understanding maths in a learning environment where they felt supported and safe to make mistakes. They were able to retell stories of their maths learning through memorable learning experiences that they had experienced, both positive and negative. This prompted me to confirm how I was going to design the research and collect the data. It was through the pupils' voices and ideas that my thoughts on a new pedagogical approach took shape. My ultimate concept of evental learning emerged out of the voices and ideas of the maths pupils in the pilot study telling me that they wanted time to enable maths pupils to utilise the five needed conditions for evental learning to impact on learning, of time to think, reflect, consider, discuss and practice their maths differently.

3.8 Selection Criteria

The selection criteria for pupil participation was identified as:

- Teacher perception indicated the maths pupil enjoys learning maths.
- Teacher has no knowledge or experience of the child having or displaying any maths anxiety.
- Based on knowing the child, the teacher thinks that the child might be interested in becoming a co-researcher alongside me for this study

The selection criteria for the participants was based solely on existing attitudes towards maths and therefore gender, ethnicity, maths ability, learning dis/ability was not relevant to include or exclude within the selected participant. I then spoke to any maths pupil identified by staff, as a possible participant, to explain the research context and the role of co-researcher. It was important that the maths pupils who consented to participating in this research understood their role as co-researchers.

The idea that the children enjoyed maths was important as Zizek (2014) aligns the concept of enjoyment to the way that individuals perceive and accept their world and this study wanted to apply this idea by testing the levels of pupils' positive emotional connection to learning maths within current primary school education in England. For this reason, I invited the pupils' ideas about they how much they enjoyed maths lessons. In their dual role as co-researchers the pupils steered the constructivist methodological approach that I took, and we travelled along together towards a greater understanding of how maths pupils like to learn maths.

The participants in this study supported me as co-researchers, by raising awareness of how upper primary aged maths pupils (aged between nine and eleven) can understand, recognise and skilfully articulate when they are learning maths and how to apply new mathematical concepts. Their contributions also have the potential to influence current, ongoing and future maths pedagogical research.

3.9 Research Context

Teachers have some responsibility to help to shape what pupils view as what is important to them about the educational experience however, as discussed in an earlier chapter, in English primary schools, because they must comply with rather prescriptive government policies, they don't always have the agency to do this creatively and imaginatively (Ball, 2013). Nonetheless, the idea of researching maths pedagogy with maths pupils was very appealing to the staff at both research settings and very new to the maths pupils I worked with.

I approached two senior leaders in two contrasting schools called, for the purposes of this research, Riverside Primary and Buckingham School. Both schools work with my university to support trainee teachers on teaching practice at their school. The leadership teams at both schools position the teacher as a researcher, whose daily responsibilities include the development of an understanding of children and their relationship to learning. Likewise, the staff concerned in my research study view themselves as research led practitioners. I prepared a presentation to share with both Heads as well as books on research with children and the book called 'Event' by Zizek (2014) to inform about the nature and purpose of my research.

The data collection period occurred in the autumn term of 2018. At Riverside Primary School, I sat in a year six classroom for five consecutive maths lessons on different days of the school week. At Buckingham School, I sat in a year five classroom for four consecutive maths lessons on different days of the school week. Due to the nature of schools and how busy their timetables are, this was the only time that they could accommodate me. However, A short intense period of data collection suited my study as it was more useful to be present for a whole school week to see possible continuity and progression in learning maths, reflecting the short-term outcomes of the Teaching for Mastery approach.

3.10 The Settings

Riverside Primary School was used to using research to support practice, and its research activities had always previously been staff driven. My study became the first opportunity for the school to engage in a different type of research activity with pupils as researchers. The head teacher and maths lead teacher at Riverside Primary School were particularly interested to see the extent to which taking part in the data collection might impact on the pupils' development of a greater emotional impact and a positive relationship with learning maths.

Buckingham School promoted maths positively everywhere around the school setting. Posters displaying positive messages about learning and making mistakes were clearly visible in public areas of school as well as within classrooms. The visual message when looking around the school was that learning was at the heart of pupil-teacher interactions.

The school leader and maths lead teacher, in both research settings, were interested in gaining further understanding about metacognitive teaching approaches within maths lessons. They were keen to find out more about the extent to which metacognitive processes could be understood and utilised effectively to support maths pupils. I was interested in how it could be developed. They had early career teachers in their schools who had had some ITT training in metacognition and the processes of metacognition. The school staff and I were interested to see how recognising learning

something new in mathematics could be characterised by my co-researchers as an evental moment in their school day. They were hopeful that they could use my study as the catalyst for more research around maths in the future.

3.11 Research Design

This research comprises two small case studies. Typically, case study research uses a variety of evidence from different sources, such as interviews and observation (Yin 1994) to provide a response to a set of research questions. Case study research is useful when a question has been raised about a contemporary issue over which the researcher has little or no control (Yin, 1994). For my study, the participants/co-researchers had the same amount of control as I did on how the data was going to be collected. Through the live lessons and the lived experiences of the maths pupils, the data collection method was purposely symbiotic, synergetic, and fluid as the maths pupils had to feel comfortable and safe to say what they wanted to about how they were learning maths. Kohler (1993) explores how research participants construct stories and narratives from their own lived experiences. There is a layer of interpretation that is two-fold in narrative analysis. Firstly, the participants interpret their own lives through narrative. Secondly, the researcher interprets the construction of that narrative. As the data collected for this study comes directly from the lived experiences of the maths pupils/co-researchers, so an opportunity provided me a form of storytelling, known as a vignette (further discussed in 3.14), to explain and offer an interpretation of meaning. Although case studies cannot be generalised as they often draw on small, statistically insignificant numbers of participants, Thomas (2009) states that the aim of a case study is to gain a rich and detailed understanding of an aspect of the research setting in great detail. In this study the data obtained is the direct experiences of the maths pupils captured in a particular moment of time. In doing so I sought to capture the lived experiences of the maths pupils as they experience maths teaching and learning through the Teaching of Mastery approach.

The data is unique and cannot be replicated as each maths lesson has the potential to produce different outcomes and different perceptions and emotions for the maths pupils. Therefore, the data gathered from this study makes generalisations unsustainable. However, in justifying my use of case studies I draw on the work of Bassey who (1991) identifies three types of generalisations, one being a scientific generalisation and another being statistical and the third is fuzzy generalisation. He terms fuzzy generalisation as a way of simplifying the results of educational research specifically, and especially of case study educational research.

Hammersley (2001) interrogated Bassey's (1991) work and argues that Bassey's message about fuzzy generalisations is that they do not explicitly claim to apply to every case study scenario as data collected is not based on statistical sampling. However, Cohen *et al* (2007) stated that case studies

can provide a unique example of individuals in real situations, and they recognise that context may be an influencing factor.

As both research settings were research focussed and had engaged staff with maths CPD to give opportunities for them to gain further knowledge and understanding on mathematics pedagogy. This demonstrates the schools' commitment to good teaching and learning. Both class teachers who allowed me to sit in their classrooms during the whole duration of the data collection period had an interest in becoming maths lead teachers in school. Both schools, therefore, wanted to develop their understanding of how their maths pupils learnt maths best to impact on whole school maths provision, development and improvement and were interested in the findings that my research might offer.

When collecting the data, I was very aware and appreciative of what I had learnt during the pilot study stage of the research process. The pilot study had given me more questions than answers but it had shown me that my bias of thinking that progress in mathematical learning was connected to the degree and availability of appropriate mathematical resources was incorrect. Maths pupils were more concerned with how they were being asked to learn maths. As mentioned in 3.7, the responses of the maths pupils during the Pilot study focussed on their emotional responses to the learning. They talked about the importance of the learning environment and how mistakes were viewed as part of the learning journey. The maths pupils told me stories from their own lived experiences that described the extent of their mathematical understanding. This prompted me to confirm how I was going to design the research and collect the data. Therefore, when the time came to collect the data for this research, a lot of the methodological choices came from the maths pupils themselves. They directed much of the way that the data was collected. I knew that I wanted to use participatory observation of a group of selected maths pupils in each school. When I spoke to the maths pupils about how I might collect the data, they made it clear that they wanted to communicate with me during the lesson as they wanted me to capture how they were feeling about each part of the lesson be it the teacher led input or opportunities for them to work independently. They were mindful of their peers and did not want to disrupt the learning of others, so they came up with communicating with me and each other through a traffic light type of system. This initially took the form of a series of cards which could be used by the pupils during the observed lessons. A green card on the table meant that the maths pupils felt they were able to understand and learn. An orange colour card represented the maths pupil indicating some understanding and learning and a red card represented that little understanding or learning was taking place. As the data collection period continued the maths pupils felt that a symbolic coloured card was not detailed enough for me to understand fully how they were feeling and wanted to add more detail about the extent to which they felt they were learning at different stages of the live maths lesson. A communication card system evolved as a result of this which further evidenced how the maths pupils were able to control the direction of the developing methodology. Each had a different communication message on it. One read **'**I am learning', another one read 'I understand' and the third communication card read 'I need some help'. The communication cards were used each day during the data collection at various intervals during the live lessons in both settings, alongside me and the maths pupils (who were also taking the role throughout the data collection as children as co-

researchers) talking together as they worked. Through this process, the maths pupils had an opportunity to discuss their learning during the lesson. They did this through reflection, discussion and sharing their ideas. I recorded actions and any dialogue between the participants, the teacher and myself on my two-minute interval observation sheet and used this record in my follow-up focussed group discussions, which occurred after each lesson.

3.12 Data Collection

Three different data sets were collected to represent the views, ideas and opinions of maths pupils, at each of the two research settings and are presented as two case studies. The data came from focused discussion groups and participant observation. Within the focus group discussions, which lasted no longer than fifteen minutes after each maths lesson had finished, I used open-ended questioning to probe the awareness of their processes of metacognition socialisation, personal experiences and emotion for each of the maths pupils. findings, my focus was very much centred on the thoughts, ideas and opinions of my maths pupils as co-researcher, and as such, was able to take an insider researcher position. All The data was combined and analysed in the form of vignettes.

Observations noted in 2-minute intervals	Contemporaneous Field notes – my own jottings on behaviours and dialogue observed	Voices of children captured as their own quotes	Images of learning as drawn by the participants
9 days in total x 60-minute maths lessons, noted every 2 minutes 30 notes x 9 lessons = 270 observations	Ongoing throughout 9 maths lessons Notes taken during post lesson discussion	Ongoing throughout lessons and post lesson discussions	07

FIGURE 7 TABLE SHOWING RECORD OF DATA COLLECTION METHODS AND RESPONSES

At Buckingham School, I sat at a table in a group seating arrangement where we could all see each other and could talk across the table at each other. At Riverside Primary, I sat in the middle of a row of tables with the four participants sitting either side of me. My seating position was decided as a

result of discussion with the maths pupils as it was important to my study that they felt safe and comfortable.

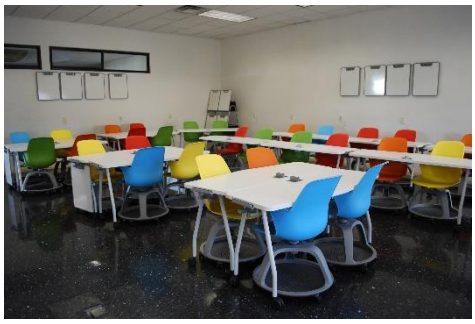


FIGURE 8 SEATING ARRANGEMENT AT BUCKINGHAM SCHOOL

FIGURE 9 SEATING ARRANGEMENT AT RIVERSIDE PRIMARY

During each maths lesson, I focused my discussions with the maths pupils around their learning. I wanted to know to what extent they could identify and articulate their own learning processes. I especially wanted to challenge their thinking beyond what they had been asked to think about in previous maths lessons by asking them whether they had any opportunities to think and reflect on what they had been asked to learn. I wanted to see if our discussion would lead to an increase in their level of understanding, awareness and more positive relationship with mathematics.

3.13 Presenting the data as Vignettes.

This study is an attempt to redress the balance as much research into maths educations is centred on teachers' perspectives and experiences rather than on those of pupils. The pupils' accounts in this study in their own voices, confirm the intricacies and breadth of the problem of learning maths. They also provide an opportunity for maths teachers to listen to and act on the ideas of the maths pupils who are directly experiencing the way that maths is currently delivered in classrooms. Using vignettes as a data collection tool became a natural methodological choice for me as a vignette is essentially, a snapshot of a story. This study tells a story of the perception of small group of young maths pupils who want to share their own lived experience of how they are asked to learn maths within their school learning environment. Kittelstad (2017) argues that vignettes capture a moment of time whereas the whole story can be much more complex and detailed:

> They say literature and film are forms of escapism. We can check out of our own lives for a time and walk in someone else's shoes. While the entire story is meant to paint a picture or convey a theme, smaller scenes and colourful vignettes can stop time. (Kittelstad (2017:42))

Much research has been done to describe and justify vignettes as a legitimate and valid source of data collection. Miles (1990) described them as a type of snapshot of a practitioner at work, thereby reflecting a recent episode of practice. Using vignettes as my methodological approach is innovative as it allowed the maths pupils to direct the methodology in that their lived experiences were what I was able to capture and frame their thoughts ideas and opinions in a way that presented a snapshot and not the whole story. Brown (2023) argues that vignettes give an opportunity for the reader to examine more closely an aspect of what the main story is about, but it also gives the writer an opportunity to awaken the awareness of the reader into an underlying subplot that perhaps could be overlooked when reading the whole story. The ideas of Atzmuller and Steiner (2010) defined a vignette as an opportunity to describe a person in a lived experience as referred to in chapter 2 and chapter 3, so this became the primary source for collecting my data.

Freeman (2001) captured the events of children as they grew up and coped with their different circumstances as short episodes centred on their lives and families, described in their own words, through vignettes. Barter *et al* (2000) used the vignette approach, in addition to group discussion and participation, as she captures views and experiences directly from primary school pupils. This study will use vignettes as a similar way when working with the maths pupils, as it will utilise the opportunities that their views and experiences will offer, to share their reality of being taught maths through the Teaching of Mastery approach. Barber *et al* (2008) used vignettes to tell the story of teenagers' own experiences of teenage partner abuse and violence. Similarly, I will use the voices of the maths pupils involved to support my discussions on maths pedagogy. In this study, I have written each vignette with deliberate use of descriptive language. I have portrayed each maths pupil to and include a lot of details about how they behaved and interacted with me and each other during the data collection process to paint a vivid picture in the readers mind of what is happening (Brown 2023), for each of my seven maths pupil participants who were children as co-researchers, as discussed in 3.5.

Within each vignette presented in Chapter 4, I provide supporting evidence to offer clarification of the event of learning and possible reasons for its occurrence and make relevant links to how the use of an evental learning approach might support a deeper understanding and an emotional connection to learning mathematics. This is important and is central to the investigation of my research questions:

1. How can a more developed understanding of their own process of learning, which I am calling evental learning, support primary maths pupils in English schools to experience and understand learning more effectively and consciously?
2. How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum in England?

Chapter 4 – Findings

This chapter analyses the data collected from focussed group discussions, and maths lesson observations, and it represented as a series of seven individual vignettes. Within the vignettes are the words of the maths pupils as they expressed them in live maths lessons. By using the theoretical frameworks of Event (Zizek 2014) and Human Flourishing (Su 2022) I will analyse and discuss what the maths pupils are conveying through their actions and behaviours as interpreted rom an insider researcher perspective.

The seven vignettes represent the voices and behaviours of the maths pupils involved in the research. Their opinions, reflections, and ideas about their experiences of maths are presented as accurately as possible with due consideration to my position as an adult researcher recording their words. My focus on ensuring the credibility of this data remained at the forefront of this study as maths pedagogy is all too often adult driven.

I will firstly discuss the four vignettes of Carla (R), Ishmael (R), Jack (R) and Ellie (R) who attended Riverside Primary School where maths was delivered through a formalized three-part lesson structure following the Teaching for Mastery approach. The data was captured in October 2018 over five consecutive maths lessons. When referring to the maths pupils from Riverside Primary, I will indicate by adding a capital R at the end of their first name. The maths pupils were familiar with the structure of the maths lesson which developed from a teacher input part to a fluency part followed by a reasoning part, with problems to solve throughout the lesson, and had been learning this way since they were in year three (7-8 years old). There is no statutory prescribed structure when delivering the principles of Teaching for Mastery approach, but this school used the three main aims of the statutory maths National Curriculum programme of study (2013) as their guiding structure to ensure that statutory requirements were met. The Teaching for Mastery lesson was therefore presented to the maths pupils as a formal three-part maths lesson.

The remaining three vignettes from James (B), Saima (B) and Maisie (B) who attend Buckingham Primary are presented later in this chapter. Their research setting will be identified by adding a capital B after their first name and I will further explain the context of their maths lesson structure before introducing their vignettes.

4.1 Carla (R)

Carla had attended Riverside primary school for the whole of KS1 and KS2. She had built successful social relationships and liked the familiarity of the structured maths lesson. The maths learning environment for Carla presented an opportunity for successful learning through familiar learning environment, acceptance and conformity. I began my conversations with Carla by asking her to tell me her thoughts about learning maths in year six.

Carla: I mostly like maths lessons as I like my teacher and he makes it fun. I know what I am doing and I like to know where I sit for maths because it changes for other subjects.
Me: Do you always find the maths challenges easy to do?
Carla: I don't find maths easy but I try to listen to the teacher as he explains what I need to do. It's always good when we get given time to think about the challenge and we can talk to our friends about it.
Me: do you think maths is an important subject for you to learn at school?
Carla: *Maths is an important subject and it is important to do well. I want to do well in the SATs test.*

Carla talked of a place of security, and she gave the example of knowing and feeling comfortable in her prescribed seating position. Her behaviour remained consistently compliant throughout the data collection period. As our ongoing dialogue developed throughout the lessons and focused discussion groups, Carla engaged with others, only after careful and deliberate thought. Carla told me that she liked her teacher and that she liked to learn and work independently, but she also like to work with her friends.

Me: How do you feel about working with other people in maths Carla?
Carla: I don't mind it, sometimes we can work together as friends which I really like as we can talk easily together as we know each other and get on well.
Me: When you say that you get on well, what does that mean for your maths learning?
Carla: It means that if we are stuck on the maths, then we can ask each other and talk about what we did yesterday, we can look in our books or use the maths working wall and it feels easy.
Me: I think it's great that you know how to help yourself and each other in your maths.
Carla: We don't always have time to talk though. Sometimes we just have to get on and finish the work.

I then asked her if she was able to think of any way that she could try to help herself to understand during the lessons when her teacher requires her to work alone:

> *Carla: I asked my friend and then asked my teacher for some help and I was able to get on again. This time I got it right. I was pleased to get it right but not everyone knows everything, there's a lot to do but I think that it's a good thing to not understand sometimes because it reminds you that you don't know everything and then there's something new to learn.*

When I asked her to share her ideas on what she was thinking, understanding and learning, Carla was able to identify many opportunities in the maths lesson where learning may have happened. I asked her to try to explain what 'understanding' means to her:

> *Carla: It's hard to put my understanding into words. I don't really know if thinking or understanding comes first. I know that I made a mistake earlier in my counting and I couldn't carry on until I understood where I went wrong.*

The following exchange demonstrates Carla's emerging reflection on her own learning:

> *Me: Carla, you worked really hard today, what did you learn?*
>
> *Carla: I learnt more about rounding up numbers*
>
> *Me: How do you know you learnt that today Carla?*
>
> *Carla: I never really thought about it before - it's like your brain wants to try to understand and that makes me happy*

In this exchange Carla demonstrates that she was able to think about the process of learning and verbalise her thoughts, but she had used the words 'learnt' and 'understand' without really thinking about what they might mean. This is significant because as I have already discussed in my literature review in 2.3.1 Theories of Cognition and the Mind are complex but teachers in primary schools use the words, thinking, understanding, and learning as part of their everyday vocabulary. Pupils are therefore exposed to these words and start to use them when describing their own learning experiences. As the researcher I wanted to delve deeper into these three words and begin to unpack what they might mean in practice and through the experiences of the maths pupil.

The following section highlights aspects of the vignette of Carla that became prominent to my analysis and discussion of what she might have been saying, in relationship to my review of the existing literature. I have chosen to further discuss aspects of how Carla was able to connect emotionally and socially within maths lessons and the importance that she placed on doing well in a summative assessment to impact her future success as a secondary school maths pupil. I have made connections to many of the ideas raised in the literature review that link to social interaction and metacognition.

Carla has already learnt the importance that society has placed on SATs and feels that being successful in her end of key stage two tests is one way that she can demonstrate her success in maths. This is significant as Carter et al (2013) argue that an individual is able to adapt their behaviours according to the environment they find themselves in, as discussed in 2.1.1. The dialogue throughout the vignette indicates that Carla enjoys the opportunity to work within a social working environment but has become aware that the teacher does not always let her work with others in an interactive way. As discussed in the literature review (2.2.6), social interactions can give signals and signs to individuals about how to behave in an accepted way within the environment. As discussed in 2.3.3, social interactions and learning environment can all contribute to the impact on learning through the co-existence and interaction of individual habitus, institutional habitus, and cultural capital (Piaget 1936, Walden 2015).

The focus group discussions opportunity seemed to help her to develop Carla's awareness of her thinking, understanding and learning processes as she was starting to consider the types of tasks and activities that she was asked to do in her maths lessons. I assert, therefore, that Carla was now beginning to question the activities she had been asked to complete in a useful way. She thought carefully about what learning was and she was starting to adapt her thinking and through the dialogue between us, as detailed throughout her vignette (R), I believe that Carla and her peers were starting to become aware of her emotional connection to maths and this as a very positive development in her maths learning identity. My observation of Carla was that she was using an emotional connection to her learning in mathematics to make sense of it in a real-world context. This is where the elements of evental learning can work successfully alongside the Teaching for Mastery approach which has an emphasis on the transference of knowledge content form teacher to pupil. The pupil has to learn the mathematical knowledge but if they were given more time to think and reflect and transpose to real life situations that they can relate to, then the mathematical learning would become more meaningful and sustainable. This is part of my doctoral claim.

The opportunity to consider the structure and organisation of the maths lesson had never been a consideration for Carla before. She was very accepting of the rules of societal order and institutional harmony delivered through what she had always perceived to be her comfortable place in the maths classroom. This could reflect Zizek's (2014) point that individuals can become so institutionalised that they will behave and think as the institution wishes them to without realising that this is what they are doing, or why. In 2.3.4 I state that Zizek believes that all individuals are ideological beings and argues that if individuals want to believe what is in front of them, they will, without necessarily questioning or challenging what they are told. In this compliance becomes part of who they are in their embodied habitus. As discussed in 2.3.4, Zizek (2014) argues that understanding education takes time, risk and energy, and so by seeking the views of all who would have a vested interest in the education, would support nourishment of learning and higher interest and engagement stakes. I interpret this as the study for which Carla was a part of, gave Carla a chance to think much more deeply about what

maths meant for her in terms of her progress and understanding. Carla was already able to identify the need to learn as she needed to sit a SATs maths test and be successful in her results and his may have been of greater importance to Carla and indeed to all of the maths pupils, at this stage of her educational career rather than getting involved in questioning the Teaching for Mastery discourse applied in the school. Carla was demonstrating that if given the opportunities in her maths lessons then she could utilise the components of evental learning to support her understanding of wider implications of the reasoning behind sitting a test in maths. As discussed in the literature review (2.3.4) the Convention on the Human rights of the child (UNICEF 1989), actively encouraged the view of the child through their participation in decision making and planning but the Teaching for Mastery approach was installed into schools, through endorsement of its principles, without seeking the view of either maths pupils or the maths teacher.

Through Carla's words, she was motivated on a personal level, to perform well at the end of KS2 SATs tests, but she had begun to realise that learning involved more than a readiness to pass a test. She had begun to work within the notion of evental learning. This became apparent during the focus group discussions when another of the maths pupils' participants asked if what they had been learning today would be part of the test. Carla had been given time to think and reflect on this and came to the conclusion that a question on rounding up numbers might be on the test, but it was actually a skill that she needed to be able to do and give an example of when at the shops, she might need to do a calculation on approximate cost and balance that calculation with the amount of money she had got with her.

Carla developed her ability to reflect on and consider the teacher's expectations of her throughout the data collection period. As discussed in the literature review (2.3.2) the research of Winne (2017) demonstrates the importance of metacognition which encompasses the skills of reflection, to impact on effective pupil learning. Carla is reflective throughout the dialogue presented within this whole vignette. She reflects on her learning, she can reflect on how effectively she works with others and alone, she is reflective about the actions of thinking, understanding and learning. The evental learning approach would suit the way that Carla works as she is already able to think very deeply about many aspects of the maths lesson, both content and organisation. As discussed in the literature review (2.3.1) within Vygotsky's theory of the Zone of Proximal Development theory (1978), the social environment that pupils are situated within impacts on how they think and what they think about in order to help maths pupils to verbalise the act of cognition or learning. Carla's school learning environment has supported her this far in her school career, to develop her skills of thinking and reflection. However the constraints of the Teaching for Mastery approach are conflicting as whilst at the beginning of the data collection period, Carla accepts without question how mathematics is delivered to her, by the end of it, she began to consider how the teacher requires her to work and what she actually prefers in terms of how she likes to learn. Evental learning would allow her to take time to reflect and consider in more depth as these opportunities would be embedded within the lesson structure. The consequence of this however is that less mathematical statutory content might

be covered. The dichotomy here is that whilst the quality of learning might be improved, the amount of subject knowledge needed to demonstrate success in a SATS test may not have been amassed.

It is of interest that Carla's (R) embedded characteristic of liking to think about things before she gave an answer or an opinion, enabled and equipped her to be able to talk on a more emotional level than some of the other pupils in the focus group. My vignette of Carla is a representation of how she had begun to think about how she learnt maths. By employing the elements of my notion of evental learning, an increased teacher agency, (Biesta 2013), and autonomy when delivering mathematics would give greater opportunities and time for maths pupils which may enable maths pupils to utilise the five needed elements of evental learning to impact on learning, of time to think, reflect, consider, discuss and practice. This would support Carla throughout the rest of her maths career as she has already indicated that working within her friendship group makes her feel safe and free to share her ideas. She also feels safe to make mistakes (Su 2020). This is because her maths learning environment has endorsed mistakes as part of learning but not every maths classroom in England currently shares this philosophy.

Carla's vignette offers a good example of the ability of primary aged maths pupils to self-regulate. To self-regulate means that the individual has the skills and qualities to self-manage their thoughts, ideas and opinions. Self-regulation is also linked to emotion and evental learning supports the development of self-regulation to support the maths pupil to become more aware of their own learning position and learning needs. As discussed in the literature review (2.3.3), Winne (2017) states that when a learner can regulate their self-learning, their learning experiences contribute to their personal learning habitus and the way that they approach future tasks. Carla has developed some of these qualities within the school learning environment, within the constraints of the maths curriculum that is being delivered to her. By implementing the five elements of evental learning as a whole school ethos and using them alongside Teaching for Mastery, Carla would have many opportunities to use and further develop her self-regulation skills to support her mathematical understanding. She would be developing her conceptual and procedural mathematical knowledge but would also be provided with the time she needed to think, reflect, consider, discuss, and do. By having the opportunity to utilise any or all of the five aspects of evental learning may help her to understand her emotional responses to learning something new. Through the opportunity of time and a slowing down of the process of mathematical learning the notion of evental learning would help her to continue to make connections between what she is being taught in maths lessons and how this is related to real life contexts, as part of a growth mindset, discussed in 2.3.1 (Dweck 2007).

4.2 Ishmael (R)

As mentioned at the start of Chapter 4 Carla (R), Ishmael (R), Jack (R) and Ellie (R) all attended Riverside Primary School where maths was delivered through a formalized three-part lesson structure following the Teaching for Mastery approach. This consisted of a fluency worksheet, a class discussion over the questions on the fluency worksheet to demonstrate the maths pupil ability to reason and explain their thinking in a class or group situation and a page of similar questions to work through for the maths pupil to demonstrate their ability to problem solve. From the beginning of the data collection period, Ishmael presented himself as a very independent and self-assured character. He wasted no time in asking me what I was doing and why I was in his classroom. His interest and eagerness to find out things he didn't know was both clear and endearing.

Me: Ishmael, I have come to work with you this week as I want to know more about how you think you learn in maths lessons.

Ishmael: Why?

Me: Well, because I think that you might have a lot that you can teach me about how you learn maths and how you might like to change how you learn maths if you had a chance to change it.

Ishmael: Ok Miss, let's do it.

As I observed and interacted with Ishmael over the week, he appeared to be very secure in his maths pupil identity and was able to work both independently and with others, although he told me that he preferred to work alone. He said that he enjoyed maths and was comfortable asking for help when it was needed. This interested me as it may have indicated some awareness in Ishmael that he was learning in a classroom where asking for help was encouraged and where he may feel safe. I decided to ask Ishmael about the classroom conditions as I wanted to try to ascertain from his responses his level of awareness of the learning environment that he was being asked to learn mathematics within. I began by asking him if he liked sitting in the place in the classroom that his teacher had directed him to sit.

Ishmael: I like where I sit for maths because it means that I can choose to work on my own or work with others, whichever I am in the best mood for. I actually think I learnt quite a bit in maths because Sir always lets us talk and work together if we want to. Sometimes I want to and sometimes I don't.

Me: Why don't you always want to talk to the person next to you?

Ishmael: It's good to swap your ideas and see which one is best to get the right answer but I also like to think on my own to see if I can do it myself.

Me: Has there been any times when you have been glad that you are allowed to sit by another person?

Ishmael: There was a time last week when I was not able to solve the maths challenge at first but then I talked to Rory (class peer seated next to Ishmael) and I was able to do some thinking about what Rory said. Then Sir asked me if I was ok, so I asked Sir as well and then tried again.

Me: Did you understand the maths challenge after being able to talk to Rory and to your teacher?

Ishmael: This time it made more sense to me, and I could do it. I think that thinking helps, as you have to think about it before you can understand it and then you talk about it and then you get the answer. By practicing the same sort of questions, you can feel like you are learning.

Me: So, you felt like you were learning?

Ishmael: Yes, I think so. I think that it is good when you know you are learning as it helps you to enjoy maths. Not everyone likes maths though and it's important for Sir to help everyone to understand how they feel about maths, as some people, like my mum, she don't like it.

Throughout this exchange Ishmael's behaviour strongly indicated to me that he had the metacognitive regulation needed to identify his own evental learning journey. His actions and behaviours indicated that he might be able to identify the extent and depth of his own learning and then be able to recognise it as new learning, enabled through the application of prior learning and experiences. Accordingly, he was able to confidently articulate his understanding of the intention of the different parts of the lesson to help him to learn maths. He knew that his teacher wanted to see what he understood and that this was assessed through the 'daily fluency worksheet activity', as part of the formal three-part maths lesson structure used at the school. Ishmael offered that both his peers and he enjoyed completing the daily fluency worksheet, but the reasoning part of the lesson was less popular. This was because the teacher would choose individual maths pupils to explain to the rest of the class how they had arrived at the answers recorded on their fluency worksheet.

Ishmael: I like doing the worksheet.

Me: Why

Ishmael: Because I can just get on with answering the questions. I don't have to talk about it if I don't want to.

Me: Is there any part of the maths lesson you don't like so much?

Ishmael: We all don't like the reasoning part as I just want to get on with my work, but Sir sometimes makes me explain how I got the answer.

Me: Why don't you like that bit?

Ishmael: I don't really like explaining to the whole class.

This was further evidenced during the maths lessons where I observed Ishmael using the communication cards (discussed in 3.11) when he was working with his friend but not when he was

working independently. In these instances, he preferred to talk to his peers or his teacher only if he was stuck. This behaviour may show a possible reluctance to publicly display a communication card that asks for further clarification or support from his teacher, indicating a possible level of maths anxiety, not yet noticed by his teacher, or even recognised by Ishmael himself, as able mathematicians can still have maths anxiety. However, being given an opportunity to develop his own awareness of how he learns best, even if it involves asking for help may then reduce any feelings of anxiety for Ishmael, and instead, develop an acceptance of support as one of his traits when learning.

During the study, I observed that Ishmael started to use talk more openly as a tool to communicate with me about his opinion of the importance of understanding the task set. Something had changed during the research for Ishmael in that he was more communicative and responsive during lessons and focused group discussions within the data collection period. I wanted to know more about the circumstances when Ishmael may feel safe to ask for help, so I asked him how he would deal with a maths challenge that he didn't fully understand how to solve.

> Ishmael: *I don't mind if I don't understand but if I still don't understand by the end of the lesson, I might forget it tomorrow. I would rather ask Sir and try to understand it, so I don't get frustrated with it.*

Ishmael was aware of and able to recognise that for him, learning was an action which required an emotional connection. He had verbalised in the quote above an acceptance of not understanding but a preference to understand. He may think that the teacher expects him to communicate when he may not want to. Ishmael does not seem to show any signs of frustration at not being able to understand first time around and indicates that he knows what to do in order to avoid feeling frustrated. I surmise, thereby slowing the lesson requirement of learning a set amount of knowledge by the end of the lesson, and instead allowing the maths pupils to acquire the learning at their own rate, the notion of evental learning may actually enrich the Teaching for Mastery approach as Ishmael may have had the opportunity for reflection and discussion before completing the task set.

I asked all of the children if they wanted to draw an image to reflect what learning might look like. Ishmael wanted to do this and the picture that Ishmael drew for me to represent what learning looked like to him, was an up and down zig-zag type of pattern.

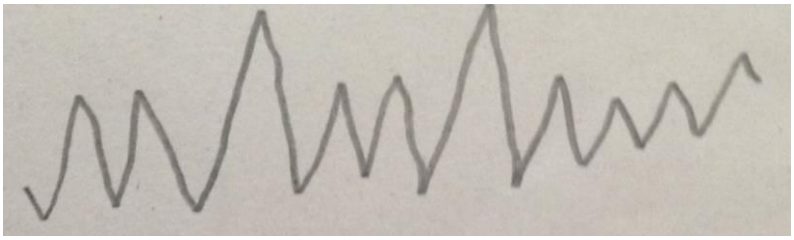


Figure 10 Ishmael Diagram of what learning looked like to him.

He told me that the week of maths lessons had been up and down for him as at times, he felt he was learning and at other times, he felt he was not learning. He also felt that the picture explained that sometimes he felt that he wanted to speak, but only to his friends, and sometimes he felt that he had nothing to say so didn't need to speak. This demonstrates to me the iterative nature of learning and the importance of the organisation of the maths curriculum so that concepts are introduced and then revisited at different intervals during a pupils primary school maths career. The spiral curriculum theory (Bruner 1960) gives opportunity for mathematical concepts to be revisited at varying degrees of difficulty and challenge as conceptual and procedural knowledge develops for the maths pupil. The image that Ishmael created and the explanation of it that he offered, evidenced to me the high level of metacognition, self-regulation, and independence that Ishmael had built up throughout his life so far. The five elements of evental learning would suit Ishmael as he was thoughtful and considered and was able to offer an important understanding of his thoughts and ideas of learning. He appeared to enjoy any opportunity that was given to him to think, consider, reflect, discuss and do in maths lessons but he also needed to control the learning environment and choose when and how he wanted to interact and engage with others.

I have chosen to further discuss Ishmaels' ability to develop his metacognitive skills over the data collection period. I have considered in further depth what Ishmael was saying about the Teaching for Mastery approach, the learning environment that he found himself working within and how he liked to communicate his learning and understanding to others. The discussion of the vignette of Ishmael concludes with further thoughts on the place and value of having a positive emotional connection to mathematics.

As already explored throughout the literature review, through the ideas of Zizek, Gravitz, Byers and Su, (2.3.1) learning is complex, Moon (2002) describes learning as a

> 'network of ideas and knowledge' (Moon, 2002:24)

In Kolb's experiential theory of learning, (2011), which I further consider in 5.1, there is an emphasis on the interactions that occur between a learner and their environment that inevitably affects the process of learning and the success of that process. For Ishmael's experience of learning so far in his life he is able to use what he has already stored in his long-term memory (Boaler 2016) to support him to construct new learning required of him within a set approach to teaching mathematics that the school is currently using, namely Teaching for Mastery. Ishmael is able to confidently states that he is able to separate the three formal parts of the lesson. He can see where he is being required by his teacher to demonstrate his fluency, his skills of reasoning and his ability to solve problems. He can therefore satisfy all three aims of the statutory national curriculum maths programme of study. He can communicate with me which parts of the Teaching for Mastery three part formally constructed lesson he enjoys, and which he does not and why. He is demonstrating a clear and conscious awareness of

how he likes to learn. I would claim that this demonstrates how by his using all five elements of evental learning, namely thinking, reflecting, considering, discussing, and doing maths, could enhance the learning experience for Ishmael, when maths is delivered through the Teaching for Mastery approach.

Ishmael is able to demonstrate some awareness of himself as a learner. He is able to dissect the different parts of the lesson and separate them whilst at the same time, understanding that they are all important. An example of this is when he says:

> 'We all don't like the reasoning part as I just want to get on with my work, but Sir sometimes makes me explain how I got the answer.'

Ishmael's vignette suggests that there is a clear understanding that he has developed positive social and interaction skills which help him to learn more effectively. However, this is dependent on how confident he is feeling within the learning environment that he finds himself in. What is clearly apparent is that Ishmael is very aware of his emotional connection towards learning. He can articulate the extent to which social interaction is important to him and the opportunity to discuss with his peers when faced with a solving mathematical problem task is of varying importance and relevance to him but nonetheless, he sees the place for it sometimes. The place for quiet reflection and a slowing down in the learning process, is important to him at other times in his learning, as discussed in chapter one and 2.3.3, through the ideas of Thom (2018), but he has an awareness of how he learns best and what he needs from his learning environment, in order to be successful in his learning. The awakening of his ability to consciously use his metacognitive processes of thinking, reflecting, considering, discussing and doing could support and sustain his mathematical understanding.

The importance of the relationship between the learning environment and the process of learning is exemplified in Ishmael's case. It reflects that the findings of Kirsten & Billman (1997), Illeris (2003), Watson et al (2003), and Wolf (2009), discussed at the very start of this thesis in chapter one show that the process of learning occurs over time with regularity, familiarity and structure. The learning environment created for young mathematicians to feel safe to learn within is within the control of the class teacher. Therefore, for a pupil to develop a positive relationship with their class teacher may support developing a positive relationship with the mathematics that has to be learnt. Evental learning requires an emotional connection to learning maths through the maths pupil awakening their consciousness of how they learn best. By feeling positive about the learning environment and the opportunities to learn that are being offered to the maths pupil, a connection with what is to be learnt is more likely to develop and the maths pupil is more likely to approach it without fear or anxiety. This view is supported by the work of Blair and Hindle (2019), as discussed in 2.3.1, who argue that the balance of power and positive mind-set greatly contributes to individual learning method.

Aspects of the Teaching for Mastery approach, such as working through the formal three-part structured lesson, are challenging for Ishmael despite his overall confidence in the subject. For

example, he does not enjoy the fluency part of the lesson when a maths problem is presented to the whole class and the teacher then instructs the maths pupils to talk to their talk partner about how the maths problem would be approached and solved. At other times of the Teaching for Mastery lesson the teacher is directed within the approach to select targeted maths pupils to answer questions in a whole class discussion environment. Talking, when instructed to, is problematic for Ishmael, but what is not problematic for him is an opportunity for him to talk when he wants to. If Ishmael knew that he had discussion as a tool to support him in maths, he would feel under less pressure to talk when directed to. He does not want to and furthermore he does not enjoy learning in this prescribed way. This is demonstrated when Ishmael said to me quite clearly after a maths lesson:

> 'I don't really like explaining to the whole class'.

The experience clearly made him feel uncomfortable which could lead to feelings of anxiousness. This reluctance is arguably part of Ishmael's wider personality. As discussed in 1.1.2, Revelle and Scherer (2009) and Bergner (2020) argue that personality can contribute to the way an individual may think, feel, and behave. At this point in time Ishmael feels confident in his own mathematical ability, but less confident in talking about it when asked. Talking when directed to, therefore, may not be a useful tool for communication for Ishmael. However, Teaching for Mastery requires it of him for him to meet expectations of the approach. In contrast evental learning would give Ishmael the tool of discussion to use at his discretion which he could have more control over.

Teaching for Mastery considers only the spoken word as a form of assessment for mathematical understanding. My thesis calls for the ideas, opinions and views of the maths pupil to be heard in the way they want to communicate it. Due to my methodological approach being fluid and allowing for the maths pupils to work as children as co-researchers, the data collection in the fortunate form to vary as Ishmael the way Ishmael could communicate with me in different ways and to different extents. Unlike his teacher, I was not confined to following Teaching for Mastery, so I asked Ishmael if he would draw what maths learning looked like for him during the week we had spent together. The drawing that Ishmael presented, as shown above in Figure 5 is a useful way of communicating to me how he feels about his learning which might have been difficult for him to put into words. In evental learning the maths pupil is given time to reflect and consider and can do this is a way that makes them feel most comfortable. This relates back to the discussion in 3.3. about my role as an insider-researcher and allows opportunity for a consideration of how familiarity and trustworthiness can influence the behaviours of all those concerned in the study.

Ishmael represents the kind of maths pupil who enjoys his mathematics lessons. Throughout all of the dialogue recorded in his vignette he appears interested in learning, he wants to think about maths problems and he indicates that he likes to be challenged. He can self-regulate, and he can evaluate his own learning. He is able to assess his own learning level and has developed his strategies to improve his own learning and progress in mathematics lessons. Ishmael, therefore, appears to use the affective domain of the brain and creates an emotional connection to maths. This in turn allows him to display some emotional intelligence towards learning mathematics as discussed in 2.3.1.

Ishmael exhibits this propensity when he talked about his concept of and attitude towards understanding mathematics, in the words that I have already stated earlier:

> I don't mind it if I don't understand but if I still don't understand by the end of the lesson, I might forget it tomorrow. I would rather ask Sir and try to understand it, so I don't get frustrated with it.

In saying this he arguably wants to develop his mathematical understanding at a deeper level, and he is aware that he might need some help from someone else to achieve this.

As discussed in the literature review, the affective domain of the brain is connected to persistence, attitudes, and level of success. Boaler (2015) argues that teachers have the power to unlock learning potential by promoting an emotional 'can do' or 'can't do it… yet' mind-set, as discussed in 2.3.1. The concept of 'yet' and the idea of taking time to learn is supported by Thom's (2018) slow teaching approach, mentioned in 1.1, which calls for pupils to be allowed time to consider and process what they are being asked to learn. This idea aligns to my notion of evental learning which if applied, gives maths pupils time to to enable maths pupils to utilise the five elements needed for evental learning to impact on learning, of time to think, reflect, consider, discuss and practice, thus supporting the development of a more positive relationship between the learner and something that is to be learnt.

4.3 Jack (R)

During my observations of the maths lessons, Jack sat in the middle of the front row in the maths classroom. He told me throughout the data collection period that he liked sitting there as he was surrounded by lots of his friends. He liked to work with others, and he liked to share his ideas. I asked Jack to tell me what he liked about maths lessons at his school.

Jack: I like maths. I always like to choose the hard task because it gives me a new challenge. The hard tasks challenge me more.

Me: Is it important to have a challenge in maths?

Jack: Sir said that challenges help you to think in greater depth… this means that you think more deeply. It's not just answering questions on a worksheet. You have to solve a problem and there could be add and takeaway in the sum that you have to do…

Me: Do you like solving problems in maths Jack?

Jack: I do

Me: Why?

Jack: My teacher always tells me that I am good at maths whenever I solve a maths problem or complete the higher challenge.

Me: Do you think you are good at maths?

Jack: Yes, I am… but if I am stuck, I can look back at the work we have done before to help us. If I still don't understand, then I can ask my teacher for some more help. I like to nail it in the lesson.

Jack talked about challenge, the use of his prior learning, his ability to ask for help and how it felt for him to successfully complete a task. He also used the words 'greater depth' which is a term applied to those maths pupils who can meet more challenging learning expectations.

At one point during a focused group discussion, we talked about what it might mean to learn something.

Jack: I have learnt to listen.

Me: What do you mean Jack?

Jack: The teachers expect me to listen so that I can learn.

Me: How do you think listening might help you to learn?

Jack: Well, I can think about what the teacher said and have a go and then I realise that by thinking, I have definitely learnt something.

In this exchange, I suggest that Jack was beginning to dissect for himself the components of learning. He was developing his awareness of the connections between thinking, listening and learning.

Jack was also developing a keen interest in the research study and my purpose for it. He was often seen looking through the published research books that I had initially shared with all the maths pupils to introduce them to the concept of doing research with children.

Me: I see that you like to look at the books that I have brought in

Jack: Yes, they are interesting.

Me: What is most interesting for you about them?

Jack: I think the books you show us are interesting because I never knew that children did research before. It's interesting. I like to learn new things. You are making me think about what I do in maths.

Me: Perhaps you might not have thought about your learning in the way we are doing this week…

Jack: I haven't thought about it before. I like maths and I just do it but I have realised that I like maths because I like thinking about things and maths lets you do that. I like it when I can work with my friends too. I like learning and its not just maths I am good at. I like to I know that I have learnt things. I can look back in my book and see that I have got things right in all of the subjects.

Me: How do you know that you have got things right?

Jack: Because Sir marks my work, and he tells me.

Me: Is that the only way you know when you have got things right?

Jack: It's the main way but I do also know because I can just feel it and if I have enjoyed it, then it feels good.

Jack's comments were referring to the confirmation by the teacher through their marking of Jack's work that he had indeed correctly completed his work, but he also stated an emotional connection to this successful learning. Jack said that if he had enjoyed his learning then he felt positive about his learning experience. This suggests that Jack was already experiencing an emotional connection towards learning maths and that embodying the five elements of evental learning would not be a challenge to Jack.

Through further interrogation of possible reasons for why and how Jack presented himself and was confident in his maths lessons, I can offer some analysis as to why his desire to be successful was important to him. Throughout his dialogue with me,

Jack used the words 'greater depth' in his conversations. My interpretation of those words could symbolise a neoliberal idealisation that, when followed, Teaching for Mastery will produce successful mathematicians, which Jack has subscribed to, but was unaware of. Askew and Morgan as discussed in the literature review section 3.2.1, argue that the terminology of greater depth comes from the Teaching of Mastery discourse, and is connected to level of challenge that a maths pupil is offered.

I surmise that for Jack the words 'greater depth' is just part of the mathematical key vocabulary that is used within his maths classroom in daily maths lessons. At no time during my work with him as a co-researcher or as a maths pupil did Jack question the mathematical vocabulary that was being used in the classroom. For me, greater depth might indicate a link to assessment and progress but to Jack it was just part of the lesson and nothing more. I chose not to deliberately ask Jack about the use of the words 'greater depth' as I did not want to influence his ideas or cause him to question why they were being used. I wanted Jack to awaken his awareness of the vocabulary he was using and start to ask questions about it himself. However, the terminology that maths pupils are taught to use in maths lessons, as well as other lessons in the curriculum such as English is an important consideration which is inextricably linked to a neoliberal agenda.

Jack recognised himself as a successful maths pupil, measured by his level of understanding of the requirements of him and his capability of meeting them. He already demonstrated some awareness of how he liked to learn maths and talked openly of his emotional connection to maths. His institutional habitus been shaped by previously successful experiences of learning maths and how success to Jack had been communicated to him by his maths teachers over his primary school carer to date. The ideas of Watson *et al* (2003) who writes about learning environment, Boaler (2016) who writes about teaching styles and Dweck (2007) who writes about mindset, all previously discussed in chapter two, can be applied to Jack's responses. He demonstrated a level of compliance to learn maths in the way that it was being delivered to him as he felt comfortable within the setting in which he was being taught. The elements of evental learning were perhaps somewhat already evident in Jack's attitude towards mathematics as he used time and space to consider and conjecture but I wonder if this was only evident because Jack didn't need more time that the lesson structure allowed him, as he found maths easy and felt comfortable in his learning environment. I am confident that Jack felt a sense of belonging to the maths class that he was part of. He was aware of how he was being taught maths and accepted this as a way that he could learn maths.

> …when young people feel that they are safe in school, when they feel they belong, when they feel rooted, school becomes a place for them. They become open to learning and they succeed in many spheres (Riley, 2017:09).

Jack regularly told me that he liked maths and that he felt that he was good at it. Jack had no reason to think about the way his maths lessons were organised and the content within them, as he had no difficulties with regard to learning maths. His degree of social confidence supported Jack with his academic and maths confidence. He was secure in who he was and what subjects he enjoyed learning and maths was one of these subjects He displayed some maths confidence within the answers that he gave to my questions, as he felt he was able to solve problems and complete challenges that the teacher had set. He also had the confidence to seek support from his peers and his teacher when he required it. A considerable period of childhood is spent in school (Werner & Smith, 2001), therefore the impact and influence of schools cannot be undervalued and underrated. As discussed in 3.2, McPherson et al (2010) argues that a strong connection to a subject is experienced may lead to a strengthened notion of belonging. As discussed in 2.3.1, Riley (2017) argues that schools can be places of possibility, positivity, opportunity and places of belonging, depending on the learning environment that is created.

Safe in his maths learning environment, Jack felt he belonged. He was able to ask questions, try out new ideas and become interested in his role as a co-researcher alongside me as he felt comfortable and part of the group. Jack was already comfortable with learning new concepts and procedures in mathematics so I believe he would easily adjust to modified maths lesson structure if the teacher was to build in all five elements of evental learning. Jack liked to complete challenges and problems and if offered the opportunity of being given time to think, reflect, consider, discuss and do, (the five elements of the evental learning pedagogical approach), Jack's mathematical abilities may have improved further. Jack was certainly demonstrating an ability to use his skills of self- awareness and self-regulation in maths lessons to make self judgements on how well he was doing on a maths performance level and Jack's vignette raises an interesting question. It is questionable as to whether Jack was learning something new or was able to hold the information, he needed in his short-term memory long enough to record the correct responses to questions when given a problem or a challenge. Jack's vignette also gives an opportunity to consider the extent to which the 5 elements of evental learning were already available to Jack but as they were not highlighted as interconnected skills to learning mathematics, Jack used them as they were part of his embodied habitus. The group discussion forum provided Jack with an opportunity to use his skills of maths confidence to develop his understanding of a potential process of learning.

Through his dialogue with me and the rest of his co-researchers, Jack was starting to realise that he had a positive emotional investment in maths which actively supported his learning. Not only was Jack feeling confident in his mathematical abilities, but he was also starting to understand what he was being asked to do in maths and why. He was developing his awareness, and he was experiencing a level of enjoyment and success. When Jack was given an opportunity to look back through his maths workbooks and talk about the tasks that he had completed, he was able to see for himself and articulate the progress he had made in his learning. Jack was also able to support his peers. For me, Jack demonstrated the ability to subjectively experience, understand and articulate his aptitude for his learning, this reflects what I am calling evental learning. Through observing him and engaging him in discussion and dialogue it appears as if the Teaching for Mastery discourse supported Jack to access conceptual and procedural maths knowledge. His personality of confidence and self-assurance enabled him to embrace and enjoy maths in whichever way it would be presented to him.

4.4 Ellie (R)

At the start of day 3 of the data collection period, Ellie approached me to ask if she could join the research group. She was interested to get involved in the study going on in her maths classroom and I was interested to try to understand her motivations to be part of the research group.

Me: Ellie, Why do you want to join the others in the study?

Ellie: Because my friends are in it and they say they can talk to you about learning.

Me: Why do you want to talk to me about your learning?

Ellie: Because I don't think I have done that before. I haven't really thought about it. We just come to school and do our work.

This conversation was insightful as this maths pupil aged ten, was able to clearly articulate to me that her voice was neither heard nor required in her maths lessons which adds weight to my argument that maths pupils can and will be metacognitive about their learning if given the chance.

I asked her to try to explain what 'learning' means to her:

Ellie: You have to understand the idea first before you can learn to do the sums.

Me: Does understanding come before learning would you say?

Ellie: Yes, I think so because if you don't understand, then you won't learn, you might remember for the rest of the lesson but if you haven't learnt it, then you might forget it tomorrow.

Me: How might you know that you have learnt something then?

Ellie: Sir always asks us to remember what we were learning yesterday at the start of the new maths lesson and that gives me a bit of a test. I don't always put my hand up, but I think of it as a bit of a secret test for me, to see if I can remember.

Me: What do you do if you can't remember?

Ellie (R): I will check my workbook and see if I can remember that way.

Me: Good idea.

Ellie was demonstrating her positive attitude to learning.

I observed Ellie from day three of the data collection period and was interested in her particular physical relationship to learning maths. Ellie would often be observed getting out of her seat and wandering around the room. The affective domain of the brain is concerned with how individuals deal with new information to support thinking, understanding and learning, and it became clear that Ellie dealt with new information through physical movement. Ellie may not have interpreted her need to move as part of the way she processed and understood what she was learning, and the teacher may not have interpreted and understood her movement as part of her unique learning process, therefore it was interesting for me to reflect on how both Ellie and her teacher could be supported to work within this way of learning. For some class teachers, movement around the room by a pupil, when a task has been set may be largely deemed as unacceptable and I reflected on whether this may have been the case for Ellie and her teacher in the past. I was able to use the focus group discussion

opportunities to talk to Ellie and the rest of the group about behaviours, like moving about in the classroom whilst learning within maths lessons.

Me: How do you like to learn maths, do you like your classroom and do you always learn maths in the classroom?

Ellie (R): I like the classroom but I don't always like sitting at my desk for the whole of the maths lesson.

Me: Why not Ellie?

Ellie: it might sound a bit strange, but I don't always like to sit down when I am thinking about the maths challenge.

Me: It doesn't sound strange to me, it sounds interesting – can you tell me a bit more about how you like to think?

Ellie: Well, I get out of my seat sometimes in maths lessons as it gives me time to think away from the others. Sir normally tells me to sit down but I have told him that moving around helps me as I can see what everyone else is doing and that makes me know if I am doing it right too.

Me: Does it help you to see what everyone else is doing? How does it make you feel?

Ellie: Moving around the room helps me to feel like I can concentrate better. I like to see what my friends have written for their maths challenge and then I like to be on my own a bit more and then I can learn. I know that I am learning when I get a feeling and then I get the answer right. I like my friends but then I want to concentrate on doing it myself.

In this exchange Ellie shows that she was willing to take the risk of being told to sit back down in her seat by her teacher in order for her to try to find some time on her own to connect emotionally and subjectively with the maths problem solving task she was working on. During one of the focused discussion group sessions, I used Ellie's example above to re-visit the subject of researching with children. It was Ellie who contributed most on this occasion.

Me: Can anyone remember why I came to work with you all this week in maths?

Ellie: Is it because you wanted to find out what we are learning?

Me: It was more about how you were learning maths that I was interested in and I wanted to try to encourage you to be interested in it too.

Ellie: You have made me think about it this week. Before I didn't think about it. I just did my maths.

Me: What has changed for you in maths this week Ellie?

Ellie: It's made me think about what I do when I am trying to get my work done.

Me: What do you mean?

Ellie: It's made me think about when I get stuck. We work on a (maths) topic and then we have to change the topic and sometimes I am still trying to work on it but then I have to change and work on something else.

Me: How does that make you feel about your learning in that topic?

Ellie: It makes me feel that it isn't finished. I think we should be able to finish it before we change the topic.

Ellie was talking at a sophisticated level about the whole school maths planning and delivery. This is significant to my notion of evental learning as Ellie was able to confidently articulate to me how she liked to learn maths. She had ideas and she had spent time thinking, considering and reflecting on how her ideas might improve her learning experiences in maths lessons. If applied in classrooms the notion of evental learning could provide educators with opportunities to listen to the voices of those who are receiving the lessons, with a view of action to improve.

By talking to Ellie throughout the week, it became clear that she was a maths pupil who was thoughtful in her approach to learning and had some ideas, based on her maths learning experience to date, on maths pedagogy.

When Ellie said:

Ellie: It makes me feel that it isn't finished. I think we should be able to finish it before we change the topic…

Ellie wanted to try to understand what she had learnt and where her gaps in learning remained. This is an example of Ellie being able to take responsibility for her own learning but also wanting to tell her educators who hold the power to affect action to change practices for improvement in maths learning experiences.

What follows is my dissection of what Ellie was communicating to me through her words and actions. I have included a commentary on how she contributed to the study, her motivations and behaviours and added a section on how this might link to metacognition and how my notion of evental learning, if implemented as a strategy in maths lessons would support her future learning.

Ellie was a key contributor in the study. When Ellie said to me that she had not been asked to discuss her learning before and that in her view her role was just to attend school and do her work, it made me reflect deeply on the value and place educators currently give to those being educated as Ellie had a lot to say about her experiences of maths lessons. The 'Virtual School Bag' was a term originally coined by Thomson (2002) which explains the experiences, knowledges, and understandings which children bring to school each day. Twigg (2021) argues that the bag contains

amongst other elements, cultural capital and agency and identity and identifies them as micro-level interactions. Cultural capital as discussed in 2.3.3 (Bourdieu 1984) comes from an idea that individuals bring with them to new experiences, a culmination of previous experiences that help them to understand and interpret their current contextual situation. Similarly, Moll, Tapia & Whitmore, 1993 state that children bring 'funds of knowledge' into school which forms part of their cultural capital. These ideas align to the use of the 5 elements of evental learning but for Ellie to use evental learning to support mathematical success, she would need to feel safe in her learning environment, to proceed successfully in continuing to learning in the way that she likes to learn maths best.

My study aimed to give the maths pupils participating as children as co-researchers, in the research an opportunity to raise their awareness which, as discussed more fully in 2.3.4, originates from my application of the philosophical stance of Zizek, (2014) who talks of the individual person as 'the self' as a metaphor for the process of awareness. My children as co-researchers were encouraged to become more aware of the value of giving time in maths lessons for thinking about their maths learning to support their fluency and procedural maths understand which may then lead to learning. This challenged Ellie, who at the start of the study, believed that her role within her institution of school was to attend her maths lessons, to do the maths work that the teacher required of her and then go home.

My study had given Ellie an opportunity to contribute fully within the data collection period. Ellie knew that my research study subject focus was centered on learning in mathematics, and she was aware that some of her peers were helping me to learn more about this in their role as co-researchers. Her interest reflects Luch (2016) who, as discussed in 1.1.2, maintained that motivation can stem from processes of learning that can be controlled and initiated. However, as already discussed in 2.2.2, it is adults that drive policy and make decisions about the curriculum (Salmieri (2018). The idea of choice and maths pupil agency is central to a personalised learning philosophy as discussed in 2.3.3 (Kelly 2002, Boaler 2016). By designing maths learning which enabled choices around when, what, and how learning in maths lessons occurs would impact on improved pupil engagement and motivation. This is an important point when considering the ideas and opinions of Ellie who had mush to comment on about how the mathematical pedagogy had been organised and delivered in her school. As discussed earlier in this vignette, it is also an important aspect of evental learning.

During the research Ellie talked at a sophisticated level about whole school maths planning and delivery. She was able to articulate her view on the organisation of the maths curriculum in her school. When Ellie said:

It makes me feel that it isn't finished. I think we should be able to finish it before we change the topic…

I believe that she wanted maths pupils to be given the time that they needed in order to continue to build and develop their mathematical knowledge and understanding. She was able to demonstrate to me a level of understanding of how she thought conceptual and procedural fluency could develop in maths learning over time, and she understood the conditions that she needed in order to learn.

The findings, illustrated through the story of Ellie, demonstrate her capacity and desire to contribute to the organisation and provision of maths for which she was subjected to. She had clear ideas of how it might be improved and was able to make her own connection between revisiting maths concepts. This aligns with the view of Boaler (2016), as discussed in 2.3.1, who states that when maths pupils believe that they can be successful in mathematics it is likely to occur, as per the Pygmalion Effect (Rosenthal, R., & Jacobson, L. 1968).

In terms of the continuous development of maths pedagogy within a primary school maths curriculum, Ellie's thoughts and responses could be of great interest and use to school leaders. I believe that Ellie recognised and verbalized her thinking as important steps in the learning process. In doing so, Ellie was developing a deeper understanding of the process of learning as she utilised the opportunity to unpick maths content and question it in terms of its value to the development of her mathematical knowledge and understanding. The notion of evental learning gives opportunities for maths pupils to develop their metacognitive skills including the elements of thinking, reflecting, considering, discussion and demonstrating their mathematical conceptual and procedural understanding. Without even being offered the opportunity, Ellie is already demonstrating elements of evental learning as she is already awakened to what she is being presented to learn in maths lessons and is critically reviewing it in light of how she likes to learn maths best. Ellie is able to use metacognition to support her learning and development and if evental learning was embedded into all maths lessons then I am sure that Ellie's awakened consciousness in learning, would continue to flourish. As Su (2020) states, and as discussed in 2.3.5, teachers could encourage their maths pupils to become 'maths explorers' where they can engage in inquiry and justification in order to be able to describe what is going on, using mathematical language. Su (2020) argues that learning maths within an emotional context enables 'human flourishing'.

Ellie was motivated to be part of the group of children as co-researchers. She became more aware of what she was learning and how she was being asked to work in maths lessons. She became able to use a range of self-regulating learning strategies to support herself and raise her own conscious level of awareness as the data collection period progressed. This self-regulated behaviour illustrated to me Ellie's (R) level of consciousness of the way she learns maths best as discussed in 1.1.2 (Rotter 1966, Sword 2001).

Ellie appears to have behaved in accordance with teacher expectations for the whole of her primary school career so far. Assessment for learning requires children to have self-belief and know how to learn and for teachers to have high expectations and a belief that all pupils can succeed (Clark *et al*, 2011) but within this data collection period. Ellie had shown me that she was able to question what she was being asked to learn and why. This was important to my study as I was trying to find out if the

maths pupils had any awareness of this. Ellie was demonstrating that she was able to question the pedagogical approach being delivered but so far, was not given the opportunity to openly and safely express her views or offer her alternative ideas. Evental learning, as I have previously discussed is a pedagogy of resistance in 2.3.5, in that it requires and demands its maths pupils to awaken their consciousness and awareness through the opportunity to question how maths is being delivered to them and reflect on the extent to which it suits the way that they like to learn. To become motivated to take ownership for personal learning requires certain conditions to be in place such as a positive and safe learning environment, secure relationships build on mutual trust and respect between teacher and maths pupil and an awareness of how the maths pupils likes to learn. Ellie appears to be a maths pupil who demonstrates this level of motivation. Her motivation was evident in how she wanted to do well in maths and also evident through her interest in becoming part of the research group and becoming one of the children as co-researchers. Ellie's maths pupil identity, like all of the other maths pupils, was formed, based on what she has experienced around her as part of the institution that she belonged to as discussed in 2.3.1, through the ideas of Riley (2017). It was only by awakening herself to her surroundings and becoming conscious of the influences around her that she may have been able to think differently about learning maths and perhaps saw the opportunity to become part of the research as a way of having her voice represented, within a purposeful learning environment.

As discussed in the literature review (2.3.3), the value of creating a purposeful learning environment supports learning and progress. Understanding and enabling opportunities for a maths pupil to feel safe provides a learning environment that meets the needs of the maths pupils. The class teacher had created a purposeful environment for his maths pupils, where they had felt safe (White 2002). This was true for Ellie who felt able to move within the learning environment that the teacher had created in maths lessons. One of Ellie's characteristics was that she liked to get physically involved in her maths problem solving tasks on both a practical and emotional level. Despite extensive reading, this remains an area of research which would benefit from further investigation. In their research Baker & Simpson (2020), discussed in 2.3.1, explored possible new approaches to behaviour management but the impact on learning through moving when learning is an area which requires further research. Ellie told me that if she was not allowed to walk around the classroom, then she would have to find a different way of working which may not have been as comfortable for her. In turn this may have produced differing outcomes of perceived personal success in maths. Ellie's comment and her use of physical, practical and emotional actions to support her problem solving in maths is an aspect of evental learning and presents an interesting opportunity to probe further and remains an under researched area with clear links to the principles of evental learning.

Winne (2017) in 2.3.3, states that when a learner can regulate their self-learning, their learning experiences contribute to their personal learning habitus. I interpret Ellie as one of my co-researchers who was able to openly think about thinking, understanding, and learning. She demonstrated self-regulation, not currently incorporated, or valued in the Teaching for Mastery approach. The Teaching for Mastery approach calls for acquisition of knowledge and although it recognises talking as part of the learning process, the time for talk is controlled and positioned in the lesson as part of the lesson

structure. When learning maths within the Teaching for Mastery approach, conceptual and procedural knowledge and skills are the expected learning outcomes as they can be measured. However, Ellie was able to demonstrate affective learning outcomes which also encompassed attitudes, motivation, and values These are more difficult to measure and so are not recognised as national performance indicators but thinking and reflecting on how she learned as well as what she learned was clearly important to Ellie. This links well with my notion of evental learning which is more concerned with an emotional response to maths than a performance measurement response to maths.

What makes Ellie different to the other maths pupils in this research is that she was willing and able to question the organisation of the maths pedagogy that she was presented with. Current Teaching for Mastery provision doesn't allow her the opportunity to do this but Ellie used her metacognitive skills to suggest that maths learning is individual and subjective and occurs at different rates for different maths pupils. My interpretation of what Ellie was saying was that she understands a maths concept once she has had time to work on it and develop her conceptual and procedural understanding skills. I would argue that Ellie if given the opportunity, was capable of using metacognitive processes, an integral part of my evental learning approach which gives maths pupils time to enable maths pupils to utilise the five needed elements of evental learning to impact on learning, of time to think, reflect, consider, discuss and do , which extended way beyond the expectations of the school's interpretation of mastery.

What is interesting to note about Ellie is that she was not originally selected as one of the participants for my study. However, she put herself forward to me during day three of the data collection period. I assume that in order to position herself to me as an ideal maths pupil to join the group, she told me that she realised that practicing her maths helped her to improve as she had more to learn. Ellie had spotted an opening to express a need to belong, as discussed by Riley (2017) in 2.3.1, to the data collection group as well as to develop her existing intellectual curiosity in the field of research.

4.5 James (B)

James presented himself as a maths pupil who liked to clearly understand what was expected of him for each different curriculum subject. He was able to separate the curriculum subjects even though the school organised maths through a cross curricular approach. This approach has potential but for James, the idea of linking subjects together was less obvious to him.

At the start of the data collection period, James made it clear to me that he liked to learn maths as a discrete subject. The maths pupils had been given an activity to work in partners to design a number game using the Mayan number system and then decorate the game with symbolic artistic images from the Mayan Civilization that represents numbers. James expressed his feelings about this activity to me:

James: I don't like art

Me: Is this an art lesson today then James?

James: Well, it's maths as well, but we have to do art too. I would rather just get on with the maths.

Me: Why?

James: It's my best subject. I like my teacher and the way she gives us problems to solve. I like getting the answers right.

Me: Is it important to you to get the answers right James?

James: Well in maths it's either right or wrong but art isn't like that and it can get a bit confusing.

Me: I am sure that you can still get the answers right if you mix some art in with the maths

James: Yes but I don't like mixing maths with art because whatever you do is ok but everyone does different things, so it makes it all different.

The dialogue above has indicated to me that James expected to learn something new in each maths lesson and needed to understand it as maths, and not as maths within art.

During one of the cross curricular maths lessons, he noted:

The maths was complicated today. I didn't enjoy the lesson. I had to work out what all the symbols meant. There was lots of art pictures and we had to work out what the pictures meant and then turn them into numbers and then work out the answer. I didn't like all the pictures. They made finding the numbers a bit confusing.

I asked James to tell me how he liked to learn maths. His response was:

I enjoy learning maths when there are lots of challenges. Sometimes the challenge is easy at the start and then gets harder but today it was just confusing as we had to make a game, we had to do art and then we had some maths in the middle of it all.

The above quote denoted to me that James was able to identify the different subjects within the lesson but was struggling to understand the rationale for putting the subjects together. James needed time to process what he was being presented with and to understand the reasoning behind it and if he had been given opportunities in maths lessons to develop his abilities to use the elements of evental learning he could feel more comfortable with across curricular approach.

James continued to work through a range of different maths challenges throughout the data collection period. On one occasion the maths pupil partner that James had been paired up with to create a

game based on the Mayan number system, wandered away from the table leaving James to continue to work alone:

Me: What has happened to your friend James?

James: He's like I was yesterday but its ok because I know how to do it today so I can work on my own until he comes back.

Me: Are you feeling better about making the game in today's maths lesson James?

James: The numbers seem to make better sense today as we are putting them into a game. I asked Miss to explain it again and it's clearer now and I think I understand how to make the game. I

Me: That's good – can you tell me how you are going to make the game?

James: I have got to think about where to put the numbers now so it can make sense and when people play the game, they can get the answer right. I want to get the numbers in the right place, but we can check the game before we give it to someone else to play it.

Me: Why is it important for them to get the answer right?

James: Miss says that it's ok to make mistakes as long as we learn from them. I like to always get it right though.

During the research period, James often told me that he always wanted to complete his work successfully. Getting it right seemed to be important to James. He seemed always keen to get on with his work and was going to try to finish all of the number problems to be solved in the lesson. An example of this was during one of the lessons where James was able to talk to me about learning about a new number system that uses Base 20:

Me: How are you going to solve this sum, James? It just looks like dots and lines to me.

James: We have to use this chart thing to help us, it shows us what the dots and lines mean.

Me: How would you start to work it out then?

James: I know the bar means five and there are two bars so that's ten and then the three dots are one each so the answer would be thirteen.

Me: Do you enjoy working puzzles out like this James?

James: Its ok, it's not numbers like we use numbers but it's a puzzle and so I like to try to solve the puzzle.

Me: Do you think of these puzzles as maths?

James: Urm, they are puzzles and I suppose I do have to think about what the bars and dots mean so I suppose it could be maths, but I thought it might be art too. Miss says its maths.

Me: Do you understand how to solve the puzzles, James?

James: Now I can see the chart, I can understand how the Mayan number system works. It makes you think about how other people learnt maths in the past doesn't it.

Me: I see that your partner has moved to another table. Are you ok to work on your own?

James(B): Now that I know what to do, I can do it and I want to finish all of the puzzles so I can go onto the challenge which is to think about making a game using the Mayan number system. That sounds fun.

This dialogue between James and I may suggest evidence of aspects of evental learning in that James was developing some awareness that he needed certain tools in his mathematical toolkit to help him to learn and complete a task successfully.

I have chosen to further discuss aspects of mindset, curiosity and developing the ability to notice and become more aware as these have been discussed in the literature review and now illustrated through the behaviour, actions, and ideas of James.

James had developed, by the age of nine, a very clear mindset, of the subjects that he enjoyed learning at school and those that he did not, as discussed in 2.3.1, (Dweck 2007). He equated liking a subject to being good at it and therefore identified himself with maths as he got the answers right and felt successful in the subject. With art, there is arguably no right answer. This led to James indicating to me that as he was less interested in art, he was unable to engage with it emotionally which affected his enjoyment and feeling of success. There is a perception among current curriculum designers that children need to see the connections between one subject and another in order to fully understand the world and its realties and how aspects of the world interconnect. Understanding of the world can perhaps be enhanced by looking at it through more than one lens as illustrated by James when he told me, as detailed in the dialogue above, that he struggled to understand how the subjects of art and maths were connected. This suggested to me that his mindset has been impacted by previous experiences of the organisation of prior mathematics lessons which were now showing in his epistemological view of how he wanted to learn maths. James was reaching the end of his primary school career so had experienced different approaches on how his teacher's delivered maths to him. Currently the school was trying out a cross curricular method of teaching maths and trying to apply the principles of Teaching for Mastery within it but earlier in his career maths had been delivered as maths, and art had been delivered as art, and he was now struggling to see how the two subjects connected.

James consistently evidenced that he needed more time to understand and connect the purpose of combining different subjects. Su (2020) as discussed in the literature review (2.3.5), states that mathematical play can build the emotional response of curiosity. I interpret Su's comment about play to lean towards finding creative ways to explore mathematical concepts, such as within a cross curricular approach which currently James finds challenging. Currently, James sees maths as a linear subject as he has not yet made the link in his own consciousness, that learning maths can be done through an inter-connected way. I felt through observing James actively listening to the teacher and watching closely how she modelled problems, that he would benefit from further mathematical learning posed within a cross curricular format, as this may support him to understand how maths is everywhere and within everything. This is stated as part of the purpose of study within maths NC 2014. He might experience the emotional response of struggling when working in this way, but Su (2020) states that to struggle is to grow which I interpret to mean in pedagogical terms that the theory and power of making mistakes and learning from them is helpful to the learning process. James currently saw the incorporation of art in his maths lesson, as a barrier, as he was unable to get to the maths. James had indicated a willingness to learn maths, but in order to do that he had to process the information and context of a cross curricular maths lesson, provided for him so that he was emotionally in a position to learn**.** Evental learning would support James to gain a deeper awareness of the way he thinks about mathematics. If James was given time to think about the format and structure of the cross curricular maths lesson he was being offered, he may be able to see maths as a highly interconnected subject and develop his curiosity to work in new ways. The Teaching for Mastery approach could be supported in its delivery, by including elements of evental learning, such as time for thinking, reflecting, and discussing. I believe that this transitional next step would be achievable for the school's delivery of maths in the future as the school had already looked at the Teaching for Mastery approach and through delivery, had interpreted it in a more creative way to meet the learning needs of the pupils.

When engaged in a paired activity of creating a number game in the series of maths lessons during the data collection period, James showed no real concern at one point when his partner wandered away from the task and James had to continue completing it independently. I noticed that he showed emotional empathy to his maths pupil partner by acknowledging that his partner may be feeling what James had been feeling in a previous lesson, as evidenced in his dialogue with me. The idea of noticing is relevant to understanding James's feelings here. I would assert that noticing how maths pupils learn best, is a way to understand how teachers could make sense of complex situations in classrooms. It may also be linked to how the maths teacher had designed the learning environment in this instance. The forced independent working scenario that had been created may have evidenced a level of resilience in James in that he was able to work in isolation.

During the data collection period, James had come to understand more about his own ability to think, understand and learn and wanted to apply prior learning to the current task that he had been working on, whether alone or with someone else to work alongside. James had started to develop his own

subjective, conscious awareness of learning and that this process sometimes needed time and an awareness, access to and use of the appropriate resources to help him, but he had the resilience to accept this. What is potentially problematic for schools, is that time is not always easily available or accessible within a Teaching for Mastery approach (NCETM 2017), for the teacher to notice and support the sustained teaching and learning of maths for individual pupils in this way, neither are the appropriate resources always available. I would argue that Evental learning would work if national policy could be re-examined and re-imagined through the ideas of Thom (2022), discussed in chapter one, who calls for a slowing down and a filtering of the curriculum to be delivered in terms of relevance to a pupil living in current times. I argue that if there was less content in the National Curriculum (2013), teachers and pupils would have more time to engage in the elements of evental learning and that the quality of learning would be enhanced and life-long and assessments could be modified so that pupils were given opportunity to demonstrate what they have learnt in a more purposeful and meaningful way.

The cross-curricular Teaching for Mastery approach that Buckingham School took, offered for James a way of learning maths that possibly created conflict within James. This conflict could reflect Biesta's ideas on the multidimensionality of educational purpose (2013), discussed in 2.1.1. James wanted to learn mathematics and felt he was successful in the subject but due to the organisation of a cross curricular approach to math sin his school, which was out of his control, the challenges presented to James to completed mathematical problems when they were encased in a cross curricular approach were sometimes out of reach for him. This could have led to, in the case of a less reflective or resilient maths pupil, disengagement and a negative emotional experience of maths which they would possibly take with them to secondary school and adult life. However, fortunately, James was able to identify, within himself, an ability to develop his awareness of how he liked to learn maths best and so was able to separate the maths learning intentions from the art learning intentions as well as meet teacher expectations and the requirements of the lesson. Maths pupils are individuals and whilst all aspects of education cannot be tailored to individual preferences, the evental learning approach combines the use of the cognitive and affective domains, as it embraces the provision of opportunities for maths pupils to take time to think, reflect, discuss and do, within a longer period of time so that teaching is slowed so that thinking, learning and understanding skills can be developed and an awareness of these processes can be awakened (Zizek 2014).

I posit that both Mastery (Bruner 1976) and Teaching for Mastery (NCETM 2017) must be considered within wider whole school maths planning for implementation and delivery. As discussed in the literature review, Teaching for Mastery is currently endorsed as the preferred approach to teaching mathematics and the learning theory of mastery seeks to ensure a deeper level of learning and understanding, but by incorporating the 5 elements of evental learning and making this pedagogical approach available, a deeper level of sustained learning may be acquired for some maths pupils.

4.6 Saima (B)

Saima was new to the school and was learning to adapt to the methods and organisation of a different institution to that which she had grown used to in previous academic years. A three-part formal maths lesson had been all that Saima had experienced in her previous school career. During the research period I got to know Saima by asking her to share her thoughts about mathematics as a subject. I was asking her to share her current emotional connection to maths.

Me: Saima, I know that you have just joined this class as you have recently moved house, so the school is new to you. How are you settling in?

Saima: I am new to this school and so far, I have made some new friends.

Me: What is your favourite subject at this school?

Saima: I love stories. I have always loved sitting in the reading corner and looking at all of the books. I love it when Miss reads to us at the end of the day.

Me: Do you like maths Saima?

Saima: I don't really like maths. I have never found maths easy. I don't always know what the numbers mean, and I struggle with the different types of sums we had to do at my last school.

Me: Are maths lessons the same at this school?

Saima: Not so far. We do maths a different way. Miss helps me a lot and she turns maths into stories. I think she knows that I like stories. At the moment we are doing some art as well as maths and I like art.

During another conversation with Saima, I asked her how she liked to learn maths. I was trying to find out more information about how aware she was of the learning environment that she was working within:

Me: Tell me something that you enjoy in your maths lessons Saima.

Saima: Miss lets me sit with my new friends.

Me: Why do you like sitting with your friends in maths?

Saima: We all help each other. I much prefer learning maths at this school.

Me: I am glad that you have made some new friends and that you are all allowed to help each other. Why is that important to you?

Saima: I know that I need to do well in maths. I am in year 5 now so we have to get ready for SATS soon, so I need to practice some more. It helps because I sit next to Gina who is much better at maths than me. If I get stuck, I start to worry but Gina helps me. My teacher helps me too and then I think I can have a go.

Later in the week, Saima and I had a conversation about the maths game she had been making with her friend Gina:

Me: How have you and Gina got on today, Saima?

Saima: It was fun to learn today as the learning got harder.

Me: What do you mean?

Saima: We had to work together to understand all of the Mayan numbers that we wanted to use in our game. Gina and I looked back in our maths books from earlier in the week when we had written all the numbers down. It helped 'cause we could do it together. Gina is my friend.

One conversation on learning during the focused group discussions was of interest to me with regard to the process of thinking and understanding:

Me: Which comes first do you think – thinking or understanding?

Saima: We are always asked to think about what the sum means so I suppose thinking comes first.

Me: What does it feel like to think?

Saima: It's hard for me to think on my own because I sometimes can get a bit confused about the numbers and the words when they are all mixed up.

Me: Is it easier if your teacher reads out the maths problem for you?

Saima: Yes, sometimes but then she writes it down or turns it into pictures for me. That's easier for me to understand and think about.

Me: You just said "understand" – do you think that you understand and think at the same time sometimes?

Saima: Yes, because I have to understand what the problem is to help me to think about it.

It was clear that Saima flourished in confidence, and this developed further when she felt safe. In the following section, I attempt to discover how this may have happened through the relationships that she was able to build, the use of a particular strategy that the teacher utilised to enable Saima to develop her confidence and her safety in struggling as part of the process of learning. Throughout the discussion I link back to the threads of my thesis and the link to evental learning.

As discussed in the literature review (2.2.1), Thom (2018) talks of the importance of building positive relationships to the extent where this is fundamental to quality teaching. To understand Saima and her relationship with maths, it is useful to understand the context of Saima's past maths learning experience at her previous school. The class teacher had informed me that her previous school took the same approach to delivering the principles of Teaching for Mastery (NCETM 2017) as Riverside Primary, the other research setting in my study. In her past experiences of learning mathematics, Saima had been required to keep up with the requirements of a three-part formal lesson, transitioning from fluency to reasoning, (with an expectation from the teacher and the requirements of the Teaching for Mastery approach used at the school) of doing this with ease and this had put demands on Saima as this approach to delivering maths content is not conducive to how Saima likes to learn. As discussed in the literature review (2.3.1) Bandura's (1997) social cognitive theory and reciprocal causality theory could offer some explanation for the way Saima perceived maths. The relationships that she had formed with maths, within her previous educational setting as part of the wider class group within the learning environment that the teacher had created as required in the Teaching for Mastery approach, may have impacted on her performance. A formalised approach to delivering the Teaching for Mastery approach, was arguably not appropriate for Saima. She worked at a slower pace to her peers and found that she was always in the 'catching up group' in the afternoons, thus missing other important curricular subjects.

Saima needed additional time to process information. As discussed in the literature review (2.3.1) Piaget's theory of cognitive development recognises that cognitive development comes in different stages and the timescale for when an individual reaches each stage can differ. At the time of the data collection, Saima did not know how she learnt, as she had not been given the opportunity to think about it. A negative attitude to maths may have already formed for reasons already discussed, including relationships, environment, good quality teaching. Saima's (B) introduction to the approach that Buckingham School took to maths pedagogy may have come at just the right time for her attitude towards maths to change. Vordeman (2011) and Jones (2012) as discussed in the literature review (1.1.2) argue that attitudes are fixed by the time an individual reaches the age of nine. At Buckingham School, Saima was introduced to a new way to think about her learning and the time and space to do it. Learning through a cross curricular way was refreshing to her, as learning became an act of making connections. The study and my time spent with her as co-researchers may have also supported her to

begin to develop her own subjective, conscious awareness of learning, which may be interpreted as early beginnings of her ability to use some of the elements of evental learning.

As discussed at the beginning of this chapter, the school organised maths through a cross curricular approach, so the class teacher had the autonomy to adjust the maths focus into a medium of story. The Teacher turned all the maths problems she had set for Saima to do into stories that Saima could relate to. She used Saima's peer's names, and she used settings that were familiar to Saima in an attempt to relate the maths problem into a story that Saima was able to relate to in a real-life context. This enabled Saima to access the maths concepts in a more creative way. As I observed her, Saima indicated a need for self-assurance to confirm that her thinking was correctly focused and as she enjoyed stories, the class teacher was able to support Saima's (B) learning and progress. Saima appeared to lack the confidence needed to ask for help and seemed unable to identify in herself the need to seek clarification or further support. Cognitive load theory (Sweller, 1988) as discussed in the literature review (2.3.1) links how learning resources presented by the teacher are prioritised, presented and understood as relevant to the maths pupil.

Due to the formation of a positive relationship between Saima and her teacher at Buckingham Primary, the resources presented to Saima to support her conceptual and procedural understanding of mathematics were in the form of stories. The class teacher knew that Saima enjoyed stories and felt safe in a story sharing learning environment. This enabled the class teacher to offer Saima maths challenges that required initially a low cognitive load. A task that Saima had perceived as easy was then accepted by Saima as she felt able to complete the maths challenge and feel successful. With time, and experience, the levels of complexity of a maths challenge can increase which in turn would reduce extraneous load because Saima would have less new material to process. I observed through the data collection period, a range of teaching strategies, including 1-1, intervention groups and peer working to support Saima's (B) mathematical understanding whilst engaged in various stories of the Mayan Civilization, linking the stories to the number systems and the creation of the number game. As the dialogue above shows between Saima and I, at one point in the data collection period she demonstrated a positive emotional response when the learning got harder and the reason for that response was that she felt safe and able to work with her friend. I interpret Saima's developing ability to feel safe and to develop her maths confidence as the beginnings of her ability to use metacognition which could lead to an awakened awareness and the ability to use the elements of evental learning.

It may be useful to reiterate the important place of socialisation for Saima, which is one of the four components of the evental learning approach as detailed in figure 4 in 2.2.4. In the captured dialogue extracts between Saima and myself, recorded earlier in this section, Saima mentions Gina a lot which indicates how important Gina was to Saima in her maths lessons. Gina was not one of my seven co-researchers who participated in the study, but she is an important part of Saima's vignette as she made her feel safe and helped to develop her maths confidence. Socialisation is also central to my notion of evental learning as one of the five elements of evental learning is discussion. Feeling safe to openly and confidently express ideas on how to approach and solve mathematical problems could be dependent on the learning environment that the learner finds themselves within, as discussed

throughout this thesis and in 2.3.1. Saima had made a friend in Gina and between them, they were able to support each other's mathematical growth and development through their interactions and discussions. As discussed in 3.2, friendship groups may be able to achieve more when doing cognitive work. This information is useful to explain the success that Saima was starting to enjoy at Buckingham Schol as she and Gina were friends who depended on each other to achieve as they were able to share their thinking, understanding, and learning.

From my discussions with Saima, Saima knew that she had a lot of support around her which indicated to me that Saima felt safe to ''have a go' in the maths class. Saima demonstrates a conflicted character, which is all too often the case in primary maths classrooms in England when maths is taught through the formalised three-part maths lesson as dictated by the Teaching for Mastery approach. She demonstrated an aspiration to succeed in maths and enjoyed how maths learning was presented to her, but she did not quite know how to succeed without help and additional time to consider and understand her learning process. Her ability to verbalise and contribute to a social discussion of a maths problem could have been an important attribute needed in supporting her own ability to self-regulate and reflect, which is an element of evental learning. When Saima appeared happy to be working with Gina who she knew well, she was able to access the learning in the lesson as she felt able to join in and offer her own ideas. The sense of belonging is apparent here. As already discussed in 2.3.1, when young people feel that they belong, they become responsive to the learning opportunities offered to them, which may then lead to achieving success. Buckingham School subscribed to a growth mindset (Dweck 2007) and this possibly helped Saima to change her attitude towards maths as the maths learning environment in Buckingham School was more conducive to the way she liked to work and learn. For Saima, the way she learnt best was through accessing a teaching approach that took into consideration her emotional learning needs as well as her academic ones.

Saima is important to this study as an example of a maths pupil who had had a history of struggling, as discussed in the ideas of Su (2020) in the literature review (2.3.5). Fortunately for Saima, the change of school and the different approach to delivering maths at Buckingham School meant that she was now surrounded by positive messages about maths. Aligned to the ideas of Su (2020) Saima, in her new maths learning environment is being given the opportunity to flourish in developing her mathematical understanding. Her teacher had a good understanding of her learning needs and responded positively to her attempts to participate and complete tasks set, by encouraging her and offering her praise. By engaging in the research, as a co-researcher, Saima was asked all week to consider and talk about her learning, to her peers and to me. She started to develop her maths confidence as well as her social confidence which gave Saima a new opportunity to think about thinking and the conditions that she needed in order to support her learning, so demonstrating the beginnings of her ability to use metacognition and therefore some elements of evental learning.

The story of Saima demonstrates the complexities of teaching maths in a way that can successfully meet learning needs for all maths pupils (SEND Code of Practice 2015). Whilst Saima was not on the SEND register of the school, it was accepted by her class teacher that when she arrived from her

previous school, her learning needs had not yet been met. Whilst the class teacher could see that Saima worked hard to comply and accommodate to the learning environment that the teacher had created for her, the potential jeopardy of this was that Saima could have been trapped within a way of learning maths that did not suit her. Without the fluid and creative approach that Buckingham School had adopted, learning maths may have become confused and chaotic for someone like Saima who lacked the self-regulation skills to identify her own gaps in learning and was therefore unable to see through the layers of delivery methods to get to the actual maths. The class teacher had utilised her knowledge of metacognition, provided during her ITT degree course, and offered Saima the use of story and socialisation with a friend as strategies to support her mathematical growth. The SEND Code of Practice (2015) states that:

> 1.6 Children have a right to receive and impart information, to express an opinion and to have that opinion taken into account in any matters affecting them from the early years. Their views should be given due weight according to their age, maturity and capability (Articles 12 and 13 of the United Nations Convention on the Rights of the Child).
>
> DfE SEND Code of Practice 2015:20

Whilst I worked with Saima, I could see that she was now beginning to enjoy her maths learning. The initial thoughts I had about her having possible maths anxiety may have still been the case, but as Saima developed positive relationships within the classroom learning environment, she was able to start to start to use her voice as she knew that her class teacher was listening to her. The class teacher knew Saima and knew also, that if given the learning environment that suited Saima, then Saima would be successful in maths. It may also have been a deliberate act by the maths teacher to increase the level of challenge for Saima as an assessment strategy and demonstration of her high expectations (TS 2011) of Saima – which she was able to rise to and achieve.

My interpretation of Saima's (B) character through her conversations with me, was that she was beginning to identify that she was becoming aware of her own ability to make connections in her mathematical learning. Through the cross curricular approach, Saima may have felt happier and more confident about solving the numerical problems and challenges. I interpret her words as the beginning of her awakening to her process of learning and the benefits of Saima being able to work within an evental learning framework may enable her to develop further her metacognitive processes which were enabling her to start to make connections in her mathematical thinking, understanding and learning. By beginning to take some responsibility for her own learning through a carefully scaffolded approach constructed and directed by her teacher (literature review 2.3.1, Vygotsky, 1978: Rosenshine, 2012), Saima was beginning to feel comfortable in her maths-learning environment. Observations of her indicated that she had started to understand how she might be able to take some ownership of her own maths learning by strengthening further her ability to work collaboratively, to ask questions and to engage in an emotional awareness of how she learnt maths best. These are elements of evental learning and Saima may perhaps have benefitted from the inclusion of this to support her thinking, understanding, and learning in maths delivered through the Teaching of Mastery approach.

4.7 Maisie (B)

As a maths pupil, Maisie, like all of the other maths pupils, had to learn maths in the way that the school delivers it and then success in maths for her, was measured through her performance at the end of Key Stage Two SATS test. However, Maisie was an interesting character and even though she was able to comply and accept the way she was expected to learn maths, she was also very interested in the study and in getting involved in research. Maisie wanted to learn more about how she learnt and during the data collection period, Maisie appeared to enjoy having the opportunity to talk about learning. Our first discussion supports this idea:

Me: Do you find learning easy or hard Maisie – tell me about it.

Maisie: I haven't really thought about it before. I like learning. I like knowing things that I didn't know before. I think actually that learning can be easy and hard.

Me: Yes I know what you mean – sometimes it can be easy but sometimes it can be hard. How do you feel if the maths work that Miss gives you is a bit hard?

Maisie: I don't mind as long as I can have some help.

Me: What do you think about getting the maths wrong first, and then asking for help?

Maisie: It's also good when you make a mistake and then try again and get it right. That makes me feel clever because you got it wrong first but didn't give up and then got it right. I am not bothered about making mistakes as mistakes help me to learn.

Me: How does it make you feel when you are learning?

Maisie: It makes me feel even more clever if it get it right first time.

During one of our post lesson discussions, I brought up the topic of preparing for SATs. The reason for this was that the Y6 maths pupils had spent the week on the Mayan number system and SATs was not the focus of the learning that week. I wanted to know how important SATs were to my co-researchers. I asked Maisie for her views on whether it was important to her to be successful in maths, she told me:

Me: What do you think about the SATs test coming up later in the year for you Maisie?

Maisie: I know that my SATs results are very important to the teachers in secondary school, and I wanted to make my mum happy.

Me: Are they important to you?

Maisie: Not really, but I know we have got to do them, so I am going to try hard and do my best.

Me: I am sure that you will do really well.

Maisie: I like to know that I have done ok. I like it when my teacher tells me I am doing well.

During a discussion with Maisie which continued from during the lesson to after it had finished lessons, I was interested in Maisie's motivation to participate. She had been particularly involved in all aspects of the lesson and she had appeared interested to learn:

Me: You seemed like you really enjoyed making the game today, Maisie. Can you tell me about your maths lesson today?

Maisie: *I liked having a go at everything today. I was really in the mood to learn. I wanted to answer the questions that my teacher asked me because I wanted to make the board game and so wanted to know if I was right.*

Me: Was it important for you to get it right?

Maisie: Because we were making a game, I wanted to make sure that anyone can play it and they have fun.

Me: You looked like you had fun too today.

Maisie: Today, it was really fun. I had a good time. We had to create a game using all of the Mayan numbers we had learnt in the week and then we got to decorate the board with all of the Mayan art. I like it that we can do both maths and art together.

Me: Do you think you learnt anything about art or about maths today?

Maisie: I think I have learnt a lot today, I learnt how to use the numbers to make up a board game and we are going to play the games together tomorrow. It is exciting.

I asked all of my seven co-researchers if they wanted to draw a picture of what learning looked like for them. Maisie decided that she wanted to take up this challenge and produced a spiral image as seen here on the left. Maisie said to me that she had felt she had learnt something new, as she had not heard of the Mayan number system before the maths lessons of this week. When I asked her to tell

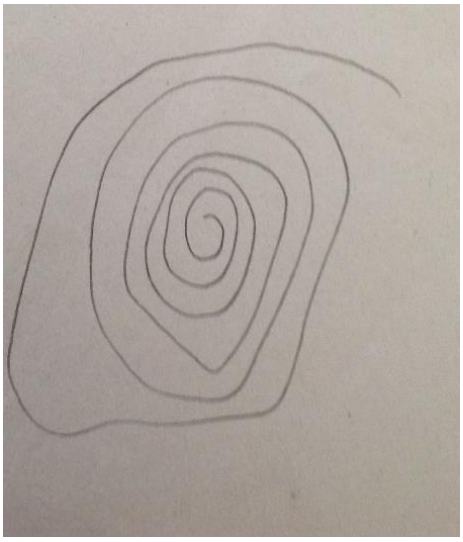


FIGURE 11 MAISIE DIAGRAM OF WHAT LEARNING LOOKED LIKE TO HER.

me how she knew she had learnt something, Maisie said that she felt excited when she was able to recognise the Mayan numbers and translate them into the Hindu-Arabic numbers that she was much more familiar with, and the excitement was linked to the feelings in her brain. The image that Maisie decided to draw as an interpretation of what learning looked like for her is interesting and I interpret her diagram as evidencing characteristics of resilience and stiving to flourish (Su 2020). Maisie drew a spiral diagram. In art terms, a spiral could go on forever as it could be argued that there is no end, apart from the end point that the artist themselves decided on.

Maisie understands that learning is a process. In ancient Greek mythology a spiral symbolises continuity. Maisie's (B) interpretation of her own unique approach to learning through the drawing of a spiral may have indicated a willingness to continue to learn and grow in her mathematics learning, as noted within Bruner's ideas of the Spiral curriculum (1960) and discussed in the literature review 2.3.2). From my recorded observations of her and through discussion with her, Maisie demonstrated to me that she wanted to attempt all activities, she wanted to have a go at everything, she wanted to take the lead, she wanted to help others and she wanted to see what she had already learnt.

I have made connections to the ideas and themes of my thesis to demonstrate how Maisie behaves as a maths pupil is a product of how she perceives success whereas in reality she is already a successful learner as she knows her strengths and what she needs to do next but needs to confidence to believe in herself. If the five elements of evental learning were incorporated into the delivery of mathematics, Maisie would perhaps have the opportunity to consciously consider her own self-belief and confidence levels. She may have been able to identify how she self regulates and identifies her own next steps as discussed in 2.3.2.

From my observations of and discussions with Maisie, she was a character who enjoyed doing well and appeared motivated to gain praise and positive reinforcement from who Vygotsky might call More Knowledgeable Others (1978) including teachers and parent figures (2.3.3.). Maisie wanted to do well but at the same time told me that she felt safe to make mistakes within her learning environment. Maisie displayed a mind-set where it was also necessary for her to succeed in her end of key stage tests both in primary and later on during her secondary school career. Maisie interpolated her identity as a maths pupil who has totally accepted the Teaching for Mastery approach as a way to meet her goal of becoming successful in her maths SATS test. Maisie's clear and open expression of her views evidenced her character as self-determining and motivated to succeed but for Maisie success was linked to praise. Her perception of how she could achieve her goals was to continue to

consciously subscribe to the habitus of the school, to follow rules, to comply fully and to accept the Teaching for Mastery approach to learning maths without question. Towards the end of each lesson, Maisie's behaviour was consistent. She always wanted to complete her learning by receiving some positive reinforcement from her teacher, which involved time and a positive emotional connection, as discussed in chapter 1, through the use of the research of Wolf 2009, Kirsten & Billman 1997, Illeris 2003.

What provoked Maisie to openly discuss her learning may have been linked to the relationship she has previously experienced between interaction with those deemed more knowledgeable (Vygotsky 1978 as discussed in 2.3.3) than her as well as the conditions in which she was able to learn. Rotter (1966) looked at motivation in two ways, internal and external as discussed in 1.1.2, and refers to an individual with an external locus of control as someone would look to blame other factors that were out of their control if their performance was perceived less well by others. When Maisie comments on the importance of completing her maths work accurately, she is motivated by extrinsic factors, Maisie knows she has done well only if she is told she has done well.

Masie put her hand up to answer every single question and sometimes offered an acceptable answer and sometimes was asked to think again, either way she maintained her enthusiasm and engagement. I would argue, however, that an evental learning approach would allow her to take more ownership of her progress in maths through use of both cognitive and affective domains. She already has an emotional response to the need to pass a test but by adopting the elements of evental learning she would have the opportunity for finding the space and time she needed to achieve those ends. Maisie might also, though evental learning principles, develop a more intrinsic level of control (Rotter 1966) as successful self-regulated learning depends on the success of learning strategies that are available to the learner to use. Maisie's characteristics of motivation were already evident throughout the data collection period and evental learning may support her to develop greater self-confidence and self-awareness to make her own judgements on her performance and therefore less reliance on needing praise from external sources.

Maisie is a character who persisted until she found a solution that made her feel comfortable and, in a position, to learn. She demonstrated that she already possessed the ability to use all five elements of evental learning to support mathematical understanding and progress in that she was already able to think, reflect, consider, discuss and do. I believe that the only reason Maisie was unable to directly articulate that she learnt using evental learning, is that she did not know about it. Her teacher had had some training during ITT of metacognition but as yet, the use of metacognitive process to support and awaken an awareness in Maisie of knowing how she learnt best, was not yet an embedded pedagogy of whole school maths organisation and provision. She demonstrated a willingness to explore and understand how she learnt, within a maths focused and motivated learning environment but still required external reward to support her to develop her own confidence and belief in herself and her abilities. This study gave the opportunity to do that and could have been the start of a revised way of thinking about the delivery of mathematics education within the school.

Chapter 5 Conclusions

What follows is my concluding chapter where I offer my ideas on future maths teaching and learning approaches and state how this thesis contributes to maths research for different audiences, including maths researchers, maths teachers, maths leaders and maths policy makers.

It is important for me to acknowledge my own epistemology and ontological position as my thirty-year career as a primary school maths teacher, a teacher educator and as a researcher within this thesis. It became the starting point for my investigation and exploration into current mathematical pedagogies. My ideas have been shaped through years of shifting maths curricula, each varying slightly but each claiming to be the most effective way to deliver and learn maths. Today, in my role as a teacher educator, I am acutely aware of my responsibilities to the next generation of primary maths teachers that I am training. I accept that I must follow ITT the prescribed course programme content and deliver modules to support my trainees to pass the course. However, it is important to me that I support them to recognise the value and importance of listening to the voice of the maths pupil and consider supporting the learning maths using metacognition, socialisation, and emotion irrespective of the commercial maths teaching package that their school has decided to buy.

I call, therefore, for consideration of the principles and processes of evental learning as a supplemental pedagogical approach towards learning maths. This I argue offers an amelioration of broadly neoliberalist education polices which have proved to be problematic for schools, teachers and pupils in several ways as discussed above.

5.1 Reflections and Recommendations.

Currently pupils in primary schools spend at least five hours per week learning maths and doing maths related work. With such an investment of available curriculum time, I am calling for all those involved in maths pedagogy to look again at the content and quality of the provision that is offered and consider its impact on learning and enjoyment for all maths pupils. I argue that there is potential for my evental learning approach to be implemented in maths and indeed throughout the whole of the English primary curriculum as a way of improving the experience and sustainability of learning at this early stage in pupils' education.

The evental learning approach requires pupils to have time for thinking, reflecting, reviewing, discussing and understanding how and when they want to approach a task or activity and to what extent they can employ affective and metacognitive processes to support their learning. The art of

reflection as a part of the learning process is gathering momentum within research and educational fields which makes the notion of evental learning timely and of some relevance when looking at pedagogical improvement with an aim to improving learning outcomes.

Throughout this thesis, I have sought to demonstrate the relationship between knowledge transfer and the emotional power of feeling confident in learning maths. Zizek, talks of 'Events' as seismic moments in history that have marked a change in society, forever changing how it viewed itself, its values and ideals. Such an 'Event' would be the very recent Covid 19 Pandemic (Zizek 2020) which affected the education system, and the business of learning maths was adapted and altered to include home learning and practical based learning for those pupils who were able to attend school. I talk of micro 'Events' which inform an evental learning pedagogical approach which looks at learning instances as events in a pupil's learning process that forever change how they view themselves as learners, their values and ideas about learning and their ability to sustain their learning and learn further. These events have the potential to inform changes, that would be experienced as part of an ongoing consciousness of what learning entails. Whilst I recognise that it is impossible for me to make predictions about the long-term impact of evental learning from the short period of my study, I consider it holds the potential to help maths pupils to overcome the ingrained social negativity surrounding maths in English society and learn how to enjoy learning how to do maths as a lifelong skill, not just to pass exams.

Whilst I firmly believe that this study has something to say, I acknowledge and recognise also that it has many limitations:

- The small number of participants was a limitation. Working with only seven participants enabled me to build a successful researcher/co-researcher/participant relationship. However, an opportunity for an in-depth understanding of the perceptions and ideas of a whole cohort of pupils was not possible in the time allowed. However, the study could be scaled up in similar future research projects to encompass a wider range of schools and a more representative sample of children.
- I missed the opportunity to question the seating arrangements of both schools. As a researcher I walked into the classroom and accepted what I saw. It may have added some value to the study to gain the teacher's perspective about why the classroom was arranged as it was and whether the seating arrangement was for maths or for the whole curriculum delivery.
- The research settings could be viewed as a possible limitation as there was a potential for bias in many ways. I had an existing relationship with both schools. I knew the staff and the children and the school maths policies really well, so I had to ensure that I remained as objective as I could when talking with the maths pupils about their experiences of learning maths.

- The selection of the participants was a limitation as they were selected initially by the class teacher within the three identified selection criteria. There was an opportunity for bias in the selection as the class teacher had a vested interest in ensuring the findings supported the future maths vision for the school. If I conducted this study again, I would give greater consideration to gender, ethnicity and cultural backgrounds within the three selection criteria as I have become more aware, whilst analysing my findings of how these aspects affect positions of cultural capital, epistemology and ontology.

- On reflection a limitation of this study was that I was so determined to capture the voice of the maths pupils, that I almost disregarded the views of the teachers. Any comments about the study that were offered to me from one of the maths intervention teachers and one of the class teachers, were informal and offered voluntarily, rather than part of my structured methodology. If I did this research again, I would conduct a formal interview with both of the class teachers, maths intervention teachers, the two maths lead teachers and the head teachers of each research setting and capture their views within an adult-centric driven maths curriculum. The focus of my questions to teachers could have been based on their views, knowledge and understanding of the Teaching for Mastery approach and their perceptions and thoughts around the notion of evental learning. This would have added another level of relevant interest to my study as it may have uncovered the extent to which teachers in school are able to adapt and refine their current maths organisation, delivery and assessment procedures, with an emphasis on interactions between learner, process and success of learning based on the ideas of Kolb (1984). Whilst the teachers in the school were extremely supportive of this study, by allowing me all the facilities and resources to carry it out, I feel that overall, this study missed the opportunity to record all of their views and opinions. I know that it is only by changing the attitudes of maths teachers that the provision of maths can be changed and ultimately the voices of the pupils be listened to more. My oversight of not interviewing the maths teachers in both settings has personally and professionally alarmed and disappointed me, but it provides me with the next important step of my research career and to achieve, through further research activities, my ambition that the voices of maths pupils will be heard.

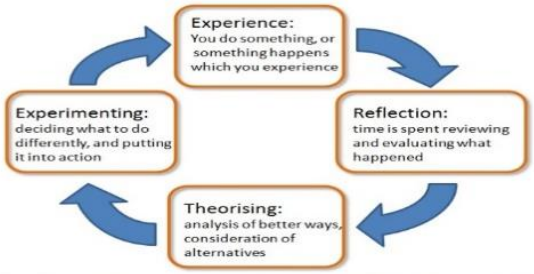


FIGURE 12 KOLB (1984) EXPERIENTIAL LEARNING CYCLE

- A further limitation is linked to the methodological approach of using focused discussions after each maths lesson. This does not present the reality of what a primary school maths classroom teacher can ordinarily do on a day-to-day basis, due to the constraints of time, their

busy role and many varied responsibilities of teaching a range of ten subjects across the curriculum.

5.2 My Contribution to Maths Research

In conclusion, from my research with the maths pupils in this study, it was clear that most of them felt that learning comes from within them. They sensed that they were learning when they felt an emotional connection to the subject and this had a positive effect on how they felt about themselves, not just as maths pupils, but as individuals who had more awareness about the purpose of the activities that they were engaged in and who were capable of making decisions on how they learn best.

It is my assertion that all adults connected to maths pedagogy need to become more aware of and recognise and value the struggles, fear, anxiety and battles that many maths pupils experience every day, in the pursuit of demonstrating their maths knowledge and a deeper mathematical understanding. It is vital to remember that the social relations between policy and the subject of discourse are adult driven, a fact that informs the overarching message of my doctoral claims:

My first doctoral claim is that the voices of maths pupils need to be heard and acted upon.

The relationship between learning and the affective domain needs to be at the forefront of teaching, especially regarding maths, given its negative status in English educational history. It is important for pupils to have the opportunity to verbalise how learning maths through the framework of Teaching for Mastery framed around the 5 Big Ideas and a formalised three-part lesson (NCETM 2017) feels for them and how they relate emotionally to the subject cannot be underestimated.

My original research questions sought to examine:

1. How can a more developed understanding of their own process of learning, which I am calling evental learning, support maths pupils to experience and understand learning more effectively and consciously?
2. How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum?

Much of the discussion in the vignettes focusses on how using evental learning processes and principles pupils would be able to influence of change the pedagogies and practices in their classroom so that they may suit them better.

My second doctoral claim is that evental learning principles and processes highlight and support the ways in which learning maths effectively depends on the social conditions of the teaching and learning discourse and environment.

By taking an evental learning approach, a more positive experience of learning in maths for all pupils may be consciously experienced by the maths pupil. For example, by slowing down the delivery of the maths content, teachers can offer pupils more opportunities to think, reflect and talk about how and what and why they are learning on a metacognitive level. This could help foster conscious and deliberate learning strategies which maths pupils could later apply to more complex mathematical problems as their educational journey continues.

With regard to my first research question:

> 1. How can a more developed understanding of their own process of learning, which I am calling evental learning, support primary maths pupils in English schools to experience and understand learning more effectively and consciously?

I wanted to explore the extent to which my contribution towards awakening maths pupils' awareness, as an insider-researcher, with the questions I asked and the focussed group discussion we engaged in, may have any impact in the outcome:

The vignettes demonstrated how the participation in the research occasioned some awakening and some awareness in my co-researchers. They demonstrated that primary maths pupils are able to reflect on how effectively they can learn within the context of the maths lessons that they are receiving as well as offer additional and alternative ideas on how they would like to learn.

My third doctoral claim is that this study highlights the importance of overtly including, at a curriculum level, processes of metacognition, socialisation and emotion in the construction of mathematical understanding for pupils.

By listening to the ideas of Su (2020) who talks of how a human being can flourish if presented with opportunities to do so, then the notion of teaching and learning mathematics can be considered on a greater holistic level. Currently Maths curricular is concerned with identifying success at the end of each educational key stage, and this is measured in the form of a maths test. Flourishing is not about an individual and how successfully they can complete a number of maths tests to demonstrate success, but instead it concerns itself with a lifelong relationship with mathematics. Societal relationships with maths are emotional but they are usually an extremely positive emotion or an extremely negative emotion. To flourish, according to Su (2020) is to engage with possibilities without fear or worry. Using the five elements of evental learning, alongside the preferred Teaching for Mastery approach as part of a national mathematics pedagogy, may awaken an awareness of how a maths pupil learns best and if this was to be understood, valued and respected, then more of us would truly flourish in maths.

My fourth doctoral claim is that without the recognition of a need for an emotional connection to maths, maths pupils are being denied space and time to think, reflect and become aware of their own learning as an emotional as well as an intellectual practice.

'It's not what happens to you, but how you react to it that matters.'

Epictetus, Stoic philosopher

There is no space for a Zizekian notion of Event in current maths curricula and pedagogies and subsequently no opportunity for an evental learning approach to be developed. In Zizekian terms this creates a 'climate for disaster' (Wall & Perrin 2015:51). Perhaps this is already happening, the result of a global overreliance on educational policies and agendas based on neoliberal ideologies about results and outcomes. It is important that all of us who work with young learners towards meeting the National Curriculum 2013 requirements to consider an evental learning approach which could help to provide a rich and creative learning experience, not only in mathematics but across the whole curriculum. If our learners were given space and time to think, reflect and consider across all subjects of learning and all concepts taught, then they might also develop their abilities to discuss with others, openly and with confidence and then practice their new ideas and skills in a safe and stimulating learning environment. This important point has significance to my original second research question, which sought to examine:

2.How might evental learning be used to support the teaching and learning of maths and other subjects in the primary curriculum?

Because the focus of this study was on the current provision of mathematics, my second original research question is connected to maths education. If maths educators were able to employ the teacher agency that I assert the Teaching for Mastery approach is reducing, then perhaps an opportunity may be proffered to start to think differently about the relationship between emotion and awareness of learning in maths pupils. The education sector is also currently trying to adapt to the post pandemic needs of the learners it serves. The time is never more prevalent than now to embrace and accept that a development of metacognitive abilities within maths pedagogy, consciously lays the foundation for the important lifelong skills of learning and applying mathematics.

Throughout this thesis, I have leaned heavily on the ideology of Zizek's notion of Event and re-purposed it within the pedagogy of maths. I have used Su's (2020) Human Flourishing theory and have utilised the combination of Event and Human Flourishing to present an argument for an approach to learning maths (and learning across the whole curriculum) called evental learning, which I believe elements of which are already evident in the way maths pupils engage with and think about mathematics but it is not yet formalised as part of the structure and organisation of maths delivery in school. Over the course of my writing this thesis, there has been a renewed educational and psychological interest in metacognition to support thinking, understanding and learning. I believe that

whilst Teaching for Mastery remains the preferred maths approach politically, an emotional connection to maths through evental learning will give all maths pupils the opportunity for an enjoyment of and a connection to learning maths, which will ultimately lead to success, as recognised not only by academic performance but also personal satisfaction, self-belief and accomplishment.

Finally, self-recognition of and refection on my own practice throughout the course of my doctoral journey has demonstrated to me the extent to which I have been influenced by policy discourses and successive new demands as a part of my own maths teaching career. I will take my new enlightened awakening to impact on my future practice with ITT students. Whilst I continue to work within the ITT department of a university, I must ask the question about teacher agency loudly and constantly so that my voice is heard on behalf of the next generation of maths teachers.

If I was to embark on further research as a result of my findings and conclusions in this original study, I would want to explore:

> **To what extent do trainee teachers have an opportunity to critically examine and evaluate ITT maths delivery in the light of neoliberalism, globalisation and marketisation?**

I am concerned at the decreasing levels of teacher agency as a consequence of the increase in policy and dictate at a centralised level. I believe that university should be a place where trainee teachers who are embarking on a future career which is people focussed, can ask questions freely and safely. Trainee Teachers should be able to critically examine what is increasingly being required from teachers in school and they have the opportunity to look for and offer alternatives. The current cohort of trainee teachers across the whole of England are the next generation of the teaching profession, and although I accept that change is inevitable, I am passionate that teaching should remain a profession whose impact on young lives and human flourishing, is second to none. I argue that for this to occur, trainee teachers need the opportunity to continue to explore and develop their own philosophy based on the principles and values that they have developed through being exposed to an investigative approach to maths pedagogy throughout their training. The five elements of evental learning is a pedagogy of resistance and can sit alongside any centralised endorsed approach to teaching mathematics, whether this is the national Strategies approach of the 1990's, the Teaching for Mastery approach (2016 onwards) or any approach introduced in the future. Evental learning is a process to support thinking, understanding and learning and through awakening maths pupils to how they learn best may support life-long learning and an ability to flourish.

5.3 Intended Audiences

This thesis can be useful to the following groups for different purposes: ITT Providers, Trainee Teachers, Teachers, Research Academics and Policy makers:

ITT Maths Providers:

- To promote an opportunity for trainee teachers to hear and respond to the voices of their pupils who experience the maths content that has been planned, organised and delivered from an adult perspective.
- To challenge government policy directives within ITT maths education.

Trainee Teachers:

- To raise awareness of the limitations of many of the commercial programmes that are being 'sold' to them under the requirements to cover the contents of the Core Content Framework within the ITT Market Review 2022.
- To have access to research papers which offer different perspectives and ideologies based on different areas of expertise and knowledge. This may support trainee teachers to work alongside a range of professionals within their training, teachers, researchers, academics, policy makers to enable a teacher training programme that is research driven and will enable critical thinking.

Teachers:

- To raise awareness of the issues of the influence of neoliberalism, globalisation and marketisation on the dictate of DfE policy guidance on content to be taught and how to deliver lessons within a primary school curriculum.
- To offer an opportunity to awaken awareness that the pupils have a voice and, if asked, can will offer valuable contributions to curriculum design.

Research Academics:

- To promote further discussion over ITT provision of primary mathematics and how it sits within HE framework and University vision which states as part of its vision:

> We aspire to change lives, inform practice and challenge perceptions through world-leading research and critical thinking.
>
> (BCU Vision Statement)

- To purposefully unsettle and disturb traditional views of how maths should be taught and to promote further research into current and future possible provision.

- To engage in further research working with children as co-researchers.
- To evaluate the use of a vignette as a methodological approach.

Policy Makers:

- To consider alternative ways of learning maths, based on established principles of how learning occurs and the inclusion of metacognitive processes in action.
- To consider an opportunity for inclusion of practice-based professionals to be part of consultation and decision making regarding future education curriculum policy.

5.4 Final thoughts and the future of maths education

The research in this study was of interest to the two participating schools as both of the school leadership teams had been actively encouraging their schools to be research driven. Both primary schools were interested in the development and improvement of maths provision in their settings and remained open to new ideas. The research data was able to offer school leadership teams an informed view of the thinking, understanding, and learning processes of the maths pupils who were participants in the study and who had to learn maths under the current Teaching for Mastery approach. It is my assumption that after sharing my findings with the school maths lead teacher and the head teacher of both settings, consideration will have been made to future maths provision in their schools, especially with regard to primary school learning, post-pandemic.

In 2021, Oxford Education Press invited a selection of respected maths education experts, led by Mitra (2021), to consider the question of how learners might best learn maths in the future within the post pandemic world. The panel shared a vison that all maths pupils should be introduced to the world of mathematics which will support lifelong skills including resilience, connection, curiosity, and creativity.

The panel shared their ideas, which I wholeheartedly support, which reflected the need to awaken pupils' curiosity by developing a maths curriculum where all maths pupils have some autonomy to lead their own learning. The panel also considered how the pandemic in 2020, forced learning to go on-line and argued that this method of teaching and learning maths could still be utilised to support maths pupils to better develop the metacognitive skills of inquiry and self-questioning needed for distance learning.

Mitra (2021) further argued that the need to unleash creativity through the re-ignition of teacher agency is crucial to ensuring that future maths lessons are planned creatively and imaginatively. In addition, they supported the idea of building on the parental involvement that was so needed during the pandemic. During this time the panel recognised that many maths pupils received

individualised support which was gained from spending more time with their parents or carers. This has helped to:

> …foster positive dispositions towards learning, allowing many families to find enjoyment in mathematics, and to make and learn from mistakes, with a playful approach that reduces anxiety about the subject.

Oxford University Press, Mitra *et al* (2021) Taken from the blog on The Silver Lining Report.

The expert panel, led by Mitra (2021) stated that online learning may have supported a more personalised and focussed learning experience, which in turn supported maths pupils to self-regulate. Within the Oxford University press blog called 'The silver lining: What changes did 2020 bring to the future of maths teaching?' Mitra *et al* (2021) argue that it is now time to reconsider what exactly a school is and suggest that a school needs to be a place for academia but also for emotion and metacognition. Their message was to encourage policy makers and educational leaders to think about learning settings as emotional spaces as well as cognitive spaces. They note the importance of focussing on nurturing children's capacity and enthusiasm for learning rather than filling gaps in prior learning.

The children as co-researchers who were fundamental to the success of this study, are the maths pupils who are directly experiencing the government led offer of today and they have clear ideas of what works well and what could be improved. The vision of my thesis is that a more evental maths education in primary school contexts would promote a positive attitude towards maths learning and help learners to release their learning power. The report produced by Mitra *et al* (2021) argue that through a maths delivery experience where teachers have the agency to adapt their approach to teaching maths, maths pupils will be supported to adapt their approach to learning. In turn this will develop skills that will be valuable to promote maths confidence and the ability to become flexible learners in the future.

It is time to listen and time to change the focus and purpose of learning maths; the next generation of maths pupils deserve it.

52921 words.

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Appendix 1 Policy Timeline

Timeline	Policy Reform	Main points
1976 Callahan Ruskin speech	Green paper *Education in schools: a consultative document*	Primary schools have been transformed in recent years by two things: a much wider curriculum than used to be considered sufficient for elementary education, and the rapid growth of the so-called "child-centred" approach' (DES 1977:8). It commended many aspects of these developments. 'In the right hands, this approach has produced confident, happy and relaxed children, without any sacrifice of the 3Rs or other accomplishments - indeed, with steady improvement in standards. Visitors have come from all over the world to see, and to admire, the English and Welsh "primary school revolution"' (DES 1977:8).
1978	HMI's survey of *Primary education in England*.	'the teaching of the basic reading skills was accorded a high degree of priority' (HMI 1978:47) and that there had been 'a rising trend in reading standards between 1955 and 1976-77' (HMI 1978:45). It concluded that 'teachers in primary schools work hard to ensure that children master the basic techniques of reading and writing. There is little support for any view which considers that these aspects of language are neglected in primary schools' (HMI 1978:51).
Conservative era 1980	*A framework for the school curriculum*	At the heart of the education system are individual schools. Their role is vital, both in contributing to the formulation of agreed local policies, and in translating these into curricular content in the light of particular needs and circumstances.

1980	*A View of the Curriculum*	As a first step towards the development of such a framework the Secretaries of State have invited HM Inspectorate to formulate a view of a possible curriculum on the basis of their knowledge of schools.' This document is the response to that invitation.
1981	*The School Curriculum*	This paper covers the whole period of compulsory education. What is taught at school should be adapted to the needs of every pupil, including the gifted, and those with special educational needs, so that everyone is appropriately prepared for the practical demands of adult and working life.
1984	The Council for the Accreditation of Teacher Education (CATE) was established	To set standards for initial teacher training courses.
1985	*The Curriculum from 5 to 16*)	Required LEAs to report on their progress in developing curriculum policy.
1988	*1988 Education Reform Act*	Presented as giving power to the schools. In fact, it took power away from the LEAs and the schools and gave them all to the Secretary of State - it gave him hundreds of new powers. Even more importantly, it took a public service and turned it into a market. The Act imposed on schools a National Curriculum written by a government 'quango' (quasi-autonomous non-government organisation). Teachers had virtually no say in its design or construction. It was almost entirely content-based. Addressing a conference at the University of London Institute of Education, Dennis Lawton described the new curriculum as 'the reincarnation of the 1904 Secondary Regulations'. It was huge and therefore unmanageable, especially at the

		primary level. It divided the curriculum up into discrete subjects, making integrated 'topic' and 'project' work difficult if not impossible. It prevented teachers and schools from being curriculum innovators and demoted them to 'curriculum deliverers'. And its implementation led to a significant drop in reading standards.
1988	*National Curriculum Task Group on Assessment and Testing* (TGAT).	Each pupil was to be assessed on ten 'Levels' across hundreds of 'Attainment Targets' in the ten National Curriculum subjects. It never had a chance of working and was soon drastically reduced.
1992	*Curriculum Organisation and Classroom Practice in Primary Schools: A discussion paper*	There was evidence of falling standards in some 'important aspects of literacy and numeracy' (DES 1992:1); that Piaget's notion of 'learning readiness', as set out in the Plowden Report, was dubious and that the progress of primary pupils had been 'hampered by the influence of highly questionable dogmas' (DES 1992:1); that while there was a place for well-planned topic work more emphasis should be put on the subjects of the National Curriculum; and that many primary teachers were not equipped to teach subjects effectively so there should be more use of specialist teachers.
Labour era 1997	*Excellence in schools*	It was proposed that at least an hour a day in primary schools would be spent on English and an hour on maths. Teachers would be told not only *what* to teach but *how* to teach it.
1997 - 2011	The National Strategies	The National Strategies have supported the delivery of a wide range of programmes, including: • The Early Years Foundation Stage (EYFS) framework and materials, with a particular focus on supporting the narrowing of gaps in early years outcomes.

		• The development of systematic synthetic phonics through the Communication, Language and Literacy (CLLD) programme. • Improved pedagogy and subject knowledge in the core subjects of primary and secondary English and mathematics, and in secondary science. • Improving attainment and progress of the lowest-attaining 5% of children in primary schools through the Every Child programmes. • Primary programmes such as the Improving Schools Programme (ISP), which was originally targeted at schools below floor targets but was later extended as a bespoke support to a wider range of schools. • Support for secondary schools below floor targets (National Challenge). • The School Improvement Partner (SIP) programme. • Behaviour and Attendance, including the well-regarded Social and Emotional Aspects of Learning (SEAL) programme. • Special Educational Needs (SEN), including the highly successful Inclusion Development Programme (IDP) and the Achievement for All (AfA) pilot. • Narrowing the Gaps (for pupils on free school meals, black and ethnic minority pupils and gifted and talented pupils from deprived backgrounds).
2001	White Paper *Schools - achieving success*	The New Labour government seemed to have mixed views on the value of the National Curriculum. It announced that only English, maths, science, IT and swimming would now be statutory requirements for primary schools,

		though the schools were still required to provide a 'broad curriculum'. Successful primary schools could opt out of the National Curriculum and develop curriculum innovations.
By 2003,	National Literacy Strategy review	Concerns were growing about the effectiveness of the National Literacy Strategy. Ministers announced that it would be reviewed, since it had failed to deliver any improvement in reading and writing scores in three consecutive years
2004	Introduction of 'synthetic phonics'	Ofsted published *Reading for Purpose and Pleasure: An evaluation of reading in primary schools*. The following year the government announced that it would force schools to teach reading by the 'synthetic phonics' method
2006	The Primary Review	Led by Professor Robin Alexander, it has been widely seen as the successor to the 1967 Plowden Report. The 2006-8 Review 'seeks to combine retrospective evidence with prospective vision. Like Plowden, the Primary Review seeks to be reasonably comprehensive. Like Plowden, the Primary Review hopes to make a difference.
2008	The Rose Review	Secretary of State Ed Balls wrote to Sir Jim Rose inviting him to conduct 'an independent review of the primary curriculum'
2009	*Towards a new primary curriculum*	Published in two parts: *Past and Present* and *The Future*. In the authors' view, a future primary curriculum must: • confront and attempt to address the problems and challenges in current arrangements; • be grounded in explicit principles of design and implementation;

		• pursue and remain faithful to a clear and defensible statement of educational aims and values (Alexander and Flutter 2009b:21).
2014	National Curriculum 4th iteration	To include sex and relationships
2016	Teaching for Mastery	Maths approach taken from Shanghai/Singapore endorsed by OfSTED, NCETM and DfE and to be used in every primary school when teaching mathematics.
2020	Recovery Curriculum	To be adopted with emphasis on mental health and well-being after world pandemic