“I’m Going to Maybe Not Get It Right”:

Exploring Year 2 Children’s Lived Experiences of Maths and Early Maths Anxiety

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Introduction and Overview

Mathematics (maths) anxiety has increasingly been recognised as a barrier to children's learning, wellbeing, and long-term engagement with maths, yet the voices of young children themselves remain largely absent from the evidence base. Much of what is known about early maths anxiety is inferred from adult perspectives, quantitative measures, or older learners, leaving a gap in understanding how younger children experience, interpret, and emotionally respond to maths within the everyday contexts of their classrooms. As a Trainee Educational Psychologist (TEP), I am acutely aware of how early emotional experiences shape later academic identity, self-efficacy, and participation. My professional practice has repeatedly highlighted the importance of listening to children's lived experiences, particularly in domains, such as mathematics (maths), where evaluative cultures, ability narratives, and classroom structures can profoundly influence confidence and engagement. This study therefore seeks to foreground children's voices, exploring how Year 2 pupils working at expected attainment levels make sense of maths and how early signs of maths anxiety emerge within relational, contextual, and developmental processes.

My positionality as a practitioner-researcher shaped both the design and interpretation of this study. Having worked extensively with young children, I hold a commitment to childist principles that position children as competent meaning-makers whose perspectives warrant direct attention. This stance informed my methodological choices, my reflexive engagement with the data, and my aim to generate findings that are both academically rigorous and practically meaningful for Educational Psychologists (EPs). Understanding children's lived experiences of maths is essential for EPs, who play a key role in early identification, systemic consultation, and the development of emotionally attuned, inclusive learning environments.

This thesis is divided into three chapters: a literature review, an empirical paper, and a reflective account of the research process. In the first chapter, I present a narrative review of literature relating to maths anxiety in children, drawing together existing research to establish what is known about early maths anxiety, how it is identified, and how it may be supported. This review informed the design of the

empirical study that follows. The second chapter comprises the empirical paper, outlining the research aims, design, methodology, and presenting and discussing the findings. The final chapter offers a reflexive account of the research process, including personal and professional reflections, philosophical considerations, and plans for disseminating the findings.

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Chapter 1: A Narrative Literature Review on Mathematics Anxiety in Primary School Children

1.1 Introduction

This narrative literature review aims to examine how mathematics (maths) anxiety is conceptualised, measured and experienced in younger primary-aged children, with particular attention to contributory factors, children's perspectives, and implications for understanding early emotional responses to maths. This chapter synthesises and critically examines existing literature on maths anxiety and negative emotional responses to maths in primary-aged children, with particular attention to prevalence, contributory factors, and children's lived experiences. In doing so, it considers how maths anxiety has been conceptualised, operationalised and explained within existing research, while identifying limitations and gaps in the evidence base that informs the rationale for the subsequent empirical study. The maths anxiety literature remains weighted towards adolescents, adults, university students and teachers, including pre-service teachers, with comparatively limited research involving younger primary-aged children. The literature review identified a gap in relation to the experiences of younger primary-aged children. This review therefore focuses on early primary-aged children, with particular attention to Year 2, because existing research suggests that early signs of maths anxiety may emerge before negative mathematical self-beliefs and avoidance patterns become more established. The review considers literature relevant to younger primary-aged children's emotional responses to maths and identifies gaps that inform the empirical focus on Year 2 in Chapter 2.

This narrative literature review aims to develop a critically informed synthesis of literature relating to the conceptualisation, measurement and lived experience of maths anxiety in younger primary-aged children, with particular attention to factors that may contribute to its early development. A narrative approach was selected because the field includes heterogeneous forms of evidence, including quantitative studies, qualitative research, theoretical literature and policy documents. Narrative reviews are particularly suited to areas where the evidence base is conceptually and methodologically diverse, and where the purpose is to interpret, integrate and critically synthesise bodies of literature rather than aggregate findings statistically (Baumeister & Leary, 1997; Snyder, 2019). Rather than seeking to aggregate effect sizes, this review aims to interpret and synthesise diverse forms of evidence in order to develop a conceptually integrated understanding of early maths anxiety. Therefore, this literature review serves the purpose of being an interpretive synthesis of the information that currently exists around this area and the search terms outlined below and supports the development of a multi-layered conceptual understanding of early maths anxiety. Using a narrative approach enables the researcher to bring together definitions, theories, lived experience and contextual influences.

This study draws upon attribution theory (Weiner 1985, 2010), Bronfenbrenner's bioecological systems theory (Bronfenbrenner & Morris, 2006), cognitive models of anxiety, and a childist epistemological stance to construct a multi-layered understanding of early maths anxiety. Together these perspectives allow early maths anxiety to be understood as a cognitive, emotional, relational and systemic phenomenon rather than solely as an individual difficulty located within the child.

Each section of this review is guided by a critical question posed of the literature. Rather than summarising the studies thematically alone, the review considers how well the existing evidence base answers these questions. This enables the review to examine not only what is known about early maths anxiety, but also the strength, limitations and applicability of the knowledge for understanding the lived experiences of young primary-aged children. The questions will cover how maths anxiety is defined and conceptualised; the emergence of maths anxiety, how it is measured in young children; what cognitive, relational and contextual factors contribute to its development; how it affects learning, wellbeing and engagement; and what is known about children's own experiences of maths-related emotional distress and how early identification and intervention can support. Literature was identified through searches conducted between September 2024 and June 2026 using the following search strategy.

1.2 Search Strategy

Literature searches were conducted between September 2024 and June 2026 to identify research relevant to maths anxiety, emotional responses to maths, and children's experiences of maths in the early primary years. As this review is narrative rather than systematic, the aim was not to provide an exhaustive account of all the available studies, but to identify, interpret and synthesise literature that could inform a conceptually rich understanding of early maths anxiety and its relevance to EP practice.

Searches were undertaken using a university library database powered by EBSCOhost, alongside Google Scholar. To extend the breadth and rigour of the narrative search process, database searches were supplemented by hand-searching

and manually reviewing the reference lists of key papers. This enabled the identification of further empirical, theoretical, policy and professional sources that were conceptually relevant but may not have been captured through keyword searches alone. This included government guidance, legislation and publications relating to maths education, special educational needs and disabilities (SEND), pupil voice, and EP practice to identify any additional literature that would be relevant and appropriate to this study. A search strategy was developed to enhance the rigour of this literature review using terms developed to capture literature relating to the construct of maths anxiety, the early primary age range, children's lived experiences, and educational context. As shown in Table 1, Boolean operators were used where appropriate to combine terms, for example: "math* anxiety" AND "primary school"; "math* anxiety" AND "child*" AND "experience"; and "numeracy anxiety" AND "child*". Initial screening involved reviewing titles and abstracts to assess relevance to the focus of the review.

Table 1

Search Terms Used to Identify Literature Relevant to Early Maths Anxiety

Search focus	**Search terms**
Maths anxiety construct	"math* anxiety"; "numeracy anxiety"; "numeracy apprehension"; "maths attitudes"; "math* self-concept"
Age range and educational phase	"primary school"; "Key Stage 1"; "Year 2"; "child*"
Children's perspectives and lived experience	"pupil voice"; "children's perspectives"; "lived experience"
Example Boolean combinations	"math* anxiety" AND "primary school"; "math* anxiety" AND "child*" AND "experience"; "numeracy anxiety" AND "child*"

Inclusion and exclusion decisions were guided by relevance to the aims of the narrative review. Literature was included where it addressed maths anxiety, numeracy anxiety, negative emotional responses to maths, maths attitudes, children's experiences of maths, pupil voice, or educational contexts relevant to early maths anxiety. Priority was given to studies involving primary-aged children, particularly those in Key Stage 1 or comparable early primary age ranges. Studies involving older children, adolescents, adults or teachers were included where they offered conceptual, theoretical, methodological or contextual insight relevant to understanding early maths anxiety. Literature was excluded where it focused solely on maths attainment, curriculum content or pedagogical approaches without reference to emotional, affective, motivational, relational or experiential dimensions. Sources were also excluded where they were not meaningfully applicable to children's maths experiences or did not contribute to the conceptual, empirical or professional aims of the review. No strict exclusion criteria were applied to year of publication because foundational work on maths anxiety remains important to the conceptual development of the field. For example, early definitions and measurement tools continue to shape contemporary research. Priority was given to literature published from 2015 onwards where possible, given the relevance of the SEND Code of Practice (Department for Education [DfE] and Department of Health [DoH], 2015), the increased emphasis on pupil voice and person-centred practice, and more recent developments in maths anxiety research with younger children. Peer-reviewed empirical studies available in full text were prioritised, although policy documents, professional guidance, doctoral theses and theoretical texts were included where they helped to contextualise the issue within EP practice and the wider education system. Kirkland and Hunt (2025) are cited frequently throughout

this review because it provides a recent, field-specific synthesis of maths anxiety research, drawing together the authors' work and a broad range of existing empirical and theoretical studies. It is therefore used as a secondary synthesis source to support conceptual framing and to signpost wider debates within the literature, rather than as a standalone empirical study.

Given the focus on early primary-aged children in England, particular attention was paid to literature from UK contexts and to research that could be meaningfully related to the English education system. This was important because curriculum sequencing, school starting age, classroom practices and assessment processes vary across national contexts. International research was included where it offered relevant conceptual, theoretical, methodological or empirical insight, but its applicability to younger children in England is considered critically throughout the review. This was necessary because the UK evidence base remains limited, particularly in relation to younger primary-aged children and children's own lived experiences of maths anxiety. Where international studies are discussed, their applicability to early primary-aged children in England is considered critically, with attention to differences in curriculum expectations, assessment systems, pedagogical traditions, cultural meanings attached to maths and the age groups studied. These studies are used to inform and extend the review, rather than to make direct generalisations about early primary-aged children in England. This means that although international research contributes important evidence to the review, the limited availability of UK-based studies with younger primary-aged children remains a significant limitation within the field.

The inclusion of studies was guided by relevance rather than methodological hierarchy. The search strategy reflects the purpose of a narrative review: to draw

together diverse bodies of literature (Baumeister & Leary, 1997; Snyder, 2019) in order to develop an integrated understanding of early maths anxiety. This approach is particularly appropriate because the research area spans cognitive psychology, developmental psychology, education, policy and EP practice. The review therefore does not aim to offer a systematic-quality appraisal or meta-analysis. Instead, it seeks to critically synthesise key themes, tensions and gaps across the literature, with particular attention to the limited evidence base concerning younger children's own accounts of maths-related emotional experiences. This review informs the rationale for the present study, which aims to explore how Year 2 children make sense of their experiences of maths and early signs of maths anxiety within the classroom.

1.3 How has maths anxiety been conceptualised in research?

Before considering how maths anxiety has been conceptualised, it is necessary to clarify what is meant by maths itself. This matters because maths is not a single, uniform activity, but a broad curriculum domain involving numerical, spatial, procedural, conceptual, communicative and problem-solving demands. Although maths anxiety is widely researched, the literature rarely provides an explicit definition of maths itself; instead, the nature and scope of maths are typically implied through the tasks, domains or curricular content examined. This lack of definitional clarity is significant because children's anxiety may attach to particular mathematical demands, representations or classroom practices rather than to maths as a single global subject.

For the purposes of this study, maths is understood in line with Dowker et al. (2016) as a broad set of numerical and spatial concepts and procedures, including

counting, arithmetic, problem-solving, and reasoning, providing the conceptual scope within which children's experiences of maths anxiety emerge. At a broader educational level, maths involves conceptual understanding, reasoning, problem solving, representation, mathematical communication and the capacity to apply abstract ideas to everyday, academic and future occupational contexts. Within the UK educational context and the National Curriculum maths is defined as "a creative and highly interconnected discipline… essential to everyday life" and foundational for reasoning, problem-solving, and understanding the world (DfE, 2021). This provides a curriculum-level conceptualisation of "maths" that underpins the content children encounter and, consequently, the contexts in which maths anxiety may arise.

Learning maths is therefore important because it provides children with more than a set of school-based skills. Early mathematical understanding supports children to interpret the world around them, notice relationships, solve everyday problems, reason with evidence and participate in social, economic and community life. In the early years and Key Stage 1, mathematical development is also associated with wider aspects of learning, including language, executive function, metacognition, self-regulation, curiosity and persistence. Secure early mathematical foundations are particularly significant because early attainment is strongly associated with later educational outcomes and future opportunities (as discussed later in the chapter). Conversely, when children experience persistent difficulty, limited confidence or avoidance in maths, they may have fewer opportunities to practise, consolidate understanding and experience success, potentially widening attainment gaps over time.

As a contemporary synthesis text rather than a single empirical study, Kirkland and Hunt (2025) is used in this section to support conceptual framing and to

locate individual empirical findings within wider debates in maths anxiety research. Where empirical claims are made, their synthesis is considered alongside primary studies to avoid treating the text as standalone research evidence.

Research into attitudes towards maths indicates that maths anxiety sits within a broader affective domain that includes enjoyment, confidence, self-efficacy, motivation, beliefs and identity. Maths attitudes encompass an individual's views about maths, including the extent to which they enjoy the subject and perceive it as valuable, relevant or applicable to everyday life (Kirkland & Hunt, 2025). Individuals experiencing maths anxiety may therefore be more likely to hold negative attitudes towards learning and using maths, including beliefs that maths is not useful, interesting or enjoyable (Hembree, 1990; Kirkland & Hunt, 2025). This is significant because attitudes have been found to influence behaviour, engagement and motivation, while negative attitudes may contribute to reduced resilience, diminished effort and avoidance behaviours (Popham, 2005). Attitudes have been operationalised within maths anxiety research through measures such as the Fennema-Sherman Mathematics Attitudes Scale (Fennema & Sherman, 1976) and scales developed by Gierl and Bisanz (1995) and Thomas and Dowker (2000), indicating that the affective dimensions of maths learning have long been recognised as relevant to understanding learners' mathematical experiences. However, the relationship between attitudes and maths anxiety should not be treated as straightforward or deterministic. Research indicates that learners with positive attitudes towards maths can also experience maths anxiety (Cipora et al., 2015), and that maths anxiety may also occur in those who are mathematically able (Kirkland & Hunt, 2025). Although correlational research has shown an association between negative attitudes and higher levels of maths anxiety, with a stronger relationship

reported in secondary school students than in post-secondary learners (Hembree, 1990), such evidence does not establish directionality. There remains debate about whether maths anxiety contributes to a decline in positive attitudes towards maths, whether declining positivity increases vulnerability to maths anxiety, or whether these processes develop reciprocally over time (Kirkland & Hunt, 2025). Tuohilampi et al. (2014) found that pupils in Finland often had positive attitudes before entering primary school, which deteriorated over the course of schooling, suggesting that educational experiences may play an important role in shaping children's developing relationship with maths.

Overall, the evidence suggests that maths anxious individuals may be more likely to hold negative attitudes towards maths, but that negative attitudes are neither a necessary nor sufficient condition for maths anxiety. This distinction is important because it prevents maths anxiety from being reduced to dislike or disengagement and highlights the need to understand the wider affective, motivational and contextual processes through which children's relationships with maths develop. Supporting students to develop positive attitudes towards maths may therefore contribute to addressing maths anxiety and improving their broader relationship with the subject, but such support should be understood as one component within a more comprehensive response to children's emotional experiences of maths (Kirkland & Hunt, 2025).

Positive attitudes towards maths are also educationally significant. Children who experience maths as meaningful, accessible and emotionally safe are more likely to engage with challenge, persist when tasks become difficult, take risks in their thinking and recover from mistakes (Grootenboer & Marshman, 2016). In this sense, mathematical progression is not only cognitive but also affective and

relational: children's beliefs about whether they can do maths, whether mistakes are acceptable, and whether support is available, shape how they participate in lessons. Where children develop negative attitudes, low self-efficacy or anxiety, maths may become associated with threat, shame, helplessness or avoidance (Grootenboer & Marshman, 2016). This can have consequences not only for immediate attainment, but also for children's developing identities as learners and their willingness to pursue future pathways involving numeracy, science, technology or applied problem solving. It is also important to note that research has shown that being maths anxious does not preclude positive feelings and attitudes towards the subject (Cipora et al., 2015; Kirkland & Hunt 2025). This suggests that attitudes towards maths are not merely background dispositions, but part of the affective context through which maths anxiety may emerge, intensify or be buffered.

Approaches to teaching maths in England have also changed substantially over the last 20 years. Earlier policy and classroom practice were often shaped by the National Numeracy Strategy and a strong emphasis on mental calculation, pace, interactive whole-class teaching and raising standards in basic numeracy. More recently, the 2014 National Curriculum intensified expectations around fluency, reasoning and problem solving, with an emphasis on secure conceptual understanding, rapid and accurate recall, and progression through increasingly complex mathematical ideas (DfE, 2021). Since 2014, teaching for mastery has become a particularly influential policy and pedagogical direction in English primary maths teaching, influenced in part by approaches associated with high-performing East and South-East Asian education systems. These developments are important for the present review because they show that maths education in England has increasingly foregrounded mathematical competence, coherence, progression and

mastery. However, they also raise questions about how children experience these expectations emotionally. Approaches that support deep understanding, dialogue and conceptual security may provide protective conditions for confidence and engagement, whereas classroom cultures that are experienced as overly fast-paced, evaluative or focused on visible correctness may contribute to anxiety, avoidance or negative mathematical self-beliefs for some children. Consequently, any conceptualisation of maths anxiety in younger children needs to be situated within the changing pedagogical and policy context of maths education, rather than understood solely as an individual child-level difficulty.

Maths occupies a distinctive position within schooling because it is widely regarded as both educationally important and, for many learners, difficult (Kam Chi & Cameron-Flitcroft, 2025). Kam Chi and Cameron-Flitcroft's (2025) study should be interpreted as indirect evidence, as it draws on qualitative data from UK primary school teachers about their understandings of children's maths experiences and anxiety, rather than eliciting children's own perspectives directly. Whilst research relating to maths skills and attainment has largely focused on cognitive factors, including information-processing and neuropsychological components, self-efficacy, attitudes towards maths and other emotional and motivational processes have been less considered (Kaskens et al., 2020; Shore & Kelleher, 2024). Maths learning should not only be considered in terms of concepts, procedures, maths curriculum, and instruction but also the emotions and anxieties children may bring to the learning situation (Ramirez et al., 2013). Although children may begin school with broadly positive attitudes towards maths (Nicolaidou & Philippou, 2003), maths learning cannot be understood solely through cognitive competence or attainment. Children's engagement with maths is shaped by an interaction between cognitive, emotional

and motivational processes, including beliefs, self-efficacy, motivation and anxiety (Hunt & Petronzi, 2024; Kam Chi & Cameron-Flitcroft, 2025). This is particularly important because widespread underachievement in maths continues to be reported, alongside avoidance of maths and a wide attainment gap between pupils with different levels of advantage and attainment (Organisation for Economic Co-operation and Development [OECD], 2013; Ofsted, 2021). Within this context, maths anxiety becomes a central issue for maths education because it concerns not only performance but also psychological safety, wellbeing, resilience and children's willingness to engage with maths learning (Hunt & Petronzi, 2024). Psychologists have become interested in maths anxiety as it "sits at the intersection between emotion and cognition" (Kirkland & Hunt, 2025).

Research into anxiety in relation to maths began in the 1950s. Mary Gough introduced the term 'mathemaphobia' in 1954 (Kirkland & Hunt, 2025). Early work by Dreger and Aiken (1957) identified a lack of research attention to emotional factors in mathematical learning. They referred to 'number anxiety'. Since then, research has increasingly examined the emotional and psychological barriers associated with maths, using terms such as maths anxiety, numeracy anxiety and numeracy apprehension (Petronzi, 2017). The term number anxiety was gradually replaced by maths anxiety because researchers recognised that anxious responses were not limited to numerical tasks. Number or numeracy anxiety or apprehension was deemed to be too narrow to fully explain the concept. As measurement tools and theoretical models developed, it became clear that the anxiety encompassed a wider range of mathematical activities including problem solving, symbolic reasoning, and classroom evaluation leading to the adoption of the broader and more accurate term maths anxiety. In this thesis, the term maths anxiety is used because it is the

dominant construct within the literature and allows engagement with the wider empirical and theoretical evidence base. Given the young age of the participants, this study refers to early signs of maths anxiety rather than assuming that young children experience a fixed or clinical-like construct.

Definitions of maths anxiety have varied across the literature but consistently emphasise negative emotional responses to maths-related situations. Hembree (1990) describes maths anxiety in terms of feelings of incompetence, anxiety, worry and fear in maths-specific contexts (including contact with maths, classes, homework and tests), Tobias and Weissbrod (1980) use the words panic, helplessness, paralysis and mental disorganisation to describe maths anxiety, while Richardson and Suinn (1972) define it as anxiety that interferes with the manipulation of numbers and the solving of mathematical problems in both academic and everyday settings. Although Richardson and Suinn (1972) retained a strong emphasis on numerical manipulation, reflecting the earlier 'number anxiety' literature, their definition also incorporated wider mathematical problem-solving demands and everyday mathematical situations. This positions their conceptualisation as broader than number anxiety but not yet aligned with contemporary understandings of maths as a diverse, multi-component discipline. Ashcraft (2002) offered a conceptualisation that suggested a broader range of mathematical skills, defining maths anxiety as the negative feelings experienced when thinking about, anticipating or performing mathematical tasks. This anticipatory dimension is important, as the prospect of doing maths alone has been found to elicit negative emotional responses among students with high maths anxiety (Lyons & Beilock, 2012). More recently, Kirkland and Hunt (2025) define maths anxiety as a negative response to an individual's previous, current or anticipated experiences of maths, including learning, evaluative

and applied contexts, and as typically comprising emotional, cognitive and behavioural components. Neuropsychological evidence (referring to research using brain-based or cognitive neuroscience methods) further supports the validity of maths anxiety as a substantive affective phenomenon, with research indicating maths anxiety is associated with patterns of brain activation linked to threat detection, emotional regulation, attentional control and mathematical processing. Such findings suggest that, for maths anxious individuals, anticipation of mathematical activity and mathematical stimuli may be experienced not merely as difficult or aversive, but as emotionally and physiologically threatening, with neural responses overlapping with systems involved in threat, distress or physical pain-related processing (Kirkland & Hunt, 2025). Trujillo and Hadfield (1999) introduce the idea that maths anxiety is related to a state of discomfort that might be experienced if an individual perceives a mathematical situation as a threat to their self-esteem.

Maths anxiety has been conceptualised not as a single, uniform construct, but as a multidimensional phenomenon that may vary according to stability, timing, context and task demand. Whilst most definitions involve the word tension, referring to mental or emotional strain, key distinctions within the literature include trait and state maths anxiety, anticipated and real-time emotional responses, and global versus specific forms of maths anxiety. These distinctions are important for research with younger children because early maths-related anxiety may be situational, developmentally fluid and closely shaped by particular classroom experiences, rather than reflecting a stable or generalised disposition towards maths.

Some studies distinguish between trait and state forms of maths anxiety. Trait maths anxiety refers to a relatively enduring tendency to experience anxiety in relation to maths, whereas state maths anxiety refers to a temporary, situation-

specific emotional response during or in anticipation of mathematical activity (Spielberger, 1972). This distinction is important for research with young children because many self-report measures ask children to imagine or retrospectively report how anxious they would feel in maths-related situations, an approach Petronzi (2017; Petronzi et al., 2019a; Petronzi et al., 2019b) argues is developmentally inappropriate for 4-7-year-olds, who often lack the cognitive maturity for such reflective judgement. Such measures may therefore capture state-like or anticipated anxiety rather than real-time emotional experience. More recent studies have attempted to measure state maths anxiety during mathematical activity (Vanbecelaere et al., 2021), although such approaches have also been criticised for potentially inducing worry or anxiety in children (Sorvo et al., 2017; Orbach et al., 2019).

Maths anxiety is also commonly described as situational, domain-specific and performance-related because it is triggered by maths-related tasks and is often associated with evaluation, correctness and mathematical self-concept (Ashcraft & Moore, 2009). Describing maths anxiety as situational indicates that anxious responses may arise in particular mathematical contexts rather than being continuously present. Describing it as domain-specific distinguishes it from more generalised forms of anxiety, because the emotional response is attached specifically to maths-related meanings, tasks and expectations. Describing it as performance-related highlights the role of evaluation, comparison, public correctness, time pressure and fear of mistakes in shaping children's emotional responses to maths. This is especially relevant in school contexts, where maths is frequently positioned as a subject in which answers are visibly right or wrong and where children may become aware of their performance in relation to peers. Hill et

al. (2016) examined the relationship between maths anxiety and general anxiety in primary and middle school children, finding that although the two constructs were moderately correlated, they remained statistically independent, suggesting that maths anxiety should be understood as related to, but not reducible to, broader anxiety. However, Hill et al (2016) also found that when the effect of general anxiety was controlled, the initially significant negative association between maths anxiety and maths achievement was reduced. This provides an important qualification: general anxiety may heighten children's vulnerability in mathematical situations, but maths anxiety appears to involve additional domain-specific meanings, expectations and threat appraisals attached to maths itself.

This domain-specific framing also provides a basis for distinguishing between global and specific forms of maths anxiety. Yanuarto (2016) differentiates between global maths anxiety, where anxiety is elicited across mathematical situations regardless of task, context or content, and specific maths anxiety, where anxiety is triggered only by particular mathematical situations or demands. This distinction is important given the breadth of skills within the maths curriculum. Children may respond differently to number facts, written calculation, problem solving, spatial reasoning, measurement, timed tasks or public explanation. A child may therefore feel confident in one area of maths while experiencing anxiety in another, suggesting that maths anxiety may be attached to particular curriculum domains, classroom demands or evaluative conditions rather than to maths as a whole. For example, children may feel confident and competent in one area of maths, such as counting or practical problem solving, while experiencing anxiety in relation to another, such as timed recall, written calculations or tasks requiring public explanation. This distinction aligns with trait and state conceptualisations by underscoring that maths anxiety is

not a uniform or fixed response; rather, its presence, intensity and expression may vary substantially across individuals, curriculum domains, tasks and contexts (Kirkland & Hunt, 2025). It is also important to recognise that maths anxiety is not confined to children who dislike maths or who have low mathematical attainment. Children who hold positive attitudes towards maths, or who appear to be attaining well, may still experience maths-related worry, tension or fear (Kirkland & Hunt, 2025). This is significant because an overreliance on attainment, behaviour or expressed dislike as indicators of anxiety risks overlooking children whose anxiety is less visible, particularly those who continue to perform adequately while experiencing internal distress. Although low attainment may be one pathway into maths anxiety, it should not be treated as either a necessary condition nor a sufficient explanation. Instead, maths anxiety needs to be understood across a spectrum of attainment, attitudes and self-beliefs, where children's emotional responses may be shaped by factors such as perceived competence, fear of mistakes, task demands, comparison and the meanings attached to mathematical success and difficulty.

Conceptualising maths anxiety in this way prevents it from being treated as a fixed within-child attribute and instead highlights the importance of context, task demand and meaning-making. Nevertheless, there remains a risk that defining maths anxiety primarily as a performance-related emotional response locates the phenomenon too narrowly within the individual child. A broader conceptualisation recognises that children's anxiety about maths is also shaped by the meanings attached to maths within classrooms and wider systems (Eccles & Wigfield, 2002). This is particularly relevant in early primary school, when children are developing academic self-concept (their developing beliefs about themselves as learners) and

they become increasingly aware of evaluation and comparison (Harter, 2012). From a social constructionist perspective, ideas about being ‘good’ or ‘bad’ at maths, the importance of speed and correctness, and the emotional consequences of making mistakes are produced through classroom narratives, adult expectations, peer comparison and wider societal narratives about maths ability, making evaluative classroom experiences especially significant for the emergence of maths-related anxiety (Kirkland & Hunt, 2025).

Cognitive and motivational factors, including self-efficacy and motivation, provide an important link between children’s emotional responses to maths and their subsequent engagement. If children begin to interpret mathematical difficulty as evidence of low ability, or experience maths as evaluative and unsafe, their belief in their capacity to succeed may be weakened. This can reduce motivation, increase avoidance and limit opportunities to practise, receive feedback and experience success, creating a reciprocal cycle in which anxiety, reduced engagement and lower performance reinforce one another (Carey et al., 2016; Foley et al., 2017). From a bio-ecosystemic perspective, these factors should not be understood as located solely within the child. Children’s self-efficacy, motivation and avoidance behaviours develop through ongoing interactions with classroom activities, teacher feedback, peer comparison, parental interactions, assessment practices and wider cultural narratives about maths and mathematical ability. This conceptualisation positions maths anxiety as a situated response arising at the intersection of mathematical task demands, children’s developing self-beliefs and the relational and systemic contexts through which maths is taught, evaluated and given meaning, for example timed recall, whole-class marking, ability grouping or teacher feedback. It may therefore be experienced internally, but its emergence and expression are

shaped relationally and systemically through the meanings children attach to maths within their everyday learning environments. Maths anxiety can therefore lead to avoidance of tasks, situations, school activities or future pathways that require the use of maths and numerical skills (Jansen et al., 2016). Avoidance should not be interpreted simply as low motivation or lack of effort. For some children, avoidance may represent an attempt to manage perceived threat, embarrassment or anticipated failure. Importantly, maths anxiety should not be assumed to reflect low mathematical ability, as individuals who appear to struggle may have underlying competence that is constrained by anxiety. Beilock and Willingham (2014) therefore position maths anxiety as a modifiable barrier, suggesting that reducing anxiety may allow some learners to demonstrate their mathematical capabilities more effectively.

At present, much of the existing literature tends to examine maths anxiety through discrete associated constructs, such as self-efficacy, attitudes towards maths, motivation or attainment, rather than attending to the more holistic and situated experience of maths anxiety as it is lived and interpreted by learners within particular educational contexts (Kirkland & Hunt, 2025).

The body of evidence suggests that maths anxiety should be conceptualised as a multi-layered phenomenon and recognised as a negative reaction that has a negative effect on an individual (Kirkland & Hunt, 2025). At one level, it involves cognitive processes, including worry and the disruption of working memory, which can interfere with mathematical performance (Kirkland & Hunt, 2025). At another level, it involves affective and physiological responses, such as tension, apprehension or fear (Ashcraft & Moore, 2009; Dowker et al., 2016). It is also relational and contextual, emerging through children’s experiences of feedback, comparison, mistakes, performance expectations and the wider status of maths

within education (Kirkland & Hunt, 2025). A growing body of evidence highlights the importance of taking into account both cognitive and affective factors in understanding children and young people's academic achievement (Ramirez et al., 2013). For this thesis, maths anxiety is therefore understood not simply as an individual difficulty located within the child, but as an early emotional response to maths that is shaped by cognitive, social-emotional and ecological factors. This conceptualisation supports the need to explore how young children themselves make sense of maths-related emotions, particularly in early primary school age where academic identity, social comparison and formal expectations are becoming increasingly salient (Harter, 2012; 1999). At this age children's self-concept shifts from global, optimistic self-views to domain-specific academic identities shaped by teacher feedback and peer comparison (Harter, 2012; 1999). In addition, early identification and intervention to address maths anxiety at the earliest possible age may prevent early anxiety from "snowballing" into the escalating patterns of heightened anxiety, declining self-beliefs, and avoidance (Ramirez et al., 2013; Wigfield and Meece, 1988). Their longitudinal findings show that affective reactions to maths strengthen over time and increasingly undermine children's perceived ability, motivation, and performance, suggesting that early difficulties can become progressively more entrenched if left unaddressed. Intervening early may therefore not only disrupt this negative developmental trajectory but also contribute to higher maths achievement in the population going forward (Ramirez et al., 2013).

The existing literature provides a strong conceptual foundation for understanding maths anxiety as more than a simple dislike of the subject or low attainment. Nevertheless, as most of the conceptualisation has been developed from research with adults and older learners, the developmental fit for younger primary-

aged children remains only partially established. There is limited attention to whether young children experience, organise and communicate maths-related anxiety in ways that align with existing theoretical definitions. The evidence therefore is useful for defining the construct, but further understanding is needed to explain how younger children themselves understand or describe early maths-related emotional responses and experiences.

1.4 What evidence is there that maths anxiety emerges in early primary school?

This section considers research on the developmental emergence of maths anxiety by examining the definitions and theoretical assumptions used, what the evidence suggests about early onset, and how this literature is relevant to understanding early primary-aged children's experiences.

Research increasingly indicates that maths anxiety is not confined to adolescents or adults. Although maths anxiety has historically been studied most extensively in adolescents, adults and university populations, a growing body of research suggests that negative emotional responses to maths may emerge much earlier in development (Ramirez et al., 2013; Cargnelutti et al., 2017; Gunderson et al., 2018; Sorvo et al., 2019; Primi et al., 2020; Carey et al., 2016; Petronzi et al., 2019b, Wu et al., 2012). The studies reviewed draw on definitions of maths anxiety as a cognitive, affective and behavioural response to maths situations, while also pointing towards ecological explanations in which children's emotional responses are shaped by teachers, parents, peers and classroom practices. Studies show evidence of measurable maths anxiety or numeracy apprehension in children as young as four or five (Petronzi et al., 2019b), children aged 6 or 7 year (Harari et al., 2013), with

reliable anxiety-performance links in early primary school (O'Connor et al., 2023), and anxiety precursors already present in kindergarten (Svraka et al., 2024). This challenges the assumption that maths anxiety develops only after prolonged academic failure or later formal assessment. Instead, early signs may emerge through children's affective responses to maths tasks, their confidence, their experiences of evaluation and their developing beliefs about themselves as mathematical learners. Research suggests that maths anxiety increases with age (Dowker et al., 2016; Krinzinger et al., 2009), although some studies refute this (Gunderson et al., 2018; Sorvo et al., 2019).

Early childhood experiences of maths are reported to be shaped by contextual influences such as teacher attitudes, instructional practices, parental beliefs about maths, and peer evaluation. This claim is grounded in review-based evidence: Dowker et al. (2016) synthesise findings from a wide range of empirical studies demonstrating that these social and instructional factors are consistently associated with children's emerging emotional responses to maths. Their integrative review highlights that early maths anxiety is not an individual phenomenon but one that develops within relational and contextual environments. This reinforces the view that maths anxiety can begin developing earlier than previously assumed, before formal instruction intensifies, and that children's initial encounters with maths are embedded within broader interpersonal and environmental contexts.

Some research states that children do not start their educational life with maths anxiety but leave the educational system with it, suggesting that maths anxiety is formed in the classroom once children have experienced repeated failure in maths (Ashcraft et al., 2007; Beilock et al., 2010; Harari et al., 2013; Newstead, 1998). Importantly, from an early age, children are influenced by mathematical

attitudes by relatives, media, peers and teachers (Adelson & McCoach, 2011). This is discussed further in section 1.3 and 1.8. Harari et al. (2013) challenge this dominant view and show that first-grade children already report meaningful levels of maths anxiety, aligning with developmental evidence that other anxieties emerge at around this age. Studies have demonstrated that more negative attitudes to maths may result in decreased levels of engagement with maths (Adelson & McCoach, 2011) and these attitudes have been found to develop at an earlier age than previously predicted with some children developing beliefs in their ability in maths by the age of 7 (Eccles et al., 1993; Larkin & Jorgensen 2016). This is important because early primary school is a period in which children are beginning to form more stable beliefs about themselves as learners, including whether they see themselves as competent, capable and safe to make mistakes in maths (Harter, 1999; 2012; Eccles & Wigfield, 2002). These beliefs can negatively impact attainment, self-efficacy and motivation to engage with maths (Dowker et al., 2012). This is important as those who have higher enjoyment and self-efficacy for the subject are more likely to experience positive outcomes, active engagement and increased perseverance in tackling maths challenges (Stipek, 2002). Maths anxiety is therefore increasingly recognised as a significant factor influencing children's mathematical engagement, attainment and emotional wellbeing across different groups of learners (Hunt & Petronzi, 2024).

More recent research has extended attention to primary-aged children, suggesting that maths anxiety can be identified in younger learners as well as in adolescents and adults (Ramirez et al., 2013; Cargnelutti et al., 2017; Gunderson et al., 2018; Sorvo et al., 2019; Primi et al., 2020; Wu et al., 2012). Studies have also reported evidence of maths anxiety or numeracy apprehension in the early years of

primary education, including in children aged 4-7 (Petronzi 2016, 2017; Petronzi et al., 2019b), with some work suggesting that relevant precursors may be evident from around age four. Petronzi et al. (2019b), Harari et al. (2013) and Ganley and McGraw (2016) provide empirical evidence that young children can provide measurable self-reports of maths anxiety using adapted instruments. This challenges the assumption that anxiety measures are only meaningful for older learners, while still requiring caution about how reliably very young children can interpret and report complex emotional states. Overall, this body of research supports the argument that maths anxiety has early developmental roots and is not merely a secondary-school phenomenon.

Harari et al. (2013) explored the multidimensional nature of maths anxiety in young children (mean age = 6.84 years) in the United States, focusing on a sample of 106 first-grade students using an exploratory factor analysis. They found that negative reactions (physiological tension, unpleasant feelings) and numerical confidence (initially labelled numerical anxiety; reflects confidence in everyday maths use) were significantly related to foundational maths skills, whereas worry (negative cognitions) was not related to any maths outcome. Because only negative reactions and numerical confidence, not cognitive worry, were associated with mathematical performance in first grade, Harari et al.'s findings suggest that maths anxiety initially emerges as an affective and physiological response rather than a cognitively mediated fear, underscoring the importance of examining its developmental origins in early childhood. Harari et al (2013) also found that maths anxiety scores were significantly negatively correlated with computation, counting and maths concepts and strongly negatively correlated with attitudes towards maths, which were consistent with patterns found in older children and adults. Importantly, Harari et al.

derived their items by selectively adapting the numerical-anxiety components of the Maths Anxiety Rating Scale-Elementary (MARS-E; Suinn et al., 1988) and the worry/negative-reaction elements of the Mathematics Anxiety Questionnaire (MAQ; Wigfield & Meece, 1988). This selective derivation means that their operationalisation of maths was largely numeracy-based, which may partly explain why their findings appear to define maths in terms of number skills. Although this approach reduced developmental demands and supported brief group administration, it also meant that the measure inherited the conceptual constraints of instruments designed for older learners, raising questions about whether it fully captures the broader and more nuanced manifestations of maths anxiety in early childhood. Contrary to findings in older samples, where females often report higher levels of maths anxiety, Harari et al. (2013) reported no gender differences.

Considered collectively, this evidence suggests that maths anxiety, or its early precursors, may be present from the first years of formal schooling, but the strength of this claim must be understood in relation to the nature of the evidence base. The studies draw on samples ranging from relatively small cohorts, such as Harari et al. (2013) with 106 first-grade children in the US, Ramirez et al. (2013) with 154 first- and second-grade children in the US, Wu et al. (2012) with 162 second- and third-grade children in the US, and Petronzi et al. (2019b) with 163 children aged 4-7 in two UK schools, to larger longitudinal samples such as Gunderson et al. (2018) with 634 first- and second-grade children and Sorvo et al. (2019) with 1,321 Finnish children from Grades 2-5. Cargnelutti et al. (2017) add further longitudinal evidence from 198 Italian children in Grades 2 and 3, while Primi et al. (2020) contribute measurement-focused evidence from 150 Italian children aged 6-7 and a second sample of 223 children from Italy and Northern Ireland. Across these studies, the

repeated finding of associations between maths anxiety and poorer maths performance, sometimes independent of general anxiety, provides converging support for the argument that maths anxiety is not only an adolescent or adult phenomenon. Nevertheless, the evidence is not uniform in its implications. Some studies suggest that maths anxiety predicts later performance, while others indicate that lower prior achievement predicts later anxiety, supporting a reciprocal rather than linear causal account. This means that early maths anxiety should be understood as emerging through interactions between achievement, working memory, motivational beliefs, classroom experiences and broader social influences, rather than as a fixed trait located solely within the child.

The methodological profile of this evidence base is also important. The studies reviewed are overwhelmingly quantitative, relying on questionnaires, psychometric scales, teacher ratings and standardised or researcher-administered maths tasks. This gives the evidence certain strengths: several studies use validated or developing measures, some include longitudinal designs, and the larger samples strengthen confidence that early affective responses to maths are measurable and meaningfully related to attainment. At the same time, these methods limit what can be known about how young children themselves understand, describe and make sense of maths anxiety. Self-report scales may be useful for identifying patterns, but they inevitably constrain children's responses to adult-defined constructs and require young participants to map complex emotional experiences onto predetermined items. This is particularly significant in early primary education, when children's emotional vocabulary, metacognitive awareness and understanding of anxiety may still be developing. Consequently, the literature is able to show that some young children endorse anxiety-related items and that these scores relate to performance,

but it tells us far less about the lived, relational and classroom-based meanings of those experiences from children's own perspectives.

There are also contextual limitations. Much of the empirical evidence comes from outside the UK, particularly the United States, Italy and Finland. While this international evidence is valuable in showing that early maths anxiety is not restricted to one education system, its relevance to children in England must be considered with caution. Differences in school starting age, curriculum expectations, assessment culture, classroom pedagogy and cultural meanings attached to maths may all shape how maths anxiety develops and is expressed. UK-based evidence with younger children is more limited, with Petronzi et al. (2019b) providing important but geographically narrow evidence from two schools, and Primi et al. (2020) including Northern Ireland within a wider cross-national sample. Evidence from England specifically therefore remains underdeveloped, particularly in relation to Key Stage 1 pupils. A further limitation is the relative absence of pupil voice. The dominant quantitative tradition has established that early maths anxiety can be measured, but it largely constructs children as measured subjects rather than as meaning-makers who can explain how maths is experienced in classroom life. It has not sufficiently explored how children experience maths emotionally, how anxiety is constructed within peer and teacher relationships, or how children interpret difficulty, correctness, speed, comparison and support in everyday classroom contexts.

Early primary school is therefore a particularly important period for understanding how maths anxiety begins to emerge and develop. At this stage, children may experience maths-related distress before they can articulate it through the more cognitively elaborated language of worry, rumination or anticipatory fear. Harari et al.'s (2013) findings suggest that early maths anxiety may first appear

through affective, physiological, behavioural and confidence-based responses including feeling tense, uncomfortable or lacking confidence, which may later become more closely connected to children's academic self-concept, metacognitive awareness and interpretations of evaluation. Harari et al. found that in young children, the cognitive components more associated with maths anxiety in older children and adults, such as intrusive thoughts, rumination, fear of failure and anticipatory worry, were not yet driving mathematical performance. This finding is developmentally important. From a cognitive-behavioural perspective, anxiety is often understood as involving interactions between thoughts, feelings, bodily responses and behaviours; yet, in younger children, the cognitive and metacognitive components of anxiety may be less verbally accessible or less fully elaborated. Similarly, Piagetian accounts of cognitive development suggest that children in the early primary years are still developing the capacity for more abstract reflection on their own thinking. Early primary-aged children may therefore experience maths-related distress before they can articulate it as anxious self-talk, rumination or anticipatory worry. This suggests that early maths anxiety may first appear through emotional, bodily, behavioural and confidence-based responses, which may later become more cognitively elaborated as children's metacognitive capacities, academic self-concept and awareness of evaluation develop. These emotional reactions to maths experiences are developmental precursors, the building blocks from which more complex forms of anxiety can later grow if there is not intervention. This shows the developmental trajectory of maths anxiety, with maths anxiety as a construct becoming more cognitively elaborated over time. Harari et al.'s (2013) work therefore challenges the assumption that maths anxiety only emerges once maths becomes more complex or once repeated failure has occurred. Instead, it points to

earlier developmental origins, including early classroom experiences, parental and teacher influences, and foundational numerical skills.

Early emergence should be understood developmentally and contextually, but the detailed ecological influences are explored in Section 1.8. Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 2006) is therefore used here only as a developmental framing device, helping to position early maths anxiety as shaped over time through interactions between the child and their contexts. Section 1.8 then applies this framework more fully to examine how individual, classroom, home-school, institutional and wider systemic influences may contribute to the development of early maths anxiety.

Despite this growing evidence base, less is known about how maths anxiety emerges and is experienced in younger primary-aged children, particularly from children's own perspectives. This matters because adult-defined measures and adult interpretations may not fully capture how young children understand their feelings about maths. Children may describe experiences through concrete and relational terms, such as finding maths hard or difficult (Gunderson et al., 2018; Harari et al., 2013), feeling worried about getting answers wrong and not wanting others to see their mistakes (Jameson, 2014; Dowker et al., 2016), or needing reassurance (Beilock et al., 2010; Dowker et al., 2016; Maloney et al., 2015). These forms of expression reflect early metacognitive awareness, emerging social comparison, and sensitivity to evaluative contexts, all of which contribute to the development of maths anxiety in the early primary years. Understanding children's perspectives is therefore important for clarifying what early maths anxiety looks like developmentally and for identifying forms of support that are responsive to children's own meanings and experiences. This aligns with the SEND Code of Practice (DfE & DoH, 2015)

because the Code mandates that children's views, wishes, and feelings must be central to assessment, planning, and review processes, requiring professionals to actively elicit and meaningfully incorporate pupils' own perspectives in order to ensure person-centred decision-making, promote genuine participation in shaping their provision, and uphold the statutory principle that support for learners with SEND must be co-constructed with them rather than imposed upon them. Nonetheless, children's voices and perspectives remain underrepresented in not only maths anxiety literature but in educational research and policy in general (Lundy, 2007).

The evidence that maths anxiety can emerge in early primary school is increasingly persuasive, particularly where studies have identified measurable anxiety-related responses in children aged 4-7. Although, the evidence base remains comparatively small when compared with the body of research involving adolescents and adults, and studies vary in their measures, samples and definitions of anxiety. As a result, the literature supports the claim that early maths anxiety exists but is less able to explain how it develops within everyday classroom relationships and practices and how systemic changes can reduce maths anxiety or stop its emergence. The strength of existing literature in these age groups is challenging the assumption that maths anxiety is primarily an adolescent or adult phenomenon, although as many studies identify the presence of anxiety-related responses without explaining their meaning for young children, this leaves a gap in understanding how early emotional responses to maths are interpreted by children themselves.

The literature suggests that the developmental emergence of maths anxiety should be understood as gradual, relational and contextually situated. The evidence base is increasingly persuasive in beginning to challenge the assumption that maths anxiety is confined to older learners, particularly through studies identifying

measurable anxiety-related responses in early primary-aged children. Though, much of the evidence is emerging, small-scale, measurement-focused, or drawn from international or older-child samples, with limited UK-based qualitative research exploring how younger children themselves interpret maths-related emotional experiences. Rather than assuming that young children experience maths anxiety as a fixed or fully formed construct, it may be more appropriate to consider early signs of anxiety, apprehension, avoidance, low confidence and fear of mistakes as developing within classroom ecologies.

This evidence is relevant to the present study because it suggests that early maths-related emotional responses may already be developing during the first years of formal schooling.

1.5 What is known about the impact of maths anxiety on children's learning, wellbeing and identity?

Maths anxiety has implications for learning, wellbeing and children's developing identities as mathematical learners. In England, maths attainment has remained a persistent focus of educational policy over time, with recent policy ambitions emphasising the proportion of children expected to reach the required standard by the end of primary school and wider debates about extending maths participation beyond compulsory schooling (Hodgen et al., 2022; DfE, 2022; UK Government, 2023). Numeracy is also commonly framed as important for future employment, financial independence, everyday functioning and national productivity (National Numeracy, 2022; UK Government, 2023). While these discourses rightly underline the importance of mathematical competence, they may also increase the symbolic weight of maths as a marker of intelligence, success and future opportunity.

For young children, experiences of difficulty, repeated correction or perceived comparison in this high-status subject may therefore affect not only performance, but also self-worth, academic self-concept and identity as a maths learner (Eccles & Wigfield, 2002; Harter, 1999; 2012; Kirkland & Hunt, 2025).

This is particularly relevant in the context of the UK's acknowledged maths "crisis" with concerns that over half of the UK's working population (54%) having low numeracy skills (National Numeracy, 2022). National Numeracy (2022) found that despite spending their entire educational journey learning about maths, young people are entering adult life with a lack of confidence in maths that is having a significant impact on young adults' mental health and ability to cope with the stresses of life. Maths attainment has been an important focus in educational policy discourses for over 60 years (Hodgen et al., 2022). Such is the perceived importance of maths that there have been discussions around making maths mandatory subject in 16-18 education (UK Government, 2023). The Government White Paper *Opportunity for All* sets ambitions for 90% of children to reach the expected standard in maths by the end of primary school by 2030, compared with 65% in 2019, alongside a commitment to timely and evidence-based support for children who have fallen behind (DfE, 2022). These priorities underline the importance of supporting mathematical development, but they also raise questions about how attainment-focused policy agendas may be experienced by children who already find maths emotionally difficult.

Maths anxiety can undermine individuals' capacity to enjoy maths, distort their self-perceived mathematical ability, and contribute to avoidance of maths-related tasks (Shore & Kelleher, 2024). It may be expressed through a range of behavioural, emotional, cognitive, motivational and physiological responses (Kirkland & Hunt,

2025). For example, individuals experiencing maths anxiety may avoid mathematical situations, feel worried, distressed or helpless, hold negative attitudes towards maths, develop negative self-beliefs, show reduced motivation, experience changes in thinking and concentration, or display physical signs of anxiety (Kirkland & Hunt, 2025). Nevertheless, these responses are not uniform: a maths anxious individual may show some, all or none of these indicators, and their presentation may vary across contexts and over time (Kirkland & Hunt, 2025).

Prevalence and scale of maths anxiety

Prevalence estimates vary across age groups, countries and measurement approaches. Yanuarto (2016) suggests that the number of people affected by maths anxiety is “overwhelming”. For example, Ramirez et al. (2018) reported that across 65 countries participating in the 2012 PISA survey, 33% of 15-year-old students reported feeling helpless when solving maths problems. While such data relate to adolescents rather than younger children, they demonstrate the scale of maths-related emotional difficulty internationally.

UK prevalence data also point to the breadth of maths anxiety across the life course. In 2018, the Maths Anxiety Trust commissioned two nationwide surveys: one survey of the general UK population (n = 2,019) reported that 20% of adults had felt maths anxious at some point in their lives, 8% had felt maths anxious within the previous month, and 36% of 15-24-year-olds had experienced maths anxiety previously, while a second survey of 11-18-year-olds found that 40% of students reported feeling maths anxious sometimes and 25% reported feeling maths anxious most of the time (Bell, 2018). Although these survey findings are descriptive rather than diagnostic, they indicate that maths anxiety is not a marginal phenomenon and

strengthen the case for understanding its developmental emergence and identifying supportive responses before anxiety, avoidance and negative mathematical self-beliefs become more established. Further UK evidence from National Numeracy's 2023 survey of 3,000 adults similarly illustrates the scale and impact of negative emotional responses to maths: 35% of participants reported that doing maths made them feel anxious, 29% stated that they actively tried to avoid mathematical situations, 52% reported stopping studying maths at the earliest opportunity, and 20% indicated that doing maths made them feel physically sick due to anxiety or panic. In combination, these survey findings suggest that maths anxiety affects a notable proportion of the UK population and can shape not only immediate emotional responses to maths, but also avoidance behaviours, educational choices and longer-term engagement with numeracy.

Prevalence rates in younger children should be interpreted cautiously as prevalence estimates for maths anxiety in early-primary children vary substantially across studies, ranging from around 6-10% to over 30-40%, reflecting differences in measures, sampling, cultural contexts and children's early mathematical experiences (Dowker, 2026; Jameson, 2014; Krinzinger et al., 2009; Ma & Kishor, 1997; Petronzi et al., 2019b; Ramirez et al., 2013; Szczygieł, 2020a, 2020b; Vukovic et al., 2013). This is particularly important in research with younger children because measures may capture a range of related experiences, including dislike of maths, low confidence, fear of mistakes, performance worry or general school-based evaluative anxiety. Research (such as Harari et al., 2013; Ganley & McGraw, 2016) highlight the multidimensional nature of maths anxiety in young children taking into consideration distinct components such as performance anxiety and numerical processing anxiety. These studies highlight that children's experiences are not

uniform and highlights the necessity to focus on children's lived experiences and treat maths anxiety as a complex emotional and cognitive construct. The multidimensional nature of maths anxiety observed in the child-focused work of Harari et al. (2013) and Ganley and McGraw (2016) aligns closely with patterns seen in adolescent and adult samples, where studies consistently identify a range of components and domains that make up maths anxiety, such as performance anxiety, numerical processing anxiety, cognitive worry and physiological tension. This indicates that maths anxiety remains a complex, multidimensional construct across development.

Early maths anxiety has been reported as a potential risk factor for more severe maths difficulties and for children's socio-emotional development (Balt et al., 2022). Its impact is therefore not limited to attainment. It may affect how children approach challenge, whether they feel safe to make mistakes, and how they come to see themselves as learners.

Consequences for learning and attainment

Maths anxiety is relevant to learning and attainment because it has been consistently associated with lower academic performance, lower achievement, avoidance and disengagement from maths-related tasks (Hembree, 1990; Moore et al., 2015). Meta-analytic evidence also identifies a negative relationship between maths anxiety and maths attainment (Barroso et al., 2021; Hembree, 1990; Zhang et al., 2019). As discussed later in relation to explanatory models, this relationship should not be understood as simple or unidirectional: maths anxiety may be both a cause and an outcome of poorer maths performance, meaning that anxiety and attainment can reinforce one another over time (Carey et al., 2016; Foley et al.,

2017). This section therefore summarises the short- and longer-term implications for learning and attainment, while recognising that the cognitive and relational mechanisms underpinning these effects are considered in more detail across the wider review.

Research indicates that early maths anxiety may have both short- and long-term negative consequences for children's mathematical development and performance (Sorvo et al., 2017; Namkung et al., 2019; Zhang et al., 2019; Barroso et al., 2021). In the short term, maths anxiety has been linked to poorer arithmetic, problem-solving and maths fluency (Hembree, 1990), while in the longer term it may contribute to educational inequalities where avoidance reduces opportunities to practise, consolidate skills and experience success (Hembree, 1990; Moore et al., 2015). Evidence of performance differences is substantial: Field et al. (2019) reported that individuals with high maths anxiety score, on average, 34 points lower than their peers, a gap described as equivalent to almost a year of lost learning. Such findings highlight the importance of addressing maths anxiety early, while also recognising that attainment effects must be interpreted alongside children's emotional experiences and classroom contexts (Field et al., 2019).

The relationship between anxiety and performance nevertheless requires caution. Petronzi et al. (2019b) reported a strong negative correlation between maths anxiety and mathematical performance, with children who scored lower on the Children's Maths Anxiety Scale (CMAS-UK) generally performing better on the maths task, yet they also noted that some high-performing children reported high levels of maths anxiety. Similarly, Ashcraft (2002) suggested that some children may report anxiety while their competence scores remain unaffected, and Ashcraft et al., (1998) found that anxiety effects may be more apparent for some mathematical concepts

than others. Hunt et al. (2019) and Ferguson (1986) also suggested that maths anxiety may be particularly associated with more abstract forms of maths. This indicates that maths anxiety may be intensified by particular mathematical content, especially where a concept requires extensive prior knowledge, places substantial demands on working memory, introduces unfamiliar ideas without clear links to previous learning, or requires learners to engage with abstract representations. Conversely, more familiar concepts may offer relative emotional safety by allowing learners to draw on prior success, established understanding and a sense of competence (Kirkland & Hunt, 2025). Importantly, elevated anxiety is not always visibly linked to low performance: some children may achieve well despite worry, tension or fear, meaning that emotional difficulty may be masked by strong competence, coping strategies, external pressure or perfectionistic tendencies. This supports the need to explore children's subjective experiences directly, rather than relying only on attainment data or questionnaire scores to infer emotional states.

Maths anxiety may also affect attainment through performance-based, motivational and behavioural pathways. It has been described as a performance-based anxiety because it can place learners in a cognitively passive or withdrawn state, reducing the cognitive resources available for mathematical thinking (Ashcraft & Moore, 2009; Cooper et al., 2020; Luo et al., 2009). It has also been associated with lower mathematical resilience, with higher anxiety linked to reduced capacity to cope with challenge (Hunt & Maloney, 2022). Behaviourally, maths anxiety may lead to avoidance of maths tasks, reducing opportunities to practise, consolidate skills and experience success (Dowker et al., 2016). Avoidance may occur within individual lessons but may also become more global if children begin to avoid subjects, activities or future pathways that involve maths. These patterns are

particularly significant for children whose mathematical confidence or proficiency is already low (Witt, 2012), including children with dyscalculia or unrecognised maths learning difficulties; dyscalculia remains under-recognised within maths education (Kunwar, 2022), suggesting that some children may experience repeated difficulty without their needs being fully understood or supported.

These impacts highlight why early identification and understanding are important. Cognitive research shows that maths anxiety can disrupt working memory and contribute to an affective drop in performance during mathematical tasks (Ashcraft & Moore, 2009), while also being associated with heightened emotional distress (Luo et al., 2009; Young et al., 2012) and behavioural avoidance, including the “no-attempt” error observed in anxious learners (Chinn, 2012). As these mechanisms have been discussed earlier in the review, the key point here is that consequences for attainment cannot be fully understood through performance data alone. Understanding why maths becomes threatening for some children also requires attention to children’s own interpretations of their maths experiences.

Emotional wellbeing and identity

Concerns about children’s emotional wellbeing are well documented in educational research (Marshall et al., 2017) and maths anxiety represents one specific form of emotional distress that can negatively shape young people’s experiences of learning. Research consistently shows that maths anxiety is associated with heightened negative affect and poorer emotional wellbeing (Carey et al., 2016), with wider reviews highlighting its close links to stress, worry, and reduced psychological resilience in children and adolescents (Dowker et al., 2016). Children may experience frustration, helplessness and low self-esteem in relation to maths

(Ramirez et al., 2018). These emotional experiences are significant because they may become connected to children's developing identities as learners. If children repeatedly experience maths as threatening, embarrassing or outside their control, they may begin to construct themselves as "not good at maths" or as someone for whom maths is unsafe.

Long-term educational and life implications

Early numeracy skills are strongly associated not only with later academic attainment, but also with longer-term educational, occupational and everyday life outcomes, underscoring the importance of understanding emotional barriers that may constrain children's engagement with maths from an early stage (Short & McLean, 2023). This is particularly significant for children from low-income backgrounds, who are more likely to experience poorer mathematical outcomes and may enter formal schooling with already disadvantaged foundations for numeracy development (Short & McLean, 2023). Understanding the cognitive, emotional and contextual skills that support the acquisition of early mathematical competence is therefore important not only for scaffolding maths learning, but also for addressing educational inequalities and improving longer-term life chances.

Long-term implications are also important. Sound understanding and application of mathematical concepts is widely recognised as an important part of education and may influence later career opportunities (Ashcraft, 2002; Rahim & Koeslag, 2005). Maths anxiety is negatively related to wanting to pursue future study or work involving maths (Ahmed, 2018), meaning that it may shape future educational choices, employment pathways and opportunities.

At a societal level, maths skills are linked to economic prospects and participation, and poor adult numeracy has been associated with unemployment and lower wages (UK Government, 2023). These wider implications should not be used to place pressure on young children, but they do underline why early emotional barriers to maths matter. If maths anxiety contributes to avoidance or reduced willingness to persist, it may restrict children's future engagement with maths-related learning and opportunities.

The weight of the evidence suggests that maths anxiety can affect learning, wellbeing and identity in interconnected ways. The research provides consistent evidence that maths anxiety is associated with lower attainment, avoidance and reduced engagement. It may reduce performance, disrupt cognitive resources, increase avoidance, lower resilience, and shape children's sense of themselves as mathematical learners. Notably, the impact of maths anxiety cannot be inferred from attainment alone. The relationship between anxiety and achievement is complex, and causality cannot be assumed from correlational evidence alone. The evidence is therefore persuasive in identifying a risk and the linked wider implications of low maths achievement and attainment which is well documented in government policy, highlighting the relevance and need for support in this area, but the evidence is less able to explain how children experience the emotional, relational and identity-related consequences of maths anxiety in daily classroom life. Much of the evidence concerning impact is strongest at the level of measurable outcomes, such as attainment, task performance and avoidance. Less is known about the subjective consequences of maths anxiety for children's wellbeing, confidence and developing identities as maths learners. This is an important limitation because children may experience significant emotional distress even when attainment data do not indicate

obvious difficulty. Some children may perform well while still experiencing significant worry, and some may avoid maths without having the language to describe this as anxiety. This emphasises the need for child-centred research that explores how young children understand the emotional meaning of maths in their everyday school lives.

1.6 How adequate are existing methods for identifying maths anxiety in young children?

Kirkland and Hunt (2025) identify a range of approaches used to assess maths anxiety, or the affective, cognitive, behavioural and physiological responses understood to be associated with it. These include physiological indicators, measures of neural activity, self-report instruments such as questionnaires and rating scales, and qualitative approaches including observations and interviews. This range reflects the affective, cognitive, behavioural and physiological complexity of maths anxiety, but it also raises important questions about what different methods are able to capture, particularly when they are used with younger children whose emotional vocabulary, metacognitive awareness and capacity for abstract self-report are still developing.

Physiological and neurocognitive methods, including cortisol, heart rate, blood pressure, eye movements, fMRI and electroencephalography (EEG), have contributed to the conceptual legitimacy of maths anxiety by demonstrating that it can involve embodied stress responses, attentional processes and neural activity linked to emotional processing and mathematical reasoning. Hunt et al. (2017), for example, used heart rate and blood pressure to examine children's physiological responses, while Mattarella-Micke et al. (2011) used cortisol with undergraduate

students. Hunt et al. (2015) also identified associations between maths anxiety and eye-movement patterns, including fixations, dwell time and saccades, during mathematical tasks with undergraduate students. Neuroimaging evidence further supports this affective-cognitive framing: Young et al. (2012) found that children aged 7-9 with higher maths anxiety showed increased activation in the right amygdala, a region linked to negative emotion, alongside reduced activity in regions associated with mathematical reasoning (posterior parietal and dorsolateral prefrontal regions), and greater connectivity between the amygdala and ventromedial prefrontal cortex. Pletzer et al. (2015) similarly suggest that maths anxious individuals may show reduced processing efficiency. Such findings indicate that maths anxiety is not merely a self-reported dislike of maths, but may involve physiological arousal, attentional disruption and neural responses associated with threat and emotional regulation. These methods require specialist equipment, controlled conditions and adult interpretation of biological signals, making them more feasible in laboratory research than in everyday primary classrooms. Their value for the present review is therefore primarily conceptual rather than methodological: they strengthen the evidence that maths anxiety has affective, attentional and cognitive dimensions, but offer limited insight into how young children recognise, express or make meaning of anxiety within ordinary classroom contexts.

Self-report measure, including questionnaires and rating scales, are more readily usable in classroom contexts than physiological or neuroimaging methods and have therefore become a dominant approach to assessing maths anxiety. Yet their practicality should not be equated with adequacy. Kirkland and Hunt (2025) caution that many measures have been developed in Western, educated, industrialised, rich and democratic contexts (WEIRD), often using American samples,

and may carry assumptions about mathematical language, classroom practices and school experiences that do not travel easily across cultures or age groups. If such measures are used without careful adaptation or validation, children's responses may reflect misunderstanding, unfamiliar language or culturally specific interpretations rather than maths anxiety itself. Self-report instruments are also vulnerable to response biases, particularly where children may seek to preserve a preferred self-image, avoid appearing incompetent or anxious, or provide answers they believe will please or impress adults. At the same time, modifying established measures can compromise reliability and validity if changes alter item meaning, scale structure or psychometric properties. It is therefore preferable to select measures that have already been developed, culturally adapted and psychometrically evaluated with the intended population, particularly when researching young children whose developmental stage may make self-report especially sensitive to wording, format, contextual familiarity and perceived adult expectations.

From a childist and social constructionist position, adult-designed rating scales risk imposing adult categories onto children's emotional lives and treating maths anxiety as a stable internal attribute rather than as an experience negotiated through language, relationships, classroom norms and assessment practices. A score may show that a child endorses worry about maths, but it cannot show whether that worry is connected to teacher evaluation, peer comparison, timed tasks, previous failure, fear of mistakes, or the perceived consequences of being seen as "bad at maths". Self-report tools are therefore useful for identifying possible patterns of concern, but they are weak instruments for accessing children's situated meanings. Used uncritically, they may convert complex accounts into adult-defined

labels and obscure the relational conditions through which anxiety is produced. This highlights the need to complement self-report measures with qualitative, child-centred approaches that allow children to describe the situated meanings of their maths-related emotions in their own terms.

The limitations of established measures illustrate this uneven suitability. The Maths Anxiety Rating Scale (MARS; Richardson & Suinn, 1972), although historically influential, was developed for college students in the US, contains 98 items and relies on respondents' ability to imagine and evaluate complex academic scenarios. Abbreviated versions reduce administration time but do not resolve the developmental problem that many items assume adult-like literacy, self-reflection and educational experience. The Abbreviated Maths Anxiety Scale (AMAS; Hopko et al., 2003) is more manageable at nine items and has been used with adults and younger students, but its brevity may narrow the construct and underrepresent the breadth of individual experience, particularly beyond formal educational contexts. The Mathematics Anxiety Scale UK (MAS-UK; Hunt et al., 2011) offers greater UK contextual relevance and includes evaluative, everyday/social and observational dimensions, but it was developed primarily with secondary-aged pupils and still assumes levels of reflection and academic experience that younger pupils may not possess. The MAS has also been modified for use in other countries, including Iranian university contexts (Firouzian et al., 2015), although such adaptations again raise questions about cultural and developmental fit.

Developing measures for young children has been reported to involve substantial challenges, regardless of the construct being measured (Besenski et al., 2007; Ganley & McGraw, 2016). These challenges are particularly pronounced when researchers seek to measure emotional experience. Measuring emotions in young

children is methodologically complex because children's emotional vocabulary, self-awareness, memory, language comprehension and ability to reflect on internal states are still developing (Denham et al., 2009). The measurement of anxiety presents additional difficulties, as anxiety may be expressed through behavioural, somatic, relational or situational responses rather than through explicit verbal labels, and young children may find it difficult to distinguish anxiety from fear, dislike, frustration or general distress (Schniering et al., 2000). These developmental and methodological issues are likely to be one reason why there has been comparatively less research on maths anxiety with younger children. The appropriateness of questionnaires for measuring maths anxiety in children has been debated, particularly in relation to whether children can reflect on their emotions and anxiety in the same way as adults, and therefore whether their responses fully reflect their lived experience (Kirkland & Hunt, 2025). Questionnaires used with children need to be appropriate for their age, language, comprehension and developmental stage. This is especially important because measures that are complex in terms of wording or content may themselves increase anxiety or confusion, potentially influencing children's responses to the items.

The Maths Anxiety Rating Scale-Elementary (MARS-E; Suinn et al., 1988) and Mathematics Anxiety Scale for Children (MASC; Chiu & Henry, 1990) were developed for school-aged children, but both remain relatively literacy-heavy, scenario-based and shaped by formal or test-related contexts. Measures for younger children, including the Math Anxiety Scale for Young Children (MASYC; Harari et al., 2013; revised by Ganley & McGraw, 2016) designed for 6-9 year olds, Ramirez et al.'s Child Mathematics Anxiety Questionnaire (CMAQ; 2013) for 6-9 year olds and revised CMAQ (CMAQ-R; Ramirez et al., 2016) for children aged 7-12 years, and

the Scale for Early Maths Anxiety (SEMA; Wu et al., 2012) for 7-9 years, use more simplified language, more developmentally relevant items and everyday maths situations, yet several were developed in the United States and therefore require careful adaptation for UK contexts. The Modified Abbreviated Math Anxiety Scale (mAMAS; Carey et al., 2017) is designed for UK children aged 8-13, but it still relies on hypothetical academic scenarios, self-reflection and also assumes a level of self-reflection, literacy and metacognitive awareness that younger children may not yet possess, potentially reducing the accuracy of responses. In addition, the use of a traditional Likert-style format may disadvantage children who benefit from visual or pictorial supports, highlighting the need for more accessible and child-centred measures suitable for younger children.

The Children's Mathematics Anxiety Scale-UK (CMAS-UK; Petronzi et al., 2019b) represents a more contextually and developmentally appropriate attempt to identify maths anxiety in young UK primary children, specifically children aged 4-7. It uses age-appropriate language, pictorial response formats and UK-specific classroom practices, and its validation within UK contexts strengthens its relevance for early primary research. However, its relative newness means that there are fewer published empirical studies using the measure beyond the original validation work. Despite this smaller evidence base, the CMAS-UK offers clear advantages for research with younger children. It uses age-appropriate language, pictorial response formats and UK-specific classroom practices, making it developmentally accessible and culturally relevant for early primary pupils. Its design also aligns with current UK expectations that young children engage in self-assessment using visual scales. Its psychometric validation within UK contexts strengthens its suitability for studies involving early primary school-aged children. Whilst it can indicate the possible

presence or relative intensity of maths-related anxiety, it cannot fully explain how children interpret their feelings, which classroom situations matter to them, or how teacher feedback, peer comparison, time pressure and fear of mistakes shape those responses. The CMAS-UK therefore strengthens the field's capacity to identify possible maths anxiety in young children, but it does not overcome the broader epistemological limitations of self-report measures.

A further limitation of self-report measures concerns the use of cut-off scores to categorise children as experiencing low, moderate or high levels of maths anxiety. There is no universal agreement about what constitutes each level, and maths anxiety may be better understood as existing along a continuum rather than as a discrete condition that is either present or absent (Kirkland & Hunt, 2025). This raises ethical and conceptual questions about labelling. Describing a child as maths anxious may validate distress and prompt adult support, but it may also imply that anxiety is fixed, reinforce low mathematical self-beliefs, or position the child through a deficit lens. Conversely, categorising a child as not maths anxious may minimise their worries or suggest that their responses are not significant enough to warrant attention. For young children in particular, rating-scale categories should therefore be treated as contextual indicators rather than definitive labels.

Qualitative approaches offer an important complement to standardised measures because they can provide richer and more detailed insight into what individuals experience, as well as when and why maths anxiety occurs (Kirkland & Hunt, 2025). This is supported by Dove et al. (2021), who argue that questionnaires alone do not capture the full experience of maths anxiety. Using interviews and Interpretative Phenomenological Analysis, Dove et al. (2021) explored how four UK, primary school teachers made sense of their experiences, demonstrating the value

of qualitative methods for accessing subjective meaning-making. Observational approaches can also be useful because they allow researchers to identify behaviours, patterns of response, and particular situations or mathematical content that appear to heighten anxiety. However, observations must be interpreted carefully, as individuals may alter their behaviour when they are aware that they are being observed. Kirkland (2020) used questionnaires, observations and interviews to develop a more detailed understanding of students' experiences, illustrating the value of combining methods rather than relying on a single source of data. Kirkland and Hunt (2025) further note that interviews must be conducted sensitively so that the research process does not increase anxiety and so that learners feel comfortable speaking openly. Although many studies have explored the perspectives of significant adults in the learner's life, including parents and teachers, such accounts should also be treated carefully because they reflect others' subjective interpretations and may not provide a fully accurate account of the learner's own experience (Kirkland & Hunt, 2025).

Overall, existing methods are only partially adequate for identifying maths anxiety in young children. Physiological and neurocognitive approaches provide important evidence that maths anxiety is embodied, but they are impractical for routine educational use and do not access children's meanings. Self-report measures are feasible and can identify patterns of concern, but many are developmentally, culturally and conceptually limited. Even the strongest child-focused measures remain dependent on adult-designed categories and cannot, on their own, explain how children understand anxiety within classroom relationships, assessment practices and maths identities. For childist and social constructionist research, the key issue is therefore not whether self-report measures should be

rejected, but whether their claims are kept proportionate: they can support identification, but they cannot stand as complete accounts of children's lived experience.

1.7 How well do existing explanatory models account for early maths anxiety?

A central debate within the maths anxiety literature concerns whether maths anxiety is primarily a cause or consequence of poor mathematical performance. Different explanatory models have attempted to account for this relationship. Reduced competency accounts suggest that repeated difficulties in maths may lead to anxiety, while disruption accounts propose that anxiety interferes with the cognitive resources needed for mathematical problem solving (Ramirez et al., 2018). More recent reciprocal or bidirectional models suggest that anxiety and performance may reinforce one another over time (Carey et al., 2016; Foley et al., 2017; Young et al., 2012). Although these explanatory models are widely cited in maths anxiety research, they are not designed specifically for young children. They come from mixed-age evidence with most empirical evidence underpinning them coming from older learners, whose cognitive, emotional, and metacognitive capacities differ substantially from those of early-primary pupils. They are presented in the literature as general models rather than models tailored to a particular developmental stage. As a result, while the models offer useful conceptual tools for understanding the relationship between anxiety and performance, they risk implicitly locating maths anxiety within the individual learner and may overlook the relational, pedagogical, and systemic factors that shape younger children's emotional experiences of maths. To understand how maths anxiety emerges, it is therefore necessary to consider cognitive processes, children's previous experiences of difficulty, their interpretations of success and failure, and the classroom conditions that shape how maths is

experienced. Together, these factors help to explain why some children may begin to experience maths as threatening rather than empowering, and why early signs of anxiety may become connected to avoidance, self-concept and engagement.

Cognitive and disruption accounts: anxiety disrupts performance.

Cognitive models of maths anxiety frame it as an internal psychological process that can interfere with the cognitive resources required for mathematical thinking. Disruption accounts suggest that maths-related worry, negative self-evaluation and rumination about mistakes or failure can reduce the working memory capacity and attentional control available for problem solving (Ramirez et al., 2013; Ramirez et al., 2018; Pizzie et al., 2020b). Consequently, the stress of math anxiety can overload a student's working memory, forcing them to switch to less sophisticated tactics or trigger a utilization deficiency, where they attempt advanced problem-solving strategies but fail to benefit because the strategy requires too much cognitive effort (Miller & Seier, 1994). This cognitive strain ultimately leads to poorer performance, as the effort required for the strategy itself overwhelms the student under stress. From this perspective, anxiety is not simply an emotional response that accompanies maths; it can actively interfere with the processes needed to engage successfully with mathematical tasks. These disruption/debilitating anxiety models therefore propose that it is maths anxiety that causes poor mathematical performance (Carey et al., 2016; Hembree, 1990; Lyons & Beilock, 2012)

These cognitive accounts are supported by evidence linking maths anxiety with reduced working memory capacity and attentional control (Carey et al., 2016), heightened emotional reactivity (Justicia-Galiano et al., 2016; Luo et al., 2009; Young et al., 2012), and an affective drop in attainment during mathematical tasks (Ashcraft

& Moore, 2009; Carey et al., 2016; Foley et al., 2017). Time pressure may also act as a stress-evoking factor because it appears to affect children's arousal during maths tasks (Caviola et al., 2017; Orbach et al., 2019). These findings are important because they suggest that children's emotional readiness to engage with maths may shape whether instructional approaches are effective. Disruption accounts do not fully explain why maths becomes threatening for some children in the first place, or how classroom meanings around speed, correctness and evaluation become attached to children's developing mathematical self-concept.

Reduced competency accounts: difficulty produces anxiety.

A different explanation is offered by deficit/reduced competency accounts. These accounts suggest that maths anxiety may develop from repeated difficulties, persistent failure and reduced confidence in maths; that poor maths performance leads to maths anxiety (Maloney, 2016; Tobias, 1986). Although children may begin school with broadly positive attitudes towards maths (Nicolaidou & Philippou, 2003), negative attitudes can develop as a consequence of ongoing difficulty. Once anxiety develops, it may become a more rigid educational obstruction that shapes future engagement and may take time to alleviate (Baptist et al., 2007).

From this perspective, anxiety may emerge after a child has repeatedly internalised failure and negative feedback (Harari et al., 2013). Children may begin to perceive themselves as incapable of learning or applying mathematical concepts, leading to withdrawal, guilt and shame (Brady & Bowd, 2005; Mutodi & Ngirande, 2014). Chinn (2012) described this kind of avoidance as the "no attempt" error, where children avoid engaging with a task because they anticipate error or failure. This may be particularly relevant when children are asked to complete complex

mathematical problems or where mathematical learning difficulties, including dyscalculia, are present or unrecognised (Ashcraft, 2002).

Ramirez et al. (2018) proposed, within the reduced competency account, that avoidance of mathematical situations may contribute to the emergence of developmental deficits. Avoidance restricts opportunities to practise, receive feedback and build competence, which can then maintain or worsen both maths difficulties and anxiety (Ashcraft & Moore, 2009; Dowker et al., 2016). This account needs to be used carefully as if reduced competence is treated as the primary cause of maths anxiety, there is a risk of adopting a deficit-oriented explanation that locates the problem within the child and overlooks the role of classroom practices, social comparison, teacher feedback and instructional experiences in shaping children's emotional responses to maths (Barroso et al., 2021). For this reason, reduced competency accounts are useful but incomplete when considered without relational and ecological explanations.

Ramirez et al.'s (2018) reduced competency account also struggles to explain children who are objectively competent yet still experience high levels of maths anxiety. For these learners, the model can only account for anxiety by assuming a subjective sense of reduced competence, such as perfectionism, fear of mistakes or misinterpreting normal challenge as failure, rather than genuine mathematical difficulty. This illustrates a further limitation: the reduced competency account risks attributing anxiety to internal deficits even when children's attainment does not support this interpretation, thereby overlooking how classroom climates, social comparison, evaluative practices and teacher-child interactions can generate anxiety in capable learners. As such, while reduced competency explanations offer insight into one pathway through which anxiety may develop, they remain incomplete

without attention to relational, pedagogical and ecological factors that shape children's emotional experiences of maths.

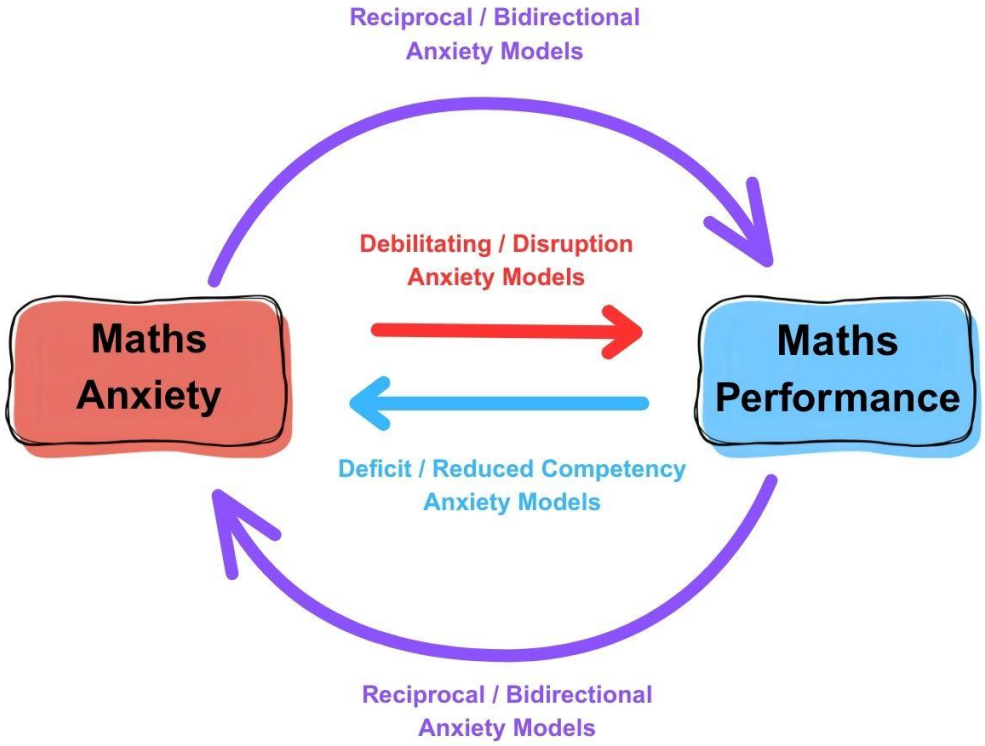
Reciprocal and bidirectional models: anxiety and performance reinforce each other.

Reciprocal/bidirectional models attempt to move beyond the question of whether maths anxiety causes poor performance or whether poor performance causes anxiety. Instead, they suggest that early difficulty, negative emotional responses, avoidance and reduced preparation may interact over time, creating a cycle that affects attainment, engagement, self-concept and self-efficacy (Ashcraft et al., 2007). Literature therefore suggests that the relationship is bidirectional, with maths anxiety acting as both a cause and an outcome of poor maths performance (Carey et al., 2016; Foley et al., 2017; Young et al., 2012).

The different explanatory models of maths anxiety discussed above are visually represented in Figure 1. The figure summarises the models to illustrate the directional nature of the relationship between maths anxiety and performance. The red arrow represents that causal relationship described in the disruption / debilitating anxiety models which propose that maths anxiety causes poor maths performance, whereas the blue arrow represents the deficit / reduced competency model which propose that it is poor maths performance that results in maths anxiety. The purple arrows represent the cyclical causal relationship as proposed in the reciprocal / bidirectional models, which propose that maths anxiety and poor maths performance can be both a cause and outcome of each other.

Figure 1.

A summary diagram of the explanatory models of the causal links between maths anxiety and maths performance. (Inspired by Ford, 2021).



The interpretation account model

The deficit and reduced competency models offer useful explanations but they fail to account for individuals who have poor maths ability who are not maths anxious (Ramirez et al., 2018) or those who have good maths ability/performance, but who are maths anxious (Lee, 2009). The interpretation account model proposes that it is how the individual interprets and views their own maths performance, experiences and outcomes that influences their level of maths anxiety (Ramirez et al., 2018). This supports the idea that it is the meaning an individual attributes to one's own abilities and difficulties that has an influence on how it is experienced. This is supported by research that explores young people's perceived maths ability, rather than their actual ability and achievement (Meece et al., 1990). Meece et al., (1990) explored

young people aged 11 – 13's perceived ability in maths, maths anxiety and actual maths achievement. They found that a young person's perceived ability was the strongest predictor of later maths anxiety (Meece et al., 1990). This has also been found in research exploring self-concept with children aged 7 – 8, which suggested that maths self-concept (how children perceive their ability in maths) was a strong predictor of their levels of maths anxiety (Jameson, 2014).

Within explanatory models of maths anxiety, motivation is often conceptualized as a key affective mechanism that shapes how individuals engage with mathematical experiences (Shore & Kelleher, 2024). Motivation in maths reflects the enthusiasm in which learners approach challenges, the value they assign to maths competence and the effort they invest in maths-related tasks (Gottfried et al., 2007). Maths anxiety interacts closely with these motivational processes: research indicates that the combination of high maths anxiety and low maths motivation predicts outcomes more strongly than either construct alone (Lyons & Beilock, 2012). From this perspective, reduced self-confidence and heightened anxiety can weaken student's motivation to learn, contributing to avoidance behaviours and other maladaptive patterns (Paechter et al., 2017). Conversely, individuals who experience elevated maths anxiety alongside diminished motivation are more likely to demonstrate poorer performance on maths-related tasks (Wang et al., 2015). Together these findings illustrate how emotional responses and motivational beliefs co-construct people's experiences of maths. This helps explain why mathematically competent learners may respond differently to maths anxiety. For some, elevated anxiety may undermine motivation, reduce attentional control and increase avoidance, leading to a decline in performance despite underlying competence. For others, strong motivation, high self-efficacy, supportive feedback or external

expectations may buffer the effects of anxiety, enabling them to maintain performance even while experiencing maths-related distress. Suggesting that the impact of maths anxiety is moderated by both internal factors, such as confidence, motivation and coping strategies, and external factors, such as classroom climate, teacher feedback, task demands and evaluative pressure.

Self-efficacy is another affective construct closely implicated in explanatory models of maths anxiety. Referring to learners' beliefs about their capability to perform academic tasks (Pajares & Graham, 1999) it has long been recognized as a predictor of academic engagement and achievement (Bandura 1986; Loo & Choy, 2013). Within maths, higher self-efficacy is associated with greater persistence and mathematical resilience, stronger motivation and more adaptive learning behaviours (Cassidy, 2015; Samuel & Warner, 2021). Crucially, self-efficacy appears to interact with maths anxiety: an individual with greater confidence in their maths abilities can act as a buffer against negative emotional responses characteristic of maths anxiety, supporting sustained engagement and improved performance (Galla & Wood, 2012). Equally, low self-efficacy may contribute to the development and maintenance of maths anxiety, reinforcing avoidance and undermining motivation (Shore & Kelleher, 2024). This relationship positions self-efficacy alongside motivation within explanations of why some learners experience heightened anxiety in mathematical contexts.

Attribution, self-concept and children's interpretations of mistakes

Attribution theory provides a useful framework for understanding how children interpret success and failure in maths, particularly whether mistakes are understood as part of learning or internalised as evidence of fixed ability (Weiner 1985, 2010).

This is important in early childhood because children are developing academic self-concept and beginning to make sense of ability, effort and mistakes within classroom contexts. Cognitive models help to explain how worry and fear may disrupt working memory and attentional control, but attributional accounts draw attention to the meanings children attach to difficulty. In attributional terms, children's responses to maths may depend partly on whether they attribute difficulty internally, for example to fixed ability or being "not a maths person", or externally, for example to task demands, unclear teaching, time pressure or the availability of support. Notably, these attributions are themselves socially shaped, as classroom feedback, peer comparison and wider narratives about mathematical ability influence whether children come to view mistakes as temporary and manageable or as evidence of personal inadequacy.

This creates a further theoretical debate about whether maths anxiety should be understood primarily as an individual difficulty or as something produced through relational and contextual conditions. Deficit-oriented accounts can be helpful in identifying individual cognitive and performance-related processes, but they may obscure the role of classroom climate, assessment pressure, teacher responses, peer comparison and children's developing identities as mathematical learners. Ecological and social constructionist accounts therefore add an important layer by asking how maths becomes emotionally charged for children in particular contexts, rather than only asking how anxiety affects performance once it is present.

Viewed collectively, these models suggest that maths anxiety is best understood not as a single-cause phenomenon but as a complex, reciprocal and contextually situated process. Cognitive disruption may explain how anxiety interferes with mathematical performance, while reduced competency accounts

highlight how repeated difficulty and avoidance can contribute to anxiety. Reciprocal models show how these processes may reinforce one another over time. The interpretation account illustrates that perceived difficulty, low self-efficacy and low academic self-concept can influence how children experience maths and maths anxiety even if they are mathematically able. For younger children, these models also need to be held alongside attributional, ecological and child-centred perspectives, because early maths anxiety may develop through children's interpretations of mistakes, feedback, comparison and classroom meanings around correctness. This integrated understanding supports the present study's focus on children's lived experiences of maths, rather than relying solely on attainment data or adult-defined measures of anxiety.

The explanatory literature is persuasive in showing that maths anxiety and performance can be mutually implicated. A limitation, though, is it remains less developed in accounting for the social and relational conditions through which anxiety emerges. In particular, models focused on cognition and attainment risk individualising maths anxiety unless they are considered alongside classroom climate, teacher feedback, peer comparison and children's developing academic identities.

1.8 To what extent do relational and ecological factors shape early maths anxiety?

Maths anxiety does not develop only through individual cognitive processes or prior attainment. It is also shaped by the relational and ecological conditions in which children learn maths. Different factors can impact not only the development of maths anxiety but also the intensity of the experience. Rubinsten et al. (2018) argue that

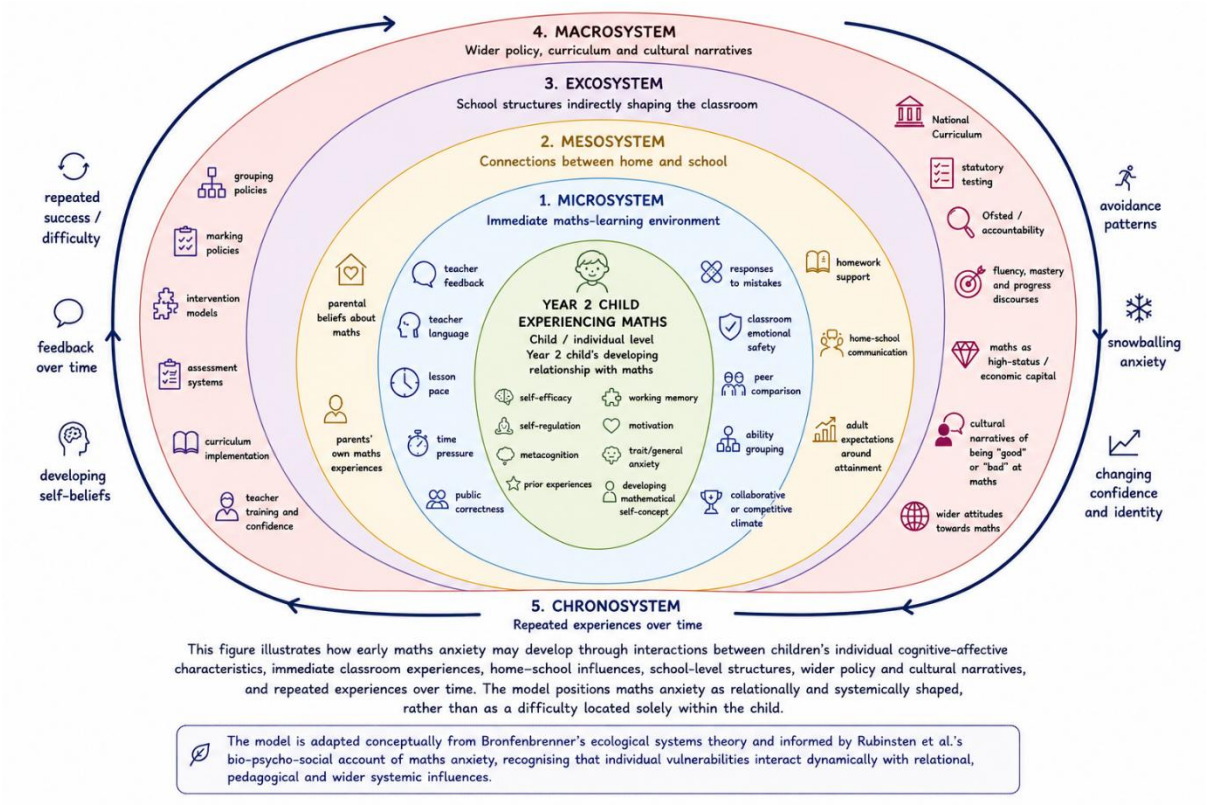
maths anxiety develops through a dynamic bio-psycho-social interplay in which environmental influences, including parenting, teaching practices and wider social attitudes, interact with intrinsic factors such as neurocognitive predispositions, genetic vulnerability and general anxiety tendencies. This framework is useful because it avoids reducing maths anxiety either to individual vulnerability or to classroom context alone; instead, it highlights the need to recognise children's differing vulnerabilities while also considering interventions that address relational and contextual factors alongside individual cognitive-affective processes. Bronfenbrenner's bioecological levels (Bronfenbrenner & Morris, 2006) are used to structure this section because they provide a coherent way of organising these interacting influences, moving from children's individual characteristics to immediate classroom relationships, home-school connections, school-level structures, wider policy contexts and developmental change over time (see Figure 2). A social constructionist approach is useful alongside this because it shifts attention away from internal deficits and towards the social, relational and discursive conditions through which children come to understand maths as anxiety-provoking. Rather than assuming that anxiety originates solely within the child, this perspective highlights how meanings of difficulty, ability, success and failure are produced through classroom talk, teacher expectations, peer comparison, assessment practices and wider cultural narratives about maths.

The section therefore considers early maths anxiety across ecological levels. It begins with individual-level developmental, cognitive and socio-emotional factors, before examining the microsystem of classroom climate, teacher practices and peer relationships. It then considers mesosystem influences relating to home-school connections and parental beliefs, followed by exosystem and macrosystem factors

such as school policies, assessment practices, national curriculum priorities and wider cultural narratives about maths. Finally, the chronosystem is used to consider how repeated experiences over time may shape children's developing mathematical self-beliefs, avoidance and anxiety trajectories. Figure 2 demonstrates visually how early maths anxiety may develop through interactions between children's individual cognitive-affective characteristics, immediate classroom experiences, home-school influences, school-level structures, wider policy and cultural narratives, and repeated experiences over time. The model positions maths anxiety as relationally and systemically shaped, rather than as a difficulty located solely within the child.

Figure 2

Bioecological Influences on the Development of Early Maths Anxiety in Year 2 Children. Developed From Bronfenbrenner's Bioecological model (Bronfenbrenner & Morris, 2006).



Individual-level factors: developmental, cognitive and socio-emotional vulnerabilities

At the individual level, children's developmental stage, prior experiences, self-efficacy, self-regulation, trait anxiety, gender, working memory, mathematical confidence, self-concept, motivation and capacity to reflect on internal emotional states may all contribute to how maths is experienced (Dowker et al., 2016; Luttenberger et al., 2018). Developmental evidence suggests that, around the end of Key Stage 1, children's academic self-concept becomes more differentiated and increasingly influenced by evaluation and social comparison (Harter, 1999; 2012). This is important because early emotional responses to maths may become attached to children's developing identities as mathematical learners. High self-efficacy in maths can serve as a protective factor (Palestro & Jameson, 2020): when children believe in their mathematical abilities, they may approach tasks more confidently, manage anxiety more effectively, and persist more resiliently during problem solving.

Conversely, Rozgonjuk et al. (2020) found that low self-efficacy can contribute to high maths anxiety, as learners who doubt their ability to understand and do maths may experience increased anxiety and avoidance behaviours. Frazier et al. (2021) suggest that self-regulation enables individuals to manage their emotions, thoughts and behaviours while engaging in mathematical tasks. Learners with strong self-regulation skills in maths may be better able to manage their time, persist during problem solving and select appropriate strategies (Guntur & Wahyu Purnomo, 2026). They may also be more able to identify and correct errors, reflect on their learning processes and make informed decisions about how to approach mathematical tasks. Metacognition in maths learning involves the ability to monitor and control cognitive processes while engaging in mathematical tasks (Efklides & Metallidou, 2020),

including awareness of problem-solving strategies, evaluation of their effectiveness and adjustment where necessary. Metacognitive skills enable learners to regulate their learning, self-identify areas of difficulty and develop effective strategies (Guntur & Wahyu Purnomo, 2026). Ganley and McGraw (2016) report significant negative correlations between maths anxiety and maths achievement even in young children, suggesting that anxiety and attainment may be linked from an early stage. This relationship is unlikely to operate in a single direction: for some children, anxiety may interfere with attention, participation and learning, while for others, learning difficulties, dyscalculia or repeated experiences of mathematical difficulty may contribute to anxiety. This supports a reciprocal understanding of early maths anxiety, in which emotional responses, attainment, classroom experiences and access to support may shape one another over time.

However, these individual-level factors should not be understood in isolation from context. For example, self-efficacy is shaped by whether children believe they can successfully complete the maths tasks presented to them (Bandura, 1986; Hackett, 1985), but these beliefs are formed through experiences of feedback, success, difficulty and comparison. Children high in maths anxiety may display avoidance behaviours when they perceive a task as complex (Chinn, 2012), including not attempting tasks, becoming emotional, leaving the situation or displaying disruptive behaviours (Petronzi et al., 2019a, 2019b). Such behaviours may reflect attempts to manage anticipated error, embarrassment or failure rather than a lack of motivation. Self-regulation may provide an important mechanism linking self-efficacy and maths anxiety (Guntur & Wahyu Purnomo, 2026). Where learners have stronger self-efficacy, these self-regulatory skills may help them to respond more adaptively when they encounter difficulty, including by managing

anxiety, maintaining attention and adjusting their problem-solving approach. Through monitoring their progress and revising their strategies, learners may be better able to sustain confidence and reduce the extent to which maths anxiety disrupts performance. Conversely, limited self-regulatory capacity may make it more difficult for children to contain worry, recover from mistakes or remain engaged when maths feels challenging. This is particularly relevant for younger children, whose self-regulatory skills are still developing and may therefore be especially dependent on adult scaffolding, classroom routines and emotionally supportive learning contexts. Similarly, metacognition is seen as a mediating factor between self-efficacy and maths anxiety, with those with higher self-efficacy being more likely to engage in metacognitive processes and have more metacognitive awareness that helps them to identify areas of difficulty or confusion, seek help and resources and overcome maths anxiety by taking proactive steps in their learning (Di Leo & Muis, 2020).

Microsystem: classroom climate, teacher practices and peers

At the microsystem level, classroom climate is central to how children experience maths. Children encounter maths within immediate classroom relationships, routines and task demands. Teacher feedback, peer comparison, time pressure, public correctness and responses to mistakes may shape whether maths is experienced as exploratory and supported or evaluative and threatening. Prior negative experiences of maths, repeated experiences of difficulty, and the ways in which mistakes are responded to can shape children's developing attitudes towards maths. Teachers are among the most frequently researched influences on maths anxiety, partly because they are consistent role models across children's educational journeys and because their interactions with pupils occur within the everyday contexts in which maths is taught and learned (Kirkland & Hunt, 2025). However

much of this research draws from international contexts and therefore should be considered with this limitation in mind. Teacher attitudes, feedback, language, time pressure, evaluation, peer comparison, ability grouping, responses to mistakes and the emotional safety of the classroom may shape whether maths is experienced as exploratory or threatening.

UK-based qualitative research highlighted that teachers may play a significant role because their feedback, expectations, emotional responses to maths, and classroom practices can influence how children understand success, failure and ability (Kam Chi & Cameron-Flitcroft, 2025). At this level, classroom feedback and interactions may therefore do more than support or correct learning; it may also contribute to how children begin to construct themselves as capable or incapable mathematical learners.

Environmental and classroom factors include teacher evaluation, perceived judgement, time pressure, competitive classroom climates, negative peer evaluation and classroom-based negativity (Fraser & Honeyford, 2013; Geen, 1991; Maloney & Beilock, 2012; Tok et al., 2015). Collaborative and supportive classroom environments may help to reduce anxiety, whereas high-pressure or highly evaluative settings can exacerbate it (e.g., Petronzi et al., 2019b, 2021). This finding suggests that children's emotional responses to maths are partly produced through the conditions in which maths is taught and assessed.

Teacher language is particularly important because it can influence classroom culture and children's perceptions of how achievable maths feels. The ways in which teachers talk about success, failure, mistakes, task difficulty and challenge may shape whether children interpret difficulty as part of learning or as evidence of

inability. Negative comments about a pupil's lack of understanding may also have a social dimension, influencing not only the individual child but also the peer group, particularly where pupils fear being shamed or exposed in front of others. In this sense, teacher discourse can contribute to shared classroom expectations about what counts as success, how errors are interpreted, and whether mathematical difficulty feels safe to reveal. How teachers respond to mistakes, including their own mistakes, may therefore be influential in modelling adaptive ways forward and in reducing the threat associated with being wrong.

Evidence from Ismail et al. (2022), conducted in Nigeria, illustrates how teacher-related factors may both heighten and reduce maths anxiety. Fast-paced maths lessons, excessive notes and exercises, disparaging comments and feeling overly punished were identified as teacher-related contributors to pupils' maths anxiety. In contrast, teachers' effective use of learning resources, consideration of lesson pace, motivational statements and support were reported to minimise anxiety (Ismail et al., 2022). Although the educational and cultural context differs from the present study, it provides international support for the broader ecological argument that teacher practices can alter the emotional conditions under which children encounter maths.

Pedagogical choices may also influence how pupils respond emotionally to maths. An emphasis on right answers has been associated with the development of maths anxiety (Harper & Daane, 1998), while Ashcraft and Krause (2007) identify non-supportive teaching as a key contributing factor. Approaches that prioritise rote memorisation and procedural knowledge without supporting conceptual understanding may create negative associations with maths, particularly for children who require time, dialogue and exploration to make sense of mathematical ideas.

Where classroom practice places pressure on rapid correctness, children may experience maths as a test of fixed ability rather than a process of learning, increasing the likelihood that difficulty becomes associated with anxiety, avoidance or shame. Time pressure has increasingly been identified as a salient contextual factor in children's maths anxiety (Szczygieł & Pieronkiewicz, 2022). Its relevance is partly conceptual, as timed mathematical tasks can blur the boundary between maths anxiety and test anxiety by introducing evaluative pressure, performance monitoring and fear of failure. Many children also come to associate being quick with being good at maths, a cultural assumption that may persist into adulthood, where rapid fact retrieval and efficient problem solving are often treated as expected features of mathematical competence. Notably, judgments about speed are rarely absolute; they are frequently made through comparison with how long others take to complete the same task. As a result, learners' self-beliefs about their time-based performance may remain unstable and continually recalibrated in relation to the perceived speed and fluency of those around them (Kirkland & Hunt, 2025). Time pressure may also have cognitive implications. Kirkland and Hunt (2025) note that it can intensify the negative association between maths anxiety and mathematical performance, particularly when tasks place demands on working memory. In such contexts, speeded conditions may not simply assess fluency; they may alter the emotional, cognitive and relational conditions under which children engage with mathematical problems. Beilock and Willingham (2014) suggest that alleviating time pressure may reduce maths anxiety by lessening students' concerns about not finishing in time and by allowing greater time and psychological space to work through mathematical responses. Chinn's (2009) study with pupils aged 11-13 similarly found that "having to work out answers to maths questions quickly" was rated fifth out of 20 anxiety-

provoking classroom experiences, indicating that speeded performance can be experienced as a significant source of classroom stress. At the same time, the quick retrieval of mathematical facts can be beneficial because it reduces the working memory demands involved in more complex problem solving, and some real-world mathematical situations do require efficient calculation or rapid decision-making. Yet, this does not mean that speed should be foregrounded before children have developed sufficient confidence, conceptual understanding and emotional safety. Chinn (2012) argues that school cultures that promote speed and accuracy may sit in direct tension with the need to develop students' confidence and mathematical self-belief. The effects of time pressure are therefore not uniform. For some learners, particularly those who are motivated and confident, time limits may increase focus, engagement and performance. For others, especially those who attach speed to ability, evaluation or comparison, time pressure may intensify anxiety and undermine performance. Therefore, time pressure should not be treated as inherently detrimental, but as a contextual feature whose impact depends on the interaction between task demands, motivation, perceived competence, peer comparison and the emotional meaning attached to speed and correctness.

It is also important to consider that primary teachers are usually teachers of all subjects and may not be maths specialists. This does not mean that primary teachers necessarily hold negative relationships with maths, but they may have had less specialist training, fewer advanced qualifications in maths, and comparatively less time teaching the subject than secondary maths specialists. Teachers who are not maths specialists are consistently shown to hold more fragile mathematical identities, report lower confidence and experience higher levels of maths anxiety than specialist teachers, often shaped by negative personal histories with the subject

(Bibby, 2002; Brown et al., 2008; Sloan, 2010). This pattern supports Kirkland and Hunt's (2025) observation that non-specialists may have more strained relationships with maths, with implications for the emotional climate of lessons and the possible transmission of maths anxiety to young learners. If a teacher feels uncertain about their own mathematical competence, subject knowledge or maths-teaching self-efficacy, this may influence how they present mathematical concepts, respond to pupils' questions, and model confidence in relation to maths. Newly qualified teachers may also experience particular pressures around teaching performance and may have less confidence teaching maths than more experienced colleagues. From an ecological perspective, teacher confidence and subject identity matter because pupils' perceptions of whether adults can support them may shape whether maths feels manageable, supported and learnable, or alternatively too difficult and anxiety-provoking.

Teachers may also shape children's experiences of maths anxiety through their own beliefs, affective responses and pedagogical practices. Teacher beliefs and instructional style have been linked to children's anxiety in maths (Maloney & Beilock, 2012), while adults' attitudes towards children's mathematical ability, and towards maths more broadly, may influence the implicit and explicit messages children receive about competence, effort and success (Chang & Beilock, 2016). Finlayson's (2014) study of adult students provides retrospective evidence, through survey responses, of the enduring influence of earlier classroom experiences: 17 of the 30 participants attributed their maths anxiety to fear of failure, while 28 associated it with the teaching style they had encountered. Reported features included an excessively rapid pace, authoritarian teaching, and insufficient checking of pupils' understanding. Such practices are significant because authoritarian

classroom approaches may reduce pupil agency, engagement and enjoyment (Kirkland & Hunt, 2025). Similarly, when explanations are repeated without adaptation, or when pupils perceive teachers as unresponsive to their confusion, they may experience maths as unsupported, inaccessible and threatening, increasing the likelihood that difficulty becomes associated with anxiety (Kirkland & Hunt, 2025). Evidence from younger pupils is consistent with this interpretation. Helmane (2016), in a study of pupils aged 8-9 years (n = 124), found that 36% reported negative emotions towards maths in relation to perceptions of authoritarian teaching, limited teacher responsiveness and restricted opportunities to be active learners. Kam Chi and Cameron-Flitcroft's (2025) small-scale qualitative study with primary teachers (n= 11) in the South-West of England further suggests that staff awareness and understanding of maths anxiety may be limited, particularly in relation to how teachers' own thoughts and feelings about maths can affect children's classroom experiences. Although the small and geographically bounded sample means these findings should be interpreted cautiously, the study highlights the potential importance of teacher training, reflective practice and whole-school awareness. Across the literature it is suggested that teachers can both mitigate and intensify maths anxiety through the emotional climate, language, feedback, pedagogical choices and support structures they create within the maths classroom.

Peer comparison and social evaluation are also important within the microsystem. Peer pressure, anxiety and self-esteem may interact with children's experiences of maths, while negative evaluations from peers and teachers can create embarrassment in public mathematical performance (Ashcraft & Krause, 2007; Ma, 1999). Children who compare themselves with peers may experience heightened anxiety when they perceive themselves as struggling (Hunt et al., 2017).

Peer interactions can therefore shape maths anxiety in different ways: collaborative learning may support confidence, while competition and comparison may increase perceived threat (Foley et al., 2017). Peer influence is particularly relevant in early primary classrooms because children are increasingly aware of comparison, competence and belonging within the peer group. In maths lessons, peers may shape emotional responses through visible differences in speed, correctness, confidence and willingness to contribute publicly. Supportive peer interactions may normalise mistakes and encourage participation, whereas competitive or evaluative peer dynamics may increase embarrassment, avoidance and fear of being seen as less capable. Peer influence should therefore be understood not only as an individual social factor, but as part of the wider classroom ecology through which children learn what it means to be “good” or “bad” at maths.

Peer influence can also be understood through the social norms that operate within children’s peer groups: the often-unwritten rules about what is valued, accepted or avoided, which are themselves shaped by wider cultural values, beliefs and expectations (Kirkland & Hunt, 2025). For children, peers’ opinions may be highly influential, including their attitudes towards maths, their perceived enjoyment of the subject, their views about its usefulness, and their shared understandings of what it means to be “good” or “bad” at maths. In this sense, maths can become socially divisive, as children may mimic the language, behaviours and beliefs of peers in order to fit within particular groups. Over time, outwardly expressed attitudes may become internalised, gradually shaping a child’s own beliefs about maths. Although Kirkland and Hunt (2025) note that direct evidence for this process in maths contexts remains limited, they draw attention to the wider research base on conformity and normative social influence. Gest and Rodkin (2011), for example,

identified how children may mirror peers' language, behaviours and beliefs in ways that reflect group norms, while Hatfield et al. (1992) describe emotional contagion as the process through which one individual's feelings may transfer to others through mimicry of expressions, language and behaviour. More directly, Kim et al. (2023), in longitudinal research, found that students' maths anxiety became more similar to that of their peers over the course of an academic year, suggesting that maths anxious peers may shape an individual child's own emotional experience of maths. These peer processes are also likely to be influenced by wider social representations of maths in the media, which may reinforce cultural narratives about maths as difficult, stressful or only accessible to certain kinds of learners.

Mesosystem: home-school relationships and parental influences

At the mesosystem level, home-school relationships, parental beliefs about maths and family narratives about being "not a maths person" may shape how children interpret mathematical learning and how they interpret mathematical success, difficulty and mistakes. Parental attitudes and expectations can either alleviate or exacerbate maths anxiety (Dowker et al., 2016; Ramirez et al., 2018), particularly because children's understandings of maths are shaped not only by school experiences, but also by the language, beliefs and emotional responses they encounter at home. Ganley and McGraw (2016) suggest that parents and teachers may contribute to early maths anxiety through modelling anxious behaviours, negative talk about maths and high-pressure evaluative environments. This interpretation should be treated with caution because it is inferential rather than based on direct behavioural observation within their study; yet, it is consistent with wider evidence indicating that adults' maths anxiety, communication and evaluative pressure can shape children's attitudes and emotional responses to maths (Beilock

et al., 2010; Maloney et al., 2015). Bartley and Ingram (2017) explain that parents may model their beliefs and attitudes towards maths in multiple ways within the home environment. These influences are not necessarily negative: parents may draw on their own school experiences, perceived ease or difficulty with maths, attitudes, self-efficacy, motivation and experiences of overcoming challenge in ways that communicate either confidence and resilience or anxiety, avoidance and low self-belief. Such modelling may influence how parents discuss maths, how they support homework and how they present their own relationship with the subject, which may in turn shape children's behaviours, perceptions, beliefs and attitudes (Kirkland & Hunt, 2025; Maloney et al., 2015). International evidence further suggests that parental maths anxiety may be associated with children's maths anxiety and attitudes; for example, research conducted in India found that parents' maths anxiety significantly predicted their child's maths anxiety and attitudes towards maths, with stronger parental anxiety and greater exposure to that anxiety linked to a greater likelihood of anxiety in the child (Soni & Kumari, 2015). The evidence is not consistent, as other studies have found that children's attitudes, feelings towards maths and maths anxiety were not related to those of their parents (Jameson, 2014; Sari & Hunt, 2020). Claims about parental influence therefore need to remain tentative and contextually sensitive, rather than assuming a simple direct transmission from parent to child. One possible explanation, identified in research with Chinese students, is that parental pressure to achieve may contribute to maths anxiety (Szucs & Toffalini, 2023). Another is that parental maths anxiety may influence the extent to which parents engage in high-quality number talk with their children, potentially affecting children's development of mathematical understanding (Berkowitz et al., 2021). The weight of the evidence suggests that parental influence

is best understood as part of a wider home-school ecology in which beliefs, emotional responses, expectations and support practices may interact with children's classroom experiences, rather than as an independent or uniformly negative cause of maths anxiety.

Exosystem and macrosystem: school structures, policy and cultural narratives

At the exosystem level, children may be indirectly affected by school policies and organisational practices that shape classroom conditions. Grouping practices, intervention models, assessment policies, marking policies, curriculum implementation and school-level accountability may influence how maths is taught and how children experience success, difficulty and comparison. Concrete examples include whether pupils are placed in ability groups or flexible mixed-attainment groups, whether additional maths support is framed as exploratory consolidation or deficit-based catch-up, whether marking policies foreground errors or next steps, and whether assessment information is used to provide responsive teaching or to increase visible comparison between pupils. Although children may not directly engage with these school-level decisions, such structures can shape the emotional climate of maths lessons by determining how progress is monitored, how pupils are grouped, how support is allocated and how mistakes are responded to. This means that exosystem influences are not abstract background conditions: they are experienced by children through everyday classroom routines, feedback practices, grouping decisions and opportunities for participation.

At a broader level, children's experiences of maths sit within historical, political and systemic developments in education in England. The introduction of the National Curriculum in 1988 marked a significant shift by establishing maths as a

core subject with defined attainment targets and progression expectations. Subsequent developments, including statutory testing, league tables and inspection frameworks, have further embedded a performative culture within schools. More recently, the 2014 National Curriculum and related primary maths guidance have foregrounded fluency, reasoning, problem solving, secure conceptual understanding, rapid and accurate recall, and progression through increasingly complex mathematical ideas (DfE, 2021). DfE guidance for primary schools also emphasises coherent progression through core concepts and ready-to-progress criteria from Year 1 to Year 6, supporting current practice in which teachers plan sequenced learning, frequent practice, consolidation and progression through small conceptual steps (DfE, 2021). These developments show how the maths curriculum has moved from a broad standards-raising agenda towards a more explicitly sequenced, mastery-oriented approach to developing mathematical knowledge and fluency.

At the macrosystem level, national policy, SATs, Ofsted and accountability frameworks, discourses about numeracy as economic capital, and wider societal beliefs about maths ability may all contribute to the symbolic status of maths and the perceived consequences of struggling. In practical terms, these macro-level priorities can be translated into classroom practices such as regular arithmetic practice, explicit teaching of methods, timed or speeded recall activities, whole-class checking of right answers, use of attainment data to identify pupils for intervention, and visible narratives about progress towards age-related expectations. Such practices are not inherently anxiety-provoking and may support learning when they build fluency, conceptual security and confidence. But where children experience them as high-pressure, public, punitive or comparative, they may contribute to maths anxiety by shaping how children interpret mistakes, pace, correctness and mathematical ability.

This is consistent with authors who have commented on the influence of classroom and systemic conditions, including Chinn's (2012) argument that school cultures promoting speed and accuracy can sit in tension with confidence and mathematical self-belief, Petronzi et al.'s (2017) UK qualitative evidence that young children may associate maths with fear of failure, punishment, teacher authority and competition, Gripton's (2020) work on ability grouping as a classroom structure through which children experience messages about competence and belonging, and Kirkland and Hunt's (2025) synthesis of how task demands, speed, evaluation, teacher discourse and broader meanings attached to maths can shape maths anxiety. This aligns with ecological and social constructionist accounts, which suggest that children's emotional responses to maths are formed through interactions between policy contexts, classroom pedagogy, teacher discourse, peer comparison and children's developing self-concept, rather than arising solely from individual cognitive vulnerability or low attainment (Bronfenbrenner & Morris, 2006; Eccles & Wigfield, 2002; Harter, 1999; 2012).

Chronosystem: development over time

The chronosystem draws attention to how maths anxiety may develop over time through repeated experiences of success, difficulty, feedback and comparison. Early emotional responses may not yet represent a fixed or fully elaborated anxiety construct, but they may form part of a developmental trajectory in which avoidance, reduced confidence and negative self-beliefs become increasingly established if not recognised and supported.

Considered together, relational and ecological influences suggest that maths anxiety should not be understood as a purely individual difficulty. The literature on

relational and ecological influences broadens the understanding of maths anxiety beyond the individual, highlighting the roles of teachers, parents, peers, classroom climate and wider educational discourses. Children's emotional responses to maths are shaped by interactions between prior experiences, self-efficacy, adult expectations, peer comparison, classroom climate, assessment practices, family narratives and wider educational discourses. Notably, much of the existing evidence in the literature is indirect, retrospective or drawn from older children and adults or drawn from different cultural/curriculum contexts, meaning that conclusions about relational and ecological factors that impact younger children should be made carefully. The evidence is therefore conceptually important but requires further empirical grounding in children's own accounts of everyday classroom experience. A relational and ecological understanding therefore supports the need to explore how children make sense of maths within everyday classroom contexts, rather than assuming that anxiety can be fully explained through attainment or cognitive processes alone.

1.9 What does the literature reveal about children's own lived experiences of maths anxiety?

The literature reveals only a limited and fragmented account of children's own lived experiences of maths anxiety, particularly for younger primary-aged children and especially in UK-contexts. Much of the existing maths anxiety literature has relied on quantitative measures, adult-defined constructs and performance data, which are valuable for identifying prevalence, associations with attainment and broad patterns of anxiety, but are less able to show how children themselves understand maths, mistakes, teacher responses, peer comparison or their own emotional reactions. A childist lens therefore changes how this evidence is read: rather than

treating children primarily as measured subjects whose experiences can be inferred from scores, it positions them as competent meaning-makers whose accounts are necessary for understanding how maths anxiety is lived, interpreted and socially situated within classroom contexts.

From this perspective, the existing evidence base is important but epistemologically limited. Studies that measure children's anxiety on self-report, quantitative scales or examine performance outcomes can show that maths-related distress may exist and may matter for learning, but they cannot fully explain what maths anxiety feels like to children, what classroom situations make it salient, or how children interpret the social meanings of being correct, quick, helped, compared or judged. This limitation is particularly significant because most maths anxiety research has focused on older children, adolescents, adults, university students or teachers, meaning that the construct has often been defined through adult or older-learner understandings rather than through the language, meanings and experiences of younger children themselves.

The strongest direct evidence in this section comes from qualitative and child-centred work, although this body of literature remains small, with few studies directly eliciting younger children's own accounts of maths-related emotional experiences. There is a small body of UK-based qualitative work relevant to primary children's experiences of maths and maths anxiety, most notably Petronzi et al. (2017) and Ashby (2009). Petronzi et al. (2017) provide important UK-based qualitative evidence by exploring maths anxiety with children in Reception, Year 1 and Year 2 across three UK primary schools. Their findings suggested that children who appeared apprehensive or relatively anxious about maths often associated mathematical activity with fear of failure and punishment, with teachers sometimes positioned as

figures of punishment and maths experienced as competitive, hierarchical and evaluative. These findings are significant because they show that younger children can communicate maths-related emotional meanings, and that these meanings are relational and classroom-based rather than simply internal responses to mathematical content. The study is limited in scope and context, meaning that its findings should be interpreted as providing rich insight into possible lived experiences rather than as generalisable evidence about all early primary-aged children. Ashby (2009) explored primary school children's behaviour, attitudes and beliefs towards maths in the classroom and the impact that this may have on their mathematical ability. The study focused on Year 3 pupils from a one school, using short worksheets, which were used to guide a discussion on what aspects of maths the children liked and disliked. Some pupils also joined a focus group.

Some related UK qualitative work explores children's perspectives of classroom structures such as ability grouping (Gripton, 2020) or teachers' understandings of maths anxiety (Dove et al., 2021; Kam Chi & Cameron-Flitcroft, 2025), but these studies provide indirect rather than direct evidence of how young children themselves make sense of maths anxiety in everyday classroom contexts. A childist reading of this literature therefore foregrounds not only the scarcity of children's voices, but also the risk that adult accounts, teacher interpretations and quantitative measures may stand in for children's own interpretations and experiences.

The wider qualitative literature suggests that children's school experiences are influential in shaping their identities and future educational experiences (Pollard, 1996; Gripton, 2020; Rubie-Davies et al., 2014; Viljaranta et al., 2014). Research also suggests that children may feel they have limited influence over what happens

in school, with teachers perceived as holding power (Einarsdóttir, 2010). In relation to maths anxiety, this suggests children's lived experiences cannot be reduced to whether they like or dislike maths; they may also involve how much agency, choice, status and emotional safety children experience within maths lessons. This is important because maths anxiety may be formed not only through difficult content, but through children's interpretations of power, authority, comparison and the consequences of error.

Gripton (2020) provides useful indirect evidence because the study explores children's experiences of ability grouping rather than maths anxiety directly. Gripton highlights that, within a large body of research on ability in education, children's own perspectives are often missing, including how ability grouping is experienced by young children and how this may communicate messages about competence, comparison and belonging. Although not a maths anxiety study, Gripton's qualitative UK-based work is relevant because ability grouping may shape children's sense of mathematical competence, peer comparison and belonging. The study contributes to understanding the classroom structures through which maths may become emotionally charged, while also illustrating the limits of the evidence base: much of what can be inferred about maths anxiety from this work is indirect rather than based on children's explicit accounts of maths-related anxiety.

Research into children's attitudes towards maths also provides insight into lived experience, although it should not be conflated with maths anxiety. Attitudes towards maths have long been recognised as influential for maths achievement, yet there has been limited research into young children's attitudes (Quane, 2024). Quane's (2024) research with 106 children aged between seven and nine in South Australia found that young children's attitudes towards maths varied significantly: 60

percent had positive or extremely positive attitudes, 29 percent were neutral and 8 percent had negative attitudes. This indicates that young children's feelings towards maths are nuanced, variable and shaped by emotional responses, their vision of maths and perceived competence (Quane, 2024). Many children described a mix of emotions, indicating that feelings about maths may be fluid and dependent on context and task. Negative feelings were expressed through confusion, frustration and dislike, with one child depicting themselves as Frankenstein's Monster to symbolise feeling "disgusting" and "stupid" during maths. Quane also found that children's feelings about maths were shaped by social and school experiences, including interactions with teachers, peers, family members and the broader school environment. Because this study focuses on attitudes rather than maths anxiety, and was conducted outside the UK, it should be used as relevant but indirect evidence of the emotional meanings children attach to maths rather than as direct evidence of early maths anxiety.

Szczygieł and Pieronkiewicz (2022) similarly argue that, although interviews with children have limitations, children themselves are well placed to explain why maths makes them feel anxious. Drawing on Petronzi et al. (2019a), they suggest that interviews with children may generate new knowledge about maths anxiety that is not accessible through measures alone. This supports the central finding of this section: the literature reveals that children can provide meaningful insight into maths-related emotional experiences, but the empirical evidence directly capturing these accounts remains limited. Existing qualitative studies indicate that children may associate maths with fear of failure, teacher authority, classroom comparison, limited agency, confusion, frustration and negative self-meanings. However, the small number of studies, the limited range of contexts, the reliance on indirect evidence

and the dominance of adult-defined quantitative methods mean that the literature provides only a partial account of younger children's lived experiences of maths anxiety.

1.10 How robust is the evidence for interventions to support children experiencing maths anxiety? What are the implications for EP practice?

Although maths anxiety has received increasing research attention over the last decade, less attention has been given to interventions aimed specifically at reducing maths anxiety in school-aged children, and the evidence is particularly limited for younger primary-aged children (Balt et al., 2022; Passolunghi et al., 2020). Several studies highlight the importance of interventions to improve maths anxiety-related outcomes (Harari et al., 2013; Petronzi et al., 2021; McKenna et al., 2022; Kirkland, 2020; Krinzinger et al., 2009). However, Balt et al.'s (2022) systematic review of intervention research indicates that the evidence base remains uneven, with many studies involving older adolescents, adults or school-aged samples where the relevance to younger primary children is not always clear. This is a significant limitation given the evidence discussed earlier that early signs of maths anxiety, apprehension and avoidance may already be present in the first years of formal schooling. For this reason, the present review comments on intervention studies involving older children, adolescents and adults where they offer useful conceptual, theoretical or practical insight into the wider intervention evidence for maths anxiety. These studies are included not to imply direct generalisability to younger primary-aged children, but to show what is currently known about intervention approaches in the broader maths anxiety literature and to identify which features may, with caution, inform thinking about younger learners. Similarly, international studies are discussed because much of the available intervention evidence has been generated outside the

UK; however, their applicability is considered critically in relation to differences in curriculum, school starting age, pedagogy, assessment culture, classroom organisation, language, home-learning expectations and wider cultural meanings attached to maths. Intervention literature therefore needs to be read with care, both in relation to participants' age and developmental stage and in relation to whether interventions target anxiety itself, mathematical performance, or the wider classroom conditions in which anxiety may develop.

One strand of intervention research is based on the view that maths anxiety may develop as an outcome of low maths performance or repeated difficulty. From this perspective, strengthening children's mathematical competence is expected to interrupt cycles in which struggle leads to avoidance, reduced confidence and heightened anxiety (Balt et al., 2022; Dowker et al., 2016; Ramirez et al., 2018; Supekar et al., 2015; Passolunghi et al., 2020; Vanbecelaere et al., 2020). Studies using educational maths games in primary school report reductions in maths anxiety alongside gains in early numeracy, suggesting that active, playful and motivating approaches may support both engagement and emotional responses to maths (Alanazi, 2020; Huang et al., 2014; Vanbecelaere et al., 2021). Alanazi (2020), for example examined recreational maths games with first-grade boys in Saudi Arabia, comparing an experimental group receiving 24 sessions over two months (n = 28) with a control group receiving traditional teaching (n = 30). The intervention was associated with lower maths anxiety and higher performance, with a significant negative correlation between anxiety and attainment. Huang et al. (2014) similarly evaluated digital game-based learning with Grade 2 pupils in southern Taiwan (n = 29 experimental; n = 27 control), reporting increased interest and motivation, reduced anxiety and improved performance when an appropriate game model was

integrated into maths lessons. They also argued that when anxiety was mitigated, both learning motivation and performance were enhanced. Vanbecelaere et al. (2020) comparing adaptive and non-adaptive number games with 84 young children in Belgium. Both groups improved in early numeracy and showed lower maths anxiety after training, though adaptive games where task difficulty adjusts to performance, supported more efficient learning. Importantly, children with lower prior knowledge benefited more from non-adaptive training, whereas those with higher prior knowledge learned more efficiently with adaptivity. Collectively, these studies suggest that game-based approaches may reduce maths anxiety by making learning more active, enjoyable and success-oriented. However, the evidence requires careful interpretation. Alanazi's study involved only male pupils and was conducted in Saudi Arabia, limiting generalisability to mixed-gender UK classrooms. Huang et al. and Vanbecelaere et al. were also conducted in international contexts, raising questions about curriculum comparability, classroom culture and the applicability of findings to early primary school aged pupils in England. Moreover, while these studies report changes in anxiety, motivation and performance, they provide little insight into how children themselves experienced the interventions or whether games made maths feel safer or less evaluative in everyday classroom contexts. Skills-focused computer-based training programmes show similar patterns. Jansen et al. (2013) evaluated Math Garden with 207 children aged 8-13 in the Netherlands, reporting reduced maths anxiety across both experimental and control groups, stable perceived competence and improved addition and subtraction performance only in the experimental condition. Rauscher et al. (2017) examined a computer-based arithmetic training programme with 68 children aged 7-10 in Germany, including both typically developing learners and those with mathematical learning difficulties, and

found reduced maths anxiety in the training group compared with a waiting-list control. Supekar et al. (2015) investigated an intensive eight-week one-to-one tutoring programme with 46 Grade 3 children in the United States, reporting reduced maths anxiety among highly anxious children and associated changes in amygdala-based neural circuits. Viewed together, these studies indicate that skills-focused interventions, particularly those that are adaptive, individualised, playful or scaffolded, may improve maths performance and reduce maths anxiety. Yet they should not be interpreted as evidence that increased exposure to maths is sufficient. In Jansen et al. (2013), anxiety decreased in both groups, complicating claims about programme-specific effects. Across studies, participants were generally older than young primary school aged children and drawn from international contexts, limiting transferability to the English early-primary curriculum. The interventions also focused primarily on arithmetic practice, computer-based skill development, games or tutoring, offering limited insight into how younger children experience maths emotionally within ordinary classroom lessons. If maths anxiety contributes to poor performance, additional practice may intensify distress unless emotional safety, children's interpretations and classroom context are explicitly addressed. This is particularly important where interventions are framed as catch-up or remediation, as this may reinforce deficit narratives for children who already experience maths as threatening. This highlights a limitation of the current evidence base and a productive direction for future research: examining not only whether interventions improve attainment or reduce anxiety scores, but how children experience them and whether they make maths feel safer, less threatening and more emotionally manageable in everyday classroom contexts.

A further strand of intervention literature draws on resilience, growth mindset and emotional coping approaches. Interventions to change the mindset of learners (Blackwell et al., 2007) and ways to reevaluate stressful situations (Kross & Ayduk, 2011) have been proposed within the literature. Hunt and Petronzi (2024) note that several studies have used the Mathematical Resilience framework, which emphasises protective beliefs, coping strategies and the development of more resilient responses to mathematical challenge. For example, Para and Johnston-Wilder (2023) implemented the Growth Zone Model (Johnston-Wilder et al., 2020) alongside Siegel's (2020) hand model of the brain to support Brazilian high-school pupils in recognising and regulating anxiety responses during maths tasks. Levels of maths anxiety were measured before and after the intervention, and narrative records were also made, allowing the study to consider both change in anxiety levels and qualitative accounts of pupils' responses to the intervention. The data provide positive evidence for this kind of psychologically-informed intervention and add to the literature on building mathematical resilience. However, the study should be interpreted with caution in relation to the present research because it was conducted in Brazil rather than the UK, meaning that educational, curricular and cultural differences may limit direct transferability to children in England. The participants were also high-school pupils and therefore developmentally much older than young primary-aged children. Nevertheless, the authors recommend future interventions with larger and more diversified samples, positioning the study as a useful starting point for further research into resilience-based approaches to maths anxiety. Growth-mindset approaches have also shown promise in older learners, with Samuel and Warner (2021) reporting improved maths self-beliefs and reductions in anxiety among community college students following a mindset-focused programme. These

studies suggest that changing how learners understand difficulty, mistakes and emotional arousal may be important. However, much of this evidence is drawn from older learners, who are likely to have greater metacognitive awareness and emotional literacy than children in early primary school.

Work with adult learners has similarly demonstrated the potential of resilience-based approaches. Apostolidou and Johnston-Wilder (2023), for example, evaluated the Mathematical Resilience Toolkit (Johnston-Wilder et al., 2020) in a UK further-education context and reported improvements in resilience, reduced anxiety and increased engagement with maths. These findings echo earlier meta-analytic evidence from Hembree (1990), who identified cognitive restructuring and systematic desensitisation as effective strategies for reducing maths anxiety. Cognitive behavioural approaches, including cognitive reappraisal and expressive writing, have also been linked to disruption accounts of maths anxiety because they aim to reduce the impact of worry on cognitive processes and mathematical performance (Dowker et al., 2016; Kamann & Wong, 1993; Pizzie et al., 2020a; Ramirez et al., 2018; Wilson, 2011). Recent evidence suggests that cognitive behavioural and related psychologically-informed approaches may have positive effects on maths anxiety in school-aged children. Balt et al. (2022), for example, conducted a systematic review of intervention research with school-aged children, although the age range of children included across the reviewed studies is not specified here and therefore needs to be interpreted cautiously when considering relevance to younger primary school aged pupils. Passolunghi et al. (2020) provide more directly age-related evidence from a primary-aged sample, studying 224 fourth-grade children with a mean age of 9.6 years. Nevertheless, these approaches require critical consideration. Although Passolunghi et al.’s sample is primary-aged, fourth-grade

children remain developmentally older than pupils of early primary-age and are likely to have greater metacognitive awareness, literacy, emotional vocabulary and capacity to engage with explicit cognitive strategies. Such interventions may therefore be less developmentally appropriate for younger children if they rely heavily on abstract reflection, written expression or explicit cognitive restructuring. They may also risk individualising maths anxiety if the focus remains on changing the child's thoughts without also addressing the classroom contexts, relationships and systemic conditions that make maths feel threatening.

Pedagogic changes have also been identified as relevant to reducing maths anxiety. Studies by Elliott et al. (2016), Hembree (1990), and Oh et al. (2022) highlight the potential benefits of instructional approaches that emphasise mastery, conceptual understanding and emotionally supportive classroom climates. Such approaches are important because they move beyond the idea that maths anxiety should be addressed only through individual coping strategies. However, pedagogic interventions may still be limited if they focus narrowly on mathematical content or performance outcomes without attending to how children experience mistakes, feedback, time pressure, peer comparison and evaluation. As Petronzi et al. (2024) argue, emotional grounding may need to precede conceptual instruction if children experiencing anxiety are to be ready to engage meaningfully with maths learning.

Flipped learning approaches have also been identified as potentially useful in reducing maths anxiety (Kirkland & Hunt, 2025, Niaei et al., 2021; Segumpan & Tan, 2018). In flipped learning, direct instruction is typically delivered outside the classroom, often through pre-lesson materials, while classroom time is used for more interactive, collaborative and facilitated learning activities. From an anxiety perspective, this structure may be beneficial because children encounter new

material before the lesson, allowing classroom time to be used to deepen understanding through discussion, guided practice and peer-supported problem solving. Kirkland and Hunt (2025) suggest that this may reduce the fear of evaluation during the instructional phase, while also ensuring that learners have access to adult and peer support when engaging in mathematical problem solving. International studies provide some support for this approach. Niaei et al. (2021) examined a flipped classroom intervention with fifth-grade female students in Iran during the 2018-2019 academic year, using a purposive convenience sample drawn from two neighbouring schools. The study allocated 29 pupils to the experimental group and 27 to the control group, with the intervention consisting of four fifth-grade maths sessions each week: two home-based flipped sessions using teacher-prepared educational digital recordings and two in-class sessions focused on solving exercises. Maths anxiety was measured through pre- and post-intervention questionnaires. Segumpan and Tan (2018) similarly used a quasi-experimental pre-test/post-test design with Grade 7 students in the Philippines, comparing an experimental flipped-classroom group (n = 45) with a non-flipped control group (n = 45) from another class in the same school, while examining both maths performance and anxiety. Both studies reported reductions in maths anxiety following flipped learning interventions, attributing this to opportunities for deeper learning, increased motivation, greater learner involvement and the possibility for students to set their own learning goals. The value of flipped learning appears to lie partly in the way home-based activities function as an introduction and pre-discussion for subsequent classroom learning, rather than as independent unsupported teaching. However, the applicability of this evidence to the present study is limited. Both studies involved children older than young primary age, meaning their findings cannot be assumed to

transfer directly to early primary-aged pupils, whose independence, metacognitive awareness, reading comprehension and capacity to engage with pre-lesson materials are likely to be more dependent on adult scaffolding. The international contexts also raise questions about curriculum comparability, classroom expectations, home learning practices and access to resources. In addition, Niaei et al.'s all-female sample is important because some studies report gender differences in maths anxiety; therefore, findings from this sample may not generalise to mixed-gender classrooms or explain how flipped learning may operate differently across genders. More broadly, the reliance on quasi-experimental designs, convenience sampling and pre-/post-questionnaire measures means that these studies provide useful but limited evidence about whether flipped learning changes children's lived emotional experience of maths within everyday classroom contexts. Its applicability to younger primary pupils therefore requires careful consideration, as pre-lesson engagement may depend on children's access to adult support at home, digital resources, language comprehension and confidence approaching new material independently.

Peer mentoring approaches have also been explored as a relational intervention for maths anxiety. Cropp (2017) used student mentors in a secondary school in the South West of England with students aged 11-15 years, providing encouragement and modelling strategies for coping when pupils became stuck during mathematical tasks. This approach aligns with Vygotsky's (1978) emphasis on learning through social interaction and support from a more knowledgeable other, suggesting that mathematical confidence may be developed through scaffolded participation rather than individualised remediation alone. Cropp reported increases in positive attitudes towards both the intervention and maths, alongside reductions in

maths anxiety. Moliner and Alegre (2020) provide further support for the potential value of peer mentoring among secondary school students in Spain (n= 376, age 12 to 15 years old), regardless of age or gender. Together, these findings suggest that peer mentoring may reduce maths anxiety by normalising difficulty, modelling persistence, increasing perceived support and providing relational reassurance during problem solving. However, the evidence should still be interpreted carefully. Both studies involved secondary-aged pupils, and Moliner and Alegre's research was conducted in an international context, meaning that findings cannot be assumed to transfer directly to early primary-aged children in England. Younger children's peer relationships, developmental capacity for mentoring, classroom organisation and dependence on adult scaffolding may differ substantially from those of adolescents. Cropp's small sample size (n= 5) also limits the generalisability of the findings. Further research is therefore needed to explore whether peer-based approaches can offer a developmentally appropriate and contextually relevant form of support for younger children experiencing early signs of maths anxiety.

Cooperative learning, sometimes referred to as group or collaborative learning, has also been identified as a pedagogical approach that may reduce maths anxiety within classroom contexts (Mehdizadeh et al., 2013; Pantino & Hondrade-Pantino, 2021). Rather than positioning mathematical problem solving as an individual performance, cooperative learning creates opportunities for pupils to discuss strategies, seek help, share uncertainty and develop understanding through interaction with peers. Mehdizadeh et al. (2013), for example, used a quasi-experimental design with 40 female students in the first grade of secondary school in Roodsar, Iran. The study reported that cooperative learning methods significantly reduced maths anxiety, improved avoidance and denial of help-seeking, increased

the use of help-seeking strategies and supported academic achievement. Pantino and Hondrade-Pantino (2021) examined a related collaborative approach with 60 first-year college students in the Philippines, comparing individual and group collaborative creative writing activities in relation to maths test anxiety. Students in the collaborative writing condition reported significantly lower maths test anxiety than those receiving traditional teaching alone and paired-samples tests indicated that neither individual writing nor traditional instruction alone significantly reduced anxiety. Collaborative creative writing, however, produced a significant decrease in maths anxiety, suggesting that shared meaning-making activities may have particular value for reducing maths anxiety. These studies are useful because they indicate that anxiety may be reduced when learners are supported to externalise worry, work alongside peers and experience maths-related difficulty as shared rather than individually exposing. This may be particularly important for maths anxious learners because collaborative contexts can make help-seeking more normative, support peer explanation and distribute responsibility for problem solving across the group. Cooperative learning may also lessen feelings of shame, fear of failure and fear of judgement because difficulty is encountered within a shared context rather than exposed as an individual deficit. However, the evidence also requires careful interpretation. Both studies were conducted outside the UK and involved older learners: secondary-school students in Iran and first-year college students in the Philippines. Consequently, the findings may not transfer directly to young primary-aged children in England, whose collaborative learning is likely to depend more heavily on adult scaffolding, classroom routines and developing verbal, social and metacognitive skills. Mehdizadeh et al.'s all-female sample also limits generalisability, particularly given that some studies suggest gender differences in

maths anxiety. Furthermore, collaborative learning is not inherently protective: its effectiveness is likely to depend on the quality of group interactions, classroom norms, status dynamics and whether pupils experience peers as supportive rather than evaluative. For younger children, cooperative approaches may therefore need explicit adult scaffolding to ensure that collaboration promotes emotional safety rather than social comparison. Together these studies provide promising but indirect evidence that cooperative and collaborative approaches may reduce maths anxiety, while also highlighting the need for further research into whether such approaches are developmentally and contextually appropriate for younger primary-aged children.

Codding et al.'s (2023) meta-analysis of skills-based and therapeutic maths anxiety interventions provides an important distinction within the intervention literature. Therapeutic approaches, including psychological, counselling, emotional-regulation, cognitive-behavioural and reflective strategies, appeared to have stronger effects on reducing maths anxiety than non-therapeutic interventions that primarily targeted mathematical skill development. In contrast, skills-focused interventions produced greater improvements in maths performance. This distinction is important because it suggests that maths anxiety and maths attainment, while related, may require different forms of support. Interventions that directly address anxiety, emotional regulation and learners' interpretations of mathematical experiences may be especially relevant for reducing maths-related distress, whereas skills-focused approaches may be more effective for improving performance outcomes. For younger children, this highlights the need to consider whether an intervention is designed to reduce anxiety, improve attainment, or address both through an integrated and developmentally sensitive approach. However, Codding et al.'s findings also require cautious interpretation. The meta-analysis included studies

ranging from early primary to secondary-aged participants, and apparent differences between therapeutic and non-therapeutic approaches were no longer significant once study quality was taken into account. Much of the evidence was also drawn from US school contexts. The review therefore suggests that therapeutic approaches are promising, but not yet conclusively superior, and that further high-quality research is needed to determine their relevance for early-primary children in UK settings.

Expressive and creative writing studies illustrate both the potential and the limitations of therapeutic or emotion-focused approaches. Hines et al. (2016), working with 93 high-school students in the United States, reported reductions in maths anxiety following brief expressive or creative writing activities, suggesting that opportunities to articulate emotion may support affective regulation in adolescents. Pantino and Hondrade-Pantino (2021), in a quasi-experimental study with 60 college students in the Philippines, found that collaborative creative writing significantly reduced maths test anxiety, whereas individual writing and traditional instruction did not. This points to the possible importance of shared reflection, peer reassurance and collective meaning-making, rather than writing alone. Park et al. (2014) extended this work with 80 US undergraduates, finding that expressive writing improved mathematical test performance among highly anxious students, possibly by reducing intrusive worry during evaluative tasks. In contrast, Ruark (2021) found no significant effect of expressive or creative writing on maths anxiety among middle-school students in East Texas, although the short two-week duration may have limited the intervention’s impact, with Ruark explicitly noting that prior research emphasises the need for prolonged or repeated writing episodes to observe meaningful change. This study therefore raises questions about the duration,

spacing, and the temporal dynamics of emotional interventions. Together these studies provide tentative evidence that expressive or reflective techniques may support some learners in regulating maths-related anxiety, particularly where writing is developmentally appropriate, repeated over time, and socially scaffolded. However, the evidence remains indirect for the purposes of the present study. Participants were middle-school, high-school, college or undergraduate learners, rather than early primary children. This matters because younger children's literacy, fine-motor skills, working memory, emotional vocabulary and metacognitive awareness are still developing; for some, writing itself may introduce additional cognitive load or frustration. The studies were also conducted outside the UK, raising questions about transferability across curriculum structures, assessment cultures, classroom discourse and wider meanings attached to maths. The review therefore indicates that expressive and creative writing approaches are promising but developmentally conditional. Their relevance for early primary-aged children in England cannot be assumed without substantial adaptation and further research into how young children experience, understand and respond to emotion-focused support within ordinary classroom contexts.

Emotion-focused maths anxiety intervention literature often draws on cognitive reappraisal, which involves identifying, articulating and deliberately reframing negative thoughts associated with anxiety (Ellis & Bernard, 2006). Although Ellis and Bernard's Rational Emotive Behavioural Techniques (REBT) were not developed specifically for maths anxiety, they are relevant because they conceptualise childhood emotional difficulties, including performance anxiety, avoidance and low frustration tolerance, as arising partly from irrational beliefs and maladaptive interpretations of academic demands. Their work is also frequently cited

within maths anxiety intervention literature because of its relevance maths anxiety as a cognitive-emotional response involving negative self-talk, fear of mistakes and avoidance of mathematical situations. The relevance of REBT to young UK primary-aged children should be interpreted with thoughtful consideration that the approach is broad rather than maths-specific and relies on learners being able to identify, verbalise and reframe their own thoughts, which requires metacognitive and linguistic skills that may still be developing in early primary pupils. Consequently, Ellis and Bernard's framework is best understood as a useful theoretical lens for explaining why cognitive reappraisal may reduce maths-related distress, rather than as direct evidence that REBT-based strategies are developmentally appropriate or effective for young children. Future UK-based research therefore needs to examine how, and whether, cognitive-emotional strategies can be adapted into concrete, relational and developmentally accessible forms of support for younger children experiencing early signs of maths anxiety.

Evidence for emotion-based strategies remains limited but suggests that relaxation and self-regulation techniques may reduce maths anxiety for some learners, particularly in older student populations. Studies with US college or undergraduate students have reported reductions in maths anxiety following focused breathing techniques (Brunyé et al., 2013), combined mindfulness and growth mindset intervention (Samuel & Warner, 2021), virtual-reality relaxation (Davis & Kahn, 2018), and mandala colouring activities (Salazar, 2019). Samuel and Warner (2021) also found increased maths self-efficacy, suggesting that emotion-focused approaches may support not only anxiety reduction but also learners' beliefs in their mathematical capability. It is important to consider that the evidence is methodologically and developmentally limited. Davis and Kahn's study was small-

scale, while Salazar's findings are difficult to interpret as both mandala and comparison colouring activities reduced anxiety, raising questions about whether the effect was specific to mandala colouring or reflected a broader calming effect of structured creative activity. In UK undergraduates, Gan et al. (2016) found only small, short-term reductions in self-reported maths anxiety following sedative music, suggesting that music-based relaxation may influence learner's perceptions of anxiety more than their underlying physiological arousal. Collectively, these studies indicate that emotion-regulation activities may have some immediate benefit, but the evidence is largely drawn from older learners, often in university contexts, and does not yet demonstrate sustained or developmentally transferable effects for younger children in the UK. Johnston-Wilder and Marshall's (2017) conference paper is not an empirical evaluation of a maths anxiety intervention, but it offers a useful conceptual framework for understanding processes thought to support learners experiencing maths anxiety. Its emphasis on awareness, resilience, non-threatening learning environments and learner agency provides a UK-based perspective that complements empirical intervention studies, while also highlighting broader pedagogical conditions relevant to emotional safety in maths. Because it is a non-empirical conference paper and its ideas are oriented primarily toward older learners, it should be treated as a conceptual guide rather than evidence of intervention effectiveness, and its applicability to early-primary contexts remain limited. The key contribution of this strand of literature is that emotion-based approaches may have value in reducing maths-related distress, but the current evidence base is indirect for UK-based young primary children. Most studies involve undergraduates, college students or older learners whose emotional vocabulary, self-regulation, metacognitive awareness and capacity to engage with relaxation or

reflective strategies are more developed than those of younger primary-aged pupils. Future research therefore needs to examine whether emotion-regulation approaches can be adapted for younger children in ways that are concrete, relational, classroom-based and sensitive to children's own constructs and experiences of maths anxiety.

Shore and Kelleher (2024) examined a range of maths anxiety interventions for pupils aged 9-11 in the United States, focusing on their effects on self-efficacy, motivation and attainment. Across the studies reviewed, interventions such as expressive writing (Park et al., 2014), app-based home activities (Berkowitz et al., 2015), cognitive behavioural approaches (Guimarães et al., 2021), strategy focused training (Passolunghi et al., 2020) and digital game-based methods (Bonnett et al., 2017) consistently demonstrated reductions in maths anxiety. Importantly, many of these approaches also produced gains in related affective and performance-based constructs, including increased self-efficacy, enhanced motivation and improved mathematical attainment. Together, this body of evidence suggests that early, targeted interventions can meaningfully disrupt the affective processes that contribute to maths anxiety, while simultaneously supporting broader academic engagement and achievement.

Collingwood and Dewey (2018) argued that effective maths anxiety interventions for primary-aged children must address both the academic and affective dimensions of learning, noting that cognitive behavioural approaches can reduce anxiety whilst simultaneously supporting maths understanding. Collingwood and Dewey (2018) devised an intervention called 'Thinking your problems away' that encouraged self-regulation and positive-self coping statements, teaching children to recognise, reframe and regulate anxious thoughts, alongside targeted maths

instruction. The results found this was more likely therefore to produce sustained improvements in confidence, engagement and attainment.

Storybook-based interventions may be especially relevant for early primary pupils because they offer a more concrete and developmentally accessible way of exploring maths-related emotions. Drawing on principles of bibliotherapy (Wilson, 2009), story-based approaches can provide a safe narrative space for children to explore emotions, normalise maths talk, and reflect on experiences without being directly positioned as anxious or experiencing difficulties. Buckley (2020) emphasises the value of picture books in facilitating follow-up discussions that help children connect characters' experiences with their own emotional responses, supporting metacognitive awareness and reducing avoidance behaviours. Petronzi et al. (2024) trialled a maths-focused storybook intervention with 6-7-year-olds (n= 15), finding that children engaged positively with integrated maths problems and used the narrative context to articulate emotions, practise self-regulation and adopt more resilient approaches. Notably, children with higher maths anxiety scores (as measured using the CMAS-UK) also demonstrated increased confidence and willingness to attempt problems as they progressed through the storybook. This study is promising because it is closely aligned with the age range of the present research. But the small sample size means that findings should be interpreted cautiously, and further work is needed to understand whether such approaches are effective across different classroom contexts and groups of children.

Other emerging approaches include the use of therapy dogs to support emotional regulation in anxious learners (Soll et al., 2026), and interventions that integrate emotional-regulation strategies alongside traditional maths support (Elliott et al., 2016). These developments reflect a broader recognition that standard maths

“catch-up” interventions may not be sufficient for children who experience maths as emotionally threatening. In some cases, additional exposure to maths may inadvertently heighten anxiety if the child’s emotional experience, sense of safety and voice are not considered. Teacher and parental support strategies have also been shown to influence children’s emotional responses to maths (Beilock et al., 2010; Maloney et al., 2015), suggesting that intervention should not be understood only as something delivered to an individual child. Rather, support may need to involve adults changing the emotional and relational conditions around maths learning.

A key critique across the intervention literature is that many approaches continue to target the child’s cognition, skills or coping strategies. While such approaches may be useful, they can unintentionally reproduce a within-child model of maths anxiety if they overlook the influence of classroom climate, pedagogy, teacher discourse, assessment culture and power. This is particularly relevant for younger children, whose emotional responses to maths may be strongly shaped by adult feedback, peer comparison and the perceived consequences of mistakes (Kirkland & Hunt, 2025). Interventions therefore need to be considered not only in terms of whether they reduce anxiety scores, but also in terms of whether they change the conditions that make maths feel unsafe or evaluative for children.

Overall, the literature suggests that a range of interventions may reduce maths anxiety, but the evidence base remains limited, particularly for younger primary-aged children. Cognitive-behavioural, resilience-based and skills-focused, pedagogical interventions show promise, yet many studies involve older learners and may rely on levels of metacognition and emotional literacy that younger children do not yet have. Importantly, the evidence base is still emerging, and some evidence is

fragmented with many studies involving older learners, small samples or interventions that target either anxiety or attainment rather than the interaction between emotional experience and classroom context. This limits the extent to which existing interventions can be confidently applied to younger primary-aged children. Emerging child-centred approaches, such as storybook-based and therapy dog interventions, begin to address this developmental gap, but the evidence remains small-scale. A further implication is that interventions are unlikely to be effective if applied through a generic or uniform model. Kirkland (2020) suggested that a “one-size-fits-all” approach to maths anxiety intervention is likely to be ineffective because the experience, triggers and meanings of maths anxiety differ between individuals. Relatedly, Kirkland and Hunt (2025) argue that conceptualising maths anxiety simply as a problem to be fixed is overly simplistic, as effective responses require a deeper understanding of how maths anxiety is experienced by the individual. They therefore suggest that it may be more useful to ask, “how can we understand maths anxiety better and respond to this?” rather than assuming that anxiety can be reduced through a standardised intervention model. Sheffield and Hunt (2006) similarly identified that interventions for maths anxiety should be personalised and should focus on practical tools that individuals can implement successfully in everyday contexts. Across the literature, it is suggested that effective support for early maths anxiety is likely to require an integrated and individually responsive approach. Such an approach would attend to emotional regulation, mathematical confidence, classroom relationships, children’s own meanings, and the wider systems that shape how maths is experienced.

The intervention literature has direct implications for EP practice. If maths anxiety is understood as cognitive, emotional, relational and systemic, then EP

involvement should not be limited to identifying anxious children or recommending individual coping strategies. Many existing approaches focus on changing the child's skills, thoughts or coping strategies, while giving less attention to the conditions that may produce or exacerbate anxiety. EPs are well placed to support schools to think more broadly about how maths is experienced by children, including how feedback, grouping, time pressure, assessment practices, adult beliefs and classroom talk may contribute to children's feelings of safety or threat in maths, not rely solely on individualised intervention. This is consistent with contemporary EP practice, which increasingly emphasises consultation, prevention, inclusion, systemic change and child-centred approaches (Zuccollo & Hutchinson, 2026). The empirical chapter (Chapter 2) will discuss further how EPs can support with maths anxiety interventions and wider systemic support in this area.

The historical development of educational psychology in England is relevant to this literature review because it mirrors a broader shift away from locating educational difficulties solely within the individual child and towards understanding learning, wellbeing and participation within relational and systemic contexts. Although EP practice has historically included psychometric assessment and categorising functions, contemporary practice increasingly emphasises consultation, prevention, inclusion, systemic change and the elicitation of children's views. This shift is directly relevant to maths anxiety because it positions EPs to respond not only to individual children's anxiety or attainment, but also to the classroom relationships, assessment practices, grouping structures, feedback cultures and wider educational discourses through which maths may become experienced as threatening or evaluative.

In summary, interventions for maths anxiety need to be considered critically. While there is promising evidence for skills-based, cognitive-behavioural, resilience-based, pedagogic and child-centred approaches, the evidence base for younger children remains limited. For children in early primary school, support is likely to be most meaningful when it combines emotional safety, opportunities to experience success, sensitive adult responses, and pays attention to children's own meanings around how they explain getting stuck, being corrected, needing help, or seeing others finish first, for example. This positions EPs as key professionals in supporting not only individual children, but also the classroom and school systems that shape how maths is experienced. Such a role is consistent with preventative, systemic and child-centred EP practice, and strengthens the rationale for research that explores young children's lived experiences of maths before assumptions are made about what support they need.

1.11 Gaps in the Literature and rationale for current study

The literature reviewed above highlights a growing recognition that maths anxiety is a multifaceted phenomenon associated with attainment, avoidance, emotional wellbeing and children's developing mathematical identities. A limitation though is several important gaps remain. These gaps relate to the age range of existing studies, the dominance of quantitative and adult-defined approaches, the limited attention given to children's own lived experiences, and the need for a more integrated theoretical account of early maths anxiety. Together, these gaps provide the rationale for the present study.

A first gap concerns the age range of existing research. A considerable amount of research has focused on adolescents, adults, university students and

teachers, including pre-service teachers, rather than younger primary-aged children. As noted throughout this review, little is still known about when maths anxiety first emerges, and very few studies have explored maths anxiety in younger populations (Ashcraft & Moore, 2009; Dowker et al., 2012; Petronzi et al., 2017; Petronzi et al., 2024; Ramirez et al., 2018). Hembree (1990) conducted a meta-analysis which highlighted that out of 122 studies only 7 explored maths anxiety in participants under 16 years old and none of the participants were younger than 10 years old. Jameson (2014) suggested that this may partly reflect the absence of suitable measurement tools for younger children. While previous studies have focused more often on children over the age of seven, Petronzi et al. (2017) highlighted that the precursor of maths anxiety may be numeracy apprehension, which can occur from around the age of four, with the Children's Maths Anxiety Scale (CMAS-UK) subsequently developed to address the lack of age-appropriate assessment tools for this population (Petronzi et al., 2019b). This indicates that early primary school may be an important period for understanding the emergence of maths-related emotional responses before negative beliefs and avoidance patterns become more established.

This age gap is particularly important because early childhood may be an essential period for establishing, maintaining or initiating a positive disposition towards maths. Early beliefs are related to later achievement outcomes and are also more malleable at this stage (Mazzocco et al., 2012). Studies have highlighted the significance of early classroom experiences and their contribution to negative maths attitudes for some pupils (Rubinsten et al., 2018), while maths anxiety has the potential to affect maths achievement from as early as First Grade (Ramirez et al., 2018). Rossman (2006) also suggested that maths anxiety can develop at any age

and may be rooted in a child's first experiences of school maths, while Harari et al. (2013) reported evidence that maths anxiety, or its precursor, may develop as early as First Grade. Synthesising these findings suggests that Year 2 is a meaningful point at which to explore early maths-related emotional experiences, particularly because children are developing academic self-concept, becoming more aware of correctness and comparison, and experiencing more formalised expectations around maths.

A second gap is methodological. Much of the existing literature on maths anxiety has relied on quantitative measures and rating scales, reflecting a broader methodological emphasis on measurement, prevalence and correlational patterns rather than in-depth accounts of experience (Arslan et al., 2015). In their review of 40 studies on maths anxiety, Arslan et al. (2015) found that 33 employed quantitative methods, whereas only four used qualitative approaches. Quantitative approaches have been valuable in identifying prevalence, associations with attainment, and broad patterns across groups, but they are limited in their ability to access elaborated and detailed accounts from children themselves (Petronzi et al., 2017). This is significant because questionnaire scores cannot fully explain how children interpret maths, mistakes, adult feedback, peer comparison or emotional safety within everyday classroom contexts. Ashby (2009) and Petronzi et al. (2017) are among the relatively few studies to examine young children's numeracy experiences qualitatively, identifying issues such as negative views of maths, low confidence, limited perceived relevance, anxiety, self-efficacy and the absolute nature of maths. It is important to consider that these studies were conducted within limited UK contexts, with Ashby (2009) focusing on Year 3 pupils in one school and Petronzi et al. (2017) focusing on three primary schools in the East Midlands. It is also important

to note that Ashby (2009) focuses on children's experiences of numeracy, rather than maths anxiety specifically. A further limitation is that some studies about early maths experiences are retrospective, relying on adults' later recollections of schooling rather than children's contemporaneous accounts (e.g. Scalise et al., 2025). Retrospective studies with adults should be interpreted with caution because they rely on memory and later meaning making rather than contemporaneous accounts of childhood experience. Nevertheless, they are valuable in showing that earlier maths classroom experiences may be reconstructed as emotionally significant and enduring, particularly where adults associate maths anxiety with fear of failure, pace, teacher responsiveness or authoritarian pedagogical practices. This strengthens the rationale for research that explores younger children's lived experiences while they are still situated within the classroom contexts in which maths-related emotions are still developing. There remains a need for further qualitative, child-centred research with younger children and more varied school contexts.

A further gap is theoretical. Existing literature often explains maths anxiety through cognitive disruption, reduced competence, or reciprocal anxiety-performance cycles. These accounts are valuable because they help explain how anxiety may interfere with performance and how difficulty and avoidance can become self-reinforcing. However, on their own, they do not fully explain how young children interpret maths, mistakes, correctness and classroom evaluation within the wider ecologies of schooling. There is therefore a need for research that integrates cognitive and attributional accounts with ecological and childist perspectives, allowing early maths anxiety to be understood as both psychologically experienced and socially situated.

Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 2006), social constructionism and childism provide a way of conceptualising maths anxiety as a relational, systemic and historically situated phenomenon. This is important because it enables the present study to move beyond asking whether children are anxious about maths and towards exploring how children make meaning from mathematical experiences, including mistakes, adult responses, peer comparison and classroom expectations. Existing studies have generated important knowledge about prevalence, measurement and performance-related effects, yet they provide a more limited account of children's subjective meanings, classroom relationships and developmental contexts. The present study responds to this imbalance by exploring how Year 2 children make sense of maths and early signs of maths anxiety within their everyday educational experiences.

The present study aims to develop a child-centred ecological-cognitive understanding of early maths anxiety. It draws together attribution theory (Weiner 1985, 2010), cognitive models of anxiety and ecological systems theory, while foregrounding the lived experiences of Year 2 children. Rather than treating maths anxiety only as an individual cognitive vulnerability or as a direct outcome of low attainment, this study understands early maths anxiety as something that may emerge through children's interpretations of mistakes within particular classroom ecologies. By positioning children as active meaning-makers, rather than passive recipients of adult-defined categories, the study seeks to understand how fear of getting it wrong, perceived evaluation and classroom meanings around ability may become connected to children's developing mathematical identities.

Existing research has established that maths anxiety can emerge during the early years of schooling and is associated with attainment, avoidance, wellbeing and

developing mathematical identity. However, the evidence base remains weighted towards quantitative, adult-defined and performance-focused accounts, offering limited insight into how younger primary-aged children themselves interpret maths, mistakes, correctness and emotional safety in everyday classroom contexts. This gap is particularly significant for Year 2 children, who are developing academic self-concept, becoming increasingly aware of social comparison and experiencing more formalised expectations around maths. The present study therefore responds to a clear need for child-centred research that situates early maths anxiety within children's lived classroom ecologies and considers implications for preventative EP practice.

The study also has relevance for EP practice. EPs have a role in removing barriers to learning, promoting educational progress, supporting emotional wellbeing and advocating for children's voices. If early maths anxiety is shaped by children's interpretations of classroom experiences, then EPs may be particularly well placed to support schools to understand and respond to these experiences preventatively. This includes helping adults consider how classroom practice, feedback, assessment, grouping and emotional climate may contribute to children's feelings of confidence, safety or threat in maths.

Chapter 2: Empirical Paper

2.0 Abstract

Mathematics (maths) anxiety has been identified in children as young as early primary school age; however, relatively little is known about how young children themselves experience and make sense of maths and its associated emotional demands. Children's perspectives remain underrepresented in the literature, with a continued emphasis on adult interpretations. This qualitative study explored the lived experiences of maths among Year 2 children through a social constructionist lens informed by a childist epistemological stance.

Eighteen children from two primary schools completed the Children's Maths Anxiety Scale (CMAS-UK), and teacher assessment data were collected to contextualise attainment. Semi-structured interviews were conducted with a purposively selected subsample (n = 11) working at age-related expectations, enabling exploration of variation in experience while controlling for attainment level. Data were analysed for nine participants, who were categorised using the CMAS-UK as reporting high or moderate maths anxiety, using Reflexive Thematic Analysis (RTA), generating five themes that illuminate how children experience, make sense of, and emotionally respond to maths.

Findings suggest that maths was widely constructed as emotionally and relationally risky, with correctness and error carrying social and identity-relevant meaning. Children's responses to maths appear to be shaped by challenge, difficulty, and performance conditions, including time pressure and classroom structures. Their mathematical identities appear fragile and emerging, and may be influenced by evaluative cultures, peer comparison, and fixed ability narratives. Learning appeared to be experienced as socially co-constructed, with teacher support, peer scaffolding,

and access to manipulatives shaping emotional safety. Finally, children appear to employ coping and avoidance strategies to manage perceived threat, suggesting early signs of situational maths anxiety.

A conceptual framework is proposed to illustrate how contextual, relational, and affective factors may interact to shape young children's mathematical experiences. Implications for classroom practice, inclusive pedagogy, and educational psychology (EP) practice are discussed, including the need for early, preventative, and systemic approaches to supporting children's emotional experiences in maths.

2.1 Introductory Literature Review

2.1.1 Introduction and National Context

The UK is reportedly experiencing a maths “crisis” with over half of the UK’s working population (54%) felt to have primary school-level maths skills (National Numeracy, 2022). The impact of low maths ability and low confidence is having a significant impact on young adults’ mental health (National Numeracy, 2024) as well as impacting individual economic success and the economy, significantly increasing unemployment risk and limiting earning potential (UK Government, 2023). Early maths has been found to be essential to an effective early education and later success in education and life (UK Government, 2023). Numeracy has since become a central objective of the education system as the government sought to improve maths education and make it mandatory to age 18 to equip young people for the modern economy (UK Government, n.d.; UK Government, 2023). The Government White Paper *Opportunity for All* (Department for Education, DfE; 2022) sets ambitions for 90% of children to reach the expected standard in maths by the end of primary school by 2030, compared with 65% in 2019, alongside a commitment to timely and evidence-based support for children who have fallen behind (DfE, 2022). These priorities underline the importance of supporting mathematical development, but they also raise questions about how attainment-focused policy agendas may be experienced by children who already find maths emotionally difficult. Within the English national curriculum, maths is presented as a creative and highly interconnected discipline, with pupils expected to develop fluency, mathematical reasoning, and problem-solving across a broad range of domains, including number and place value, calculation, fractions, measurement, geometry, statistics and, in later primary years, ratio, proportion and algebra (DfE, 2021). In order to do this most

effectively, it is important to identify and address factors which may not only contribute to these mathematical skill deficits and be barriers to maths attainment, but also that can be intervened and supported to improve outcomes.

Maths anxiety has been acknowledged as a detriment to learning maths and has been dubbed a pervasive global issue (Dowker et al., 2016; Luttenberger et al., 2018). Within this study, maths anxiety is conceptualised as a developmentally situated, socially constructed and context-dependent emotional response to maths. Rather than being treated as a fixed attribute within the child or a diagnostic category, it is understood as emerging through the interaction between children's meanings, classroom experiences, relationships, expectations, and wider discourses around maths ability. It may be expressed through worry, fear, frustration, sadness, avoidance, pressure, or heightened emotional vulnerability in maths-related contexts. This definition allows maths anxiety to be explored through children's own accounts and meanings, without assuming that adult-defined constructs fully capture how young children experience and communicate their emotional relationship with maths.

Although maths anxiety has historically been studied most extensively in adolescents, adults and university populations, a growing body of research indicates that maths anxiety and negative emotional responses to maths can emerge much earlier than previously assumed, with studies identifying measurable anxiety-related responses in children as young as four to seven years old (Ramirez et al., 2013; Cargnelutti et al., 2017; Gunderson et al., 2018; Sorvo et al., 2019; Petronzi, 2017; Petronzi et al., 2019b; Primi et al., 2020; Carey et al., 2016). Existing evidence suggests that early maths anxiety may be linked to affective, physiological and confidence-based responses, fear of mistakes, developing mathematical self-concept, classroom evaluation, teacher and peer influences, and wider relational and

contextual factors. However, the evidence base remains limited in relation to UK primary-aged children, particularly those in Key Stage 1, and is largely dominated by quantitative, adult-defined measures. As a result, while it is increasingly known that early maths anxiety exists and may affect children's engagement, attainment and emotional wellbeing, less is understood about how young children themselves experience, interpret and make sense of maths-related anxiety within everyday classroom contexts. However, despite increasing research in the area (see Chapter 1) currently little is known about the lived experiences of young primary-aged children with maths anxiety.

2.1.2 Literature Review

Maths is described in research as being a subject unlike others, as it requires more perseverance to succeed and negative attitudes to maths could reduce an individual's willingness to persist (Ashby, 2009). Maths anxiety is known as a detriment to learning maths and is associated with performance deficits, avoidance and limiting career opportunities (Petronzi et al., 2024). Maths anxiety is the feelings of tension, apprehension, and discomfort when in a mathematical context or performing maths, which can then interfere with the ability to manipulate number and solve mathematical tasks (Ashcraft & Faust, 1994; Hopko, et al., 2003; Richardson & Suinn, 1972). Maths anxiety is a pervasive issue which involves physiological arousal at the point of 'doing maths', as well as in anticipation (Dowker et al., 2016; Luttenberger et al., 2018). Maths anxiety has been found to negatively impact maths ability (Petronzi, et al., 2021), maths performance (Barroso, et al., 2021; Dove et al., 2021; Hembree, 1990; Namkung et al., 2019; Zhang et al., 2019), and working memory capacity (Ashcraft & Kirk, 2001; Justicia-Galiano et al., 2017; Shi & Liu, 2016; Skagerlund et al., 2019). It also has potential implications for future

employment and financial stability (Hembree, 1990; Wicks, 2025). A narrative literature review was conducted to explore what is already known about maths anxiety and to identify gaps for future research (see Chapter 1). Key findings are outlined below.

The literature reviewed above indicates that, although there is an increasing body of research on maths anxiety, there remains limited work exploring younger children's own experiences of maths and maths-related emotions. A considerable amount of research focuses on teachers' (in particular, preservice teachers') maths anxiety or adolescents. However, little is still known about when maths anxiety first emerges and very few studies have explored maths anxiety in younger populations, something frequently cited in literature (Ashcraft & Moore, 2009; Dowker et al., 2012; Petronzi et al., 2024; Petronzi et al., 2017; Ramirez et al., 2018). In particular, research with children around the age of seven and under remains relatively limited, and much of the existing literature continues to rely on adult-defined measures rather than children's own accounts. This creates a need for qualitative research that foregrounds pupil voice and explores how young children understand maths, mistakes, emotional responses and early signs of maths anxiety within their everyday classroom experiences. Jameson (2013) speculated that the dearth of literature around maths anxiety in younger children could be the absence of suitable measurement tools for this age range. While previous studies have focused on children over seven years old, Petronzi et al. (2017) highlighted that the precursor of maths anxiety could be numeracy apprehension, which can occur from the age of four. Further development of the Children's Maths Anxiety Scale (CMAS-UK) was implemented to address the lack of assessment tools for this population (Petronzi et al., 2019b). Studies have highlighted the significance of early classroom experiences

and their contribution to negative maths attitudes for some pupils (e.g. Rubinsten et al., 2018), with maths anxiety potentially affecting maths achievement from as early as first grade (Ramirez et al., 2018). Rossnan (2006) highlighted how maths anxiety may develop at any age and is rooted within a child's first experience of school maths, while Harari et al. (2013) reported evidence of maths anxiety (or its precursor) developing as early as first grade. Early childhood could therefore be an essential period for intervening to establish, maintain or initiate the foundations of a positive disposition towards maths, especially as early beliefs are related to later achievement outcomes and are also more malleable (Mazzocco et al., 2012).

Previous studies into maths anxiety have also focused on quantitative measures and rating scales which lack the ability to obtain elaborated and detailed perspectives from the population of interest (Petronzi et al., 2017). Ashby (2009) and Petronzi et al. (2017) are among the few studies to look qualitatively at children's numeracy experiences, highlighting that children may present negative views of maths in a variety of ways, including a lack of ability to see real-life applications and wider benefits; lack of self-belief; low confidence; self-efficacy; absolute nature of maths, and anxiety (Ashby., 2009). However, these studies were conducted on non-socioeconomically diverse populations, within limited areas of the UK, with Ashby (2009) focusing on Year 3 pupils in one school setting, whilst Petronzi et al. (2017) focused on 3 primary schools in the East Midlands area.

While there is a breadth of literature around maths anxiety, literature exploring young children's experiences and maths attitudes is scant. Considering the findings from the literature review, the following key areas were identified as requiring further exploration:

1. The need to amplify pupil voice to understand lived experience of children with maths anxiety.

2. The need to gather more information around early maths anxiety to address a population gap (under 7s)

3. The need to address gaps in knowledge (using qualitative methodology) to gain a better understanding of these children's experiences. Looking at the emotional regulation side of maths anxiety and how they feel about maths.

Year 2 was therefore selected because it sits at the upper end of the age range in which early maths anxiety has been identified, while still representing a relatively under-researched Key Stage 1 population whose mathematical attitudes and self-concepts are still developing.

The present research will aim to address these gaps by qualitatively obtaining and analysing insights from children in Year 2 regarding their experiences of maths (and maths anxiety). The study seeks to understand how children describe their feelings towards maths, how they make sense of challenge and mistakes, and how early signs of maths anxiety may be experienced by children with similar levels of attainment. In doing so, the research aims to move beyond assumptions based on attainment or anxiety scores alone and instead develop a more child-centred understanding of how maths is experienced emotionally in Key Stage 1 and more precisely in Year 2. This focus is consistent with the importance of pupil voice in the SEND Code of Practice (DfE & DoH, 2015), EP professional competencies from British Psychological Society (BPS, 2021a) and Health and Care Professions Council (HCPC, 2023), and ethical guidance for research with children from British

Educational Research Association (BERA, 2024) and BPS (2021b). While pupil voice is often referenced in policy and practice, children's perspectives remain underrepresented in research on maths anxiety. This study therefore aims to contribute to a more child-centred understanding of maths anxiety by exploring how children themselves make sense of maths and their emotional responses to it.

Exploratory in nature, the research is intended to provide a building block for future research in this area. It does not aim to make broad claims about all Year 2 children or to establish prevalence. Instead, it aims to deepen understanding of how maths is experienced by a small group of children and how early signs of maths anxiety may be interpreted within classroom contexts. In doing so, it may inform future research, EP consultation, school-based reflection and the development of more emotionally attuned approaches to supporting children's maths learning.

The proposed study will aim to answer the questions:

1. How do children who are working at age expected levels in maths but score highly on a maths anxiety questionnaire describe their experiences of maths?
2. What do their responses suggest may be the factors that influence their feelings towards maths?

2.1.3 Local Priorities

In addition to its relevance to national policy and the wider literature, the focus of this research aligns with local priorities within the researcher's placement Educational Psychology Service (EPS). The EPS has a development group focused on how children and young people (CYP) with SEND can be supported with maths in school. The county in which this study was conducted and in which the researcher works has a historically lower than national average score for maths attainment at

both Key Stage 2 and GCSE level and subsequently the Local Authority (LA) has prioritised maths as an area for school improvement. This study therefore has potential local relevance by contributing to a more nuanced understanding of how younger children experience maths emotionally, and how schools and EPs might support children whose engagement with maths is affected by early signs of anxiety, avoidance or reduced confidence.

Children's Services within the LA in which this research is situated also have strategic objectives around embedding prevention and earlier intervention and improving inclusion and achievement (including learning in the mainstream). The county's pillars of practice emphasise being child-centred, outcome-focused, relationship-based, strengths-orientated, looking at the whole family and whole systems. In light of other frameworks used within the LA, maths anxiety can be seen as a barrier to curriculum and opportunities as it undermines access to learning, resilience and coping and children being understood. Identifying and addressing maths anxiety can help to alleviate these barriers. The LA is looking for early, local, mainstream support and building schools capacities to meet need.

2.2 Methodology

This chapter outlines the methodological approach adopted to explore the lived experiences of children in Year 2 in relation to maths anxiety and negative emotional responses to maths.

The section begins by outlining the philosophical underpinnings of the research, followed by justification for the qualitative design. The research context, participants, and sampling strategy are then described. The section proceeds to

detail data collection procedures, ethical considerations, reflexivity, and analytical approaches.

2.2.1 Researcher positions

2.2.1.1 Ontology

Ontology concerns assumptions about the nature of reality; what exists and what it means for something to be considered “real” in research (Crotty, 1998). This study is underpinned by a relativist ontology consistent with a social constructionist perspective. From this standpoint, realities are understood as multiple, socially constructed, and shaped through interaction, language, and cultural context (Berger & Luckmann, 1966; Burr, 2015). Rather than assuming a single, objective reality of maths anxiety, the study recognises that children’s experiences of maths and associated emotional responses are constructed through their participation in social environments, including classrooms, peer relationships, family contexts, and wider cultural narratives about maths and ability.

Within this ontological position, maths anxiety is not conceptualised as a fixed or universal psychological entity located within the individual. Instead, it is understood as a phenomenon whose meaning and expression are constructed through social experience and interpretation. Children’s accounts are therefore treated as legitimate expressions of their own constructed realities, rather than as indicators of any underlying or objective state. These accounts provide insight into how children make sense of maths within the contexts in which they live and learn.

Accordingly, the study seeks to explore how meanings surrounding maths and emotional responses to it are constructed and negotiated within children’s everyday experiences. This perspective aligns with the broader aim of capturing the diversity

and complexity of children's perspectives, recognising that experiences of maths anxiety are variable, context-dependent, and shaped through ongoing social interaction.

2.2.1.2 Epistemology

Epistemology concerns how we can know about the world and what counts as valid knowledge (Crotty, 1998). This study adopts a social constructionist, interpretivist epistemology, in which knowledge is understood as co-constructed through interaction between participants, researcher, and context. From this perspective, understanding emerges through the interpretation of meaning rather than through the discovery of objective truths. As argued within social constructionism (e.g. Berger & Luckmann, 1966; Burr, 2015; Gergen, 2009), meanings are produced through social processes and shared language; maths anxiety is therefore understood as a concept whose significance emerges through discourse and interaction rather than existing as a stable, independent phenomenon. Consistent with the childist stance outlined in Section 2.2.1.4, children's accounts are treated as legitimate situated knowledge about their lived experiences, while recognising that meaning is co-constructed through interaction with the researcher and interpreted within wider relational and social contexts (Crotty, 1998; Berger & Luckmann, 1966; Burr, 2015).

An ecological sensitivity is maintained through reference to Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 2006), which supports consideration of the multiple social contexts within which meaning making occurs. However, within a social constructionist framework and in this study these contexts are understood as sites of interaction in which meanings are produced and negotiated. Children's

interpretations of success, difficulty, and emotional responses to maths are therefore shaped through their participation in these interconnected social contexts.

Methodologically, this epistemological positioning aligns with qualitative, child-centred approaches that prioritise meaning-making. Similar approaches have been adopted in qualitative childhood research that seeks to privilege children's perspectives and explore how they construct meaning within their social worlds. For example, studies examining young people's experiences of 'ability' in the Key Stage 1 classroom (Gripton, 2020) and permanent exclusion (Murphy, 2022) have drawn on constructionist assumptions to foreground children's interpretive work and the relational, contextual nature of their accounts. RTA provides a flexible yet theoretically coherent approach that aligns with a social constructionist position through its recognition of knowledge as interpretative, situated, and co-constructed between participant and researcher (Braun & Clarke, 2019, 2020). Within this approach, themes are not understood to emerge from data as objective features; instead, they are actively constructed through the researcher's reflexive and interpretive engagement with participants' accounts. This involves the researcher sensitively 'making sense' of the children's accounts in a way that values and remains close to their words, meanings, and contexts, while recognising that the resulting themes represent the researcher's analytic interpretation of children's experiences. In this sense, the analysis does not position children as theorising or interpreting their experiences in abstract terms; rather, it develops an interpretive account of what may be happening through careful engagement with what children communicated. Whilst the analysis foregrounded children's own meaning-making, the themes produced constitute an interpretive account developed through the

interaction between participants' perspectives, the research context, and the researcher's theoretical and analytic lens.

Analysis involved an iterative and reflexive process of interpretation, reflection, and refinement, through which patterns of shared meaning were developed from children's accounts of their experiences of maths (Braun & Clarke, 2019, 2020, 2022). The analysis aimed to understand how children made sense of these experiences while recognising that the themes produced represent the researcher's interpretation of participants' accounts. Consistent with RTA, the researcher was viewed as an active participant in knowledge production rather than a neutral observer, with reflexivity used to critically examine how interpretations were shaped by theoretical assumptions, professional experiences, and the wider research context (Braun & Clarke, 2019, 2020, 2022).

Together, this ontological and epistemological positioning frames maths anxiety as a phenomenon whose meaning is constructed through children's interactions, interpretations, and social contexts. The aim of the research is therefore not to identify a single explanation of maths anxiety, but to develop a nuanced understanding of how children construct, interpret, and experience maths within their everyday social worlds.

2.2.1.3 Axiological position.

Axiology concerns the role of values in research and acknowledges that inquiry is inherently value-laden (Crotty, 1998). This study explicitly recognises that its design, focus, and interpretation are shaped by professional, ethical, and theoretical commitments.

The decision to adopt a childism stance (Wall, 2022) reflects my professional values as a TEP, particularly commitments to equity, participation, inclusion and the ethical importance of listening directly to children. This also aligns with the ethical principles outlined by the BPS (2021a, 2021b) and BERA (2024), which emphasise respect, participation, fairness, and the minimisation of harm. These principles are embedded in methodological decisions, including the use of RTA, which acknowledges the influence of researcher values and subjectivity on data interpretation.

Participation was voluntary, informed, and developmentally appropriate, ensuring that children's involvement was ethically safe and respectful. The use of RTA reflects an explicit acknowledgement that researcher subjectivity and theoretical positioning shape interpretation. Rather than seeking value-neutral analysis, the approach embraces reflexivity as a means of critically examining how professional assumptions, training, and commitments influence analytic decisions.

Although structured measures (CMAS-UK and teacher-reported information) were used to inform purposive sampling, the study's primary commitment was to foreground children's narrative accounts as the main source of meaning, reflecting an axiological commitment to valuing lived experience over adult-centric or purely psychometric framings of maths anxiety. Overall, this approach ensures that the research remains ethically grounded, child-focused, and professionally responsible, reflecting the wider role of EPs in promoting participation, fairness, and empowerment.

The researcher's axiological position is also shaped by her socio-demographic location, lived educational history, professional role, and evolving

methodological orientation. She identifies as a White British, working-class, heterosexual, neurotypical woman aged 40, whose worldview has been formed within a British social and educational context. This positioning involves both social privilege and marginality. The researcher recognises that her whiteness, heterosexuality, neurotypicality, access to higher education, and professional training afford forms of social and institutional privilege that may shape how she understands educational systems, communicates with schools, and is perceived by adult gatekeepers and child participants. At the same time, her working-class background and experience as a single parent provide points of connection with issues of socioeconomic constraint, parental pressure, and differential access to educational resources. These intersecting positions may sensitise her to inequity, exclusion, and the pressures experienced by families and schools, while also requiring reflexive attention to the ways in which her own positive experiences of schooling and maths may differ markedly from those of children for whom maths, school, or evaluation feel unsafe, inaccessible, or threatening.

The researcher's methodological position has also developed over time. Prior to this doctoral research, she had greater familiarity with, and experience of, quantitative research approaches, which initially shaped an orientation towards measurement, categorisation, and structured tools as legitimate ways of generating knowledge. This history is reflected in the pragmatic use of the CMAS-UK and teacher assessment data within the study. However, the researcher's developing EP practice has increasingly emphasised the importance of listening to children and young people, valuing lived experience, and recognising the limitations of adult-defined or psychometric accounts when used in isolation. This shift influenced the study's design: quantitative tools were retained as contextual and sampling supports

but were deliberately not prioritised as the primary source of meaning. Instead, the research moved towards a qualitative, childist, and reflexive orientation in which children's accounts were understood as central to knowledge production. This movement away from privileging quantitative indicators required ongoing reflexive attention, particularly in relation to how the researcher interpreted CMAS-UK scores without allowing them to overdetermine children's narratives or reduce their experiences to fixed categories.

Working as a TEP also positions the researcher within overlapping institutional and relational roles. She is both a doctoral student undertaking research for academic purposes and a practitioner psychologist working within a LA system. This dual positioning may shape her understandings of education, inclusion, school improvement, and the pressures experienced by schools, families, and children. The role of a TEP involves supporting schools and children, promoting participation and inclusion, and contributing to educational systems that are intended to improve outcomes for children and young people. Consequently, the researcher approaches the study with professional commitments to amplifying pupil voice, reducing barriers to learning, and identifying support that is realistic within stretched educational settings. At the same time, being embedded within LA practice requires reflexive awareness that her interpretations may be influenced by policy discourses, service priorities, and professional assumptions about what schools can or should do. These values and positional influences are not treated as external to the research; rather, they are understood as integral to the study's methodological and interpretive choices, including its childist orientation, its prioritisation of children's accounts, and its conceptualisation of maths anxiety as relationally, ecologically, and socially constructed rather than as an individual deficit. More detailed reflexivity concerning

the researcher's values, lived experiences, and analytic decision-making is provided in the reflexive chapter.

2.2.1.4 Theoretical and Philosophical Framework

This study is theoretically grounded in childism (Wall, 2022), which provides both an ethical and epistemological rationale for centring Year 2 children's accounts of maths and maths anxiety. Childism challenges adult-centric assumptions and power imbalances within education and research, positioning children as competent social actors and meaning-makers, whose lived experiences can contribute meaningful knowledge in their own right (James & Prout, 2015). Historically, children's voices have often been marginalised in both policy and psychological research, with adult interpretations prioritised in explanations of learning difficulties and emotional experiences. In relation to maths anxiety, this can contribute to individualised or deficit-focused accounts that overlook children's subjective experiences of classroom environments, relationships and pressures. Foregrounding Year 2 children's voices therefore recognises them as active meaning-makers who interpret and respond to the structures shaping their learning experiences. Interviewing children can provide access to their subjective experiences in ways that adult proxy accounts cannot (Kortesluoma et al., 2003). This orientation also has relevance for educational psychology because it supports the use of participatory and developmentally appropriate methods when exploring children's learning experiences. For EPs, children's voices are not simply sources of additional information; they can challenge adult assumptions about what maths feels like, what makes it difficult, and what forms of support may be meaningful.

This is particularly important within maths anxiety research, where younger children's perspectives have often been marginalised in favour of adult

interpretations, quantitative measures, or accounts mediated through teachers and parents. Adopting a childist stance in this study therefore supports a commitment to epistemic justice, participation, and children's rights, consistent with professional and statutory frameworks emphasising the importance of listening to children on matters that affect them. The Children and Families Act (2014), the SEND Code of Practice (DfE & DoH, 2015), the SEND and Alternative Provision Improvement Plan (DfE, 2023) and the Schools White Paper Opportunity for All (DfE, 2022) all emphasise early identification, person-centred practice and the importance of children's views, wishes and feelings. These priorities are consistent with the United Nations Convention on the Rights of the Child (UNCRC, United Nations, 1989), particularly Articles 12 and 13, which establish children's rights to express their views in matters affecting them. Within this context, exploring children's experiences of maths is not simply an additional methodological choice; it is aligned with wider statutory, ethical and educational commitments to participation. Children's accounts of maths and maths anxiety are treated as valid in their own right, consistent with statutory and professional frameworks such as the SEND Code of Practice (DfE & DoH, 2015), HCPC Standards of Proficiency (2023), and BPS (2021a) competencies, all of which emphasise participation, inclusion, and ethical practice.

At the same time, this position does not assume that young children can always provide fully elaborated causal explanations or abstract theories about why they feel as they do. Rather, children are understood as capable of describing, expressing, and giving meaning to their experiences when methods are developmentally appropriate and relationally supportive. The researcher therefore has an interpretive role in making sense of children's accounts within their wider classroom, relational, and social contexts. In this study, childism is enacted through

the use of child-centred methods, visual and verbal scaffolds, RTA, and a reflexive commitment to ensuring that adult interpretations remain grounded in, rather than overwrite, children's own meanings.

Childism (Wall, 2022) promotes the inclusion of children's perspectives and challenges the marginalisation of their voices by questioning assumptions of adult epistemic authority. Wall frames childism as a critical lens for examining power and creating more inclusive ways of thinking and acting. Childism seeks to value and centre children's lived experiences in order to challenge adult-centred assumptions and reshape the systems, practices, and structures that affect children's lives. Children's perspectives are often marginalised within societal structures, academic discipline and research practices. This is particularly pertinent in research on maths anxiety, where existing literature is dominated by adult interpretations and quantitative measures, often overlooking younger children's lived experiences and privileging the voices of teachers and parents over children themselves (Dowker et al., 2016). This has resulted in limited insight into younger children's lived experiences. Adopting a childist stance draws attention to the pervasive adult-child power dynamic, where often adults' interpretations are positioned as more legitimate or authoritative. Often overshadowing the lived experiences of children themselves.

While this may stem from practical barriers such as limited access to children or gatekeeping by schools, the result is a dilution of children's experiences and a distortion of their views through an adult lens. Adults inevitably interpret children's emotions and behaviours through their own experiences, values, and biases, which can unconsciously shape or even overwrite what the child is truly communicating. A childist approach seeks to resist this adult-centrism by recognising children as agentic beings with the right to express their own views, and the capacity to reflect

meaningfully on their experiences. It demands more age-inclusive methodologies that go beyond tokenism to genuinely empower children as knowers and contributors. By designing research that listens directly to children and amplifies their voices, we can begin to challenge entrenched hierarchies in knowledge production and promote a more equitable and authentic understanding of childhood.

Traditionally, young children are seen as unreliable reporters or too young or immature to contribute their views in a valid and meaningful way, but childism rejects that. Research often argues that there are methodological challenges that prevents children's perspectives, perceptions and experiences being represented in research (DeCosta, et al., 2023). Including young children's views in research and practice is needed to increase their visibility in the literature, ensure their ideas are valued and presented and consistently promote their wellbeing (Darcy et al., 2019). This aligns with Article 12 of the UNCRC (United Nations, 1989), which asserts children's right to be heard on matters affecting them. DeCosta et al. (2023) state that the only way to truly grasp how young children interpret and make sense of their experiences is by attempting to understand their perspectives and finding appropriate methods to do so.

A childist stance in this study was therefore essential to ensure that Year 2 children's perspectives were central to the research process and in literature around maths and maths anxiety and how it is experienced at these ages. Wall's definition of childism was selected as the underpinning theoretical lens because it moves beyond simply including children's voices and instead seeks to position children's lived experiences front and centre (Wall, 2022). This approach is not only theoretically grounded in childism but also reflects the researchers values as being committed to justice, representation and centring children's lived realities. Throughout my work as

a TEP I seek to amplify pupil voice. Despite lots of emphasis, policy and legislation about being child-focused and holding the child central, for example the quote ‘nothing about us without us’ taken from disability rights and now often used in advocating for children’s voice, the child’s voice is often the missing part of the information gathered to date. This highlights how adult attitudes and perspectives can dominate narratives. Within research on maths and maths anxiety, children’s experiences have often been understood through adult interpretations, for example through parents or teachers or through adults retelling their childhood experiences. Using a childist framework supports the view that children are not passive recipients of educational experiences but active contributors to understanding them (Wall, 2022).

This was particularly relevant to the current study, which sought to explore the lived experiences of Year 2 children in relation to maths and maths anxiety. This supports the focus of the present study on Year 2 children, where early academic self-concept, assessment awareness, social comparison and classroom meanings around correctness are becoming increasingly salient. A childist perspective creates space for children’s own meanings, interpretations, and experiences to be foregrounded rather than filtered primarily through adult assumptions regarding what maths anxiety looks like or how it is experienced. It also aligns with the aim of examining whether wider educational structures, classroom practices, and social narratives surrounding maths may contribute to children’s experiences of anxiety. Therefore, Wall’s definition provided both a theoretical and ethical rationale for centring children’s perspectives within the research process. Furthermore, Wall’s definition aligns with the methodological position of the study by recognising children

as knowledgeable participants capable of constructing and communicating meaning in developmentally appropriate ways.

Spyrou et al. (2019) argue that children's voices are not fixed representations of a single "truth" to be extracted, but are shaped by relationships, context, and social experiences. Therefore, this study sought to understand children's accounts of maths and maths anxiety as situated and co-constructed, rather than treating them as isolated or objective representations of experience. Therefore, the study aimed not simply to collect children's voices as objective facts, but to understand the broader contexts and experiences that shape how children make meaning of maths and maths anxiety. Spyrou et al's (2019) work supports the need for flexible and child-sensitive approaches to data collection. If children's perspectives are shaped by context and relationships rather than existing as fixed truths waiting to be uncovered, researchers need to create opportunities for children to express meaning in ways that are appropriate to their age, communication preferences, and experiences. Hence, developmentally appropriate methods within this study were used not simply to make participation easier, but to provide multiple ways for children to communicate and construct meaning around their experiences of maths and maths anxiety. This is further underpinned by the UNCRC (United Nations, 1989), which asserts children's right to express views on matters affecting them.

Within a social constructionist framework, this study conceptualises maths anxiety not as an inherent individual trait but as a constructed experience shaped through children's interpretations of their interactions within educational and social contexts. In this sense, children's understandings of maths, including perceptions of success, difficulty, and emotional response, are formed through engagement with

classroom practices, peer relationships, and broader cultural narratives about ability and performance.

2.2.1.5 Position Statement

As the sole researcher, I position myself within a social constructionist epistemology, recognising that knowledge is co-constructed through interaction and that my interpretations are inevitably shaped by my own social location, professional history, and personal experiences. My identity as a 39-year-old female researcher working with young children (Year 2) carries relational dynamics that may influence how participants respond to me, how comfortable they feel expressing uncertainty or emotion, and how I interpret their accounts. Following Holmes' (2020) argument that researcher identity is inseparable from the research encounter, and Braun and Clarke's (2022) emphasis on reflexivity as integral to qualitative analysis, I acknowledge that my age, gender, and professional authority may have shaped the interactional space in ways that both enabled and constrained children's meaning-making.

My professional background includes work as a TEP, as well as previous roles as a Teaching Assistant, Higher Level Teaching Assistant (HLTA), and Social, Emotional and Mental Health (SEMH) Practitioner. These roles have provided me with extensive experience supporting young children's learning, emotional development, and classroom engagement, including the teaching of maths in both infant and junior settings. Such experiences inevitably inform how I attend to children's narratives, the cues I notice, and the meanings I attribute to their emotional expressions. Having previously researched maths anxiety at master's level, I am also sensitised to particular patterns of emotional response around maths, which could predispose me to foreground certain interpretations over others.

I also recognise that my socio-economic positioning affords me particular privileges that shape how I understand educational experiences, emotional expression, and access to support. My own childhood and later-life experiences of maths may align me with some participants' narratives while distancing me from others. Following Holmes' (2020) argument that researchers must interrogate how their identities, power, and social locations shape the research encounter, I recognise that I cannot bracket or neutralise these influences. Instead, consistent with Braun and Clarke's (2019, 2020, 2022) conceptualisation of RTA, I understand my subjectivity not as a threat to rigour but as an analytic resource, one that requires ongoing reflexive engagement to ensure transparency, ethicality, and interpretive integrity. Reflexivity, in this sense, is not a procedural step but a continuous ethical and interpretive practice.

To ensure that my interpretations did not dominate or overshadow the children's voices, I employed several deliberate strategies. I maintained a reflexive journal throughout the research process, documenting my assumptions, emotional reactions, moments of resonance, and potential blind spots. This enabled me to identify when my prior experiences or expectations were shaping my initial readings of the data. I also engaged in regular supervision, using these discussions to interrogate my interpretive decisions, consider alternative readings, and ensure that my analytic choices were grounded in the data rather than in my own professional or personal narratives. During analysis, I repeatedly returned to the raw data, checking that the developing themes were supported by participants' words and actions rather than by my own preconceptions. These practices helped ensure that the final thematic stories remained anchored in the children's lived realities and

co-constructed meanings, rather than in my own assumptions or professional expertise.

The study is also guided by a commitment to applied impact. As a TEP, the intention is not only to generate theoretically informed knowledge but also to contribute to practices that support children's learning, emotional wellbeing, and inclusion within educational contexts. The research is therefore positioned as ethically grounded, child-focused, and socially responsive.

Overall, the ontological, epistemological, and axiological positioning of this study form a coherent social constructionist framework. Ontologically, maths anxiety is understood not as a fixed or underlying entity, but as a phenomenon constructed through social, relational, and cultural contexts. Epistemologically, knowledge is generated through socially situated, co-constructed meaning-making, with children recognised as credible epistemic agents whose accounts reflect how they make sense of their experiences. Axiologically, the research is guided by explicit commitments to equity, participation, reflexivity, and applied impact, consistent with childism and the professional values of educational psychology. This integrated positioning ensures philosophical alignment between the study's theoretical foundations, methodological choices, and ethical commitments, strengthening the credibility and coherence of the research as a qualitative social constructionist inquiry into children's lived experiences of maths anxiety.

2.2.2 Design

The overall research strategy was qualitative and exploratory, designed to generate an in-depth understanding of how Year 2 children experience, interpret, and emotionally respond to maths. Data collection was structured in two linked stages.

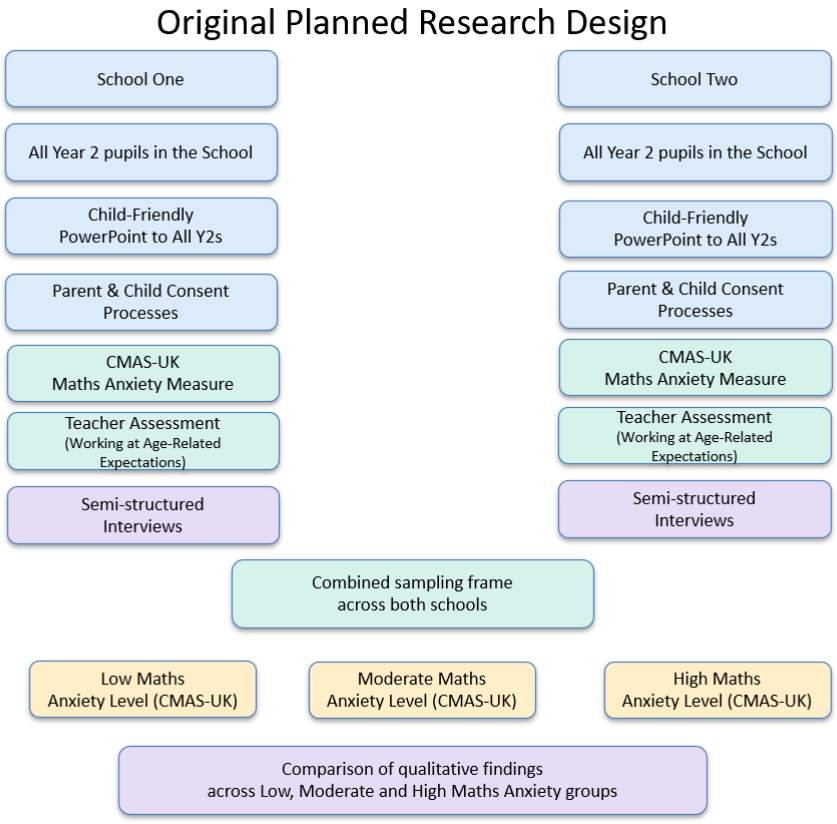
First, the Children's Maths Anxiety Scale UK (CMAS-UK) and teacher assessment data were used pragmatically to provide contextual information and inform purposive sampling, enabling the researcher to identify children working at age-related expectations in maths but reporting differing levels of maths anxiety. Second, semi-structured interviews were conducted with the selected children to explore their lived experiences in greater depth. This design was appropriate for answering the research questions because it enabled the study to move beyond identifying whether children reported maths anxiety, towards understanding how they described maths, what meanings they attached to mathematical experiences, and what relational, contextual, and emotional factors appeared to influence their feelings. The use of structured information to support sampling, followed by child-centred qualitative interviews allowed the research to remain focused on children's own accounts while ensuring that the interview sample was relevant to the study's aim of exploring maths anxiety among children with broadly comparable attainment. This staged design also enabled children to become gradually familiar with the researcher and the research process, first through the child-friendly PowerPoint presentation used to support informed consent, then through the small-group CMAS-UK administration, before taking part in an individual interview.

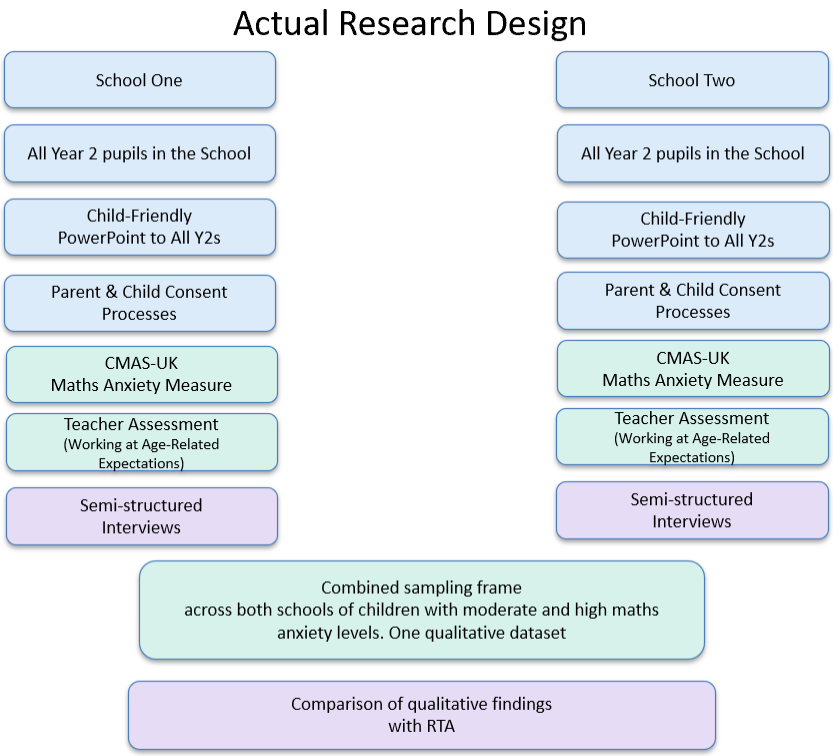
The original design intended to recruit broadly balanced groups of children across the three descriptive CMAS-UK categories (low, moderate, and high maths anxiety) from both schools, while holding attainment broadly constant by selecting children working at age-related expectations in maths. This would have enabled comparison across a wider range of self-reported maths anxiety profiles. However, due to recruitment difficulties, low consent return rates, and the resulting distribution of eligible participants, the realised sample was not evenly distributed across

categories. The final design therefore retained the original qualitative, exploratory and attainment-matched rationale, but focused on children working at expected levels who reported moderate or high levels of maths anxiety, as these participants were most closely aligned with the research questions and displayed relatively similar outlooks and experiences of maths. The inclusion of one participant within the moderate descriptive range was consistent with this adapted focus, as their account aligned closely with the experiential patterns evident among the higher-anxiety participants. The changes between the original planned research design and the actual research design implemented is visually depicted in Figure 3.

Figure 3.

Original Planned Research Design and Actual Research Design Implemented in this Study.





Rationale for focusing on Year 2 children.

Participants were children in Year 2, aged approximately 6–7 years. This year group was selected because it represents a developmentally and educationally significant point at which children are engaging with increasingly formal mathematical expectations, while also becoming more aware of correctness, adult evaluation, peer comparison and their own academic self-concepts. As the final year of Key Stage 1, Year 2 also marks a point at which attainment judgements, statutory assessment arrangements and, in some school contexts, transition to junior school may heighten the salience of performance and comparison. Existing evidence indicates that negative emotional responses to maths, including early signs of maths anxiety, apprehension and reduced confidence, may already be present by this age (Ramirez et al., 2013; Harari et al., 2013; Petronzi et al., 2019b; O'Connor et al., 2023). At the same time, children are developing greater capacity for social comparison (Festinger, 1954), more evaluative and stable self-concepts (Harter,

2015), and increasing exposure to formal academic expectations within school contexts (Eccles & Wigfield, 2002). Despite this developmental significance, the evidence base remains dominated by adult-defined measures, older samples and international studies, leaving limited understanding of how children in Key Stage 1 make sense of maths-related emotional experiences in everyday classroom contexts. Year 2 was therefore considered an important point at which to explore children's own accounts of maths, mathematical difficulty and emerging anxiety, while also offering scope for earlier identification and support before negative beliefs, avoidance patterns or fragile mathematical identities become more established.

Given this developmental and educational rationale, it was also important to consider whether children of this age could meaningfully contribute to qualitative research about their mathematical experiences. Selecting Year 2 pupils for this study is grounded in evidence that young children are developmentally capable of articulating their lived experiences when supported through sensitive, scaffolded methods. Research on early autobiographical memory demonstrates that children as young as two can meaningfully narrate past events when adults co-construct conversations with them (Fivush & Hamond, 1990; Nelson, 1993), highlighting that narrative competence emerges through social interaction rather than cognitive maturity alone. This aligns closely with a social constructionist perspective, which views children's accounts as collaboratively produced within relational and discursive contexts.

Research also suggests that young children can construct valid meanings about their experiences and communicate these through verbal and non-verbal means when adults are responsive to their evolving capabilities (MacNaughton et al., 2003). As Alderson (2008), Diaz Soto and Swadener (2005), and MacNaughton et al.

(2003) argue, children are able to provide perspectives that help adults understand their experiences more fully. Accessing authentic pupil voice, particularly from younger children, also presents methodological and ethical challenges. Children may have limited understanding of research purposes, and willingness to participate does not necessarily indicate full comprehension of why their views are being sought (Hill, 2006). Researchers therefore need to avoid tokenistic approaches that gather children's views without ensuring meaningful participation (Felce, 2002). Reviews of child research methods suggest that interviews can be useful but are often strengthened when paired with child-friendly, play-based or visual techniques that reduce power imbalances and support expression (Ponizovsky-Bergelson et al., 2019). This is especially relevant to maths anxiety because children may not use adult psychological language, and may instead describe their experiences through concrete, relational or situational examples. Year 2 children can naturally give short, partial or sometimes ambiguous responses; within this study, these were understood as developmentally typical forms of communication rather than as evidence of limited understanding. Interpretation was therefore approached as a shared, co-constructed process, consistent with the subjective and participatory stance of RTA. Rather than treating short answers as fixed indicators of meaning, the researcher attended to how meaning unfolded within the interaction, drawing on the immediate context of the task, the child's preceding comments, and the relational dynamics of the moment. For example, when a child described feeling "middle" in relation to maths, this was not interpreted as a self-contained or neutral category of feeling. Instead, it was considered in relation to the wider exchange, including the prompt being discussed, the child's preceding references to getting answers wrong, and their non-verbal behaviour during the interaction, which suggested that "middle" carried a

sense of uncertainty, ambivalence, or emotional discomfort. Non-verbal cues such as nodding, facial expressions, hesitation, and children's use of manipulatives contributed to this joint meaning-making, often signalling confidence, uncertainty, or emotional discomfort in ways that complemented their verbal responses. This is in line with DeCosta et al. (2023), who included more subtle clues, such as bodily and facial expressions, in interpretation and analysis to help adult researchers more fully comprehend children's perspectives. Prompts such as "Tell me more" were used to invite elaboration, enabling children to shape the direction and depth of the exchange. Although brief answers might superficially suggest limited comprehension, children were encouraged to ask for clarification whenever needed, and their engagement indicated that they understood the questions being posed. Within this relational and developmental context, succinct responses were treated as age-typical communicative practices, with meaning emerging through the interaction between child and researcher rather than being inferred solely from the child's words.

This study collected qualitative data. The data analysis was iterative and reflective, and analysis used RTA (Braun & Clarke, 2022). Analysis followed Braun and Clarke's (2022) established phases: familiarisation, coding, theme development, review, definition, and writing. Qualitative approaches are well suited to exploring lived experiences and the meanings individuals construct within their social contexts (Braun & Clarke, 2022). In this study, a Big Q qualitative approach is adopted, positioning qualitative inquiry as an interpretive and constructionist methodology that seeks to understand how participants make sense of their worlds rather than simply applying qualitative techniques (Braun & Clarke, 2022).

In this thesis, the term maths anxiety is used, and not terms such as numeracy apprehension, because it is the dominant construct within the literature and allows engagement with the wider empirical and theoretical evidence base. However, given the young age of the participants, this study refers to early signs of maths anxiety rather than assuming that children in Year 2 experience a fixed or clinical-like construct. Importantly, the term maths anxiety was not used with the children themselves in this study, in order to avoid introducing anxiety as a fixed concept or instilling the idea that maths should be associated with anxiety. Instead, children were asked more broadly about their feelings towards maths, using open and neutral prompts that did not lead them towards negative interpretations of their experiences.

Maths anxiety is widely understood as a complex construct encompassing emotional responses, avoidance behaviours, and disruptions to cognitive processing (Ashcraft, 2002). While quantitative measures can identify levels of reported anxiety and potential situational triggers, they provide limited insight into how children interpret, experience, and make sense of these emotions within their everyday contexts. Consistent with this study's social constructionist orientation, the focus was not on measuring maths anxiety as an objective construct but exploring how meanings surrounding maths and the associated emotional responses are constructed by children.

In this study, quantitative measures (CMAS-UK and teacher-reported assessment data) were used solely to inform purposive sampling and identify participants for qualitative exploration. These tools were not used analytically and therefore do not constitute a mixed-methods design; rather, they functioned as pragmatic supports for accessing a diverse range of children's experiences.

Nonetheless, the conceptual assumptions underpinning these measures provided an important reference point for examining how children's own accounts aligned with, extended, or challenged existing understandings of maths anxiety. Identifying those children whose experiences could be explored in greater depth through qualitative inquiry, whilst controlling for attainment (via teacher assessment data). These quantitative tools (CMAS-UK and teacher assessments) were used to identify children with differing levels of maths anxiety while holding attainment relatively constant. This enabled the subsequent qualitative phase to foreground children's meaning making in relation to maths and emotional experience, rather than conflating these with differences in performance. The study does not constitute a mixed-methods design; rather, structured measures were used to facilitate access to a range of perspectives. The primary aim of the research was to generate rich, contextualised accounts of children's lived experiences of maths anxiety through qualitative interviews. This approach aligns with educational psychology's emphasis on integrating structured information with in-depth, person-centred understanding to inform practice.

RTA (Braun & Clarke, 2022) was selected rather than IPA (Interpretative Phenomenological Analysis) because the study aimed to generate themes that reflected children's perspectives and meaning-making across the dataset. IPA's idiographic focus on a small number of individual cases was less suited to this aim, whereas RTA provided the flexibility to explore children's experiences collectively while still honouring their voices.

2.2.3 Data collection

The study was grounded in the identification of a gap in the literature regarding children's voices in relation to maths anxiety, establishing a clear childist

rationale (as outlined in Section 2.2.1.4). The data collection procedures were designed to support children's direct participation and expression of their experiences.

Data collection took place in one phase, across two schools and involved the use of the child maths anxiety scale (CMAS-UK) and teacher assessment data for initial scoping and to inform purposive sampling of the children who took part in the semi-structured interviews. The rationale for and process of data collection is outlined as follows.

Although the full recruitment process is outlined in Sub-section 2.2.4.1, it is important to note here that the data collection phase was shaped by consent-driven access. Only children for whom both parental and child consent were returned could participate in the CMAS-UK and teacher assessment phase. As a result, the initial data collection pool reflected the children made available through the recruitment process rather than the full Year 2 cohorts. This had methodological implications for the planned sampling strategy, as the resulting distribution of CMAS-UK scores and attainment profiles limited the extent to which balanced low, moderate, and high maths anxiety groups could be formed. The data collection process therefore became responsive to the recruited sample, with CMAS-UK and teacher assessment data used pragmatically to identify an analytically coherent interview sample aligned with the study's qualitative and child-centred aims. This is discussed further in the reflective chapter (Chapter 3).

2.2.3.1 Children's Maths Anxiety Scale (CMAS-UK)

Maths anxiety is widely measured through self-report measures, usually questionnaires where participants are asked to rate their own levels of anxiety in a

range of maths-related situations (Dowker, 2026). As part of the initial scoping phase of this study, the 19-item Children's Mathematics Anxiety Scale UK (CMAS-UK; Petronzi et al., 2019b) was administered. Across the two participating schools, 18 children completed the CMAS-UK following receipt of parental and child consent. The purpose of gathering these data within the overall design was to provide contextual information about children's self-reported maths anxiety, support the development of soft descriptive categories, and inform purposive sampling for the subsequent qualitative interviews. The resulting data were used to guide access to relevant experiential accounts and to support contextual interpretation but did not contribute directly to the qualitative analysis; consequently, the study does not constitute a mixed-methods design.

The CMAS-UK was selected because of its developmental and contextual suitability for the study population. The CMAS-UK is one of the few maths anxiety measures developed specifically for young children in UK primary settings. Developed and validated with children aged 4–7 years in UK educational settings, the measure employs age-appropriate language and pictorial response options that enable young children to communicate their emotional responses to maths in an accessible manner. The items also include references to UK-specific classroom practices which make it more suitable for early primary pupils than measures developed for adults, older learners or non-UK educational contexts. Its design also aligns with current UK expectations that young children engage in self-assessment using visual scales, and its psychometric validation within UK contexts supports its use with Year 2 children. The emoticon-based response format was specifically designed for young children and has been shown to support engagement and comprehension among early primary-aged pupils (Petronzi et al., 2019b). This is

particularly important given evidence that maths anxiety can emerge during the early years of schooling yet may be difficult for young children to articulate through conventional questionnaire formats. The literacy demands of the measure were reduced because children recorded their answers by selecting pictorial response options rather than producing written responses, and each item was read aloud by the researcher to minimise reliance on independent reading ability. In addition, the emoji-based Likert-style format supported children to indicate emotional intensity in a developmentally appropriate way, reducing reliance on advanced verbal, written, or self-reflective abilities and increasing the likelihood that responses reflected children's experiences of maths rather than their reading or language skills.

Alternative self-report measures, including the Mathematics Anxiety Rating Scale for Elementary School Students (MARS-E; Suinn et al, 1988), the MARS brief version (Suinn & Winston, 2003), the Mathematics Anxiety Scale for Children (MASC; Chiu & Henry, 1990), and the Child Mathematics Anxiety Questionnaire (CMAQ; Ramirez et al., 2013), were considered among others. However, these alternative measures were discounted because they were less well aligned with the study population, context or methodological stance. Alternative measures were largely developed and validated in North American contexts and were designed for older children, requiring levels of reading comprehension, metacognitive awareness, and self-reflection that may not be developmentally appropriate for children in Year 2. In addition, references to educational practices and classroom experiences may not align fully with the UK primary education context. The MARS and AMAS were developed primarily for older learners or adults and rely on adult-like self-reflection and academic scenarios. The MAS-UK is more contextually relevant to the UK but was developed mainly with secondary-aged pupils. Child measures such as the

MARS-E, MASC, MASYC, CMAQ, CMAQ-R and SEMA offer useful developments, but several remain literacy-heavy, test-focused, scenario-based or developed in US contexts requiring adaptation. The mAMAS is UK-relevant and widely used with British children aged 8–13, but it remains less suitable for younger primary pupils because of its reliance on hypothetical scenarios, literacy, metacognition and Likert-style responses. Aydin et al. (2025) highlight the need to explore maths anxiety with accurate measures for different cultures. For further discussion on other scales and measures available see Chapter 1. The CMAS-UK was therefore chosen not because it fully captures children's lived experience, but because it provides the most developmentally accessible and contextually appropriate starting point for identifying possible maths anxiety within this study.

Although the CMAS-UK has been used less extensively than some longer-established maths anxiety measures, its age-specific design and validation within UK schools were considered more important than selecting a measure with a larger but less directly relevant evidence base. Despite the evidence base for the CMAS-UK being relatively small compared with longer-established maths anxiety measures, emerging studies have used, adapted, or applied the scale in research and practice with young children, including its adaptation for use in Turkey (CMAS-TR; Aydin et al., 2025), use within a multilingual population in Mauritius (Soll et al., 2026), and application within specialist teaching assessment practice (Hunt & Petronzi, 2024). Its selection was therefore justified not by the breadth of its existing use, but by its cultural and contextual relevance to the present study: it was developed for children aged 4–7 within UK educational settings, uses developmentally accessible language and pictorial response options, and aligns closely with the age, schooling context, and aims of this research.

The CMAS-UK includes 19 sentence starters concerning day-to-day situations where children encounter maths. Children rate their feelings using a three-point pictorial scale by circling the emoticon faces (sad, not sure, happy faces) that depicts how they feel in relation to that situation. Each response is scored with the happier face indicating lower anxiety and being scored as 1, the not sure or middle face scored as 2, and the sad or unhappy face scored as 3. Higher scores therefore indicate higher levels of self-reported maths anxiety. The CMAS-UK is an open access tool widely available online. The items in the questionnaire refer to day-to-day numeracy situations that may cause anxiety for children, typically aged 4-7 years. For each item, children can place a circle around the face which describes how they feel in relation to the situation.

In each school, children for whom written consent was obtained, completed the CMAS-UK questionnaire in small groups (one, whole consented group per school) to gather information around the children's current levels of maths anxiety and a deeper understanding of their emotional responses to a range of mathematical situations. All data collection activities took place at the participant's school setting during the normal school day. They were taken out of their respective classes to complete the questionnaire in a classroom setting as a group, recording their responses on their individual sheets.

The pictorial emoji response scale has been previously shown to children as part of the child-friendly PowerPoint presentation (Appendix F) delivered by the researcher before consent processes were completed. Before administering the CMAS-UK, the researcher verbally re-introduced the activity to the small group and checked everyone was happy to proceed. Children were told that they were going to answer a questionnaire and that there were no right or wrong answers. The

researcher introduced the Likert-style emoji scale. Children were guided to interpret the Likert-style emoji scale and asked to describe the images in their own words to confirm understanding e.g. “happy”, “meh” or “middle” and “sad/angry”. The children were informed that should they need help at any point they could raise their hand and ask the researcher. Children had the opportunity to ask any questions and were informed they could stop/withdraw at any point. Children were asked to not discuss their responses with each other, as children might alter their responses based on their peers’ responses. To also control for copying, measures were taken to ensure children were spread out across the room. All children were provided with the 19-item CMAS-UK (Appendix K) and had a pencil for circling the appropriate emoticon that reflected their feelings. Children were also told that if they needed help, clarification, or for an item to be repeated, they should put their hand up. The researcher explained that children should circle one response on each line for each questionnaire item. They were encouraged to answer with what was “true for them” to encourage individual and honest responses. The researcher read each questionnaire item aloud to the children to help manage accessibility needs. For each scale statement, the researcher read the statement twice to ensure understanding. Once all children had responded, the researcher moved on to the next item. When completed, the children were encouraged to check they had only answered with one circled emoticon for each item and that they had answered all items that they felt able to answer. Children were thanked for their time and returned to class. Children were not made aware of their maths anxiety scale score.

Questionnaire items addressed situations such as:

- Completing mathematical problems

- Being questioned by the teacher
- Participating in maths tests or timed activities
- Working independently

To score the CMAS-UK, each item is assigned a value from 1 to 3, with lower scores representing less anxious responses (the happier face) and higher scores representing greater anxiety (Petronzi et al., 2019b). Item scores were summed to produce a total score ranging from 19 to 57, with higher totals indicating higher levels of self-reported maths anxiety (range 19 to 57).

Although the CMAS-UK provides a means of quantifying children's emotional responses to maths, no empirically validated clinical thresholds or standardised cut-off scores have been established for interpreting scores at either the item or total score level. Existing guidance is limited to broad descriptive interpretation, suggesting that lower mean scores reflect lower levels of maths anxiety and higher mean scores reflect greater anxiety (Petronzi et al., 2019b). In the absence of established thresholds, two approaches to score interpretation were considered: (1) distribution-based categorisation and (2) the use of mean item scores as a continuous measure (Petronzi et al., 2019b). This is discussed further in Chapter 3.

An initial exploratory analysis examined whether categorising children according to their relative position within the sample distribution (e.g., upper 25%, middle 50%, lower 25%) might facilitate identification of broad patterns across participants. However, this approach was rejected on both methodological and conceptual grounds. Methodological literature has consistently cautioned against categorising continuous variables, arguing that arbitrary cut-points can obscure meaningful variation, reduce information, and create artificial distinctions between

individuals whose scores differ only marginally (Cohen, 1983; MacCallum et al., 2002; Altman & Royston, 2006). These concerns were particularly evident within the present dataset, where tied scores and clustering around potential cut-points highlighted the extent to which category membership depended on the placement of boundaries rather than substantive differences in children's reported experiences.

These concerns also resonated with the study's social constructionist orientation. Categorising children as exhibiting "high", "moderate", or "low" maths anxiety risks implying the existence of discrete and objectively bounded groups. In contrast, social constructionism conceptualises psychological phenomena as fluid, contextually situated, and continuously varying rather than naturally occurring categories. Distribution-based classifications were therefore understood as researcher-imposed constructions rather than reflections of distinct groups emerging from children's lived experiences. Hunt and Petronzi (2024) caution against rigid categorisation of maths anxiety levels as self-report measures cannot assume the same distribution of maths anxiety scores across different groups of learners. Therefore, categorising children into fixed anxiety “levels” is problematic and risks misrepresenting their experiences. While such scales are useful for tracking changes over time, scores should always be interpreted in relation to the wider population and with awareness of self-report biases, as a child who appears “high-anxiety” within one class may in fact fall within a typical range for their age group (Hunt & Petronzi, 2024).

Consequently, CMAS-UK scores were operationalised primarily through mean item scores, calculated by dividing each child's total score by 19. Using mean scores preserved fidelity to the structure of the measure, maintained closer analytic proximity to children's responses, and supported interpretation of maths anxiety as a

continuous construct. Mean scores were used as the principal quantitative indicator throughout the analysis. Given that the CMAS-UK employs a three-point response scale, with scores approaching 1 reflecting less anxious responses and scores approaching 3 reflecting more anxious responses (Petronzi et al., 2019b), the descriptive ranges were developed around the scale's underlying continuum and midpoint. These ranges served as pragmatic interpretative guides to aid comparison across participants and were not intended as psychometric cut-offs or indicators of naturally occurring groups.

To facilitate comparison across participants and school contexts, the following descriptive ranges were developed:

- Low anxiety: < 1.5
- Moderate anxiety: 1.5–1.99
- High anxiety: ≥ 2.0

Importantly, these ranges were developed as three descriptive categories: low anxiety, moderate anxiety, and high anxiety. They were not treated as psychometric cut-offs, diagnostic classifications, or indicators of fixed or distinct levels of maths anxiety, nor were they reported to children, families, or schools as categorical or diagnostic judgements. Rather, they functioned as heuristic devices and interpretive signposts to support comparative discussion and participant selection. This soft categorisation approach was compatible with the study's sensitivity to children's data, as it avoided imposing rigid labels while recognising that it was methodologically useful to identify broad differences in children's self-reported anxiety. The CMAS-UK was therefore used as a child-accessible tool that helped children express the intensity of their feelings about maths, providing contextual

information that supported interpretation of their interview responses. The primary analytic emphasis remained children's qualitative accounts, recognising that maths anxiety exists along a continuum and may be experienced differently across contexts and individuals. Where categorical descriptors were used, they served only an exploratory and provisional purpose. Their interpretation was considered alongside qualitative interview data and contextual information from participating schools to ensure that numerical representations did not operate independently of children's accounts. Within this study, the CMAS-UK was therefore positioned not as a diagnostic or classificatory instrument, but as a contextually interpreted indicator of self-reported affect used alongside qualitative data to develop a richer understanding of children's experiences of maths anxiety.

For selection purposes, scores were grouped into the descriptive ranges: high anxiety (≥2.0), moderate anxiety (1.5–1.99), and low anxiety (<1.5), allowing children with differing levels of anxiety to be identified. The original intention was to recruit broadly equal groups of children from each descriptive category across both schools to ensure representation of a range of self-reported anxiety experiences; however, due to recruitment difficulties, low consent return rates, and the resulting distribution of eligible participants, this was not achieved. The CMAS-UK therefore served as a selection tool for qualitative interviews rather than an analytic endpoint, enabling the study to focus on rich, contextualised accounts of maths anxiety. These groupings served solely as a sampling tool rather than an analytic endpoint, enabling subsequent exploration of children's lived experiences through qualitative interviews.

2.2.3.2 Teacher Assessment Data

Teacher assessment data in maths were collected for all participating children, reflecting teachers' professional judgements of attainment in relation to curriculum

expectations. This was done following school consent procedures and used to contextualise children's mathematical attainment and support purposive sampling for the qualitative phase of the study. This teacher assessment data was provided by teachers through the researchers' nominated liaison in each school (SENDCo in one school; Maths Lead in the other), based on contemporaneous tracking data. In one setting, the more fine-grained internal descriptors (e.g., 'beginning', 'developing', 'beginning+') were mapped onto the broader 'working towards', 'expected', and 'greater depth' categories to facilitate cross-school alignment.

Teacher assessment data were relevant and necessary to the overall research design because they enabled attainment to be held broadly constant during purposive sampling, allowing the study to explore variation in children's emotional and meaning-making responses to maths without mixing these experiences with marked differences in maths attainment.

Within maths anxiety literature, attainment has often been measured through researcher-administered maths tasks alongside anxiety measures (Petronzi et al., 2019b) or through comparison with grade averages (Suinn et al., 1988). However, in the present study teacher assessment data were used in preference to additional researcher-administered assessments or tasks. This approach aligned with the child-centred orientation of the study and educational psychology practice by avoiding the need for further testing and minimising the assessment burden placed upon participating children.

Teacher assessment data also offered a more naturalistic indicator of attainment within the everyday context of schooling. Rather than reflecting performance on a single occasion, these professional judgements are typically

informed by multiple sources of evidence gathered over time, including classroom observations, pupil's work, formative assessment and ongoing monitoring of progress. As such, they provide a broader representation of children's maths attainment than may be captured through a one-off assessment administered within a research context. Furthermore, because these assessments are generated by teachers who work closely with the children over an extended period, they incorporate contextual knowledge of children's learning, engagement and demonstrated competencies across a range of maths activities and concepts. While recognising that teacher assessment is itself a socially situated and interpretive process, this data was considered sufficiently robust for the purposes of contextualising attainment and informing participant selection for interviews. The data gathered from teacher assessment was not used as objective measures of maths ability, but rather as one source of contextual information alongside children's self-reported maths anxiety scores and qualitative accounts of their experiences. It is important to note that whilst the same broad categories were used across both schools, teacher assessment is subjective and locally constructed. Therefore, there would be different criteria and assessments that feed into teacher assessments not only between these two schools but across other settings too.

Teacher assessment data were considered within the school's existing attainment categories of *working below expected levels*, *working at expected levels*, and *working above expected levels*. Children were selected based on those working at expected levels, controlling for attainment while including children with differing levels of maths anxiety. This group was of particular interest because focusing on children working at expected levels enabled attainment to be held broadly constant, while also allowing maths anxiety to be explored among children who were

considered to be managing the mathematical demands of the curriculum at an age-expected level; this reduced the likelihood that anxiety-related responses could be attributed primarily to *actual* attainment difficulties, although children's *perceived* attainment and sense of competence remained important interpretive considerations when it came to analysis.

The administration of the CMAS-UK (Petronzi, et al., 2019b) and collection of teacher-assessed attainment data in maths made up the initial scoping and this data were used solely to inform purposive sampling to select and invite these children to semi-structured interviews. As such this study does not constitute a mixed-methods design.

These children were invited to interviews through notifying the Headteacher and SENDCo of the school and making arrangements to return to school to conduct the 1:1 interviews.

2.2.3.3 Semi-Structured Interviews

Semi-structured interviews are regarded to provide insight into individuals' lived experiences, though rich, detailed data (Adams, 2015). They are felt to be helpful for exploring a certain topic in detail to fully understand the participants' perspectives on that topic (Harrell & Bradley, 2009). In terms of work with young children, semi-structured interviews balance structure with flexibility, allowing children to communicate their perspectives in ways that are meaningful and accessible to them. From a methodological perspective, semi-structured interviews provide a framework of core questions that ensure consistency across participants while allowing the interviewer to adapt language, probe deeper responses and follow topics introduced by the individual child. This flexibility is especially important when

working with young children, whose communication can be less linear or elaborated than that of older participants. By allowing questions to be rephrased and explored in greater depth, semi-structured interviews can support children to articulate experiences that might not emerge through more structured methods.

This approach also aligns with child-centred and childist research principles as rather than restricting children's responses they create opportunities for children to influence the direction of the conversation and foreground aspects of their lived experiences that they consider important. This supports the view of children as active meaning-makers and knowledgeable informants about their own lives, rather than passive recipients of adult interpretation. In this study and in relation to lived experiences, it enables the researcher to explore not only what children experience but also how they understand, interpret and attach meaning to those experiences. The conversational nature of semi-structured interviews supports the building of rapport that has been found to support children in providing their perspectives (Christensen & James, 2000) and allows children to describe feelings, events, relationships and contexts in their own words, generating richer accounts that extend beyond what can be captured through questionnaires or standardised measures. Visual prompts and other communication supports were also used to scaffold children's responses, recognising that young children's language, metacognitive awareness, and emotional vocabulary are still developing and may otherwise act as a limitation or barrier to them fully articulating their experiences.

Semi-structured interviews were conducted with a purposive sub-sample of children (n = 11) to explore their lived experiences of maths and associated emotional responses. Children were selected on the basis of similar attainment (working at expected level on teacher assessment) but differing levels of reported

maths anxiety. The intention was to aim for similar sized groups of children with high, moderate and low anxiety scores. The interviews were conducted on a different day to the CMAS-UK questionnaire.

Interviews were 10-15 minutes in length conducted in a quiet room 1:1 within the school. Only the researcher and child were present in the room to allow for free exploration of views and confidentiality. In both schools, the rooms were familiar to the children. Interviews with children are often most effective when conducted in familiar and comfortable contexts that minimise the power imbalance between adult researcher and child participant (Beresford, 1997; Davis, 1998). Rapport had been established through familiarity with the researcher delivering a PowerPoint presentation (Appendix F) to the class about the project to inform consent, then the researcher visiting to conduct the CMAS-UK questionnaires in a small group. This was then built upon in the individual interviews, using skills that the researcher possesses from being a TEP with experience working with children of all ages.

Children came into to the interview space individually, and the researcher re-confirmed verbal assent, providing a clear, age-appropriate explanation of the process and what participation would involve, including their ongoing right to decline or discontinue. During each interview, a recording was made using Microsoft Teams with consent from both children and parents. The automatic transcription software within Teams was used as a starting point for transcription. These autogenerated transcripts were then edited by hand with the researcher listening to the audio recording of the interviews. This was to improve the speech-to-text accuracy and also add non-verbal communication where appropriate.

The development of the semi-structured interview schedule was informed by the literature, researcher reflexivity, supervision, and a commitment to developmental appropriateness. Interviews with children in School Two were informed by insights from the data collection in School One, enabling abductive refinement of the developing lines of inquiry. Adjustments included increased sensitivity to developmental needs, language, prompts, and areas of emerging relevance within children's accounts. Research suggests that children of this age are capable of providing meaningful accounts of their experiences when methods are appropriately designed and conducted within a supportive environment (Sun et al., 2023). In line with RTA, reflexive notes were recorded to document methodological decisions, reflections, and anticipated challenges.

The interview schedule included open-ended prompts such as:

- "How do you feel when you do maths in class?"
- "Can you tell me about a time maths felt hard or worrying?"
- "What happens when you make a mistake in maths?"
- "What do you like about maths?"

The interview prompts were developed during an initial review of relevant literature. Some were included as a result of the study's ontological and epistemological position, for example those designed to elicit the participant's own constructions and attributions around maths. Some additional prompts were added and refined over the course of the interviews in response to areas of discussion being raised by previously interviewed participants. For the list of interview prompts used, please see Appendix A. Not all questions were pre-planned; consistent with the semi-structured nature of the interviews, some follow-up prompts were generated

responsively in interaction with children's accounts. These prompts drew directly on the child's own language and were used to clarify meaning, invite elaboration, and explore the significance of terms or ideas introduced by the participant. For example, when a child referred to "messing up," the researcher followed this up by asking, "How are you messing up? What do you mean by that?" Similarly, when children described feeling "middle" or "angry" about maths or mistakes, the researcher used hypothetical and relational questioning, such as "If you had a friend that was feeling a bit middle or angry about maths or getting things wrong, what would you say to them?" Such questions were intended to remain close to children's own wording while creating opportunities for them to expand on their meanings, reflect on emotional experiences, and communicate ideas that may not have emerged through the pre-planned schedule alone.

Literature states that young children have a greater need for guidance and direction when they are interviewed about internal experiences and often methods used are not designed with young children's unique developmental competences in mind (DeCosta et al., 2023). To support emotional literacy and facilitate expression, the same range of resources and tools were made consistently available to all participants on the table in front of them, including emotion fans (with faces and emotion words on them), cards (including A Therapeutic Treasure Deck of Feelings cards by Dr Karen Treisman), dice (depicting emoji faces), as well as literature-informed prompt cards developed by the researcher. The 'Maths and Me' prompt cards (Appendix B) were developed by the researcher as a child voice tool, consistent with approaches commonly used in EP practice to support children's understanding and articulation of their views. The content of the cards was informed by the literature reviewed in Chapter 1, alongside the researcher's wider knowledge

of maths, maths anxiety and EP practice. They were designed to help children talk about how they felt about maths, what they found easy or difficult, what helped them learn best, what happened when maths felt hard, and what support they wanted from adults. The cards were made colourful and visual to increase their appeal and accessibility for young children. Not all categories of cards were used during the interviews; rather, they were available flexibly as optional prompts depending on each child's needs and responses. A further aim in developing the cards was to create and refine a resource that could be informed by the findings of this research and potentially used in future EP practice to help explore what may be underpinning a child's maths difficulty and what forms of support may be most helpful. In this sense, the cards were intended not only as a data collection support, but also as an applied resource that could help translate and disseminate the research into something useful for the profession. These resources could be used if children chose to, or if they were struggling to articulate their feelings, describe what helps them in maths, or reflect on what maths means to them. Children selected different supports according to their preferences enabling the children to have more than one way to express their perceptions and views (DeCosta et al., 2023), and some chose not to use any tools at all. This flexible approach allowed children to elaborate on topics meaningful to them while ensuring alignment with the research questions and supporting a child-centred, developmentally appropriate methodology. As well as allowing the researcher to be responsive to the child's individual preferences for communication, supporting their ability to be able to share their perspectives (DeCosta et al., 2023). Davis (1998) highlights that children's perspectives may be more readily elicited when supported through the use of visual prompts (Curry & Russ, 1985; Backett & Alexander, 1991). Although children can participate as

competent respondents, they may communicate their experiences differently from adults and therefore benefit from developmentally appropriate research approaches (Davis, 1998). These strategies were intended to reduce potential anxiety associated with the research process, facilitate rapport, and enable children to articulate their experiences of maths in ways that were meaningful and accessible to them. The same tools were made available to all children across settings.

In practice, these resources were not used consistently by all children. A small number of children in each school used the ‘Maths and Me’ prompt cards to help them consider, for example, what they counted as maths; however, even with this support, several still identified many examples as “not maths”, reflecting a limited conceptualisation of maths that is explored further in the analysis. The emoji fan and dice were used predominantly as fidget or sensory objects by children who appeared to benefit from having something to handle while thinking or processing their responses. One or two children in each school looked at or handled the resources during the interview, although it was not always clear whether these directly helped them formulate their answers. Despite their inconsistent use, the resources remained helpful in providing children with optional, developmentally appropriate ways to engage with the interview process. If children answered briefly there were often asked to “tell me more about that” or if they wished to add anything else. Should they have declined, they were not further probed and another question asked.

Within the present study, the semi-structured interview format was used to support a co-constructed exploration of children’s meanings and interpretations of maths. This was consistent with the study’s social constructionist and childist positioning, as the researcher did not seek to extract fixed internal states but to

create a responsive conversational space in which children could communicate what maths meant to them within their everyday school contexts.

Following the interview, children were read the debrief information and were supported should they wish the researcher to inform an adult of any concerns raised during the interview. Whilst a child safeguarding/escalation pathway was made available this was not needed to be used. The children were asked if they had any questions and then returned to class. As the participants are children aged 7 years old this was not appropriate for them to review transcripts prior to analysis. To have parents or teachers review on their behalf would have potentially altered the meaning and it was important to the researcher to capture the child's voice without these influences.

2.2.4 Participants

2.2.4.1 Recruitment process

Scoping for participating schools involved informal conversations with EPs and school staff. Selection was on a first-come, first-served basis. Child participants were recruited with headteachers acting as gatekeepers. Initial contact with headteachers was via email contact. The schools were selected using a pragmatic purposive sampling approach. Both were infant schools, so they had a Year 2 cohort, making them relevant to the research focus. Pragmatically, these schools responded to the invitation, which could be due in part to them being known to the researcher through prior professional work, facilitating access and engagement through existing relationships. Recruitment emails made it clear there was no obligation to take part, their participation was fully optional and that non-participation would not impact their personal or professional relationship with the researcher or access to services from

the LA. It is also noteworthy that as both schools were infant schools, the children were approaching a key transition point (to a new school for the junior phase), though the study could have been conducted in primary schools more broadly. The LA where the study was conducted has both infant and junior schools as well as combined primary schools. The schools selected were done so on a first-come, first-served basis.

Consent was sought from Headteachers, as well as from parents and children. A detailed headteacher (as gatekeeper) participant information and consent form was generated using a template supplied by the university (Appendix D). This was supplied to schools along with a detailed participant information and consent form also generated using a template supplied by the university and example letters (Appendix E). Once headteacher consent was obtained, the children in both schools' Year 2 cohorts were shown a presentation (Appendix F) to outline the study and what it would involve, as well as to support informed consent. The researcher visited both schools and delivered a child-friendly PowerPoint presentation to all children in the Year 2 cohort across both schools in their classrooms (Appendix F). This explained the research in terms of the purpose and what it would entail, emphasised voluntary participation and consent and withdrawal processes, provided opportunities to ask questions, and provided an overview of the procedures.

Gatekeepers were then asked to share the Participant Information Sheet/Consent Form with parents. Participant information sheets and consent forms were sent home to parents/carers of all the children in the Year 2 cohorts of the participating schools (Appendix E). These consent forms included signed child consent. The signed forms were requested to be returned to school.

Only children for whom parental and child consent were returned were included in the questionnaire phase, representing a form of consent-driven sampling. Despite children expressing enthusiasm during presentations, parental consent return rates were low across both schools. Information sheets were necessarily detailed to meet university ethical requirements; however, their length may have contributed to perceived burden. No systematic reminder process was implemented by schools and follow-up communication was limited due to capacity constraints. The recruitment process highlighted the tension between ensuring ethically robust informed consent and maintaining accessibility for families.

The researcher liaised with the school contacts to schedule a convenient date to administer the CMAS-UK questionnaire and collect teacher assessment data (further detail can be found in the data collection section of this report).

CMAS-UK questionnaire scores and teacher assessments were then used to select children who were working at age-expected levels in maths who reported differing levels of maths anxiety, supporting purposive selection of an interview sample relevant to the research questions. These data were subsequently used to identify participants for interviews, which were then scheduled for a later date at a time convenient for the children and schools.

2.2.4.2 Participant Characteristics

Participants were drawn from two mainstream infant schools within one LA. Both schools were mainstream infant schools situated in rural towns within a predominantly rural county in the East of England. Both participating schools had two-form entry, with each having a higher-than-county and national average proportion of children requiring SEND support, and both contained Enhanced

Specialist Provisions (ESPs). Both schools served diverse pupil populations and followed the national curriculum.

Participants were initially identified through a pragmatic purposive sampling approach. Purposive sampling is commonly used in qualitative research to explore variation and depth of experience (Patton, 2015). Consent forms were distributed to all families of children in the Year 2 cohorts (school 1 n = 42, school 2 n = 56) of both schools. Out of the total 98 children in the two Year 2 cohorts. Signed parental and child consent was obtained for 18 participants (school 1 n = 12, school 2 n = 6).

The study used quantitative data gathered from Year 2 children (aged 6 or 7) to inform sampling for the qualitative phase. There were no inclusion/exclusion criteria in relation to the school cohort around English as an Additional Language (EAL) or SEN, however children with learning difficulties that present as low maths attainment may have inadvertently been excluded from the interview phase as not working at age-expected levels. The decision around this was intentionally left broad to maximise the number of participants from each school.

Eighteen participants took part in the CMAS-UK and teacher assessment phase scoping prior to the sampling for the interviews. This sample size therefore reflects the return rate of consent forms rather than the full year groups in each school. Further recruitment and reminders were not issued to gain more participants in line with ethical guidance around voluntary participation.

Interview participants were selected based on teacher assessment (working at expected) and varying maths anxiety levels (high, moderate or low obtained via the CMAS-UK). The decision to focus on children working at expected was a decision made from the outset. This allowed exploration of emotional experiences

among children whose academic performance was comparable, thereby challenging assumptions that anxiety is solely linked to lower achievement.

For selection purposes, CMAS-UK scores were grouped into three categories, high anxiety (≥2.0), moderate anxiety (1.5–1.99), and low anxiety (<1.5), allowing children with differing levels of maths anxiety to be identified. Across the two schools, clear differences emerged in the overall anxiety profiles. In School One, twelve children completed the CMAS-UK questionnaire and, on average, fell within the study's moderate descriptive range for self-reported maths anxiety (M = 1.67, SD = 0.50, range = 1.32). Scores within this consented participant group ranged from low (1.00) to high (2.32), indicating variation in the self-reported emotional responses to maths among those children who took part. These figures should not be interpreted as representative of the wider Year 2 cohort in School One, but they were methodologically useful in identifying children across the study's broad descriptive ranges and informing purposive selection for interview. In School Two, six children completed the CMAS-UK questionnaire. Within this consented participant group, the mean score fell within the study's high descriptive range for self-reported maths anxiety (M = 2.25, SD = 0.43, range = 1.36). Scores ranged from low (1.32) to high (2.68), indicating variation in self-reported emotional responses to maths among those children who took part. As with School One, these figures should not be interpreted as representative of the wider Year 2 cohort in School Two, but they contributed to transparency about the available recruited pool and supported purposive selection for interview.

When considered together, the consented questionnaire sample showed an overall moderate level of self-reported maths anxiety (M = 1.97; see Table 2), with scores ranging from very low anxiety (1.00) to high anxiety (2.68). These figures

should not be interpreted as representative of the wider Year 2 cohorts or of either school population, as both the school sample and the child participant sample were purposive and consent driven. Rather, the descriptive statistics are reported to provide transparency about the available recruited pool from which the interview participants were selected. The variation in CMAS-UK scores across the consented participants was methodologically useful because it enabled the researcher to identify children with differing self-reported emotional responses to maths, while later using teacher assessment data to purposively select children working at broadly comparable attainment levels for qualitative interview.

Table 2

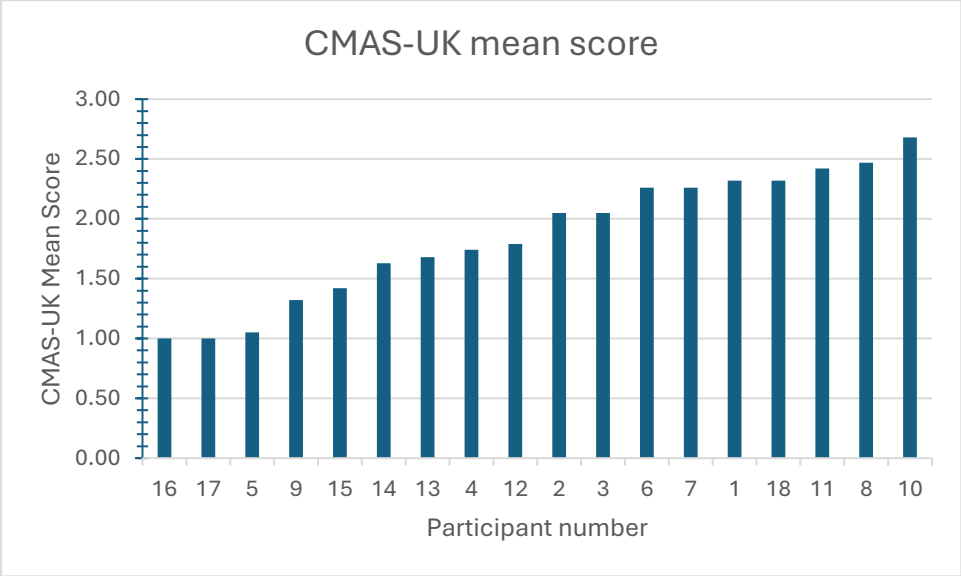
Descriptive Statistics for CMAS-UK Mean Item Scores Across the Full Sample (n = 18) and by School

Group	N	Mean	SD	Range	Min	Max
Overall	18	1.97	0.50	1.68	1.00	2.68
School 1	12	1.67	0.50	1.32	1.00	2.32
School 2	6	2.25	0.43	1.36	1.32	2.68

In the combined cohort of eighteen children, the CMAS-UK scores clustered into three groups: nine children exhibited high levels of maths anxiety (≥2.0), four fell within the moderate-anxiety range (1.5–1.99), and five scored within the low-anxiety category (<1.5). This is important as it enabled the researcher to group children with similar levels of anxiety and attainment so that potential comparisons could be made around their experiences and thinking.

Figure 4.

Distribution of CMAS-UK Mean Item Scores for All Participants



Scores are presented as continuous values to reflect the means of each child's responses to the CMAS-UK questionnaire.

To present the CMAS-UK data transparently and in a way that reflected the continuous nature of the construct, a bar chart (Figure 4) was produced showing each participant's mean item score on the original 1–3 response scale. Participants were ordered by score rather than by ID, enabling the gradual progression of values across the sample to be clearly observed. Presenting the data in this form highlighted the smooth distribution of scores, the presence of tied values, and the clustering of responses around points that might otherwise have been treated as categorical boundaries if using the distribution-based method. As well as visually representing the children's maths anxiety level scores, the chart also supports the analytic decision to retain mean item scores as continuous indicators, maintaining

fidelity to the structure of the measure and preserving interpretive proximity to children's expressed responses.

Teacher assessment data was gathered for all 18 participants (n= 11 working at age expected, n= 6 working above expected, n=1 working below expected, across both schools). Table 3 explores the CMAS-UK mean score and teacher assessment data for each participant.

Table 3

Participant-Level CMAS-UK Mean Scores and Corresponding Teacher Assessment Data for All Participants (n = 18)

Participant	CMAS-UK Mean	Teacher Assessment Data
1	2.32	Working at expected
2	2.05	Working at expected
3	2.05	Working at expected
4	1.74	Working at expected
5	1.05	Working at expected
6	2.26	Working at expected
7	2.26	Working at expected
8	2.47	Working at expected
9	1.32	Working at expected
10	2.68	Working at expected
11	2.42	Working at expected
12	1.79	Working above expected
13	1.68	Working above expected
14	1.63	Working below expected
15	1.42	Working above expected
16	1.00	Working above expected
17	1.00	Working above expected

18	2.32	Working above expected

Note. *Participants are not ordered by school to protect anonymity. However, Participants 1–11 were selected for interview, and their participant numbers are retained consistently throughout the thesis to correspond with subsequent quotations and qualitative analysis.*

Table 3 illustrates the distribution of CMAS-UK mean item scores alongside teacher-reported attainment levels for each participant. A notable pattern is that children assessed as working *above* age-related expectations displayed a wide spread of anxiety scores, with individuals falling into the study's heuristic low, moderate, and high ranges. A similarly varied pattern was evident among children judged to be working *at* the expected standard, who also showed anxiety scores spanning all three descriptive ranges. In contrast, the single child assessed as working *below* expectations reported a moderate level of anxiety. These patterns highlight that maths attainment, and reported anxiety did not map neatly onto one another in this study, and that children's emotional experiences of maths varied irrespective of their assessed performance (according to teacher assessment). Importantly, to clarify the ranges used in this study (<1.5 low; 1.5–1.99 moderate; ≥2.0 high) served solely as interpretative guides to support descriptive comparison and were not used for formal classification or diagnostic purposes.

It is important to emphasise that no correlational analysis was conducted, and these observations are not intended to demonstrate a statistical relationship between CMAS-UK scores and teacher-reported attainment. Rather, they describe a pattern observed visually within this small sample. Viewed by eye, there appeared to be a loose gradient in which lower reported anxiety was more often aligned with higher

teacher-reported attainment; however, high anxiety co-occurred predominantly with expected or above-expected attainment rather than underperformance. These descriptive patterns tentatively suggest that maths anxiety, as indicated by CMAS-UK scores and teacher-reported attainment data, does not operate solely as a deficit-linked construct. Instead, it may also be present among children meeting or exceeding expected standards. This provides useful context for the qualitative findings that follow, which highlight differences in how children experience, interpret, and emotionally navigate maths rather than framing anxiety as a simple marker of low ability.

The CMAS-UK and teacher data was used to inform the sample for the qualitative interviews. Interview participants were selected based on teacher assessment (working at expected). Attainment matching was methodologically important at the sampling stage, selecting children with broadly similar levels of mathematical performance to reduce the likelihood that emotional differences could be attributed simply to differences in ability. In contrast, maths anxiety and other negative emotions were conceptualised as integral to the phenomenon of interest and thus were not controlled for but explored in depth through children's own accounts.

Teacher assessment data identified 11 out of 18 participants were working at age expected levels in maths. These 11 children were selected for individual interviews to create an attainment-matched group. Although the intention was to maximise variation in maths anxiety levels within this group, the distribution of CMAS-UK scores meant that most of the selected children fell within the study's high-anxiety range (n = 8), with only one child scoring in the moderate range and two in the low range. The two participants who presented low maths anxiety profiles and

diverged markedly from the cohesive experiential patterns observed across the remaining nine children were omitted from the main analysis, though they are reflected upon in Chapter 3. Although one participant fell within the moderate rather than high descriptive range, they were retained because their interview account was consistent with the wider analytic focus on children experiencing maths as emotionally difficult.

The final sample of nine participants was considered analytically appropriate for the study aim, as the purpose was to explore patterned meanings within children's accounts rather than to pursue saturation in a positivist or statistically representative sense. Braun and Clarke (2022) note that RTA studies commonly involve relatively small samples, often between six and ten participants, making the final sample suitable for an in-depth qualitative analysis. The researcher was mindful that the study does not support statistical generalisation to wider populations; however, this does not preclude analytical generalisation. Instead, the findings are presented tentatively as conceptually transferable insights that may be critically considered in relation to similar educational contexts, where comparable relational, classroom, and affective processes may also shape children's experiences of maths. In this sense, the value of the analysis lies not in claiming that the findings apply universally, but in offering theoretically informed concepts that others can judge for relevance, resonance, and applicability within their own settings.

No further demographic information about participants was gathered as there were no plans to use this information as part of the analysis.

2.2.5 Ethical considerations

Ethical approval for the research project was granted by the University of East Anglia's (UEA) School of Education and Lifelong Learning Research Ethics Committee prior to data collection. A detailed outline of this research was supplied to the ethics board and revised multiple times based on feedback. Permission was granted to begin the project (Appendix C). The research ethics application was completed in accordance with UEA ethical guidance and Research Ethics Policy, the BPS Code of Human Research Ethics (2021b), the HCPC standards of conduct, performance and ethics (2024) and the BERA (2024) Guidelines for Educational Research. Ethical practice was prioritised throughout the research process, particularly given the involvement of young children, with careful attention to consent, assent, and power relations (Alderson & Morrow, 2020; BERA, 2024). Consent processes are stated within the recruitment process and examples of consent forms are included in the appendices.

The study complied with the UK GDPR guidance and the Data Protection Act's (2018) data minimisation principle, collecting only personal data necessary for specified research purposes and avoiding unnecessary questions or variables. In addition, professional ethical standards (BPS 2021a, 2021b, HCPC 2023 and BERA, 2024) emphasise proportional and respectful engagement with child participants, transparent consent and confidentiality. These requirements reinforce the ethical position that the research gathered only data necessary for understanding children's experiences of maths, with all data collection procedures justified in ethics submissions and participant information materials. This is also in line with EP practice and guidance from bodies like the Association of Educational Psychologists (AEP) and HCPC which emphasises taking the least intrusive approach and

respecting children's rights to privacy and only gathering information necessary for the purpose at hand.

Key considerations included:

- Informed consent and assent using accessible language and visual materials.
- Voluntary participation and right to withdraw.
- Minimising potential distress through supportive questioning
- Confidentiality and anonymisation of data
- Sensitivity to power dynamics, consistent with childist principles

Prior to administration of the CMAS-UK questionnaire and the interviews participants were reminded that they could withdraw at any time. They were given time to ask any questions. Consent to record the interviews was also reconfirmed. No children expressed discomfort; however the researcher was prepared that should a child express discomfort, the interview would be paused or discontinued. With a familiar member of staff available for support. The term *maths anxiety* was intentionally not used with children to avoid introducing suggestive or deficit-oriented language, and to prevent framing their experiences in ways that could be perceived as diagnostic.

Once all datasets had been linked (CMAS-UK, teacher assessment and interview data), all identifying information was removed and the dataset was fully anonymised prior to analysis. Participants were assigned participant numbers in order to protect anonymity. The numbers corresponded to the order the interviews were conducted. Participant numbers were used in place of names to avoid inadvertently attaching social, cultural, or gendered connotations that may arise when using personal identifiers, which could introduce unintended interpretive biases

for the reader; however, it is acknowledged that numerical identifiers can also risk depersonalising participants and reducing relational connection to the data, and therefore brief contextual descriptors (e.g., level of maths anxiety and teacher-reported attainment) were included alongside selected quotations to retain a sense of individual meaning-making without compromising anonymity. Consistent with the study's social constructionist position and commitment to contextualised interpretation, this approach was chosen to avoid layering arbitrary identity assumptions onto the dataset, while still preserving interpretive richness. Once data linkage across CMAS-UK, teacher assessments, and interviews was completed, all identifying information was removed, including names of children, teachers, peers, schools, and places, ensuring full anonymisation prior to analysis.

Information was stored with double protection on a password-protected computer in an encrypted file using the university OneDrive Storage in line with UK GDPR guidance and the Data Protection Act 2018. GDPR and data management processes were outlined in the ethics application.

2.2.6 Summary

This section has outlined the methodological approach adopted to explore Year 2 children's lived experiences of maths anxiety and negative emotional responses to maths. Grounded in social constructionist and childist principles, the study foregrounded children's meaning-making while using attainment-matched sampling to support a focused exploration of variation in emotional experience. In doing so, the research sought to illuminate how maths anxiety is constructed and experienced in the early years of schooling, and how these experiences are shaped through emotional, relational, and contextual influences within classroom environments.

2.3 Data Analysis

2.3.1 Initial Contextual Sampling Information (CMAS-UK and Teacher Assessments)

A small amount of structured information was collected at the outset to support contextual understanding and purposive sampling decisions. This included CMAS-UK responses and teacher-reported attainment data. CMAS-UK scores and teacher-reported attainment data were collected for the full initial pool of participating children prior to final sampling decisions. The purpose of this initial dataset was not to describe maths anxiety across the full Year 2 cohorts or to produce representative school-level findings. Rather, the CMAS-UK and teacher assessment data were collected to characterise the consented participant pool and to support purposive sampling for the qualitative interviews. The questionnaire data provided a descriptive indication of variation in children's self-reported emotional responses to maths within this recruited group, while teacher assessment data enabled the researcher to identify children working at broadly comparable attainment levels. This allowed the subsequent interviews to focus on children whose attainment was similar but whose reported emotional responses to maths varied, in line with the study's qualitative aim of exploring individual meaning-making and lived experience (See Section 3.6.2 for more information)

Following this initial profiling, the sample was refined through consideration of teacher-reported attainment data to ensure a purposive match across comparable levels of mathematical attainment. This process resulted in a reduced, final interview sample (n= 11) selected for in-depth qualitative exploration who all were assessed by their teachers as working at age-related expectations in maths, therefore all were

matched by attainment level. Table 4 summarises the mean scores and score distributions for the final sample.

Table 4

Descriptive Statistics of CMAS-UK Scores for participants working at age-related expectations (teacher assessment, n = 11)

N	Mean	SD	Range	Min	Max
11	2.06	0.48	1.63	1.05	2.68

As illustrated in Table 4, across the 11 participants, CMAS-UK mean item scores showed a moderately elevated overall level of maths anxiety (M = 2.06, SD = 0.48), with scores spanning a wide range from 1.05 to 2.68, indicating substantial variability in children's reported experiences. Of these participants (n= 11), 8 children exhibited high levels of maths anxiety (≥2.0), 1 fell within the moderate-anxiety range (1.5–1.99), and 2 scored within the low-anxiety category (<1.5). The two low-anxiety cases were treated as outliers and not included in the final thematic analysis because their accounts were markedly different from the wider analytic sample and did not cohere with the developing themes generated from children with moderate or high reported maths anxiety. This was to preserve the coherence and focus of the thematic analysis. The participant categorised as reporting moderate maths anxiety was retained within the final analytic sample because their interview account was broadly coherent with the patterns of meaning generated across the high-anxiety participants. This is discussed further in Chapter 3.

2.3.2 Qualitative Analysis

Following completion of data collection, data analysis was conducted on the interviews using RTA (Braun & Clarke, 2022), chosen for its explicit alignment with a social constructionist epistemology and its emphasis on researcher reflexivity, subjectivity, and the co-constructed nature of meaning-making, which coheres with both the researcher's stance and professional practice as a TEP. It was important to acknowledge this relationship because the young people and the researcher will have generated knowledge out of pre-understandings and shared assumptions (Braun & Clarke, 2022). RTA allowed for the exploration of the participant's lived experiences. Chapter 3, provides further information on decision making, thought processes and reflexivity. Children's accounts are therefore treated as situated narratives through which meanings of maths and associated emotional experiences are produced, negotiated, and understood in context.

Of the eleven participants interviewed, two did not align with the homogenous sample, as both presented low maths anxiety profiles and diverged markedly from the cohesive experiential patterns observed across the remaining nine children; consequently, these two cases were omitted from the main analysis, though they are reflected upon in Chapter 3, where their relevance and implications for future research are discussed.

Data from both schools were integrated and analysed holistically through the phases of familiarisation, coding, theme development, review, and refinement. The final themes represent an interpretive, multi-layered account rooted in children's meaning-making. Throughout, the researcher maintained ongoing reflexivity, viewing subjectivity as a generative analytic resource consistent with RTA's constructionist foundations.

Overall, the use of RTA ensured both methodological flexibility and analytic rigour, supporting an in-depth exploration of how meanings surrounding maths and associated emotional experiences are constructed within children's everyday social worlds. Reflexivity was central to a rigorous analytical process, reflecting on researcher positionality throughout the process. This involved the researcher keeping a reflexive diary and noting key decision points and thoughts along the research journey.

This section will briefly outline the RTA used in this study, alongside a personal account of putting the analytic process into practice. Whilst the phases are presented in a linear fashion in this section, as they are presented in the literature (Braun & Clarke, 2022), in practice the phases were moved between more freely. The analytical process consisted of six phases (Braun & Clarke, 2022) which are outlined below:

The process involved:

1. Familiarisation with transcripts
2. Generating initial codes
3. Constructing candidate themes
4. Reviewing and refining themes
5. Defining and naming themes
6. Writing up / producing the report

2.3.2.1 Familiarisation

This phase began during the transcription process, when the researcher listened to each interview audio recording multiple times while editing the automated

transcription produced through Microsoft Teams. In doing so, attention was given not only to the spoken content but also to pauses, hesitations, and shifts in tone. In young children's narratives, these more subtle features can provide insight into their meaning-making processes and emerging internal representations (Sun et al., 2023). Following transcription, each transcript was read and re-read in line with Braun and Clarke's (2022) approach to familiarisation, with initial reflections recorded through *familiarisation doodles* (Appendix G) and brief analytic notes (Appendix H). The doodles and notes enabled a creative way for the researcher to immerse themselves in the data and engage in critical engagement (Braun & Clarke, 2022). In creating the doodles and making the notes, it deepened the researcher's understanding of the data and the narratives of the young children. These doodles were used to visually map early impressions, emotional tone, and tentative patterns across participants, supporting an embodied and exploratory engagement with the data. The notes enabled ideas to be tentatively explored.

During this phase, early analytic impressions began to form. One such idea was that early maths anxiety may not always present as a straightforward dislike of maths. Rather, even children who like maths may experience threat when uncertainty, risk or evaluation becomes salient. This raised the possibility of understanding early maths anxiety as a form of evaluative vulnerability, with emotional responses becoming most intense for those reporting higher anxiety. This has important implications for early identification and intervention, as children may need support before negative emotional associations with maths become more visible or embedded in their learner identities. The familiarisation doodles and initial notes suggested a recurring distinction between how children spoke about their own mistakes and how they spoke about the mistakes of peers, with children often

showing greater compassion towards others than towards themselves. Examples of the familiarisation material presented in Appendices G and H show how early words, emotion-based faces and other doodles were used to map these initial impressions visually, including children's references to mistakes, being wrong, feeling "scared," "angry," "worried," or "middle," and the repeated positioning of maths as something linked to performance, correctness, and evaluation. It also became apparent that even children who stated that they liked maths could still describe apprehension, negative emotional experiences, anticipation of evaluation, and a sense that struggle or error felt risky. These early observations supported a developing a tentative interpretation of maths anxiety as existing along a continuum rather than as a fixed or discrete category. Other initial patterns during familiarisation suggested the performance-oriented nature of children's accounts, their narrow conceptualisation of maths, the emotional weight attached to correctness, and the frequency with which mistakes were discussed. These impressions were provisional and were not treated as themes at this stage; rather, they informed the later construction of initial codes and helped sensitise the researcher to possible patterns of shared meaning across the dataset.

Year 2 children can naturally give short, partial or sometimes ambiguous responses, which was the case within the interviews for this study. Within this study, children's short responses were understood as a normal feature of their developmental communication rather than as a lack of understanding. Interpretation of these responses was approached as a shared, co-constructed process, consistent with the subjective and participatory stance of RTA. In applying RTA, the researcher usually coded at the level of the sentence, short exchange or expressed idea. However, given the age of the participants, there were occasions where children's

meanings were communicated through single words, brief phrases, repetitions or affective expressions rather than fully elaborated sentences. The researcher therefore sometimes coded at word or phrase level where this appeared necessary to preserve meaning within young children's developmentally situated accounts. This was not intended as decontextualised word-level analysis, but as a flexible adaptation of RTA when working with participants whose communication was often brief, concrete and relationally supported. The researcher recognised that this introduced a risk of ambiguity and over-interpretation, and therefore returned consistently to the wider transcript context, including the question asked, surrounding dialogue, use of prompts and reflective field notes. This enabled the researcher to value children's shorter forms of expression while maintaining analytic caution and rigour. Rather than treating short answers as fixed indicators of meaning, the researcher attended to how meaning unfolded within the interaction, drawing on the immediate context of the task, the child's preceding comments, and the relational dynamics of the moment. For example, a child's brief response that maths felt "middle" was interpreted in relation to the wider interaction, including the prompt being discussed, the child's previous references to getting answers wrong, and their non-verbal behaviour during the exchange which indicated that middle was not a positive feeling for this child. Rather than treating "middle" as a self-contained category of feeling, the researcher considered how the child was using this word within the interview context to communicate uncertainty, ambivalence, or emotional discomfort. This enabled short responses to be analysed as part of a broader co-constructed account, rather than as isolated fragments of meaning. A follow-up question was also asked around how the participant would respond to a peer feeling the same, to add insight to their comment. Non-verbal cues such as nodding, facial

expressions, hesitation, and children's use of manipulatives contributed to this joint meaning-making, often signalling confidence, uncertainty, or emotional discomfort in ways that complemented their verbal responses. This is in line with the work of DeCosta et al., (2023) who included more subtle clues such as bodily and facial expressions in the interpretation and analysis to help fully comprehend the child's perspective as an adult researcher. Prompts such as, "Tell me more" were used to invite elaboration, enabling children to shape the direction and depth of the exchange.

Although brief answers might superficially suggest limited comprehension, children were encouraged to ask for clarification whenever needed, and their engagement indicated that they understood the questions being posed. Within this relational and developmental context, succinct responses were treated as age-typical communicative practices, with meaning emerging through the interaction between child and researcher, rather than being inferred solely from the child's words. This issue is returned to in the limitations section under developmental and linguistic constraints, where the variability in children's need for scaffolding is considered further. While visual resources, prompt cards, repetition, rephrasing and responsive follow-up questions were used to mitigate these challenges, the researcher noted that some children required substantially more support than others and that, even with these adaptations, many responses remained brief or context dependent. This is also reflected upon in Chapter 3, where the implications of co-constructing meaning with young children are considered in more detail.

2.3.2.2 Coding

Coding began through a systematic, manual engagement with the interview transcripts. Printed transcripts were annotated, data extracts were highlighted if they

appeared relevant to the research questions and initial code labels developed to capture both children's explicit meanings and the researcher's emerging interpretive responses. This hand-written process was chosen to support close engagement with children's language and to allow tentative interpretations and reflexive notes to be recorded alongside children's words, rather than relying on automated coding processes. Appendix I provides an example of this coding process, showing how initial descriptive labels were recorded alongside interpretive notes. The highlighted extracts indicate moments where potential meanings in children's accounts of maths were identified and developed into initial codes.

Alongside transcript annotation, mind maps and post-it notes were used to explore relationships between developing codes; this process is represented in Appendix I. These materials did not function as a formal coding framework; rather, they supported reflexive movement between individual extracts and broader patterns of meaning. The appendix example shows how these visual materials helped test, reorganise, and question emerging interpretations before moving into theme development. Throughout coding, the researcher questioned how individual codes related to the wider research questions.

Coding was primarily inductive, as codes were generated through close engagement with children's accounts rather than through a pre-existing coding frame. However, consistent with Braun and Clarke (2022), this was not understood as purely data-driven, as the researcher inevitably brought prior perspectives from the literature review and wider previous work in the topic area. Codes were treated flexibly and continually refined for conceptual coherence, with labels adjusted, merged, or split in response to ongoing interpretation, in line with Braun and Clarke's (2022) guidance. For instance, early codes such as "making mistakes" and "getting

things right or wrong” were later refined into more interpretive codes, including “emotional weight of right/wrong” and “negative perceived consequences linked to error.” This distinction was important because it separated children’s emotional responses to error from their beliefs about what might happen as a consequence of being wrong, such as adult disapproval, peer judgement, or feeling less competent. At this stage, codes were not treated as fixed or final; they formed a flexible analytic resource that was later used during theme development. A full coding conceptual map was developed and is presented in the appendices (Appendix J). The map provides a representation of how initial codes were clustered and connected to developing themes, making the interpretive movement from children’s accounts to the final thematic structure more transparent.

Coding attended to both semantic and latent features of the data. Semantic codes captured children’s explicit language, such as references to feeling ‘scared,’ ‘worried,’ ‘angry,’ or ‘middle.’ Latent coding considered the relational and evaluative meanings being constructed through these descriptions. For example, when a child described feeling scared because the teacher might scream, this was not coded as fear and literally the teacher doing this, but as evaluative threat and relational safety, reflecting the social meaning attached to error within the classroom context. This decision aligned with the researcher’s interpretive stance and enabled the analysis to move beyond naming emotions towards examining the classroom conditions through which those emotions appeared to be produced.

Initial codes were discussed in research supervision before themes and subthemes were generated. These discussions were not used to seek coding consensus, which would be inconsistent with RTA, but to support reflexive

questioning, consider alternative readings, and ensure analytic claims remained grounded in children's accounts.

2.3.2.3 Generating initial themes.

Following coding, codes were grouped into broader patterns of shared meaning, leading to the development of tentative initial themes and subthemes across the whole dataset. This process began informally through the use of post-it notes, where codes were physically arranged and rearranged to explore possible conceptual groupings. This tactile and visual approach helped the researcher explore possible conceptual relationships between codes. Some codes overlapped conceptually, requiring decisions about where they best fit and whether the theme or subtheme title adequately captured the full analytic story. In line with Braun and Clarke (2022) view of RTA as an iterative and interpretive process, several possible ways of mapping the data were explored. Initially the codes were considered in broader topic areas such as feelings about maths, mistakes, teachers, peers, difficulty and support. However, this early mapping risked becoming more descriptive in terms of topic areas rather than organising themes around shared meanings. Alternative mappings were then considered to test whether the developing themes captured shared meanings rather than descriptive topic areas. The final thematic structure was preferred because it organised the data around central organising concepts that captured both the children's words and the wider relational, contextual and emotional processes interpreted within the dataset. Theme and subtheme names were refined using quotes from the interviews so that the analytic structure was visibly anchored in children's own language.

A key decision point involved refining the early theme labelled *"maths as an emotional experience."* Although this captured children's references to feeling

“scared,” “worried,” or “happy,” it lacked the conceptual specificity needed to reflect the relational and evaluative processes underpinning those emotions. After reviewing codes such as *fear of judgement*, *teacher as evaluator*, *pressure to be right*, and *worry about mistakes*, the theme was re-named “Evaluative threat and emotional danger.” This better represented the latent meaning across the dataset: that children’s emotions were not simply reactions to maths, but responses to perceived evaluation, correctness, and social scrutiny.

Another major decision involved distinguishing between codes relating to *challenge* and those relating to *difficulty*. Initially these were grouped together, but closer analysis revealed that children used “hard,” “tricky,” and “challenge” in different ways. “Challenge” was often associated with threat, avoidance, and emotional risk, whereas “difficulty” was linked to task accessibility, novelty, and conceptual understanding. This led to the creation of two separate subthemes within Theme 2: “Perceived difficulty and reduced tolerance for challenge” and “Performance Conditions and classroom structures.” This distinction allowed the analysis to more accurately reflect children’s meaning-making and avoid collapsing different experiences into a single category.

A further decision point concerned codes relating to *teacher support*. Some codes reflected relational safety (e.g., “they help me work it out”), while others reflected evaluative ambivalence (e.g., “the teacher might scream”). Initially these sat within one theme but separating them allowed clearer articulation of how teacher interactions simultaneously supported and threatened children’s emotional experiences. This resulted in the subtheme, “Teacher support and relational safety,” with evaluative concerns feeding into Theme 1 instead.

A further example of theme development involved considering how semantic codes could contribute to more interpretive theme construction. For example, when a child said they wanted maths to be “shorter” this was coded not only as *preference for shorter maths* but also as avoidance as emotional protection, reflecting the underlying meaning that maths was experienced as stressful or overwhelming and something to be reduced or avoided. This interpretive approach aligns with RTA and the researcher’s commitment to foregrounding children’s meanings, recognising that children’s language conveys situated interpretations of power, belonging, and competence.

These themes captured not only commonalities across participants, but also the conditions under which different experiences emerged (e.g., when maths was perceived as easy versus difficult). Themes were developed as patterns of shared meaning organised around the central organising concept (theme). Theme definitions were then written as outlined in Braun and Clarke (2022). Quotes from the interviews were then selected to represent each theme and subtheme and ensure that the children’s voice was front and centre of the research.

Through this process of clustering and comparison, five preliminary themes were developed, each with three subthemes.

2.3.2.4 Developing and reviewing themes.

Further theme development was conducted in line with Braun and Clarke’s (2022) guidance and discussed during research supervision. A mind-map style visual representation was then created to explore relationships between codes and tentative themes before a conceptual map was produced (see Appendix J). This allowed for the examination of how initial ideas connected, overlapped, or diverged

across the dataset. During this stage, themes were reviewed against the dataset to ensure coherence and distinctiveness. This involved iterative movement between data extracts and thematic structure, refining boundaries and ensuring that themes captured the complexity and variability of children's experiences.

Themes were then interrogated using the evaluative questions outlined by Braun and Clarke (2020), ensuring that each theme was supported by coherent and meaningful data and contributed something important to the overall analytic story. This involved checking for internal coherence, distinctiveness between themes, and fidelity to the dataset. For example, are reported themes topic summaries, rather than fully realised themes, patterns of shared meaning underpinned by a central organising concept (Braun & Clarke, 2020)?

For the theme "Evaluative threat and emotional danger," the researcher applied Braun and Clarke's (2020) evaluative questions to ensure the theme was coherent, distinctive, and grounded in the dataset. In reviewing internal coherence, the researcher examined whether the data extracts, such as children's descriptions of feeling "scared," "worried," or "nervous" when facing mistakes or teacher judgement clustered meaningfully around a central organising concept. This process confirmed that the theme captured a consistent pattern of children interpreting maths as socially risky and emotionally charged. Distinctiveness was then considered, checking whether this theme overlapped with related themes such as "Perceived difficulty and reduced tolerance for challenge" or "Teacher support and relational safety." Although these themes shared emotional content, the evaluative focus (fear of judgement, pressure to be right, and the social consequences of error) justified maintaining it as a separate theme. Finally, fidelity to the dataset was assessed, ensuring that the theme reflected both semantic expressions (e.g., "I get scared if I'm

wrong") and latent meanings (e.g., perceived threat to identity, belonging, and competence). This interrogation confirmed that the theme contributed something analytically important to the overall narrative: that children's emotional responses were not simply about maths difficulty, but about the evaluative cultures in which maths was encountered.

Throughout this process, the researcher moved repeatedly between codes, themes, and raw data, ensuring that interpretations remained closely grounded in children's accounts. This iterative refinement reflects both the principles of RTA and the professional stance of EP practice, where interpretation must remain responsive while keeping children's voices central.

2.3.2.5 Defining and naming themes

Once a coherent thematic structure had been developed, themes were further refined, clearly defined, and named. Themes were further refined and named to reflect their underlying meaning, resulting in five themes that collectively represent how children experience, make sense of, and emotionally respond to maths. Theme names were selected to remain close to participants' meanings while also offering analytic insight. This is why the researcher decided to use quotes from the research to name the themes and subthemes, grounding every stage in the words of the children. For example, Theme 2: Challenge, Difficulty & Performance Conditions the researcher adopted the quote "When it's easy, like, I really like it… because I think I'm a bit good at it". Through iterative review and refinement, themes were developed to reflect both experiential patterns and their broader social and contextual shaping. In line with Braun and Clarke (2022), each theme was accompanied by a brief summary capturing its central meaning, functioning similarly to an abstract for each interpretive category (See Appendix J).

Theme naming was treated as an interpretive act, with attention given to ensuring that names reflected both the meanings constructed by children and the communicative clarity required for the reader. Throughout this stage, themes remained open to refinement as deeper engagement with the data continued, ensuring that the final thematic structure accurately represented the dataset while remaining analytically coherent. A summary of the themes and subthemes are outlined in Table 5.

2.3.2.6 Writing up.

The final phase involved integrating themes into a coherent narrative, supported by data extracts and interpretation. Analysis was situated within a social constructionist framework, emphasising the relational and contextual nature of children's experiences, and a childist perspective, foregrounding children's voices as central to knowledge production. The final phase involved producing an integrated analytic narrative as recommended by Braun and Clarke (2022), situating children's accounts within existing literature on maths anxiety, attribution, and identity, while maintaining a childist commitment to foregrounding children's voices as meaningful and valid forms of knowledge.

The writing phase began by structuring the analysis into thematic subheadings, under which relevant data extracts were organised. Extracts were selected both for their illustrative value and their analytical significance in developing and evidencing each theme. The analytic narrative was then constructed around these extracts, with close attention to how children's voices could be represented clearly and faithfully within the written account.

Each theme was developed individually before being arranged into a coherent overall analytic structure, ensuring a logical flow across the findings. This approach reflects the study's Big Q qualitative orientation, in which analysis is understood as inherently interpretive, meaning-making process rather than a procedural exercise. The findings and discussion were presented as a combined analytic chapter to provide an integrated, interpretive account of the data, consistent with Braun and Clarke's (2022) guidance on reporting RTA. This format acknowledges that within RTA meaning is not "discovered" in the data but actively generated through the researcher's engagement, reflexivity and knowledge of theory and literature. Presenting the analysis in this way therefore also aligns with the broader epistemological stance of the study, foregrounding interpretation, contextualisation and the co-constructed nature of knowledge that characterises Big Q qualitative research.

2.3.3: Themes and Analysis

2.3.3.1 Overview

This section presents the findings of the current study and explores how they contribute to existing understandings of children's lived experiences of maths and early maths anxiety. The analysis is grounded in a social constructionist and childist epistemology, recognising children as active meaning-makers whose experiences are shaped through interaction with classroom practices, peer dynamics, and wider educational discourses.

The section will include a descriptive quantitative context before exploring the interview data qualitatively through RTA (Braun & Clarke, 2022).

2.3.3.2 Descriptive Quantitative Context

Although the primary focus of this study is qualitative, descriptive patterns in CMAS-UK scores and teacher-reported attainment provide useful contextual grounding. Children's interview narratives were interpreted alongside their CMAS-UK profiles, enabling a more nuanced understanding of how reported anxiety manifested in lived experiences. For example, elevated scores on assessment-related CMAS-UK items were considered in relation to children's descriptions of fearing mistakes, heightened performance awareness, and feeling pressure during maths tasks. This integration supported a richer interpretation of how anxiety was experienced within everyday classroom contexts.

Across the sample (n = 18), tentative patterns emerged when CMAS-UK scores were viewed alongside attainment data. High levels of maths anxiety were not confined to lower attainment: among children identified as highly anxious, 88.9% (8/9) were working at age-related expectations and 11.1% (1/9) were working above. Within the low-anxiety group, 60% (3/5) were working above age-related expectations and 40% (2/5) were working at expected, with none working below. The moderately anxious group showed the widest attainment spread, with 50% (2/4) working above, 25% (1/4) working at expected, and 25% (1/4) working below; this was the only instance of below-expected attainment in the dataset. This pattern is relevant because it provides descriptive context for the qualitative analysis, indicating that children's emotional experiences of maths were not simply reducible to teacher-reported attainment and therefore needed to be explored through their own accounts.

2.3.3.3 Thematic Analysis: Overview

In this section, I will present the findings of the current study and discuss ways that they contribute to the existing body of literature in the area of maths anxiety and lived experiences of maths.

Five themes were constructed through RTA (Braun & Clarke, 2022), representing patterned meaning across the dataset. These themes are interpretive, not descriptive categories, and reflect my analytic engagement with the data. The thematic map (Figure 5) illustrates the relationships between themes. This analytic approach was selected for its flexibility and its alignment with the study's social constructionist epistemology and childist orientation, supporting an exploration of how children construct and negotiate the meanings of their mathematical experiences within the contexts in which those meanings are produced.

Theme 1 focuses on what maths comes to mean emotionally and relationally for children. Theme 2 focuses on the task and classroom conditions that shape those emotional responses. Theme 3 focuses on the belief systems children use to explain their competence. Theme 4 focuses on relational support and scaffolding. Theme 5 focuses on how children protect themselves from perceived threat.

Each theme is presented using a quote → interpret → theorise structure, integrating children's voices with interpretive commentary and relevant theoretical perspectives. Extracts include participant identifiers and contextual information (e.g., maths anxiety grouping, attainment level) to support transparency while maintaining anonymity. The analysis does not claim generalisability; instead, it offers a situated account of how children construct and experience maths within their everyday educational environments.

Each theme directly addresses the research questions:

1. How do children who are working at age expected levels in maths but score highly on a maths anxiety questionnaire describe their experiences of maths?
2. What do their responses suggest may be the factors that influence their feelings towards maths?

This is discussed further in the conclusion of this chapter.

Collectively, the themes illuminate the relational, emotional, and socially constructed nature of children's experiences, challenging individualised, within-child conceptualisations of maths anxiety. Instead, the analysis situates children's accounts within the dynamic interactions between classroom practices, social relationships, and wider educational discourses, as represented in the conceptual framework.

The current research identified 5 core themes as can be seen in the thematic map (Figure 5) and Table 5 which shows themes and subthemes with their core meanings.

Figure 5.

Thematic map displaying the themes generated during the process of data analysis.

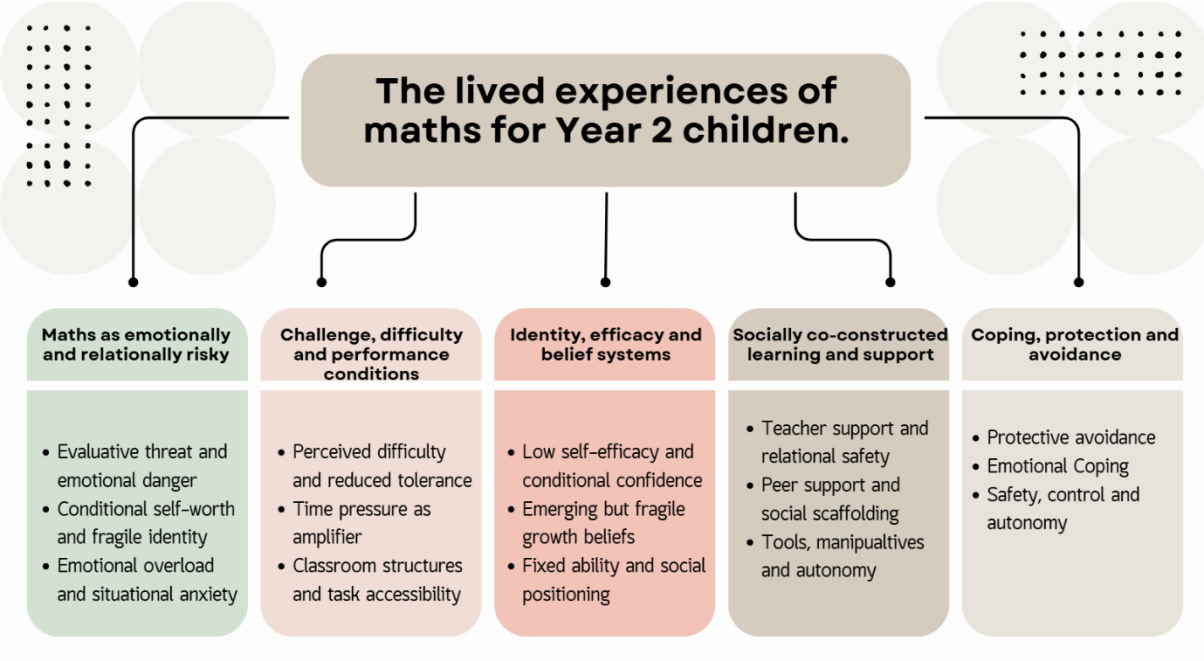


Table 5

Themes and subthemes with their core meanings.

Theme	Core Meaning	Subthemes
1. Maths as Emotionally and Relationally Risky	Maths is experienced as emotionally charged, identity-relevant, and socially risky.	1.1 Evaluative threat 1.2 Conditional self-worth 1.3 Emotional overload
2. Challenge, Difficulty & Performance Conditions	Children's emotional responses are shaped by task accessibility, pace, and situational conditions.	2.1 Perceived difficulty 2.2 Time pressure 2.3 Classroom structures
3. Identity, Efficacy & Belief Systems	Children hold emerging, fragile, and sometimes contradictory beliefs about ability and improvement.	3.1 Low self-efficacy 3.2 Fragile growth beliefs 3.3 Fixed ability narratives
4. Socially Co-Constructed Learning & Support	Learning is relational, scaffolded, and dependent	4.1 Teacher support 4.2 Peer scaffolding

Theme	Core Meaning	Subthemes
	on the availability and responsiveness of others.	4.3 Tools/manipulatives
5. Coping, Protection & Avoidance	Children use protective strategies to manage emotional risk and maintain safety.	5.1 Avoidance 5.2 Emotional coping 5.3 Autonomy/control

2.3.3.4 Theme-by-Theme Analytical Narrative

Theme 1: "I'm going to maybe not get it right and the teacher's going to scream at me" (Participant 1, Working at Age Expected Level, High Maths Anxiety Level). **Maths as Emotionally and Relationally Risky**

This theme captures how children appeared to construct maths not simply as an academic subject but as an emotionally charged and relationally consequential space and experience, where the possibility of being wrong carried social, identity-based, and emotional consequences. Rather than a purely cognitive activity, maths was experienced as emotive and precarious, shaped by fear of judgement, teacher reactions, peer comparison, embarrassment, failure, relational vulnerability and the social meanings attached to correctness. Children's accounts suggest early signs of maths anxiety emerging not from dislike of maths, but from evaluative vulnerability (a fear of being wrong, being seen, and being judged). Children's responses suggested that emotional responses from maths were rarely detached from social contexts. Rather, fear, sadness and worry were often constructed in relation to teachers, peers and the perceived consequences of making mistakes.

This theme is organised into three interconnected subthemes:

1.1 Evaluative threat and emotional danger

1.2 Conditional self-worth and fragile mathematical identity

1.3 Emotional overload and situational anxiety

Subtheme 1.1: Evaluative threat and emotional danger

A prominent pattern across the data was the children's anticipation of negative consequences associated with making mistakes. Rather than describing maths as inherently difficult, children frequently described being worried about what might happen if they were wrong.

Participant 1 explained:

"I'm going to maybe not get it right and the teacher's going to scream at me".

The significance of this extract may lie not in whether the anticipated consequence was realistic, but how the child appeared to construct maths as a context in which errors carried emotional and relational risk. The possibility of making a mistake seemed to be immediately linked to adult evaluation. The anticipated teacher response appeared to be more salient than the maths task itself. Maths may therefore have been experienced not as a neutral learning activity but as a potentially threatening social situation.

Similarly, Participant 7 (Working at Age Expected Level, High Maths Anxiety Level) described a situation in which public maths performance appeared to intensify this sense of threat:

"When I had to go up and do something in the front… I had to solve a maths problem. It wasn't adding or subtraction…. It was dividing. And that maybe I would get it wrong".

The above quote suggests that the emotional significance of the maths problem the child had to solve was intensified by its public visibility and evaluative nature. The child does not only identify the concept of division as being difficult, but rather the anxiety appears to centre on having to perform “at the front” of the class and the anticipated possibility of “get[ting] it wrong” in front of peers and the teacher. Within this account, the mathematical content, the public positioning of the child, and the possibility of error combine to produce a sense of evaluative threat. The phrase “maybe I would get it wrong” indicates anticipatory anxiety; the child is not describing an actual mistake, but the imagined social and emotional consequences of possible failure. The imagined possibility of failure becomes emotionally significant before any mistake has occurred. This indicates that, for this child, maths can become emotionally dangerous when uncertainty, public exposure and correctness intersect. The child’s concern was not simply the division task itself but being required to perform competence in front of others. This extract was interpreted as contributing to the theme of evaluative threat and emotional danger because it shows how maths may become emotionally risky when correctness is made visible in front of others. In terms of emotional danger, the child here is describing what appears to be a threat to competence, self-worth, social standing or relational safety. This extract suggests that public maths participation became associated with exposure to judgement and potential humiliation.

Children frequently used conditional phrasing such as *“I like it but…”*, indicating that enjoyment depended on getting the answer right, working with friends, feeling competent, avoiding mistakes and receiving positive feedback.

Across the interviews, children’s own words repeatedly appeared to construct maths as emotionally charged, particularly in relation to being seen to make

mistakes. Children drew on a wide affective vocabulary, including “overwhelmed”, “stressed”, “worry”, “unsure”, “scared”/ “scary”, “afraid”, “under pressure”, “jealous”, “complicated”, “frustrating”, “sad”, “embarrassed”, “nervous”, “angry” and “super angry”. These words are analytically significant because they position maths not simply as difficult, but as emotionally consequential. The recurrence of words such as “scared”, “afraid” and “nervous” suggests that children were orienting to maths as a context in which something threatening might happen, while words such as “embarrassed”, “sad” and “jealous” indicate that this threat was socially and identity laden. In this sense, the theme is grounded in children’s own descriptions of maths as a space where correctness, visibility, comparison and adult response mattered emotionally. Rather than treating these words as isolated labels for feeling states, the analysis interpreted them in relation to the situations children attached them to: going to the front of the class, waiting to find out if an answer was wrong, being unsure what to do, other children appearing “better”, or fearing that a teacher might react negatively. Together, these accounts suggest that evaluative threat was produced through the interaction between mathematical difficulty and the social conditions in which maths was encountered.

For some children, the emotional consequences of mistakes extended beyond feelings of embarrassment and became linked to perceived punishment. Participant 7 explained:

“Scared… Miss breaktime and miss time with my friends.”

This account highlights the relational significance of mistakes. Being incorrect was not merely associated with academic failure but with losing access to valued social experiences. The perceived consequence here involved separation from peers and

exclusion from enjoyable activities. In this way, maths anxiety appeared intertwined with children's broader social worlds.

The wording used by the children also showed that the feared consequence of error was often anticipated rather than already experienced. For example, Participant 7's concern that they "maybe" would get it wrong, and Participant 3's fear that the teacher was "going to scream", both locate anxiety in the imagined consequences of possible error. This was represented in other interviews as well. In RTA terms, these extracts were interpreted as part of a wider pattern of meaning in which children monitored for potential failure and attached emotional significance to being wrong before any actual mistake had occurred. The children's emphasis on being "at the front", being "wrong", being "better than" or worse than others, and feeling "under pressure" suggests that maths was experienced within an evaluative classroom culture where performance was visible and socially meaningful. The children's words therefore ground the analytic claim that maths could become emotionally dangerous: not because the maths content alone was threatening, but because mistakes appeared to carry relational consequences, including imagined adult disapproval, peer comparison, shame, or a diminished sense of competence.

Correctness emerged as a central organising feature of children's mathematical experiences. Being right was associated with competence and cleverness, while being wrong was emotionally loaded, linked to sadness, frustration, fear, or shame. Errors were rarely seen as being neutral; they were identity-relevant events. Children described "waiting to see" if they were wrong, anticipating judgement, and feeling exposed when uncertain. One child feared the teacher would "scream" at them, illustrating how evaluative threat can be amplified by perceived adult reactions.

These accounts resonate strongly with contemporary conceptualisations of maths anxiety as a response to perceived threat rather than maths difficulty alone (Ashcraft, 2002; Kirkland & Hunt, 2025). Trujillo and Hadfield (1999) argue that maths anxiety can emerge when maths situations threaten self-esteem. For these children, threat appeared rooted in anticipated evaluation, punishment and social consequences. The accounts support the understanding of anxiety as relationally produced rather than located solely within the child. Fear was not generated by maths in isolation but appeared to be through children's interpretations of classroom practices, teacher responses and classroom contexts where error carries social meaning.

These findings echo Bronfenbrenner's (Bronfenbrenner & Morris, 2006) ecological perspective whereby emotional experiences emerge through interactions between the child and their immediate relational environment. The classroom microsystem appeared central in shaping whether maths was experienced as safe or threatening. Consistent with Petronzi et al. (2017, 2019a, 2019b) children's accounts suggest fear of failure and teacher authority may become embedded within children's developing understandings of maths from an early age.

Furthermore, the following psychological theories may also help to explain these patterns. Attribution theory (Weiner 1985, 2010) shows how children interpret mistakes as reflections of ability rather than effort, heightening evaluative fear. Whilst cognitive models of anxiety suggest that anticipatory threat ("maybe I would get it wrong") consumes working memory, reducing cognitive capacity and reinforcing anxiety (Ramirez et al., 2013; Ramirez et al., 2018; Pizzie et al., 2020). Meanwhile, childist perspectives highlight how adult-constructed classroom norms around correctness, performance, and public evaluation can create emotionally risky spaces

for young children, whose own meanings and vulnerabilities may be overlooked within attainment-focused practices (Wall, 2022).

Together, these findings suggest that maths is experienced as emotionally dangerous, with evaluative threat shaping children's engagement, confidence, and sense of safety. This subtheme suggests that, for these children, maths anxiety was constructed less through the mathematical task alone and more through the anticipated relational consequences of error; correctness became emotionally risky because it was linked to adult judgement, peer visibility, and children's developing sense of safety within the classroom.

Subtheme 1.2: Conditional self-worth and fragile mathematical identity

Alongside fears of evaluation, children appeared to frequently link their mathematical competence to broader judgements about themselves. Success and failure were often constructed as indicators of personal worth, potentially resulting in fragile mathematical identities that seemed to fluctuate according to perceived performance. This perceived performance is particularly interesting and important as all the children interviewed were rated as working at expected according to teacher assessments.

Participant 1 reflected:

"Then I see another person and then I say, oh they're good at maths, better than I am."

The quote above suggests that the child's mathematical self-concept is being constructed relationally through comparison with peers rather than evaluating their progress against previous learning. The phrase "then I see another person" positions the peer as a reference point against which the child evaluates their own

competence, judging their own ability by looking at peers. While “better than I am” indicates a downward comparison of the self. Rather than describing maths ability as something developing, situated or supported through practice, the child appears to organise mathematical competence hierarchically, with some children positioned as “good at maths” and the self-positioned as comparatively less able. This supports the subtheme of conditional self-worth and fragile mathematical identity because the child’s sense of competence appears contingent upon how they perceived themselves in relation to others.

The child’s mathematical identity is fragile, and another child’s success can destabilise their own sense of being good enough. This links to the emotional risk of not only getting an answer wrong but what comparison seems to say about who the child is as a maths learner. Their mathematical identity is therefore not fixed or secure, but vulnerable to classroom comparison and the visible performance of peers. This suggests that mathematical identity is socially constructed, that the child’s view of themselves as a maths learner develops through classroom relationships and comparison, not just through actual attainment. Competence is positioned hierarchically which is something reflected in the literature and in maths practices in schools (Leach, 2026). Self-worth regarding maths appears dependent on not being outperformed by peers, not feeling slower and not being visibly less competent. Across accounts children suggested that competence was understood relationally with some children being “good at maths” and this was dependent on how one compared to peers. This suggests that maths self-worth may be conditional upon relative performance, rather than grounded in a secure sense of developing competence. Within this account, another child’s success becomes meaningful not simply as evidence of that peer’s ability, but as a point of contrast through which the

participant constructs their own perceived inadequacy. This supports the subtheme of conditional self-worth and fragile mathematical identity, as the child's maths self-concept appears vulnerable to peer comparison and classroom hierarchies of ability.

Children's feelings of competence and self-worth were conditional, fluctuating with task success, peer comparison, and perceived ability. This was accompanied by emotional consequences. When Participant 1 was asked how this made them feel, the child responded:

"Upset."

Words signalling identity threat were used by other children such as, "jealous", "embarrassed", "sad". These often arose when children compared themselves to peers or perceived others as "better" at maths. Mistakes were interpreted as reflections of personal worth ("I'm not good at maths"), demonstrating early signs of conditional self-worth and identity-based threat.

Participant 1 similarly described characteristics of people who were good at maths as:

"Confident… Resilient… Ambitious… Brilliant."

Children therefore appeared to attach desirable personal qualities to mathematical success. Being good at maths became associated with valued social and personal identities, while struggling risked positioning oneself outside these categories.

These fragile identity positions align with social comparison processes, as the child constructs mathematical competence through comparison with others. These accounts also align closely with attribution theory (Weiner, 1985, 2010), which emphasises that children's interpretations of success and failure influence emotional

responses and future engagement. Children often attributed errors and ability to stable internal causes (being “good at maths” as a personal quality located within the child) rather than effort or strategy, a changeable outcome of support, practice or context. In this sense the theme reflects an early fixed-ability narrative, where maths competence is understood as something some children possess more than others. For a child already experiencing maths anxiety, this comparative positioning may intensify feelings of inadequacy and contribute to a fragile mathematical identity. This reinforces avoidance, anxiety, and low self-efficacy. Children who attribute success to fixed ability may be particularly vulnerable when they experience difficulty because mistakes become interpreted as evidence of personal inadequacy rather than opportunities for learning.

The findings also support Harter’s (1999; 2012) work on developing academic self-concept. During middle childhood (between 6 and 12 years old), children increasingly evaluate themselves through social comparison and domain-specific judgements. Children’s descriptions suggest that mathematical identity was beginning to form around notions of being clever, brainy or naturally capable. Such constructions may contribute to ideas around fixed mindsets (Dweck, 2008) where challenge threatens identity because ability is perceived as stable.

Importantly, these accounts begin to challenge deficit explanations that locate maths anxiety solely within individual cognition. Children’s self-perceptions appeared socially constructed through peer comparison, classroom narratives and wider cultural discourses surrounding maths ability. The emotional consequences therefore emerged not simply from performance itself but from what performance was perceived to mean about the self.

By Year 2, children are already negotiating competence, belonging, and identity within maths. These early constructions lay the emotional foundations for later maths anxiety, showing how identity fragility emerges long before formal assessment pressures intensify.

In this subtheme children's mathematical identities appear already socially and relationally fragile in Year 2, with self-worth appearing contingent on being seen as capable, keeping up with peers, and avoiding evidence of being "less good" at maths.

Subtheme 1.3: Emotional overload and situational anxiety.

Although some accounts reflected broader worries about competence, children's emotional responses were also strongly shaped by specific situational factors. Anxiety appeared fluid, fluctuating according to task characteristics, support availability and perceived demands.

Participant 11 (Working at Age Expected Level, High Maths Anxiety Level) described this strongly:

"I feel a bit overwhelmed and frustrated and sad…. If I've finished my sheet, I'm feeling quite happy and impressed with myself".

This participant's account illustrates the situational and fluctuating nature of maths-related anxiety. Feelings shifted dramatically depending upon task completion and perceived success. Their description of feeling "overwhelmed," "frustrated," and "sad" suggests that, while engaged in the task, maths may exceed their perceived emotional or cognitive capacity, producing a sense of overload. However, this affective state changes once the sheet is completed, when the child reports feeling "happy" and "impressed" with themselves. This shift is analytically significant

because it suggests that the child's anxiety is not a fixed response to maths as a subject, but is activated by particular task conditions, such as uncertainty, difficulty, or the pressure to complete work. Completion appears to function as a moment of relief and self-confirmation, temporarily restoring a sense of competence. The quote therefore supports the subtheme of emotional overload and situational anxiety by showing how children's emotional experiences of maths were not fixed dispositions but appeared closely tied to immediate classroom experiences and fluctuate according to perceived task demands, progress, and the availability of success as evidence that they are capable.

Children used words indicative of intense emotions, feelings of being "overwhelmed", "stressed", "worry", "unsure", "scared/scary", "afraid", "under pressure", "nervous". These emotions highlight that maths may be experienced as more than a cognitive task: it is an affective experience that can trigger emotional overload.

Participant 4 (Working at Age Expected Level, Moderate Maths Anxiety Level) also suggested that novelty generated emotional vulnerability:

"If this is a new, if this is a new lesson, they might be worried or unsure."

New learning appeared positioned as inherently risky because children could not rely on prior knowledge or established competence. The uncertainty associated with unfamiliar maths content produced feelings of insecurity. New or less secure mathematical concepts, particularly division and time, were repeatedly described by children using language associated with threat, uncertainty, and loss of control. One child stated, "I don't like the time because it is really hard", while another reflected, "But I do get a little stressed if I don't know what to do". A further child explained,

“Sometimes it’s really like I don’t know what I’m going to do, but then I’m a bit scared of what I am going to do. Because then if it’s a bit hard, I’m like, is this this answer or that answer.” These extracts were included within the subtheme of emotional overload and situational anxiety because they show how children’s distress was not attached to maths in a generalised or stable way but was activated under particular conditions: when the task was unfamiliar, when the child did not know what to do next, when there were competing possible answers, or when the cognitive demands of the task exceeded the child’s perceived capacity. The children’s words suggest that difficulty was experienced not only as an intellectual challenge but as an affective and embodied state of uncertainty, where not knowing what to do became stressful, frightening, or overwhelming. Analytically, these quotes suggest that children were constructing mathematical difficulty as situationally destabilising. The repeated emphasis not knowing what to do indicates more than a lack of procedural knowledge; it marks a moment where the child’s sense of competence, predictability, and emotional safety becomes unsettled. The child who asks internally whether the answer is “this answer or that answer” appears to be describing a state of cognitive and emotional overload, in which multiple possibilities compete for attention and uncertainty becomes difficult to tolerate. This is important for the wider theme of maths as emotionally and relationally risky because the emotional risk here is not only the possibility of being wrong, but the experience of becoming overwhelmed while trying to decide and navigate what to do. In this sense, the task conditions themselves become anxiety-producing: unfamiliar content, ambiguity, and perceived difficulty combine to narrow the child’s capacity to think calmly and flexibly. These extracts therefore extend the theme beyond overt evaluation by showing that

emotional danger can also arise when children experience maths as unpredictable, inaccessible, or beyond their immediate coping resources.

Anxiety was not constant; rather, it appeared to be situationally activated when tasks felt difficult, unfamiliar, rushed, or socially exposed. Importantly, this does not mean that children constructed maths as wholly negative. Some children reported liking maths, or liking particular aspects of maths, but this enjoyment was often conditional and context dependent. For example, children described liking maths “when it’s easy”, feeling “happy and impressed” once a sheet was finished, or enjoying tasks that felt more creative, visual, or manageable. The repeated presence of these qualifications suggests that positive affect was possible, but fragile. Enjoyment appeared to depend on maths remaining within the child’s perceived capacity, offering opportunities for success, or being embedded in conditions that felt emotionally safe. Conversely, when tasks became unfamiliar, ambiguous, rushed, public, or socially consequential, children described feeling “a little stressed” when they did not know what to do, “scared” when deciding between possible answers, and “under pressure” when work had to be completed quickly. These contrasts are important for this subtheme because they show that emotional overload and situational anxiety were not fixed responses to maths as a subject, but were produced through particular task, relational, and classroom conditions. Emotional safety therefore appeared unstable, shifting in response to task accessibility, pace, perceived competence, and relational conditions such as working with friends, being watched, or being delayed from joining peers.

These accounts support state conceptualisations of maths anxiety (Spielberger, 1972) which emphasise temporary, context-dependent emotional experiences rather than stable traits. Anxiety appeared triggered by particular

situations, including uncertainty, novelty, perceived difficulty and task demands. This is important, and potentially hopeful, as it suggests that maths anxiety is not fixed or inevitable, but may be responsive to early identification, timely intervention, and increased awareness of the relational, contextual, and emotional factors that contribute to its emergence and escalation.

The findings also align with ecological and constructionist perspectives. Emotional responses were constructed through children's interactions with classroom contexts rather than residing exclusively within individual learners. What mattered was not only the task itself, but the meaning children attributed to it. Consistent with Eccles and Wigfield (2002), children's emotional experiences emerged through interactions between task demands, perceived competence and contextual supports.

Emotional overload can have cognitive consequences as overwhelm has been found in research to impair working memory and problem-solving, stress responses (fight, flight, freeze) can reduce engagement, and counting down until maths is over suggests avoidance and emotional fatigue (Immordino-Yang & Damasio, 2007). This avoidance can lead to a negative reinforcement cycle, with avoidance being a well-documented mechanism in anxiety maintenance (Beck & Clark, 1997; Barlow, 2002). In terms of maths anxiety more specifically, avoidance is a core behavioural feature of maths anxiety. Research indicates that when children perceive maths as threatening, they often withdraw from tasks as a way to reduce the immediate emotional discomfort. This avoidance is negatively reinforcing as whilst withdrawing from a task temporarily can reduce anxiety, this strengthens the likelihood of future avoidance (Beck & Clark, 1997; Barlow, 2002). In maths contexts this can manifest as counting down till the lesson ends, rushing to finish, the no

attempt error of difficult problems (Chinn, 2012) or wanting shorter or easier tasks, patterns that align closely with the children's accounts in this study. Cognitive load theory provides a complementary explanation for why maths anxiety leads to avoidance: anxiety consumes working memory resources, reducing the cognitive capacity available for problem solving (Sweller, 2020). Cognitive models of anxiety suggest that threat-related worry occupies attentional resources, impairing working memory efficiency (Eysenck & Calvo, 1992; Eysenck et al., 2007). In maths, where tasks often require holding multiple steps or concepts in mind, this reduction in working memory capacity makes tasks feel harder, more overwhelming, and more threatening. As a result, children may experience emotional overload, which further increases cognitive load and reduces performance creating a cycle where anxiety leads to overload which can contribute to poorer performance and increased avoidance, resulting in more anxiety.

Children also linked maths difficulty to loss of social connection, such as missing playtime, being delayed from joining peers, or being separated from the shared activity of the class. This is important within the subtheme of emotional overload and situational anxiety because the emotional cost of maths was not only located in the task itself, but in what the task prevented children from doing socially. One child described being the "only one" of their peers who found the maths difficult and "got it wrong", explaining that they had to "miss maths because it was too hard". Although they were told to "go have a play", the child described feeling "sad because everyone else done it. And I'm jealous of them doing it". This extract was interpreted as particularly significant because the opportunity to play did not appear to function as a straightforward relief from maths; instead, the child's sadness and jealousy suggest that being removed from the task also meant missing the social connection

of doing the same thing as peers. In this account, exclusion from maths becomes emotionally ambivalent: the child is protected from a task experienced as too hard, but is also positioned outside the collective classroom experience, reinforcing a sense of difference, separation, and possible inadequacy. The value children placed on play and shared peer activity was echoed in other accounts. Another child stated that maths made them feel “sad” “because I always just want to play”, suggesting that maths was experienced as emotionally difficult partly because it interrupted preferred social and developmental activity. For young children, play is not simply leisure; it is a central context for belonging, autonomy, peer connection, and emotional regulation (Arda Tuncdemir, 2025). Therefore, when maths was positioned as something that replaced, delayed, or restricted play, it became associated with loss as well as cognitive demand. A further child described still working on a calculation while others had gone to lunch: “I feel like, it’s lunchtime. I was doing a calculation and they all went and [TA] was like, waiting for me... if I just done it really, really, really quick, like zoom, I’ll just get my ticket, go straight to the hall”. Here, the pressure to complete maths quickly appears bound up with the social urgency of rejoining peers and accessing the shared routine of lunchtime. The repeated “really, really, really quick” and “zoom” suggest a compressed, urgent experience of time, where maths becomes something to rush through in order to regain social participation.

Together, these findings suggest that maths anxiety in Year 2 is situational, relational, and context-dependent, emerging when children feel cognitively or socially unsafe. This links with Bronfenbrenner’s microsystem which emphasises the impact of classroom structures and social contexts.

Children’s accounts suggest that mathematical competence was sometimes understood not only as conceptual understanding, but as alignment with classroom expectations and an internalisation of classroom norms. For example, Participant 6 explained that maths becomes difficult “if you don’t listen” or “miss what the teacher is saying,” while Participant 7 attributed another child’s lower attainment to “messing around” because “then they don’t listen what they’re supposed to do.” Such comments position compliance, attentiveness and self-regulation as part of what it means to be “good at maths,” reinforcing a performance-oriented mathematical identity.

Moreover, the accounts support recent critiques of individualised conceptualisations of maths anxiety (Kirkland & Hunt, 2025). The children's experiences suggest that anxiety is not simply a property of the child, but an emergent phenomenon shaped by classroom structures, systems of evaluation and children's interpretations of those experiences.

This subtheme suggests that children’s maths anxiety was situationally activated when task demands, uncertainty, social comparison, or disrupted access to play and peers exceeded their perceived coping resources; emotional overload was therefore produced through the interaction between cognitive demand and classroom context.

Theme 1 Summary

The emotional landscape described in Theme 1 suggests that children may experience maths as an affectively charged and relationally sensitive domain. These emotions do not arise in isolation; they are shaped by the social meanings attached to success, failure, and evaluation within the classroom. Evaluative threat,

conditional identity, and situational anxiety reveal how children's early mathematical experiences are deeply intertwined with relational safety, peer comparison, and classroom norms. Fear of mistakes was frequently linked to anticipated judgement, punishment and social consequences. Research supports ideas of perceived evaluation impacting on confidence around learning. Fear of negative evaluation has been shown to directly undermine learners' self-efficacy and confidence, reducing their academic motivation and sense of capability (Toprak & Yavuz, 2026). Similarly, research on perceived feedback highlights that it is not merely the presence of evaluation, but how children *interpret* evaluative cues, that shapes their confidence and willingness to engage (Hattie & Timperley, 2007). These findings align closely with children's accounts in Theme 1: evaluative threat, conditional identity, and situational anxiety reveal how early mathematical experiences are deeply intertwined with relational safety, peer comparison, and classroom norms.

These experiences were closely connected to emerging maths identities, with competence often positioned through peer comparison and fixed ability narratives. Emotional responses were also highly context-dependent, intensifying when children faced uncertainty, novelty or perceived lack of support.

Rather than supporting individualised understandings of maths anxiety, the findings suggest that children's emotional experiences of maths are produced through dynamic interactions between classroom structures, social relationships and broader cultural narratives surrounding ability and success. Through this lens, maths anxiety emerges not simply from mathematical difficulty but from the meanings attached to participation, correctness and competence within children's educational environments.

This emotional volatility sets the stage for Theme 2, which explores how children make sense of challenge, difficulty, and performance conditions, including classroom structures, time pressure, and tolerance for challenge, and how these situational factors further shape their emotional experiences of maths. The research on perceived evaluation provides a conceptual bridge between the themes: when children feel watched, judged, or compared, their tolerance for challenge narrows, their confidence becomes fragile, and their emotional responses intensify. Theme 2 can be understood as an extension of the evaluative sensitivities identified in Theme 1 showing how the relational and emotional dynamics of maths become further complicated by the situational demands of the classroom.

Theme 2: "When it's easy, like, I really like it… because I think I'm a bit good at it" (Participant 8, Working at Age Expected Level, High Maths Anxiety Level).

Challenge, Difficulty & Performance Conditions

Whilst Theme 1 highlighted the emotional and relational risks children associated with maths, this theme captures how those emotions were closely shaped by perceptions of challenge, task difficulty and classroom performance conditions. Across the dataset, children rarely described liking or disliking maths as a stable preference. Instead, enjoyment, confidence and anxiety fluctuated depending upon whether tasks felt manageable, whether sufficient time was available and whether support structures enabled access to learning. Difficulty itself was not inherently problematic; rather, the way challenge was experienced and interpreted appeared central to children's emotional responses.

This theme reveals how children's experiences of challenge are ecologically produced within Bronfenbrenner's (Bronfenbrenner & Morris, 2006) microsystem (classroom routines, teacher expectations), mesosystem (intervention withdrawal, home messages), and exosystem (curriculum pacing, school policies). These contextual conditions shape children's window of tolerance (Siegel, 1999), influencing whether they experience challenge as manageable (growth zone) or overwhelming (anxiety zone) (Johnston-Wilder et al., 2020). When challenge exceeds their window of tolerance, children shift into avoidance, emotional overload, or disengagement, patterns consistent with the maths anxiety growth zone, where optimal challenge supports learning but excessive pressure triggers anxiety.

This theme is organised into three subthemes:

2.1 Perceived difficulty & reduced tolerance

2.2 Time pressure as amplifier

2.3 Classroom structures & task accessibility

Subtheme 2.1: Perceived Difficulty & Reduced Tolerance

Across participants' accounts, emotional responses to maths were strongly connected to perceived task difficulty. Children frequently described enjoying maths when problems felt accessible and experiencing negative emotions when tasks exceeded their perceived competence.

Participant 8 explained:

"When it's easy. Where a few, a long time ago when we like first started like in reception or in Year One, sometimes in Year Two like, when it's easy. Like I really like it when we do plus and subtractions, because I think I'm a bit good of it."

This extract not only is the title for this theme, but it highlights the conditional nature of maths enjoyment. The child's positive feelings were not directed towards maths broadly but towards forms of maths that aligned with existing competence. This suggests that enjoyment of maths is contingent upon task accessibility and the child's perception of competence. Participant 8's phrase "when it's easy" positions ease as the condition under which maths becomes enjoyable, while "I think I'm a bit good at it" indicates a tentative and qualified sense of mathematical self-efficacy. The child's use of "a bit" is analytically significant because it suggests that confidence is present but fragile, rather than secure or generalised, suggesting an emerging but fragile self-belief. Within the theme of 'Challenge, difficulty and performance conditions', this quote illustrates how positive emotional engagement may depend on maths remaining within a manageable level of challenge. When tasks feel easy, the child can experience competence and enjoyment; however, when difficulty increases, that sense of capability may become destabilised. Other children had described some tasks that were definitely not maths, such as colouring and then said they enjoyed maths lessons where they had to do colouring, suggesting that emotional safety was created when the task felt less like traditional maths lessons and when it was something perceived as easy and enjoyable, that they liked maths when it felt manageable. Enjoyment of maths appeared to be contingent upon tasks being perceived as accessible, manageable and achievable, suggesting that positive emotional engagement was context-dependent rather than generalised across maths experiences. It appears that challenge may threaten enjoyment and if maths becomes harder the child may no longer feel competent and capable. Harder tasks may subsequently affect how the child feels about themselves as a maths learner with this difficulty being emotional and not just cognitive. Task conditions matter, the

emotional response depends on accessibility, pace, support, success and the level of cognitive demand, rather than engagement with challenge itself.

A similar pattern emerged in Participant 11’s account:

“It's only because they're like really easy.”

When explaining why addition and subtraction were preferred over multiplication and division, the participant positioned ease as the primary source of enjoyment. The distinction made between different mathematical domains demonstrates that children's experiences of maths were often highly specific. Rather than rejecting maths entirely, particular concepts became associated with difficulty and therefore negative emotional responses.

For Participant 7 (Working at Age Expected Level, High Maths Anxiety Level), division was singled out as especially problematic:

“I would change that, that we're not going to do division.”

When asked why, the child explained:

“It's scary... It's hard.”

The close association between difficulty and fear is noteworthy. The child did not describe division as merely challenging but emotionally threatening. Difficulty appeared interpreted as danger rather than opportunity for learning. This suggests that mathematical challenge had become imbued with affective meaning. This was interpreted as illustrating how perceived difficulty can narrow children’s tolerance for mathematical challenge. The child does not simply describe division as difficult; rather, they identify its removal as the preferred change to maths. This suggests that division is constructed as a task domain that exceeds the child’s perceived

competence or emotional capacity. Within this subtheme, the quote is significant because it indicates that challenge may be experienced not as an opportunity for learning, but as something threatening enough to be avoided. The desire to remove division therefore reflects more than a preference for easier content; it points to an affective response to difficulty, where unfamiliar or insecure concepts become associated with discomfort, reduced confidence, and protective avoidance. This quote supports Theme 2 because it shows how children's emotional responses to maths were shaped by the conditions under which challenge was encountered. Division appears to represent a form of maths demand that the child does not experience as accessible or tolerable. Rather than perceiving challenge as manageable with support, the child positions it as something they would eliminate from the maths curriculum. This suggests that tolerance for challenge is partly constructed through previous experiences of success, support, pace, and emotional safety. When a concept such as division is experienced as too hard, the child's capacity to remain engaged may reduce, and avoidance becomes a protective response.

Similarly, Participant 1 described telling the time as:

"Really, really tricky… And then everyone else gets it right."

Here, perceptions of difficulty were intertwined with social comparison. The challenge was not experienced solely as an individual learning struggle but in relation to peers who appeared more successful. Difficulty therefore became evidence of relative inadequacy.

These accounts align with self-efficacy theory (Bandura, 1986; Hackett, 1985), as the child's enjoyment appears connected to their belief that they can

succeed. It also resonates with the idea of an optimal challenge or growth zone: tasks that feel accessible may support confidence and engagement, whereas tasks experienced as too difficult may move the child into anxiety or avoidance. From a social constructionist perspective, the quote also suggests that “challenge” is not inherently positive or negative; rather, its meaning is constructed through the child’s prior experiences of success, classroom expectations, perceived support, and the emotional consequences attached to difficulty.

Children’s accounts linked negative feelings directly to perceived task difficulty, showing that emotional responses were shaped by how manageable, familiar, or accessible the task felt. Enjoyment was consistently associated with low cognitive demand, for example “easy is fun”, and with tasks that felt creative, visual, or less formally mathematical, such as colouring or other activities that did not appear to carry the same performance demands as number-based work. These examples are important within this subtheme because they suggest that children’s tolerance for challenge was not simply a fixed personal characteristic; rather, it was shaped by the conditions under which difficulty was encountered. When maths felt accessible, children were more able to experience enjoyment, confidence, and willingness to engage. However, when maths was described as “hard”, “tricky”, or “complicated”, children’s language shifted towards frustration, sadness, avoidance, or a desire for the task to be removed, shortened, or made easier. In RTA terms, these quotes were interpreted as evidencing a pattern of meaning in which challenge was often constructed less as a productive learning opportunity and more as a threat to emotional safety, competence, or classroom belonging. Many children wanted maths to be shorter, easier, or more like play, demonstrating reduced tolerance for challenge in contexts where difficulty was associated with uncertainty, pressure, or

the possibility of failure. Bronfenbrenner's microsystem is useful here because children's tolerance for challenge appeared to be shaped by immediate classroom norms around correctness, pace, task design, and adult expectations. Thus, reduced tolerance is not interpreted as lack of resilience within the child, but as a contextually produced response to mathematical tasks that were experienced as exceeding children's perceived capacity or emotional resources.

Difficult concepts such as division and time were frequently avoided, described as "scary," "hard," or "confusing." These concepts were also novel, suggesting that difficulty was concept-dependent and linked to unfamiliarity, potentially linking novel concepts with cognitive overload. Children often positioned challenges as being for the more able children, reinforcing ability hierarchies and fixed ability narratives. One child mentioned specific children and then said they would let them "do the challenges…. Because they're like, like, you know where they're good at maths." This is something that is supported in the literature where unfamiliar or cognitively demanding content increases anxiety because it places greater demand on working memory (Navarro et al., 2026) and where ability hierarchies reinforce beliefs around fixed maths ability and lead children to position challenge as belong to more able peers (Leach, 2026). The Zone of Proximal Development (ZPD; Vygotsky, 1978) suggests that children need scaffolded support to engage with challenge; without it, tasks fall outside their ZPD and become threatening, this alongside the window of tolerance (Siegel, 1999) can be used to explain why children experience overwhelm when challenge exceeds their emotional capacity. This highlights the need to consider how challenge is presented and perceived. Self-efficacy theory suggests that children with low perceived competence interpret challenge as confirmation of inadequacy, not opportunity. (Bandura, 1986;

Hackett, 1985). Together, these findings suggest that children's reduced tolerance for challenge may not be a deficit but may be likely to be a contextually produced response to environments where difficulty is associated with threat, judgement, and social comparison.

These accounts support findings within the wider literature suggesting that maths anxiety is often domain-specific rather than generalised (Yanuarto, 2016). Children's anxieties were frequently attached to particular mathematical concepts, including division, fractions and telling the time, rather than maths as a whole. The data therefore challenge simplistic conceptualisations of children as either liking or disliking maths. Instead, emotional responses varied according to specific curriculum content.

Furthermore, the findings align with Eccles and Wigfield's (2002) expectancy-value framework, which proposes that engagement is influenced by both perceived competence and expectations of success. Across participants, enjoyment was frequently linked to situations in which success seemed likely. Conversely, challenge appeared threatening where the likelihood of success was uncertain. Rather than viewing difficulty as an inevitable part of learning, many children appeared to interpret challenge as evidence that they were not good at maths.

From an attributional perspective (Weiner, 1985), such interpretations may be particularly significant. When challenge is attributed to a lack of ability rather than a temporary learning process, children may become increasingly vulnerable to avoidance. The accounts within this study suggest that challenge was often understood through a lens of competence rather than growth. In this way, difficult

maths became emotionally risky because it threatened children's developing identities as capable learners.

In summary, this subtheme suggests that children’s tolerance for mathematical challenge depended strongly on whether difficulty was experienced as supported, meaningful, and within reach; when challenge was interpreted as evidence of low ability, it became emotionally threatening rather than developmentally productive.

Subtheme 2.2: Time Pressure as Amplifier

Alongside task difficulty, time pressure or timed practices emerged as a particularly powerful factor shaping children's emotional experiences. Across the dataset, children frequently described feeling pressured when maths performance was constrained by real- or perceived-time limits.

Participant 11 (Working at Age Expected Level, High Maths Anxiety Level) recounted:

“We had to finish it that day and because we weren’t allowed to finish it any other day. So, it was a bit… a bit of pressure on me because I’m not very good at maths”.

This account illustrates how time constraints became entangled with perceptions of ability. The pressure described did not arise solely from the deadline itself but from concerns about completing work successfully within that timeframe. Time pressure appeared to transform an academic task into an evaluative situation.

When reflecting further on this experience, the participant explained:

“It would make me feel quite frustrated and under pressure.”

The emotional language here is striking. Rather than motivating engagement, imposed timeframes appeared to heighten stress and reduce feelings of competence.

Participant 11 later described how unlimited time would alter the experience:

“Yeah. A lot better. A lot better.”

The repeated emphasis suggests that the removal of temporal constraints fundamentally changed how manageable maths felt.

Time pressure also appeared in more subtle forms. Participant 8 described maths lessons occurring before lunch:

“My belly just starts to rumble a bit.”

The participant later laughed while describing:

“Counting down to lunchtime.”

Although seemingly humorous, this account suggests a countdown mentality where maths became something to endure before reaching a preferred activity. The focus shifted away from learning towards task completion and escape.

Time pressure emerged as one of the strongest situational amplifiers of anxiety. Children described feeling “under pressure,” “frustrated,” “overwhelmed,” and “stressed” when required to work quickly or complete tasks within strict time limits. Participant 11’s account above illustrates how time pressure operated as an amplifier of existing mathematical anxiety and fragile self-efficacy. The requirement to “finish it that day,” coupled with the sense that they were “not allowed” to complete it later, constructs the task as time-bound, inflexible, and externally controlled. Within this account, the emotional difficulty of maths is intensified not only by the

mathematical demand itself, but by the imposed temporal condition under which it must be completed. The child's statement that this placed "a bit… a bit of pressure" on them suggests that the deadline increased the emotional stakes of the task, while the explanation "because I'm not very good at maths" indicates that time pressure interacted with an already vulnerable mathematical self-concept. Thus, the quote supports the subtheme of time pressure as amplifier because it shows how pace and completion demands can magnify perceived difficulty, reduce emotional safety, and reinforce children's beliefs about their own inadequacy as maths learners.

Throughout the accounts, speed was linked to stress, reduced confidence, and comparison, suggesting that time pressure operated not simply as a practical classroom condition but as an evaluative signal through which children judged their own competence. Children who completed tasks quickly were often positioned as "better", while slower completion appeared to carry meanings of inadequacy, being left behind, or being less mathematically capable. This is important within the subtheme of time pressure as amplifier because pace intensified the emotional meaning of already difficult tasks. The requirement to work quickly did not only reduce thinking time; it also made children's relative speed visible, thereby connecting time with comparison, self-belief, and perceived ability. Where a child already held a fragile view of themselves as "not very good at maths", time constraints appeared to amplify this vulnerability by making success feel dependent on rapid completion. In this sense, pressure interacted with self-belief: the faster the expected pace, the more likely children were to experience maths as exposing, overwhelming, or confirming of their perceived inadequacy.

Children's expressed preference for unlimited or extended time further illustrates how temporal conditions shaped emotional experience. As well as being

mentioned in the interviews the couple of children who used the maths and me cards to look at what helps them, selected that having more time would support them. Across accounts, additional time was constructed as a form of safety: it created the possibility of thinking, checking, receiving support, and recovering from uncertainty without the added threat of falling behind. Conversely, fixed or restricted time appeared to narrow children's perceived capacity to cope, creating a countdown mentality in which maths was framed as something to "get done" so they could move on to more enjoyable or socially meaningful activities. One child said, "It would make me feel quite frustrated and under pressure." This countdown orientation is analytically significant because it suggests that time pressure shifted children's engagement away from mathematical sense-making and towards emotional survival, task completion, and exit from the situation. Rather than supporting productive challenge, speed and deadline conditions appeared to push some children towards rushing, avoidance, or endurance-based self-talk. This may align with the maths anxiety growth zone model (Johnston-Wilder et al., 2020), where time pressure pushes children out of the growth zone and into the anxiety zone, impairing working memory and problem-solving.

Time pressure may potentially interact with systemic structures. Exosystem influences (curriculum pacing, school policies) create conditions where speed is prioritised. While microsystem routines (timed tasks, rapid transitions) amplify evaluative threat. Children's academic self-concept is shaped by how quickly children can complete tasks relative to peers, whilst their self-efficacy decreases when children repeatedly experience rushed difficulty.

The prominence of time pressure within children's narratives is consistent with literature identifying timed conditions as a significant contributor to maths anxiety

(Caviola et al., 2017; Szczygieł & Pieronkiewicz, 2021). Research suggests that speeded maths tasks can intensify concerns about competence and increase the cognitive burden associated with mathematical thinking. When children perceive speed as a marker of maths ability, time-limited contexts become sites of comparison and evaluation rather than learning.

Children's accounts also support Kirkland and Hunt's (2025) argument that time pressure is not inherently problematic but becomes anxiety-provoking when linked to notions of correctness, ability and public performance. Within the present dataset, time limits appeared to amplify existing concerns about competence. Tasks became difficult not only because of their mathematical demands but because children feared failing to complete them quickly enough.

From a cognitive perspective, these findings align with disruption models of maths anxiety (Ashcraft & Moore, 2009). Worry about time may consume cognitive resources otherwise available for problem solving, creating a cycle whereby pressure contributes to poorer performance, which in turn confirms children's concerns about competence. Cognitive models of anxiety explain why children find it difficult to think clearly under pressure as threat consumes working memory, reducing capacity for mathematical reasoning. This is reflected in Participant 11’s account. Participant 11 presents time pressure as a major source of stress in maths, as something that intensifies maths anxiety, makes difficult work feel more frustrating and overwhelming, and reduces comfort with maths. However, the children did not specifically talk about time pressure impacting thinking. The accounts suggest that difficulty is often contextually produced, not inherent in the task itself. Thus, time pressure functioned not merely as a contextual feature of classroom practice but as an emotional amplifier that magnified perceptions of difficulty and vulnerability.

Research shows that children's academic self-concept is strongly shaped by social comparison, including how quickly they complete tasks relative to peers (Marsh & Craven, 2006; Harter, 1999). When children repeatedly experience rushed difficulty, their self-efficacy declines because time pressure is interpreted as evidence of low ability (Bandura & Wessels, 1997). In maths, speed-based evaluation reduces working memory and increases anxiety, reinforcing negative self-beliefs (Ashcraft & Krause, 2007). These findings align with research that fear of negative evaluation undermines self-efficacy and academic motivation (Toprak & Yavuz, 2026).

This subtheme suggests that time pressure amplified maths anxiety by making performance feel urgent, visible, and comparative; speed therefore functioned not only as a classroom condition but as an evaluative cue through which children judged their competence.

Subtheme 2.3: Classroom Structures & Task Accessibility

Beyond challenge and pace, children frequently discussed classroom factors that influenced whether maths felt accessible or confusing. Support structures, explanations and opportunities to understand appeared central to children's emotional experiences.

Participant 6 (Working at Age Expected Level, High Maths Anxiety Level) explained:

"But I do get a little stressed if I don't know what to do."

This simple statement highlights uncertainty as a key trigger for anxiety. It suggests that stress was activated, not because the child was incapable but because the structure of the task did not provide a clear or accessible route into the learning, perhaps lacking sufficient clarity or scaffolding. The child does not describe maths as inherently stressful; rather, the stress emerges conditionally, when they are unsure

how to proceed. This indicates that emotional responses to maths may be shaped by the accessibility of classroom tasks, including the clarity of instructions, availability of worked examples, opportunities for support, and the extent to which children can identify an entry point into the activity. The idea of not knowing what to do and where to begin arose in other interviews. In these situations, difficulty appears to not be located solely within the child but produced through the interaction between the child, the task, and the classroom context. This quote therefore supports the subtheme of classroom structures and task accessibility by showing how uncertainty about what to do can transform maths from a learning activity into an emotionally threatening experience. It also suggests that the feelings of being stressed could also impact the child's ability to think through what they need to do. The phrase "if I don't know what to do" is particularly significant because it positions stress as arising at the point of breakdown between task demand and accessible support. This suggests that children's maths anxiety may be situationally produced when classroom structures do not provide sufficient scaffolding for children to understand the task, select a strategy, or feel confident about beginning. The child's stress can therefore be understood as an understandable response to reduced task accessibility rather than as evidence of a fixed lack of mathematical ability. This aligns with the wider theme by illustrating how classroom organisation, explanation, task design, and support systems shape whether children experience challenge as manageable or overwhelming.

Participant 3 also reflected on why some children might find maths difficult:

"Because if they missed what the teacher was explaining."

The participant elaborated:

“They wouldn't know what to do.”

Here, maths difficulty was not necessarily attributed to innate limitations, but appeared to be understood, at least in part, as arising from gaps in access to instruction. Missing explanations was constructed as one possible reason for struggling. This interpretation offers a useful counterpoint to the fixed-ability narratives identified elsewhere in the dataset and suggests that some children may recognise, however implicitly, that learning opportunities and classroom access can shape mathematical outcomes. This matters because it tentatively reframes some children’s apparent difficulty or anxiety not simply as evidence of individual incapacity, but as a possible consequence of disrupted access to instruction, for example time out of the classroom for interventions, highlighting the need to consider how classroom organisation and intervention practices may inadvertently shape children’s opportunities to feel competent, included, and emotionally safe in maths.

Similarly, Participant 6 suggested:

“If you don't listen. Or if you miss what the teacher is saying.”

Once again, difficulty was constructed as emerging from access to teaching rather than stable ability. These accounts suggest a more contextual understanding of mathematical success and failure.

Classroom structures appear to play a significant role in shaping children’s emotional experiences. Worked examples and modelling were described as helpful. Maths was often constructed as rules-based, with “right ways” of doing things and constraints around which numbers “work.” This contributed to misconceptions and reduced flexibility. One child expressed a desire for autonomy in choosing strategies and manipulatives potentially reflecting emerging metacognitive awareness, while

others described more prescriptive, adult-led approaches and following the ways set out by the teacher. They said “When I'm at home, usually we say like. Do you want to do this or do that. Like, there's a few options that you could pick…. Like you could work it out with a bead string or a part whole model.”

Children demonstrated a limited conceptualisation of maths, often equating it with counting, numbers, the four main operations, classroom worksheets, or tasks with clear right and wrong answers. Participant 7 described maths as:

“Something you add things together.”

Similarly, Participant 2 (Working at Age Expected Level, High Maths Anxiety Level) explained:

“Because maths is counting.”

Many children struggled to identify broader real-world maths applications, frequently associating maths primarily with counting, number facts or worksheet-based calculations. Real-life applications were mentioned far less frequently, with fewer children recognising activities such as using money, weighing ingredients, measuring, or other everyday practical tasks as maths. This suggests that, for many participants, maths was constructed primarily as a school-bound and procedural practice rather than as a meaningful aspect embedded in daily life, play, family routines, or embodied experience. Even when the ‘Maths and Me’ cards were used as prompts, some children continued to identify several everyday examples as “not maths”, indicating that their understanding of maths remained closely tied to formal classroom representations of number and calculation. This limited view is analytically important because it may shape children’s emotional responses to maths: when maths is constructed narrowly as counting, sums, worksheets, or the four operations,

it may become more strongly associated with performance, correctness, and evaluation, rather than curiosity, usefulness, creativity, or meaningful participation in everyday contexts. Consequently, children may be less likely to view maths as useful or applicable to their own lives. This is significant because expectancy-value theory suggests that children's motivation and engagement are shaped not only by whether they believe they can succeed, but also by whether they perceive a task as valuable, meaningful or useful (Eccles & Wigfield, 2002). Similarly, research on maths attitudes highlights perceived relevance, enjoyment and value as important features of learners' broader relationships with maths (Grootenboer & Marshman, 2016; Popham, 2005). If children do not recognise maths in everyday activities such as shopping, cooking, measuring, sharing or playing, maths may remain positioned as an externally imposed school task rather than as a meaningful resource for everyday problem-solving.

Maths itself appeared to be constructed as a school-bound, instructional, procedural activity, with limited connection to everyday life. One child described having to learn maths to prepare them for junior school demonstrating an instrumental view of maths. Another child demonstrated a misunderstanding of the spiral curriculum in which maths is taught stating that "When I was in Year one, I already learnt that bit… subject… that I had to learn…. When I'm a Year two it makes me feel frustrated because I have to do it all over again". The child appears to be framing maths as something that belongs to the formal sequencing of school years and experiencing the repetition as perceived failure, but that they understand maths as a series of taught "bits" or "subject" that are delivered by adults at particular points in school. The "I already learnt that bit" positions maths as something discrete, completed and curriculum bound rather than as knowledge revisited, deepened,

applied or extended over time. This is important because it suggests that the child may not understand the purpose of repeated exposure within a spiral curriculum. Instead, repetition appears to be interpreted as unnecessary duplication. From the child's perspective, repeating content from Year 1 in Year 2 does not appear to be experienced as consolidation or progression. It is experienced as frustrating because it feels like being required to redo something already completed. This indicates that task accessibility is not only about whether a task is cognitively easy or hard, but also about whether the child understands why they are doing it and how it connects to previous learning. However, moments of creativity (e.g., incorporating maths into play) suggest that children are capable of reimagining maths beyond formal structures, positioning them as active meaning-makers. Maths being numbers, counting, equations, sums, worksheets, but children made limited spontaneous links to real-life. Maths positioned as an externally imposed school task and for learning rather than a meaningful lived practice connected to everyday life, play or identity.

Task accessibility appeared to strongly influence emotional responses with more visual or creative tasks feeling safe, whereas more abstract or new tasks (division, time) felt threatening. Children were aware of differentiation ("easy sheet" vs "hard sheet") which reinforced ability hierarchies and grouping practices shaped identity and belonging.

For some participants, curriculum structures were experienced as confusing and frustrating. Participant 1 stated:

"When I'm a Year two, it makes me feel frustrated because I have to do it all over again."

The child’s account suggests a misunderstanding of curriculum revisiting and consolidation. Rather than perceiving repetition as opportunities to deepen understanding, the child interpreted revisiting content as unnecessary repetition. This highlights how children’s interpretations of learning structures may influence emotional responses.

From a systemic perspective, Bronfenbrenner’s bioecological model (Bronfenbrenner & Morris, 2006) helps position and understand children’s experiences of maths as shaped by interacting relational and organisational contexts rather than by individual factors alone. At the microsystem level, classroom routines, teacher feedback, peer comparison, time pressure, ability grouping and responses to mistakes may shape whether maths is experienced as supported and exploratory or evaluative and threatening. At the exosystem level, school structures such as intervention models, grouping practices, assessment policies, curriculum implementation and pacing may indirectly affect children’s access to instruction and their experiences of success, difficulty and support. These structures can create conditions in which children feel rushed, unsupported or positioned through comparison, particularly where rapid correctness, withdrawal from classroom teaching, or limited responsiveness to confusion shape everyday maths experiences. These findings suggest that children’s experiences of difficulty are produced through pedagogical choices, not simply internal ability.

These findings align with Vygotskian perspectives on learning as socially mediated (Vygotsky, 1978). Children's accounts suggest that understanding emerged through access to explanation, modelling and scaffolding. Difficulties were often described not as failures of the learner but as situations in which necessary supports

were unavailable. Accordingly, anxiety appeared reduced when children felt that learning was accessible and supported.

The findings also resonate with ecological perspectives (Bronfenbrenner & Morris, 2006), highlighting how classroom structures shape emotional experiences. Whether children felt confused, confident or anxious depended not only on task demands but on the surrounding learning environment. Examples, explanations and opportunities for clarification functioned as protective factors that reduced uncertainty and enhanced participation.

Furthermore, children's limited conceptualisations of maths support arguments that school experiences can narrow understandings of mathematical meaning (Dowker et al., 2016). When maths is primarily associated with numbers, worksheets and correct answers, opportunities to view it as creative, meaningful or connected to everyday life may be reduced. Consequently, mathematical success becomes defined by performance rather than participation, potentially reinforcing anxiety when errors occur.

This subtheme reflects that task accessibility and classroom organisation appear to be central to children’s emotional experiences of maths; when explanations, scaffolds, relevance, or entry points were unclear, difficulty became socially and emotionally produced rather than simply located within the child.

This links to literature that highlights teachers may play a significant role because their feedback, expectations, emotional responses to maths, and classroom practices can influence how children understand success, failure and ability (Kam Chi & Cameron-Flitcroft, 2025). As well as Gripton’s (2020) qualitative UK-based work is relevant because ability grouping may shape children’s sense of

mathematical competence, peer comparison and belonging. Time pressure has increasingly been identified as a salient contextual factor in children's maths anxiety (Szczygieł & Pieronkiewicz, 2021). Beilock and Willingham (2014) suggest that alleviating time pressure may reduce maths anxiety by lessening students' concerns about not finishing in time and by allowing greater time and psychological space to work through mathematical responses. When explanations are repeated without adaptation, or when pupils perceive teachers as unresponsive to their confusion, they may experience maths as unsupported, inaccessible and threatening, increasing the likelihood that difficulty becomes associated with anxiety (Kirkland & Hunt, 2025). Fast-paced maths lessons, excessive notes and exercises, disparaging comments and feeling overly punished were identified as teacher-related contributors to pupils' maths anxiety. In contrast, teachers' effective use of learning facilities, consideration of lesson pace, motivational statements and support were reported to minimise anxiety (Ismail et al., 2022).

Theme 2 summary

Theme 2 suggests that children's emotional responses to maths are shaped by situational, relational, and structural conditions. Perceived difficulty and challenge, pace, accessibility profoundly shaped children's experiences. Classroom structures appear to interact to produce experiences of threat, overwhelm, and avoidance. Enjoyment frequently depended upon perceived competence, with easier tasks providing emotional safety and more difficult concepts generating anxiety and avoidance. Time pressure acted as a powerful amplifier, transforming learning tasks into evaluative experiences and encouraging countdown mentalities centred on endurance rather than engagement. These findings challenge deficit-based interpretations of maths difficulty, showing instead that children's tolerance for

challenge may be ecologically constructed within systems that prioritise speed, correctness, and efficiency over emotional safety and developmental readiness. Finally, children's accounts demonstrated the importance of classroom structures and access to support, with uncertainty, missed explanations and insufficient scaffolding often positioned as key sources of difficulty.

Collectively, these findings challenge interpretations of maths anxiety as residing solely within the child. Instead, experiences of challenge and difficulty were shown to be dynamically negotiated through interactions between task demands, classroom conditions and children's perceptions of competence. Maths became anxiety-provoking not because challenge existed, but because challenge was often experienced within contexts where success felt uncertain, time felt limited and support was not always immediately available.

Children’s responses reflect the interplay of self-efficacy, academic self-concept, window of tolerance (Siegel, 1999), and ZPD development (Vygotsky, 1978), illustrating how challenge becomes threatening when support is insufficient or pressure is high. These patterns align with work on the maths anxiety growth zone (Johnston-Wilder et al., 2020), demonstrating how time pressure and performance demands push children out of the growth zone and into anxiety.

These contextual conditions directly shape children’s emerging mathematical identities; Theme 3 therefore examines how children may make sense of themselves as learners, how self-efficacy, identity, and belief systems develop within the performance-oriented environments described in Theme 2.

Theme 3: “I learned something new and now I’m not afraid of that thing. But then I am still afraid of it now.” (Participant 8, Working at Age Expected Level, High Maths Anxiety Level). **Identity, Efficacy & Belief Systems.**

This theme captures how children made sense of themselves as mathematical learners. Across the dataset, children demonstrated emerging beliefs about competence, intelligence, effort and improvement. However, these beliefs were often contradictory. Many participants simultaneously expressed growth-oriented ideas about practice and learning whilst also drawing upon fixed notions of mathematical ability. Consequently, children's mathematical identities appeared tentative and unstable, shaped by everyday experiences of success, failure and social comparison. This theme comprises three subthemes:

3.1 Low Self-Efficacy and Conditional Confidence

3.2 Emerging but Fragile Growth Beliefs

3.3 Fixed Ability and Social Positioning.

Children’s narratives reveal fragile and fluctuating mathematical identities, shaped by self-efficacy, emotional responses to correctness, and competing belief systems about ability and improvement. Their accounts show how identity, confidence, and anxiety are co-constructed through classroom norms, peer comparison, and evaluative structures. Children simultaneously navigate growth-oriented ideas (“practice helps”) and fixed ability discourses (“brainy”, “born good at maths”), resulting in mixed, unstable belief systems characteristic of this developmental stage.

Attribution theory (Weiner 1985, 2010) is central here as children frequently attribute success to innate ability and failure to personal inadequacy, intensifying

emotional responses and early maths anxiety. Social comparison processes amplify these beliefs, with children positioning themselves relative to peers. These identity constructions emerge within Bronfenbrenner's microsystem (teacher-child interactions, peer dynamics) and mesosystem (family messages, sibling feedback), demonstrating how children's mathematical identities are ecologically shaped.

Subtheme 3.1: Low Self-Efficacy & Conditional Confidence

Children frequently described their confidence as dependent upon immediate success. Rather than viewing themselves as generally capable learners, confidence appeared highly contingent upon whether they obtained correct answers.

Participant 10 (Working at Age Expected Level, High Maths Anxiety Level) explained:

"Well sometimes I get them wrong and that makes me middle… But then when I get all of them wrong. I get. I get super angry."

Participant 10's account illustrates a broadly negative orientation towards maths and towards their own mathematical ability, with confidence appearing highly contingent on performance outcomes and correctness. Mathematical mistakes appeared to trigger increasingly intense emotional reactions depending upon their frequency. The child's use of "middle" suggests an attempt to negotiate uncertainty about competence, whilst "super angry" signals the emotional significance attached to repeated failure. The phrase "sometimes I get them wrong and that makes me middle" should not be interpreted as a neutral or positive emotional position; within the wider context of this child's account, "middle" appeared to signal discomfort, uncertainty, or a diminished sense of competence. This is important because the child did not present mistakes as occasional, manageable parts of learning, but as a recurring feature of their maths experience. Whether describing getting "sometimes"

wrong or “all of them” wrong, the child’s account suggests repeated encounters with error, with each level of incorrectness carrying emotional significance. Their description of feeling “super angry” when “all of them” are wrong intensifies this pattern, indicating that repeated error may be experienced not simply as task difficulty, but as confirmation of low perceived capability. This supports the subtheme of low self-efficacy and conditional confidence because the child appears to lack a secure sense of themselves as able to succeed in maths. Confidence is therefore not presented as stable or internalised; rather, it is dependent on getting answers right and is quickly destabilised when any mistakes occur. Analytically, the quote suggests that errors may be interpreted as evidence of personal inadequacy rather than as a normal part of learning, making correctness central to the child’s emotional regulation, mathematical self-concept, and negative sense of themselves as a maths learner.

Similarly Participant 6 described:

“When I am struggling... and I don't know if I got it wrong or right.”

The uncertainty itself appeared anxiety-provoking. The child was not describing actual failure but the anticipation of potential failure. This suggests that self-efficacy was vulnerable not only to negative outcomes but also to ambiguity.

Participant 11 reflected:

“Because I'm not very good at maths.”

Importantly, this statement emerged within a discussion about a particularly difficult task rather than general attainment. Nevertheless, the child interpreted temporary struggle as evidence of broader competence. Difficulty became personalised and internalised.

These accounts align closely with Bandura's (1986) concept of self-efficacy. Across the data, confidence was strongly influenced by immediate experiences of success and failure. Children appeared to judge their capability based upon task outcomes rather than longer-term learning trajectories. Consistent with Shore and Kelleher (2024), low self-efficacy appeared intertwined with vulnerability to maths anxiety, reducing resilience when encountering challenge. Children's self-perceptions were closely tied to their self-efficacy, emotional responses to correctness, and perceived competence. Many children described those who are good at maths as "clever", "amazing", or "brilliant", while positioning themselves as "not very good" or "middle" when mistakes occurred. These identity positions were conditional, fluctuating with task success, accessibility, and perceived efficacy. Children's accounts suggest that liking maths did not necessarily mean experiencing maths as consistently positive. Instead, enjoyment appeared conditional and context-dependent, with children often describing maths positively when it felt easy, familiar, supported, or successful, while expressing dislike, stress, or anxiety in relation to particular concepts, mistakes, time pressure, public performance, or moments when they did not know what to do. *"I like it but…"* appeared frequently, signalling that positive affect depended on feeling competent, supported, or successful. This also shows that children may broadly say they like maths, but their enjoyment is situationally fragile and shaped by the conditions of the task. This indicates that children's positive feelings towards maths were not absent but were often conditional: they could like maths in general, or in particular forms, while still finding specific tasks, concepts, or classroom situations emotionally difficult. This appears to strengthen the idea that maths anxiety is situational, relational and context-dependent rather than a fixed dislike of maths.

Correctness emerged as a central organising feature of children's mathematical experiences. Being right was associated with competence, cleverness, and social approval; being wrong was emotionally loaded, linked to sadness, fear, frustration, or anger. Errors were rarely described as neutral; instead, they were identity-relevant events carrying social consequences. Children's accounts suggested that maths difficulty was often experienced through the anticipation of error rather than the task alone. Several children described feeling scared, sad, angry, unsure, or embarrassed when they thought they might get an answer wrong, particularly when their work could be checked by adults, compared with peers, or performed publicly. For some, such as Participants 1, 7, and 10, the possibility of being wrong appeared to dominate the emotional meaning of maths. The anticipatory "waiting" to see if they were right or wrong reflects potential evaluative vigilance, a state in which attention is diverted away from the task and towards monitoring potential threat. In cognitive models of maths anxiety, evaluative threat activates anxiety, which in turn consumes working memory resources needed for mathematical problem-solving. This means that even before an error occurs, the anticipation of judgement already impairs performance. From a cognitive perspective, this creates a self-reinforcing loop: evaluative threat leading to reduced working memory capacity leading to increased likelihood of error leading to heightened sense of inadequacy leading to greater vigilance and threat sensitivity (Ramirez et al., 2013; Ramirez et al., 2018; Pizzie et al., 2020b). The data suggest that this cycle may begin far earlier in development than most cognitive models assume, indicating that evaluative processes in early primary classrooms may be sufficient to trigger the anxiety-performance feedback loop.

In terms of attribution theory (Weiner 1985, 2010), children often attributed mistakes to internal, stable causes (“I’m not good at maths”), increasing vulnerability to anxiety. Success was linked to ability rather than effort, reinforcing conditional confidence. Moreover, the findings support Harter's (2012) argument that children's academic self-concepts become increasingly domain-specific during middle childhood. Participants were already constructing identities as either capable or incapable maths learners, often based upon individual classroom experiences rather than broader evidence of competence.

Subtheme 3.2: Emerging but Fragile Growth Beliefs

Despite evidence of low confidence, children also frequently articulated beliefs consistent with growth-oriented understandings of learning. However, these beliefs often remained fragile or directed towards others and not the self and sat alongside continuing anxieties. Participant 11 stated:

“They could like practise at home. That’s what I am trying to do, but I just keep messing up”.

Participant 11’s account offers a particularly useful entry point into this subtheme because it contains both the language of growth and the emotional instability that appears to limit its application. However, this belief was immediately undermined by experiences of ongoing struggle. Growth-oriented thinking existed, but confidence in the effectiveness of effort appeared uncertain. Their suggestion that another child “could like practise at home” draws on an incremental discourse in which mathematical improvement is possible through effort, repetition, and continued engagement. The participant clearly recognised practice as a mechanism for improvement. However, this growth-oriented position is immediately complicated by

the child's turn back to their own experience: "That's what I am trying to do, but I just keep messing up." The contrast between "practice" and "messing up" is analytically significant because it suggests that practice has not yet become a secure source of self-efficacy for this child. Instead, their own attempts to improve appear to be experienced through repeated failure, frustration, or perceived inadequacy. In this sense, the quote shows an emerging growth belief because the child recognises practice as a possible route to improvement, but it is also fragile because this belief is not emotionally robust enough to protect the child from interpreting mistakes as evidence that they are still failing. The phrase "just keep messing up" suggests a cumulative and self-critical interpretation of error, where mistakes are not framed as an expected part of learning but as repeated confirmation that improvement is not yet being realised. This indicates that the child may have internalised classroom narratives about practice and perseverance, yet these narratives remain only partially available as self-supportive resources. They can name practice as something that should help, and perhaps as something others could do, but when reflecting on themselves, the dominant meaning is still one of struggle and inadequacy. The quote therefore illustrates the central analytic tension of this subtheme: growth beliefs are present, but they coexist with low self-efficacy, emotional vulnerability, and fixed-ability meanings that make practice feel uncertain rather than empowering.

Similarly Participant 8 reflected:

"We can like keep on practising it and then… First, when I was in reception, I didn't know what 4 + 4 was and I wasn't very confident. But when I keep on practising it, I knew that it was 8."

Even more explicitly, the same participant stated:

“You keep on practicing, and then you just get good at it and you're not good yet, but you will be good later.”

The child linked maths success to persistence rather than innate ability. This suggests an emerging understanding of learning as a process requiring effort and perseverance. This language closely reflects growth mindset discourse, particularly the concept of “yet.” Rather than positioning competence as fixed, mathematical ability was viewed as something that could develop over time. However, tensions remained evident. Earlier, the same participant had stated:

“Usually when we do fractions... I'm a bit afraid.”

The coexistence of growth-oriented beliefs and continuing fear highlights the complexity of children's meaning-making. Understanding that improvement is possible did not eradicate feelings of anxiety.

These findings support Dweck's (2008) conceptualisation of growth mindset but also demonstrate its limitations. Children possessed growth-oriented language and beliefs, yet these did not automatically translate into emotional security. As Kirkland and Hunt (2025) argue, awareness that learning involves challenge may coexist alongside significant maths anxiety. Intellectual understanding and emotional experience were not always aligned.

From a developmental perspective, children's accounts suggest that growth beliefs were still emerging and being negotiated. They had not yet fully displaced fixed narratives about mathematical competence. Rather, competing explanations of success and failure appeared to coexist within children's developing understandings of themselves as learners.

However, these beliefs were fragile, easily undermined by repeated difficulty, discouraging feedback (e.g., sibling comments), or social comparison. For example, Participant 11 said:

“Once I did 15 times 4 and [older sibling] said that I can't do that. And then I did 16 times 4 [older sibling] said I can't do that either.”

Children were frequently able to describe practice, persistence and trying again as helpful for others’ mathematical learning, suggesting some awareness of growth-oriented messages, compassion and encouragement. However, this did not always translate into their own self-perceptions or emotional responses. This gap between advising others and applying the same reassurance to oneself was particularly evident when Participant 1 advised a worried friend, “It’s okay, mistakes happen,” but, when asked whether she told herself the same thing, replied, “No… I forget.” For some participants, mistakes and difficulty still prompted sadness, fear, frustration or avoidance, indicating a gap between endorsing practice for others and adopting it as a personally reassuring belief. This may indicate that growth mindset language has been learned at a surface level or more of an adoption of classroom narratives. children know that they should say practice helps but for some, this message has not yet become emotionally meaningful when they themselves experience difficulty. In addition, this discrepancy suggests early tensions between self-compassion and self-criticism, with mistakes experienced as personally threatening.

Across the interviews, children’s mathematical identities appeared to be shaped through experiences of success, failure, comparison, and belonging. Children did not only describe whether they liked or disliked maths; they also used maths experiences to position themselves and others as particular kinds of learners.

For example, children associated being good at maths with getting answers right, described mistakes as emotionally significant, and compared themselves with peers who were seen as “better,” “clever,” or “brainy.” These accounts suggest that mathematical identity was constructed relationally, through children’s interpretations of correctness, peer comparison, and their sense of inclusion within classroom maths practices. Identity positions were context-dependent, influenced by correctness, speed, peer comparison, and teacher feedback. Children’s accounts also suggested that belonging was implicated, as mathematical difficulty sometimes meant being left behind, missing shared classroom routines, or feeling different from peers. According to social comparison theory (Festinger, 1954) around age 6–7, children increasingly compare themselves to peers. Maths, as a visibly evaluated subject, amplifies these comparisons, shaping identity and emotional responses.

Many children held narrow conceptions of maths, associating it with counting, rules, or classroom tasks. Many children described maths in limited terms, often equating it with counting, number work, or familiar classroom topics. For example, Participant 2 explained that a board game involved maths “because maths is counting and that’s counting,” while Participant 7 defined maths as “something you add things together” and said it was used “to help count.” Maths was often constructed as a school-bound, procedural activity with limited everyday relevance. This aligns with Quane (2024), who found that children’s perceived competence strongly predicts attitudes, participation, and achievement. The children’s narrow conceptions matter because they appear to shape children’s judgements of their own mathematical competence. When maths was understood primarily as counting, sums, worksheets or “getting it right,” children tended to evaluate themselves through immediate performance outcomes rather than broader mathematical

thinking. This is significant because perceived competence is strongly associated with children's attitudes, participation and achievement. Therefore, limited views of what maths is create limited ways of judging success; those judgements feed perceived competence; and perceived competence then shapes emotional responses, willingness to participate, and likely achievement trajectories.

Several children linked being good at maths with being "clever," indicating early internalisation of ability-based attributions. According to attribution theory (Weiner 1985, 2010), when success and failure are attributed to internal, stable factors such as ability, emotional consequences become intensified. Mistakes may then threaten not only task performance but self-concept.

From a developmental perspective, children's accounts suggest that growth beliefs were still emerging and being negotiated. They had not yet fully displaced fixed narratives about mathematical competence. Rather, competing explanations of success and failure appeared to coexist within children's developing understandings of themselves as learners.

Subtheme 3.3: Fixed Ability & Social Positioning

Alongside growth-oriented perspectives, children frequently described mathematical ability as an inherent characteristic possessed by some individuals and not others.

Participant 11 (Working at Age Expected Level, High Maths Anxiety Level) stated:

"Yeah, because [named child] is amazing at maths."

When asked what made this peer successful, the participant responded:

"He's just really brainy".

The construction of ability as something a child simply ‘has reproduces a fixed ability narrative, positioning mathematical competence as an innate, stable trait rather than a malleable outcome shaped by context, pedagogy, and relational support. Maths competence was attributed to inherent characteristics rather than effort support or learning opportunities in several incidences. Consequently, in some cases ability appeared positioned as stable and unequally distributed. When asked why a peer was successful, no reference was made to practice, learning opportunities or effort. Mathematical competence was attributed entirely to an intrinsic characteristic.

Children frequently used ability-linked language (“clever”, “brainy”, “good at maths”), constructing ability as stable and located within the person. Success appeared explained through who a person is rather than what they do. Such descriptions elevate maths competence beyond academic performance and associate it with valued personal attributes. Being good at maths became synonymous with being a particular kind of person.

These fixed ability narratives shaped how children positioned themselves and others within classroom hierarchies. Peer comparison was central: “I see another person and then I say, oh, they’re good at maths, better than I am” (Participant 1).

Children also appeared aware of classroom differentiation and ability-based task allocation. Participant 11 described “a special group that has an easier sheet” compared with “everyone else” who gets a “hard sheet,” adding that they were “in the hard sheet group” but would prefer the “easy sheet group” because it included pictures to help. This suggests that children recognised task difficulty as linked to perceived ability, with challenge and support positioned as markers of mathematical competence.

Behaviour and compliance were also linked to success. Participant 6 stated:

“If you don’t know… or if you don’t listen. Or if you miss what the teacher is saying… because they don't really listen.”

Similarly, Participant 7, linked not listening to not being good at maths:

“Because she's messing around.”
“Because then they don't listen what they're supposed to do.”

Children’s comments illustrate how classroom norms and expectations become internalised; they recognise that listening to the teacher and complying with instructional routines are part of what it means to be a “good” learner. From an attributional perspective (Weiner, 1985, 2010), success interpreted as evidence of ability tends to elicit pride, whereas failure attributed to a lack of ability evokes shame and anxiety. These attributional patterns align closely with cognitive models of anxiety, in which evaluative threat consumes working memory resources and reinforces negative self-beliefs. Together, these frameworks help explain why seemingly routine classroom interactions can generate powerful emotional responses, particularly when children perceive their performance as a reflection of fixed ability.

Children’s descriptions of peers as “clever” or “good at maths” may be cautiously interpreted as reflecting an early orientation towards ability-based classroom narratives, where maths success is understood as visible, socially recognisable, and unevenly distributed. This is offered as a latent reading rather than a direct claim that children consciously endorsed meritocratic beliefs; nevertheless, their language suggests that competence was being constructed relationally, through comparison with peers and through the social visibility of being seen as “good” at

maths. By Year 2, children are already beginning to form emerging academic self-concepts, including beliefs about whether they are capable, competent and safe to make mistakes in maths, demonstrating heightened sensitivity to evaluation, reliance on teacher validation, and growing awareness of ability differences within the classroom. This developmental moment represents a critical window in which children are actively absorbing messages about correctness, cleverness and competence before rigid avoidance patterns become consolidated. Developmental research suggests that, during early primary school, children's self-views become increasingly differentiated and shaped by teacher feedback, task success, peer comparison and classroom evaluation (Harter, 1999, 2012; Eccles & Wigfield, 2002). Maths-specific research further indicates that children may hold beliefs about their mathematical ability by around age seven, making Year 2 a meaningful point at which to explore how early emotional responses to maths become connected to developing learner identities (Eccles et al., 1993; Larkin & Jorgensen, 2016; Harari et al., 2013).This positions Year 2 as a pivotal site for preventative intervention, where adult practices, relational safety, and pedagogical choices can meaningfully shape children's emotional trajectories, self-efficacy, and long-term mathematical identity.

The same was evident of how children described other peers struggling with maths. Participant 7 explained:

"She's messing around."

And later:

"Because then they don't listen what they're supposed to do."

These accounts suggest that mathematical success was understood partly through moral and behavioural narratives. Children interpreted competence through ideas of compliance, effort and appropriate behaviour.

Competence was often understood through visible performance and pace. Participant 11 described feeling “happy and impressed” when they had finished their sheet, but “overwhelmed and frustrated and sad” when they had not, while also explaining that being asked to work quickly made them feel “under pressure.” Similarly, Participant 1 compared themselves with peers, saying, “they're good at maths, better than I am,” which made them feel “upset.” Together, these accounts suggest that children interpreted mathematical ability through speed, completion, and comparison with others. This reflects a performance-oriented culture where pace becomes a proxy for ability. Again, according to social comparison theory (Festinger, 1954), peer comparison shapes identity, belonging, and perceived competence. In educational settings, such comparison is often embedded within classroom practices that make relative performance visible, including ability grouping, differentiated tasks, teacher judgements, speed of completion, and public correctness (Harter, 1999; Marsh & Craven, 2006; Gripton, 2020). In maths specifically, research has shown that grouping practices and ability discourses can shape how pupils come to understand themselves and others as particular kinds of maths learners, with competence constructed as visible, ranked, and socially meaningful (Boaler, 2005; Marks, 2014; Gripton, 2020). This supports a reading of Participant 1’s account as more than an individual comparison; rather, it reflects how mathematical identity and belonging may be constructed within classroom cultures where being “good at maths” is made publicly recognisable through pace, correctness, and comparison. Efforts to address maths anxiety must therefore extend beyond individual coping

strategies to re-examining the emotional climate and power dynamics of early maths education. From a childist perspective this highlights how institutional norms (speed, correctness, differentiation) shape children's identities and emotional experiences.

These findings strongly reflect attribution theory (Weiner, 1985, 2010). Success was frequently attributed to stable internal causes such as intelligence, whilst struggle was attributed either to lack of ability or inappropriate behaviour. Such attributions are significant because they may influence how children respond to future challenge. When ability is viewed as fixed, mistakes become more threatening because they imply limitations of the self rather than temporary learning difficulties.

Social constructionist perspectives further suggest that these narratives are not individually generated but emerge within broader cultural discourses that position some people as naturally "good at maths." Children's accounts indicate that such narratives were already shaping mathematical identities by Year 2, reinforcing the social positioning of competence and influencing how children understood their place within classroom maths.

Theme 3: Summary

Theme 3 suggests how children's mathematical identities may be ecologically constructed, shaped by classroom norms, peer dynamics, family messages, and evaluative structures. Children navigate a developmental tension between growth-oriented narratives ("practice helps") and fixed ability discourses ("some people are clever at maths"), resulting in fragile, context-dependent identities.

Correctness, speed, and comparison emerged as powerful forces shaping self-efficacy and emotional responses. Mistakes were experienced as socially risky and identity-relevant, contributing to early maths anxiety. Attribution theory (Weiner

1985, 2010) explains how children link success to ability and failure to inadequacy, intensifying emotional responses. Social comparison theory (Festinger, 1954) highlights the role of peer dynamics in shaping identity. Cognitive models of anxiety illuminate how evaluative threat consumes cognitive resources, reinforcing negative self-beliefs.

From a childist perspective, these findings raise critical questions about what it means for 6–7-year-olds to experience error as a threat to competence. By Year 2, children are already negotiating reputation, ability status, and belonging within maths, navigating emerging ability hierarchies and reputational dynamics within maths. Research shows that children at this age demonstrate heightened sensitivity to evaluation, growing awareness of ability differences, and relational negotiations of belonging as they interpret whose ideas are valued and what mathematical success signifies about themselves and their peers (Hubbard & Russo, 2026; Throop-Robinson, 2026).This theme shows how children make sense of maths emotionally and cognitively, revealing the early construction of mathematical identity within Bronfenbrenner's microsystem and mesosystem. It highlights the vulnerability of children's emerging beliefs about competence and the need for relational, ecological approaches to supporting mathematical wellbeing. Taken together, these findings suggest that children's mathematical identities do not develop in isolation but are continually shaped through their interactions with teachers, peers, and the tools available to them; the next theme explores how learning is socially co-constructed through these relationships, and how support, scaffolding, and manipulatives play a central role in children's emotional experiences of maths.

Theme 4: “They help me work it out.” (Participant 2, Working at Age Expected Level, High Maths Anxiety Level). **Socially Co-Constructed Learning & Support.**

Children consistently described maths as a relational and socially mediated activity, shaped through interactions with teachers, peers, and the tools available to them. Learning was not experienced as an individual endeavour but as something co-constructed, scaffolded, and emotionally regulated through social support. Teacher availability, peer collaboration, and access to manipulatives played central roles in shaping children’s confidence, emotional safety, and engagement.

This theme reflects Bronfenbrenner’s emphasis on proximal processes - the sustained, reciprocal interactions through which learning and development occur. Children’s reliance on social support suggests that maths anxiety is not solely an internal phenomenon but is likely to be ecologically produced through relational dynamics, classroom culture, and pedagogical practices. When support is responsive, children feel contained and capable; when support is inconsistent, unavailable, or evaluative, children experience uncertainty, frustration, or threat.

This theme is organised into three subthemes:

4.1 Teacher support & relational safety

4.2 Peer support & social scaffolding

4.3 Tools, manipulatives & autonomy

Subtheme 4.1: Teacher Support & Relational Safety

Teachers occupied a central role within children's mathematical worlds. They were simultaneously positioned as sources of support and, in some cases, potential sources of anxiety.

Participant 2 explained:

“They help me work it out.”

Importantly, the child did not describe the teacher simply providing answers. The value lay in supporting understanding and participation.

Similarly, Participant 3 described teachers as:

“They help you when you're stuck on an answer. When you're confused on it.”

Support was framed as responsive to need. Teachers were valued because they reduced uncertainty and helped children regain a sense of competence.

Participant 6 similarly explained:

“Well, I normally pick a teacher.”

When mathematical uncertainty arose, the first coping response involved seeking relational support.

Participant 11 (Working at Age Expected Level, High Maths Anxiety Level) stated:

“Umm normally the teacher, but sometimes when the teacher isn't in the room, like sometimes she has to leave to talk to [another teacher], but when she is, I ask her for help. But if she isn't in the room and [another child] is not here, I ask [another child], but if [child] isn't here, I ask [another child].”

This child positions the teacher as a primary source of help, but availability mattered. When teachers were busy, unavailable, or when children had missed input due to interventions, children described turning to peers or feeling unsure and stressed.

However, these positive accounts existed alongside evidence from Theme 1 demonstrating fears regarding teacher judgement. Teacher availability and

responsiveness therefore appeared critical. The same adult could either facilitate psychological safety or contribute to perceptions of evaluative threat. Teacher support carried relational risk. For example, in maths anxiety literature, teachers' evaluative practices have been found to heighten anxiety and avoidance in maths (Ashcraft, 2002). This dual positioning of teachers as both helpers and evaluators created emotional ambivalence: teachers were sources of understanding but also potential sources of threat. Research across maths education, educational psychology, and attachment-based theories consistently shows that teachers occupy a dual role as both helpers and evaluators (e.g. Ashcraft, 2002; Gunderson et al., 2018; Ramirez et al., 2018). This positioning creates emotional ambivalence for young children: teachers are experienced as sources of understanding and reassurance, but also as potential sources of threat when performance is judged or mistakes are made. This tension reflects how relational safety is central to children's emotional experiences of maths.

Theoretically, these findings align with Vygotskian perspectives that position learning as fundamentally social and scaffolded (Vygotsky, 1978). Teachers functioned as more knowledgeable others who enabled children to access learning experiences beyond independent capability. The findings also resonate with ecological perspectives; whereby emotional experiences of maths emerge through interactions within the classroom microsystem.

Social constructionism frames learning as co-constructed through interaction; teacher responses shape how children interpret difficulty, error, and competence. Luo et al. (2024) found that maths attitudes and anxiety predicted perceived teacher support a year later, suggesting children are not passive recipients of support, they actively interpret and construct relational meaning. This aligns with children's

accounts: support was valued when it felt enabling but experienced as unhelpful or even punitive when linked to consequences or evaluative pressure.

Relationships are important in all walks of life and are well-documented as being foundational to children's development. General educational psychology research and practice consistently demonstrate that emotionally attuned, reliable adult relationships act as a protective factor for young children, supporting regulation, wellbeing and engagement in evaluative contexts. Attachment-based research shows that teachers can function as secondary attachment figures, providing a secure base from which children feel safe to explore, take risks with their learning and tolerate uncertainty (Bergin & Bergin, 2009; Hughes et al., 2010). Containment theory (Bion, 1962) similarly emphasises the importance of adults offering emotional holding, enabling children to manage anxiety and difficult feelings and remain cognitively available for learning. Many pieces of research highlights relationships as a protective factor and in schools is a valuable opportunity to give children a reliable and available adults as a source of support (Hughes et al., 2010). Teacher language, feedback and responsiveness have been positioned in research to be particularly important, as they shape whether children interpret mistakes and difficulty as part of learning or as evidence of inability (Kam Chi & Cameron-Flitcroft, 2025; Kirkland & Hunt, 2025). Maths-specific research therefore reinforces the relational dimension of early maths anxiety: children's willingness to persist, take risks and recover from mistakes is closely connected to whether adults provide reassurance, containment and emotional safety. Overall, this evidence positions relationships as central to children's mathematical experiences; emotionally safe adults provide reliability, encouragement and co-regulation, enabling children to approach maths with greater confidence, curiosity and resilience.

Subtheme 4.2: Peer Support & Social Scaffolding

Children frequently identified peers as important sources of both emotional and academic support.

Participant 11 (Working at Age Expected Level, High Maths Anxiety Level) explained:

“And they just give me a clue. [Named child] gives me a clue to work it out, but [child] just gives me the answer”.

This distinction is interesting as the participant demonstrated awareness that learning and answer-giving were different processes.

When asked which was more helpful, the child responded that helping was:

“Because helps me learn.”

The value of peer support lay not in solving problems quickly but in facilitating understanding.

Similarly, Participant 8 described helping classmates by:

“Don't actually tell them the answer, just like say how you could do it.”

These accounts suggest a sophisticated understanding of learning as collaborative and scaffolded. This distinction shows emerging metacognitive awareness and a desire for scaffolded learning, not passive receipt of answers.

Throughout the data, peer support was a prominent feature of children’s accounts. Children described asking friends for help, working together, and receiving “clues” from peers that enabled them to solve problems independently. Collaborative working was associated with happiness, reduced evaluative threat, and increased enjoyment.

Peer support also appeared emotionally protective. Participant 11 explained:

“I knew that I always had my friends to help me and give me clues.”

The anticipation of support contributed to feelings of safety even before maths began.

These findings align strongly with sociocultural accounts of learning, in which knowledge is co-constructed through social interaction. Peers acted as more knowledgeable others, aligning with Vygotsky’s theory of learning through social scaffolding (Vygotsky, 1978). Peer relationships served not merely academic functions but also emotional ones, reducing isolation and providing reassurance when children encountered difficulty. As previously mentioned, social comparison theory (Festinger, 1954) shows how peer dynamics shape identity, belonging, and perceived competence. Peer support acted as a buffer against evaluative threat, helping children remain within their window of tolerance (Siegel, 1999) when tasks felt difficult or uncertain.

Children also demonstrated a self-other compassion gap. They were kinder and more forgiving of peers’ mistakes than their own. Others’ errors were seen as normal and acceptable, whereas their own mistakes felt personally threatening. This gap reflects early tensions between self-evaluation and social empathy, and highlights how peer dynamics shape identity and emotional safety. For example, Participant 1 states:

“It’s okay, mistakes happen.”

When asked if they tell themselves that:

“No… I forget.”

This directly supports the claim that the child can be forgiving of a peer's mistakes but does not readily apply the same compassionate frame to oneself. The child positioned mistakes are personally threatening earlier in the interview. This suggests that mistakes were cognitively understood as acceptable for others but remained emotionally threatening when experienced personally.

Similarly, Participant 2 encouraged a worried peer by saying:
"Don't worry, you can do this," yet when discussing their own experience wanted to change maths by "not doing it." This suggests that encouragement was more accessible when directed towards others than when applied to the self. A related account was given by Participant 6 who said that getting something wrong would make them feel "sad," but would tell a worried friend, "You can do it." This suggests that mistakes were often easier to normalise for others than for the self. Together, these extracts suggest an early tension between social empathy and self-evaluation: children could offer compassion outwardly, but their own mathematical errors were more likely to threaten confidence, identity and belonging.

Subtheme 4.3: Tools, Manipulatives & Autonomy

Many children demonstrated awareness of resources and strategies that could support mathematical thinking.

Participant 1 explained:

"I usually just use my fingers or if we have a bead string, I'll use a bead string."

Children demonstrated strong awareness of manipulatives, mentioning bead strings, part-whole models, counters, Dienes, 100 squares and calculators. They expressed clear preferences for using them. Manipulatives appeared to function as bridges between abstract concepts and concrete understanding.

Similarly, Participant 11 also noted:

“We have beads, strings, dienes and counters... but we don't really use them.”

The participant later added:

“Yeah”, when asked whether greater access would help. This suggests children were aware of useful resources and manipulatives were described as helpful, enabling children to “work it out” and supporting understanding. However, children also reported underutilisation of these tools, noting that they “don’t really use them” or that manipulatives were reserved for “tricky maths” or younger children (and not them because they are nearly Year three). Schools can position manipulatives as being for a certain age of child, however the ZPD (Vygotsky, 1978) explains why manipulatives support conceptual understanding within children’s developmental readiness. This aligns with the work of the Education Endowment Foundation (EEF) who state that manipulatives can help pupils engage with mathematical ideas and should be used based on pupils’ *developmental stage*, not their chronological age, supporting conceptual understanding rather than signalling ability (EEF, 2020). The EEF goes on to state that manipulatives and representations are just tools and how they are used is essential, with them needing to be used purposefully and appropriately to have an impact with a clear rationale for their use, as well as being used temporarily as a scaffold and can be removed once independence is achieved.

Notably, some tensions emerged. Some children found manipulatives distracting, reflecting attentional needs and developmental differences. Participant 10 reported:

“Counters are also really distracting.”

The same participant also added:

“If it was a bead string or dienes, then I would get really distracted.”

Therefore, the data suggest that no single support strategy was universally valued; instead, children’s preferences appeared to vary according to their individual experiences, perceived needs, and the specific contexts in which support was offered.

This gap between available support and enacted support reflects systemic tensions in pedagogy. Children recognised the value of manipulatives but experienced inconsistent access, which shaped their sense-making around difficulty and support.

One particular child (Participant 8) expressed emerging metacognitive awareness, wanting autonomy and choice over which tools to use.

“When I'm at home, usually we say like. Do you want to do this or do that. Like, there's a few options that you could pick…. Like you could work it out with a bead string or a part whole model.”

The child not only recognised available tools but expressed a desire to choose between them. The children’s desire for agency aligns with developmental expectations for Year 2 and reflects a growing awareness of personal learning preferences. Their comments resonate with contemporary perspectives on metacognition and self-regulated learning, which emphasise that even young children can articulate what helps them learn, monitor their own understanding, and express preferences for autonomy in selecting strategies. Research shows that children in early primary school demonstrate emerging metacognitive capacities and benefit from opportunities to make strategic choices in learning (Whitebread &

Pino-Pasternak, 2010). In this study, children demonstrated emerging awareness of what helped them learn and expressed preferences for autonomy in selecting strategies. Rather than relying exclusively upon adult direction, some participants sought greater agency in determining how mathematical problems were approached.

Task design appeared to mediate children's emotional engagement with maths. Participant 11, for example, recalled enjoying a task involving "10 squares" and "colouring pencils", describing it as "really, really fun" and "nice and easy". Enjoyment here was not attached to maths in the abstract, but to a task form that was visually accessible and manageable. Similarly, Participant 7, who otherwise described maths as "worrying", identified enjoyment only in a visually framed task: "when we got to colour the numbers in." This suggests that engagement was sensitive to the form in which mathematical activity was presented. In contrast, more abstract domains (division and telling the time) were frequently described as difficult or emotionally threatening. Telling the time was repeatedly positioned as difficult across the dataset. Participant 1 explained, "I don't like the time because it's really hard." Participant 3 similarly identified "reading the time" as tricky, while Participant 6 stated, "I don't like the times in maths." This recurrence suggests that particular curricular domains, especially those experienced as abstract or less immediately graspable, carried heightened emotional risk. Engagement was therefore closely tied to perceived task accessibility and competence. This was also evident in Participant 8's explanation that they enjoyed maths "when it's easy," particularly addition and subtraction, "because I think I'm a bit good of it." Differentiation practices further shaped children's perceptions of competence. Participant 11 described "a special group that has an easier sheet" while others received a "hard sheet," explaining that she was in the "hard sheet group" but would prefer the "easy sheet group" because it

“gives you pictures to help you.” This illustrates how differentiated resources may become symbolically loaded: visual support was experienced as useful, yet the labels of “easy” and “hard” risked reinforcing classroom ability hierarchies and shaping children’s mathematical identities.

Children also demonstrated moments of agency and creativity, reinterpreting maths within play contexts (e.g., creating their own “maths lessons” in imaginative self-directed play). Participant 11, for example, explained that when playing with a sibling, “we play schools together… so that includes maths,” and described creating “Teddy School,” where they would “find 10 teddies, bring them downstairs and give them maths sheets to figure out.” This extract positions the child not merely as a recipient of school maths, but as an active producer and organiser of mathematical activity. The child appropriates the structures of formal schooling (lessons, pupils, worksheets and equations) and reworks them within an imaginative play world. From a childist perspective, this matters because it foregrounds the child as an epistemic agent: someone who interprets, reconstructs and gives meaning to maths through their own social and playful contexts, rather than passively absorbing adult-defined knowledge. With children as active meaning-makers, whose understandings are shaped through, but not limited to, formal schooling.

Theme 4 summary

Theme 4 suggests that children’s experiences of maths are deeply socially mediated. Teachers and peers may be important in shaping emotional safety, confidence, and engagement. Support was valued when it was enabling, scaffolded, and relationally safe, but experienced as unhelpful or threatening when linked to evaluation, consequences, or inconsistency. Manipulatives and visual supports were

recognised as helpful but underutilised, highlighting a gap between intended and experienced support.

These findings align with social constructionist views of learning as relational and co-constructed, and with ecological systems theory: classroom norms (microsystem) directly shape children's emotional experiences, while curriculum demands (exosystem) influence pace, structure, and access to support. Self-efficacy theory suggests that reliance on external validation may limit autonomous confidence, increasing vulnerability to anxiety in independent contexts.

These relational dynamics set the stage for Theme 5, which explores how children cope when support feels insufficient, unavailable, or emotionally risky and how protective strategies such as avoidance, minimisation, and self-talk emerge as ways of managing the emotional demands of maths.

Theme 5: "They help you when you're stuck on an answer. When you're confused on it." (Participant 3, Working at Age Expected Level, High Maths Anxiety Level). **Coping, Protection & Avoidance.**

The final theme captures the protective strategies children employed to manage the emotional risks associated with maths. These responses functioned as forms of protection, enabling children to regulate anxiety, preserve self-worth and minimise exposure to perceived failure. These strategies included avoidance of difficult concepts, minimising exposure ("make maths shorter"), seeking help, self-talk, and attempts to regain control through autonomy and choice. Coping responses were not random; they were adaptive attempts to regulate emotional discomfort, maintain social belonging, and protect fragile mathematical identities.

Avoidance emerged as a particularly powerful strategy. When children perceived difficulty as a reflection of ability, or when tasks exceeded their window of tolerance (Siegel, 1999), avoidance became a logical emotional response. This aligns with attribution theory (Weiner 1985, 2010), where children who attribute difficulty to stable internal deficits ("I'm not good at maths") are more likely to withdraw. Avoidance reinforces maths as unsafe, limiting opportunities for mastery and contributing to a cycle of anxiety.

These coping strategies reflect early self-protective behaviours within Bronfenbrenner's microsystem, shaped by relational dynamics, classroom expectations, and situational pressures. They also highlight how children actively navigate emotional risk, demonstrating agency within the constraints of their learning environments.

This theme is organised into three subthemes:

5.1 Protective avoidance

5.2 Emotional coping

5.3 Safety, control & autonomy

Subtheme 5.1: Protective Avoidance

When maths felt threatening, many children expressed desires to reduce or escape exposure to difficulty.

Participant 7 (Working at Age Expected Level, High Maths Anxiety Level) stated:

"If I, If I didn't have to do it".

Similarly:

“I would change that, that we're not going to do division.”

And:

“It's scary.”

Avoidance appeared directed both towards maths generally and towards specific concepts associated with anxiety.

Children frequently expressed a desire to avoid maths altogether or to avoid specific concepts such as division and time. Maths was often framed as something to “get done,” “get over with,” or ideally “not have to do.” Avoidance was also expressed through preferences for shorter maths sessions, easier tasks, or tasks that don’t feel like maths. For example, Participant 11 expressed a wish to make maths:

“Shorter.”

Whilst Participant 8 suggested:

“Not doing it.”

Similarly, another child described using future-oriented self-talk to tolerate the maths task: “It just makes me... say in my head, I can, I can do this; if I get over it, it will be lunchtime and then we can have more play”. This quote illustrates maths as something to be endured or “get over” before the child can return to the emotionally meaningful context of lunch and play. These extracts were included here because they show that emotional overload and situational anxiety were not only generated by perceived difficulty, correctness, or adult evaluation; they were also produced when maths disrupted children’s access to valued social routines. The children’s words suggest that maths could become emotionally costly when it delayed, limited,

or separated them from peers, play, and shared classroom belonging. In this sense, situational anxiety was relationally and developmentally situated: the pressure of maths was intensified by the fear of missing out, being left behind, or no longer doing what everyone else was doing. This is particularly salient for Year 2 children, who are navigating a shift away from more play-based learning towards increasingly formal, adult-led and cognitively demanding classroom structures.

These accounts suggest that reducing exposure was perceived as a route to emotional safety. The findings align with literature describing avoidance as a common behavioural manifestation of maths anxiety (Dowker et al., 2016; Ramirez et al., 2018). However, avoidance should not be interpreted as disengagement or laziness. Instead, children's accounts suggest avoidance functioned as protection from anticipated failure, embarrassment and emotional distress. Whilst avoidance served several protective functions, in the literature it has been linked with exacerbating maths anxiety contributing to a negative cycle of avoidance that impacts performance.

Avoidance is represented in the literature not as simple disengagement or low motivation, but as a self-protective coping response to mathematical situations experienced as threatening, evaluative or emotionally overwhelming. When children interpret difficulty as evidence of low ability (internal attribution; attribution theory, Weiner 1985, 2010) they seek to avoid situations where maths occurs. Avoidance cycles (common in anxiety research) show how withdrawal temporarily reduces discomfort but reinforces long-term fear as well as contributing to gaps in learning. Avoidance is a self-protective response which can be understood through Siegel’s (1999) window of tolerance: when maths tasks exceed a child’s perceived emotional capacity, withdrawal may function to reduce immediate distress by moving the child

away from feelings of exposure, failure or shame. However, this short-term relief can become self-reinforcing, as avoidance reduces opportunities to practise, receive feedback, consolidate understanding and experience mastery, thereby maintaining fear and contributing to cumulative gaps in learning (Ashcraft & Moore, 2009; Chinn, 2012; Dowker et al., 2016; Ramirez et al., 2018). In this sense, avoidance may be both an adaptive response in the moment and a mechanism through which maths anxiety, reduced self-efficacy and attainment difficulties become reciprocally reinforced over time (Carey et al., 2016; Foley et al., 2017). Avoidance, therefore, should be understood and be conceptualised relationally and developmentally: it is not merely a behaviour to be corrected, but a meaningful emotional strategy shaped by children's interpretations of task demand, classroom safety, adult response and the perceived consequences of getting maths wrong.

Subtheme 5.2: Emotional Coping

Alongside avoidance, children described strategies used to tolerate difficult mathematical experiences.

Participant 8 (Working at Age Expected Level, High Maths Anxiety Level) stated:

"I think it means that just keep on trying until you get it right."

Participant 11 suggested:

"If we just get over it, it will be break time."

This reflects a form of self-talk designed to sustain engagement through anticipated discomfort. The language of "getting over it" constructs maths as a temporary obstacle rather than a meaningful learning opportunity. This participant used the phrase twice in the interview. Such accounts suggest that children sometimes

managed emotional discomfort by focusing on forthcoming relief rather than mathematical engagement.

Other strategies included peer support and having peers who “help me work it out” (Participant 2) and reassurance “it’s okay, mistakes happen” (Participant 1), as well as reward focus (looking forward to breaktime or social time), task completion focus (“happy when I finish”) and environmental coping (preferring quiet spaces).

These strategies helped children regulate emotions when tasks felt overwhelming or when they were unsure what to do. Self-talk and peer reassurance acted as emotion regulation tools. These coping strategies show that children are not passive recipients of anxiety, they actively work to regulate their emotions and maintain engagement. It also highlights how emotional regulation strategies can be incorporated into interventions designed to target maths anxiety.

These findings align with emotional regulation theories and demonstrate children's emerging capacities to manage distress through self-talk, future orientation and social reassurance. However, the coping strategies described often focused on enduring maths rather than transforming relationships with it.

Subtheme 5.3: Safety, Control & Autonomy

A final pattern concerned children's desire for choice, flexibility and control over how they engaged with maths. Participant 8 (Working at Age Expected Level, High Maths Anxiety Level) stated:

“Do you want to do this or do that. Like, there’s a few options that you could pick… Like you could work it out with a bead string or a part whole model.”

The child contrasted home experiences with school maths, suggesting greater flexibility outside the classroom. Importantly, the participant demonstrated awareness that different tools and approaches might support different learners.

Children expressed an emerging desire for autonomy and choice over tools, strategies, and ways of working. The desire for choice was not simply about convenience. Rather, autonomy appeared connected to feelings of safety. When children could influence how problems were approached, maths seemed more manageable and less threatening. They recognised that manipulatives and visual supports could help them “work it out,” and wanted the freedom to choose which tools suited their learning. This reflects emerging metacognitive awareness, as children begin to understand what helps them and why. This is interesting as often in schools one way of working is presented which ignores personal preferences and strengths around certain ways of working. These findings align with self-determination theory (Deci & Ryan, 2008), which highlights autonomy as a key psychological need. They also reflect emerging metacognitive awareness, with children recognising that different strategies may support understanding. Within the context of maths anxiety, opportunities for choice may therefore function as protective factors by increasing agency and reducing feelings of helplessness.

Theme 5 summary

Across this theme, children described multiple strategies for managing the emotional risks associated with maths. Children may emotionally respond to maths through protective withdrawal, coping strategies, and attempts to regain control. Avoidance emerges as a logical response to environments perceived as threatening, particularly when difficulty is interpreted as evidence of low ability. Coping strategies

such as self-talk, peer support, environmental regulation, help children manage emotional discomfort but do not fully mitigate the underlying evaluative pressures. Opportunities for choice increased feelings of control. Whilst these strategies enabled participation, they also revealed the extent to which maths was sometimes experienced as something to survive rather than embrace.

Collectively, these findings reinforce the central argument of the analysis: children's experiences of maths anxiety are not solely cognitive phenomena located within individual learners but are shaped through ongoing interactions between emotions, relationships, classroom practices and wider meanings attached to mathematical success and failure. The findings highlight early signs of situational maths anxiety and the avoidance cycle, where withdrawal reduces immediate discomfort but reinforces long-term fear. They also show how children actively navigate emotional risk, demonstrating agency within the constraints of classroom structures.

2.3.3.5 Conclusion

This study sought to explore how Year 2 children working at age-expected levels in maths, but scoring highly on a maths anxiety questionnaire, described their experiences of maths and what factors appeared to influence their feelings towards the subject. Through Reflexive Thematic Analysis (Braun & Clarke, 2022), five interconnected themes were constructed: Maths as Emotionally and Relationally Risky; Challenge, Difficulty and Performance Conditions; Identity, Efficacy and Belief Systems; Socially Co-Constructed Learning and Support; and Coping, Protection and Avoidance.

The themes should not be understood as discrete or independent aspects of children's experiences. Rather, they appear to reflect an interconnected process through which maths becomes emotionally meaningful. Children described experiences of evaluative threat and social comparison (Theme 1), which appeared to shape perceptions of challenge and difficulty (Theme 2). These experiences contributed to developing beliefs about competence and mathematical identity (Theme 3), whilst simultaneously being mediated through relationships with teachers, peers and learning supports (Theme 4). In turn, children employed a range of coping and protective strategies (Theme 5) to manage the emotional risks associated with mathematical participation. Collectively, the themes suggest that maths anxiety may be understood not as a characteristic located solely within the child, but as something negotiated through ongoing interactions between emotions, beliefs, relationships and classroom contexts.

Together, these themes provide a situated and interpretive account of how this particular group of children made sense of maths within their everyday classroom lives. The findings do not claim to represent the experiences of all Year 2 children or all children experiencing maths anxiety. Rather, they offer one possible account of how maths anxiety may be understood and constructed by this group of participants within their specific educational contexts.

Consistent with a childist perspective, the findings demonstrate that children are active meaning-makers who can articulate sophisticated understandings of their mathematical experiences. Participants did not simply describe whether they liked or disliked maths. Instead, they reflected on competence, challenge, fairness, support, comparison and learning in ways that offer important insights into the emotional dimensions of mathematical participation. Hearing these perspectives directly

provides a richer understanding than could be obtained through questionnaire scores or attainment data alone.

The analysis also revealed tensions and contradictions within children's accounts. Participants frequently described maths as both enjoyable and frightening, endorsed both growth-oriented and fixed beliefs about ability, and recognised the value of challenge whilst simultaneously seeking to avoid it. Instead of than weakening the analysis, these tensions reflect the complexity of children's meaning-making and illustrate how emotions, identities and beliefs are continually negotiated rather than fixed.

Research Question 1: How do children who are working at age-expected levels in maths but score highly on a maths anxiety questionnaire describe their experiences of maths?

Across the themes, children frequently described maths as emotionally significant, socially visible and connected to their developing sense of self. Maths was rarely discussed as a neutral academic subject. Instead, participants often positioned it as a context in which mistakes carried emotional, relational and identity-related consequences. Within Theme 1, maths was frequently constructed as emotionally and relationally risky, with children describing worries about getting answers wrong, being judged by others, disappointing adults, or being perceived as less capable than peers. Success and failure appeared to carry meanings extending beyond the task itself, becoming connected to feelings of pride, embarrassment, sadness and self-worth.

The findings suggest that many children experienced maths through an evaluative lens. Their accounts often centred on correctness, performance and

comparison rather than enjoyment of mathematical thinking or problem-solving. Although many children were attaining at expected levels, they did not necessarily describe themselves as confident maths learners. Instead, several participants positioned themselves as competent only under certain conditions, particularly when tasks felt easy, familiar or achievable. This finding echoes previous literature suggesting that maths anxiety may occur alongside age-appropriate or even high attainment and should not be assumed to reflect low mathematical ability (Cipora et al., 2015; Kirkland & Hunt, 2025).

At the same time, children's descriptions of maths were not wholly negative. Across Themes 2 and 3, participants frequently expressed enjoyment, pride and excitement when they felt capable, understood what to do, or successfully completed tasks. Their accounts suggest that experiences of maths were often ambivalent and fluctuating rather than fixed. Children could simultaneously describe maths as enjoyable, useful, frightening, difficult, rewarding and frustrating. This complexity supports arguments that young children's relationships with maths are multifaceted and should not be understood through simple binaries of liking or disliking maths (Quane, 2024; Kirkland & Hunt, 2025).

Collectively, the themes suggest that these children experienced maths as an emotionally charged domain in which competence, identity, relationships and performance were closely intertwined. Their experiences appeared to extend beyond anxiety about mathematical content itself and instead reflected broader concerns about belonging, judgement, success and failure within classroom environments.

Research Question 2: What do their responses suggest may be the factors that influence their feelings towards maths?

The findings suggest that children's feelings towards maths may be shaped by multiple interacting factors rather than by any single cause. Across the themes, emotional responses appeared to arise through dynamic relationships between individual beliefs, classroom experiences, social interactions and wider meanings attached to maths.

Firstly, children's accounts suggest that perceived evaluation and fear of mistakes may be particularly influential. Within Theme 1, many participants associated maths with being judged, getting answers wrong, or being publicly visible as a learner. These findings resonate with literature that conceptualises maths anxiety as a response to perceived threat, particularly threats to self-esteem and competence (Trujillo & Hadfield, 1999; Kirkland & Hunt, 2025).

Secondly, Theme 2 suggests that perceptions of challenge, difficulty and accessibility may shape children's emotional experiences. Difficulty itself was not always problematic. Rather, emotional responses appeared influenced by whether challenge felt manageable, whether sufficient time was available, and whether children believed they could succeed. Time pressure, in particular, emerged as a recurring feature of narratives about stress, frustration and performance concerns. This tentative finding aligns with literature highlighting speeded performance conditions as potential contributors to maths anxiety (Szczygieł & Pieronkiewicz, 2021; Kirkland & Hunt, 2025).

Thirdly, children's developing beliefs about ability appeared influential. Theme 3 highlighted tensions between growth-oriented beliefs and more fixed understandings of mathematical competence. Although many children believed that practice could lead to improvement, they also frequently described some people as

naturally "brainy", "clever" or inherently good at maths. These findings suggest that children's mathematical identities may already be shaped by wider societal and educational discourses surrounding ability, intelligence and success (Harter, 2012; Weiner, 2010).

Importantly, the analysis also points towards the significance of relational factors. Within Theme 4, children consistently described learning maths as dependent upon teachers, peers and supportive resources. Teachers and classmates were frequently positioned as sources of reassurance, explanation and guidance, suggesting that maths learning was understood as fundamentally social and scaffolded rather than solely individual. This finding supports sociocultural and ecological perspectives that conceptualise learning and emotional development as occurring through participation in relationships and social contexts (Bronfenbrenner & Morris, 2006; Vygotsky, 1978).

Finally, Theme 5 suggests that children actively sought ways of managing emotional discomfort associated with maths. Avoidance, countdown thinking, self-talk, reliance on support and a desire for greater choice all appeared to function as protective strategies. These findings suggest that children's responses to maths anxiety may be understood not simply as deficits or maladaptive behaviours, but as attempts to maintain emotional safety, belonging and self-worth within contexts perceived as challenging or risky.

Bringing the Themes Together

Collaboratively, the five themes suggest that children's experiences of maths may be best understood as relationally, emotionally and socially situated. Their lived experiences of maths are shaped by relational safety, evaluative cultures, situational

pressures, and emerging identity processes. Rather than supporting exclusively cognitive or within-child explanations of maths anxiety, the findings point towards a more ecological understanding in which emotions emerge through interactions between classroom practices, social relationships, personal beliefs and broader narratives about maths ability.

Across the dataset, children appeared to navigate a number of tensions. They often valued maths whilst fearing mistakes. They expressed belief in practice whilst continuing to view some peers as naturally gifted. They wanted challenge but also sought safety, support and reassurance. They described themselves as anxious yet also demonstrated resilience, insight and emerging metacognitive awareness. These tensions suggest that children's experiences of maths are not adequately captured by simple notions of confidence versus anxiety, or success versus failure.

Whilst tentative, the analysis offers support for conceptualisations of maths anxiety as a multidimensional phenomenon involving emotional, cognitive, relational and contextual processes (Kirkland & Hunt, 2025; Dowker et al., 2016). The findings further suggest that children's feelings towards maths may be shaped as much by what mathematical experiences come to mean about themselves and their relationships with others as by mathematical content itself.

Ultimately, this study contributes to the limited body of research examining young children's lived experiences of maths anxiety by foregrounding children's own voices. In doing so, it highlights the importance of moving beyond individualised accounts of maths anxiety and towards greater consideration of the relational and contextual environments through which children construct the meanings of maths, success, challenge and competence.

Whilst previous research has identified links between maths anxiety, performance, self-efficacy and avoidance (Dowker et al., 2016; Kirkland & Hunt, 2025), the present study offers insight into how these processes may be experienced and understood by Year 2 children themselves. The findings suggest that evaluative threat, social comparison and concerns about mistakes may already be salient at this stage of schooling, despite participants achieving at age-expected levels in maths. This highlights the importance of considering children's subjective experiences alongside attainment data when seeking to understand early experiences of maths anxiety.

Overall, the findings suggest that, for these participants, experiences of maths were shaped by far more than mathematical content alone. Maths was constructed as an emotional, relational and identity-relevant experience through which children made sense of competence, belonging, challenge and support. Whilst these findings cannot be generalised beyond this sample, they offer a situated account of how a group of Year 2 children experiencing high levels of maths anxiety described their mathematical worlds and the factors that appeared to shape those experiences.

Addressing early maths anxiety therefore requires attention not only to children’s coping strategies but to the emotional architecture of early maths education itself, how error is framed, how support is enacted, how time is structured, and how ability is constructed and communicated. The findings highlight the importance of creating emotionally safe, relationally attuned, and developmentally sensitive maths environments that support children’s emerging identities, foster agency, and reduce evaluative threat. In doing so, they point toward the need for early, preventative, and systemic approaches that recognise children’s emotional

experiences as foundational to their mathematical learning, wellbeing, and long-term engagement.

2.3.4 Rigour and Trustworthiness

Rigour and trustworthiness in this study are grounded within RTA (Braun & Clarke, 2022), which conceptualises knowledge production as inherently interpretative and researcher-positioned rather than as an exercise in establishing objective validity through procedural checks. In line with this epistemological stance, analytic quality was supported through sustained reflexive engagement with the data. Children's interview accounts were analysed as situated meaning-making practices, with contextual assessment information used not as a means of validating accounts, but as additional interpretative context to deepen understanding of the educational and relational conditions shaping participants' talk.

The trustworthiness of this study was also guided by Yardley's (2000) criteria for qualitative rigour. Sensitivity to context was demonstrated through a childist approach that prioritised children's perspectives, ethical interviewing practices, and attention to the relational and evaluative dynamics of the classroom. Commitment and rigour were evidenced through sustained engagement with the data, iterative and reflexive coding, and the use of RTA to generate rich, interpretive themes. Transparency and coherence were ensured by clearly articulating the study's constructionist epistemology, providing a detailed account of analytic procedures, and integrating reflexive commentary throughout. Finally, the study offers impact and importance by contributing new insights into young children's experiences of maths, highlighting the role of evaluative threat, and identifying implications for EP practice and future research. Together, these principles support the methodological integrity and trustworthiness of the analysis.

Reflexivity was central throughout the analytic process and was actively maintained through a reflexive journal, which functioned as a space for documenting evolving interpretations, questioning analytic assumptions, and making visible the researcher's role in co-constructing meaning, as well as reflective notes/memoing. The reflexive journal formed the basis for Chapter 3. Examples of reflective and reflexive memoing can be seen in Appendix L, where notes show the early familiarisation with the interview accounts, through note-making, reflective observations and tentative analytic questions. This aligns with Braun and Clarke's emphasis on reflexivity as a marker of analytic rigour in RTA, where themes are understood as the product of interpretative engagement rather than discovery.

Analytic transparency was further supported through a detailed audit trail of coding and theme development decisions, not as a claim to replicability, but as a means of evidencing the iterative and interpretative pathway from data to developed themes. In reporting, quotes and descriptions was used to situate children's accounts within their broader social and educational contexts, supporting nuanced interpretation and enabling readers to assess the coherence and plausibility of analytic claims.

Together these strategies align with contemporary qualitative quality criteria that prioritise reflexivity, transparency of interpretative process, and contextual richness over positivist notions of reliability and validation (Braun & Clarke, 2020).

2.3.5 Reflexivity

Given the study's commitment to foregrounding children's voices, reflexivity was an important consideration throughout the research process. Davis (1998) argues that adults seeking to understand and represent children's perspectives must

critically reflect on their own professional, academic, and personal assumptions, recognising how these may shape both the research encounter and the interpretation of children's accounts.

The researcher’s dual role as a TEP and researcher provided important strengths in terms of rapport-building, communication, and sensitivity to children’s emotional expression. These skills supported the creation of a safe and responsive interview environment, particularly when exploring potentially sensitive experiences related to maths anxiety. However, this professional positioning also carried the potential to shape assumptions about anxiety, learning, and educational processes, which required ongoing critical reflection throughout the research process. This was explored through reflective/reflexive journalling throughout the research process.

In line with the study’s social constructionist epistemology, reflexivity was understood not as a supplementary consideration but as central to the co-construction of meaning within the research. Within this stance, both children’s accounts and the researcher’s interpretations are recognised as situated and socially produced, rather than neutral or detached representations of experience. Reflexivity therefore functioned as a means of making visible the researcher’s role in shaping interpretation, rather than attempting to remove it.

To support this process, a reflexive journal was maintained throughout data collection and analysis. This journal documented evolving thoughts, emotional responses to participants’ narratives, interpretive decisions, and emerging analytic directions and makes up the reflective chapter that accompanies this report. In particular, attention was given to how the researcher’s professional training and prior assumptions about maths anxiety may have influenced questioning, coding, and

theme development. This process aligns with Finlay's (2002) conceptualisation of reflexivity as a continuous, critical engagement with the self in the research encounter.

Within RTA (Braun and Clarke, 2022), reflexivity is understood as fundamental to theme development, with analysis recognised as an active, interpretive, and meaning-making process rather than a neutral procedure of discovery. This approach is consistent with Braun and Clarke's (2022) acknowledgement of the "messy" and non-linear nature of qualitative research, where analytic decisions are continually revisited, refined, and reinterpreted. Transparency in this process was supported through detailed documentation of methodological decisions, analytic developments, and reflective commentary, in line with quality criteria for qualitative research (Yardley, 2017).

The researcher's interpretive stance further shaped reflexive practice by foregrounding a commitment to valuing children's voices as legitimate and meaningful in their own right (Wall, 2022). The researcher's childist stance required ongoing attention to the risk that adult theoretical frameworks could overwrite children's meanings. To guard against this, the analysis was repeatedly checked against children's own words, including the phrases they used to name feelings, describe difficulty, explain mistakes, and talk about support. Children's language was used as an analytic anchor throughout coding, theme development, and theme naming, with several themes and subthemes deliberately titled using direct quotations from participants. Reflexive journalling and supervision were therefore used to check that interpretations remained grounded in children's words, actions and contexts, rather than becoming detached theoretical claims imposed by the adult researcher. Reflexivity therefore supported an ethical and epistemological

commitment to epistemic justice, ensuring that children's perspectives remained central throughout analysis.

In keeping with best practice guidance (Braun and Clarke, 2022), transparency was also achieved through clear reporting of analytic procedures, inclusion of illustrative extracts, and explicit reflection on methodological limitations and contextual influences. The accompanying reflective commentary within the thesis further extends this commitment by providing a more personal account of the researcher's engagement with the data and analytic process.

Finally, reflexivity was embedded across the wider research design, including the literature review, which was used to position the study and demonstrate its relevance; the discussion of limitations, which explicitly acknowledges the constraints of the design; and the articulation of implications for future research, which reflects an awareness of the partial and situated nature of knowledge production within a social constructionist framework. As well as in the reflective chapter that discusses decisions and reflections throughout the research process.

Overall, reflexivity in this study was not treated as a discrete stage but as an ongoing, iterative practice embedded across data collection, analysis, and interpretation, consistent with RTA and underpinned by a commitment to transparency, interpretive rigour, and social constructionist principles. This approach also aligns with the researcher's professional values and with the reflective, context-sensitive nature of EP practice, where understanding is continually shaped through interaction, interpretation, and ethical engagement with lived experience.

2.4 Limitations of the Current Study

Several limitations should be acknowledged in relation to the design, context, and methodological choices underpinning this study.

Sample Size and Ecological Context

The study involved a small sample of Year 2 children drawn from two school settings within the same LA. While this facilitated an in-depth engagement with these child participant's lived experiences, it inevitably limits the transferability of findings and generalisability. Children's accounts were shaped by the specific ecological contexts in which they were situated, including classroom cultures, teacher practices, and assessment norms. From an ecological perspective, mathematical experiences arise through interactions across multiple systems; without broader sampling across diverse socioeconomic and cultural contexts, it is not possible to determine how widely these patterns extend without further investigation.

Developmental and Linguistic Constraints

Working with 6–7-year-olds presents inherent methodological challenges. Children at this age are still developing metacognitive awareness, emotional vocabulary, and narrative organisation. Consequently, some emotional experiences may have been difficult to articulate fully, and expressions of nervousness or stress may underrepresent more complex internal states. Although the study adopted a childist design to privilege children's voices, adult–child power dynamics remain unavoidable. Children may have been influenced by perceived expectations or social desirability, and some used the interview space for relational talk, illustrating how their priorities may diverge from researcher intentions.

During data collection, the researcher noted considerable variability in the degree of support children required to engage with open-ended questions. Some

participants were able to elaborate with minimal prompting, whereas others required more frequent repetition, rephrasing, visual support, examples, or responsive follow-up prompts. The use of visual resources, emotion tools, prompt cards and flexible questioning helped to mitigate these communicative demands and was consistent with the study's childist commitment to enabling children's participation. However, these adaptations did not fully remove the constraints associated with young children's developing expressive language, metacognitive awareness, confidence, and capacity to verbalise affective experience. Even with scaffolding, several responses remained brief, partial, or highly dependent on the immediate interactional context. This represents a methodological limitation because the depth, richness, and comparability of the data may have been shaped by children's differing abilities to access and use the available scaffolds, as well as by the co-constructed nature of the interview encounter. Consequently, the findings should be understood as interpretive accounts of what children were able to communicate within a developmentally scaffolded research context, rather than as complete or exhaustive representations of their internal experiences. This issue is signposted in Section 2.2.3.3 and reflected upon further in Chapter 3.

Researcher Positionality

My dual role as researcher and TEP may have shaped the data. The authority associated with this role could have influenced how openly children discussed negative feelings about maths. Children may also have associated the researcher with school evaluation systems, potentially amplifying or minimising emotional disclosures. While a childist approach seeks to disrupt hierarchical power structures, it cannot fully remove them; the accounts presented are therefore co-constructed rather than neutral representations of children's internal experiences. To minimise

this where possible the researcher engaged in regular supervision and reflexive practice.

Cross-Sectional Design

The study captures children's experiences at a single point in time. Maths anxiety is widely considered developmental and dynamic, fluctuating in response to classroom experiences, assessment periods, and transitions across key stages. Without longitudinal follow-up, it is not possible to determine whether moderate anxiety consolidates into high anxiety, whether low anxiety remains stable, or how early attribution patterns evolve. Future studies could seek to explore this further.

Measurement and Classification of Maths Anxiety

Although participants levels of maths anxiety were considered, children's self-reported emotional experiences may not map neatly onto psychometric classifications. In early primary years, anxiety may manifest subtly, and children who report enjoyment may still experience evaluative vulnerability. This raises questions about how early maths anxiety is conceptualised and identified. It is important to note that the term "maths anxiety" was intentionally not used with children to avoid introducing suggestive or deficit-oriented language, and to prevent framing their experiences in ways that could be perceived as diagnostic. Self-report measures, whilst valuable, are subject to well-documented biases. Young children may respond in ways they believe adults expect, may struggle to differentiate between general worry and maths-specific anxiety, or may lack the metacognitive vocabulary to articulate their feelings precisely. Social desirability, acquiescence (agreement) bias, and limited emotional literacy can all influence how children score themselves on anxiety scales. As a result, self-report data may not fully capture the nuances of

children’s lived experiences, particularly in early primary years when emotional expression is still developing. This is why qualitative data was focused on.

Analytic Decisions

The decision to treat the dataset from both schools as a single entity enabled analysis of shared patterns across all interviews. However, analysing each school as a separate case study could have generated more context-specific insights into how school-level practices, policies, and cultures shaped children’s experiences. Additionally, potential variability in teacher assessment judgements may have influenced the consistency of attainment matching across participants. Nonetheless, in keeping with the study’s social constructionist stance, the research prioritised depth of engagement and contextual understanding over representativeness or generalisability.

2.5 Implications and Suggestions for Future Research

The findings of this study highlight several important directions for future research, particularly in relation to the early development of maths anxiety and the systems that shape children’s experiences of maths.

Future research should adopt longitudinal designs to explore how early emotional experiences of maths develop across Key Stage 2 and into secondary education. Tracking children over time would clarify how attributional styles evolve, whether early nervousness predicts later avoidance, and whether Year 2 represents a critical intervention window.

Examination of diverse school environments, including variation in assessment cultures, pedagogical approaches to error, socioeconomic contexts, and cultural beliefs about maths, could offer further insight. Comparative research could

help disentangle individual vulnerability from systemic influences and illuminate how different educational ecologies shape children's emotional experiences of maths.

Although maths-education research has used classroom observations to document practices such as public error correction, speed-based norms, and ability grouping (e.g., Boaler, 2002; Solomon, 2007), these studies rarely examine how such practices contribute to maths anxiety specifically. Future research could integrate naturalistic classroom observations with child interviews to deepen understanding of how error culture is enacted in practice. For example, how mistakes are responded to publicly, how speed is positioned, and how children are grouped or labelled. Combining qualitative insights with physiological or cognitive measures (e.g., working memory load under evaluative stress) would strengthen theoretical links between classroom evaluative threat and children's affective responses to maths.

Given the early emergence of ability-linked language (e.g., "clever"), further research is needed to examine the development of domain-specific self-concept in early primary years. This would build on existing research showing that competence beliefs become differentiated around ages 6-8 (Harter, 1999). Studies could explore how children explain success and failure in maths, and how these attributional narratives relate to evaluative emotions. Attributional-retraining interventions, which have been shown to reduce anxiety and improve persistence in older learners in non-maths specific contexts (Perry et al., 2005) and in maths contexts (Rattan et al., 2012), may be particularly valuable in early maths contexts. Examining whether reframing children's explanations of mathematical difficulty towards effort, strategy, and process reduces evaluative anxiety represents a promising direction for future

research. and whether reframing attributional narratives (e.g., emphasising effort, strategy, and process) reduces evaluative anxiety.

There is a need for more research continuing to centre children's interpretations of maths rather than relying solely on adult-defined constructs of anxiety. This may involve participatory methodologies, creative and visual data collection methods, and child-led definitions of what feels "safe" or "unsafe" in maths. Such approaches would illuminate how power, identity, and belonging intersect with early mathematical learning. Future studies may also consider simplified study materials, multimodal consent routes (e.g., online submission), and structured reminder systems to reduce participation barriers while maintaining ethical integrity.

Subsequent studies would benefit from extending this research with a larger, attainment-controlled sample, enabling more robust exploration of how children with differing levels of maths anxiety and confidence experience and interpret mathematical activity. A design that groups children by maths anxiety profile rather than attainment would allow researchers to examine whether and how emotional, relational, and contextual patterns vary across anxiety levels, and to identify potential early markers of vulnerability. Such work could clarify whether the evaluative sensitivity, fragile identities, and coping strategies identified in this study are characteristic of all children at this developmental stage or are more pronounced in those with elevated anxiety. A larger sample would also support comparative analysis of protective factors, such as relational safety, peer scaffolding, and access to autonomy, which may buffer against anxiety. This line of inquiry would deepen understanding of the mechanisms through which maths anxiety emerges, strengthen the evidence base for early identification, and inform targeted, developmentally sensitive interventions within EP practice.

2.6 Implications for Educational Psychology Practice

The findings of this study suggest several implications for EP practice. Whilst these implications should be considered cautiously given the small and context-specific sample, they provide insights into how EPs may contribute to understanding and responding to children's experiences of maths anxiety within primary school contexts, particularly in reframing maths anxiety as an ecological, relational, and context-dependent phenomenon rather than an individual deficit.

Across the five themes, children's accounts revealed that evaluative sensitivity, fragile mathematical identities, and situational anxiety emerge through everyday classroom practices, relational dynamics, and wider cultural narratives about ability. Research suggests that interventions need to attend to both cognitive and affective factors in understanding children's achievement, highlighting the need for support that focuses not only on mathematical skill development but also on children's feelings, confidence, and emotional experiences in maths (Ramirez et al., 2013; Sorvo et al., 2019). For EPs, this underscores the need to move beyond confidence-building interventions or isolated growth-mindset lessons and instead attend to the systems that construct children's emotional experiences of maths.

At the individual level, EPs can support early identification of evaluative sensitivity, explore attributional patterns, and strengthen maths-specific self-efficacy. Crucially, this involves assessing not only maths attainment but children's mathematical experiences, their emotional meaning-making, perceptions of error, relational safety, and situational triggers such as novelty, time pressure, or public performance. Child-led, narrative methods are essential for surfacing these experiences, aligning with childist principles and EP competencies around amplifying pupil voice. Despite their young age, participants demonstrated that they were able

to articulate their experiences of maths, including their feelings, beliefs, worries and what helps them in maths and the classroom.

EPs are therefore well placed to advocate for approaches that actively seek children's views regarding their maths (and wider school) experiences. Person-centred and child-centred approaches may support schools to move beyond assumptions about how children feel about maths and instead understand the meanings children themselves attach to success, difficulty, mistakes and support. The ‘Maths and Me’ prompt cards developed within this research (Appendix B) also have direct implications for EP practice. As a children’s voice tool, they offer a practical means of supporting young children to communicate their meanings, feelings, and experiences of maths in ways that may be more accessible than verbal questioning alone. In future practice, such cards could be refined and used within consultation, assessment, and intervention planning to explore what a child finds easy or difficult, how they respond when maths feels hard, what support they experience as helpful, and what may be underpinning apparent maths difficulty or avoidance. Their visual and colourful design may support engagement, emotional literacy, and participation, particularly for children who find it difficult to articulate abstract feelings about learning. Used alongside wider ecological assessment, the cards could help EPs move beyond attainment-focused explanations and develop more child-centred formulations of maths-related need. They therefore represent a potential applied output of this research, translating the study’s childist commitment and findings into a resource that could support pupil voice, early identification, and targeted support within EP practice. Across the themes, children described maths not simply as a curriculum subject but as an emotional and social experience connected to competence, belonging, relationships and identity. These findings

suggest that relying solely on attainment data, behavioural observations or adult reports may provide an incomplete understanding of children's experiences.

At the classroom level, EPs can help teachers examine the “error culture” of maths lessons, noticing how speed, correctness, and public comparison may inadvertently heighten anxiety. Across the themes, children's accounts frequently reflected concerns about mistakes, judgement and perceived evaluation. Participants often described emotional responses linked to getting answers wrong, comparing themselves with peers or anticipating negative consequences. These findings suggest that psychological safety may be an important consideration within maths teaching and learning. EPs may therefore have a role in supporting schools to develop emotionally attuned and psychologically safe maths classroom environments in which mistakes are positioned as expected and valuable aspects of learning rather than indicators of competence. As well as reducing time pressure, increasing access to manipulatives and visual scaffolds, and offering process-focused feedback that emphasises strategy and reasoning rather than innate ability. EPs can also help staff recognise early behavioural and physiological signs of maths anxiety, integrating emotional regulation strategies into everyday teaching rather than treating wellbeing as separate from academic learning.

The findings also align with wider EP work around resilience, self-efficacy, growth-oriented beliefs and emotionally supportive learning environments. However, the analysis suggests that promoting these approaches may be most effective when combined with attention to the wider relational and contextual factors that shape children's experiences.

EP’s can also help move beyond attainment-based identification. An important finding was that participants were working at age-expected levels in maths despite reporting high levels of maths anxiety. This highlights the possibility that emotional difficulties associated with maths may remain hidden when identification is based primarily on attainment outcomes. The findings suggest that some children may experience significant maths-related worry, fear of mistakes, social comparison and emotional distress whilst continuing to achieve within expected ranges. Consequently, EPs may support schools in recognising that attainment alone may not provide a complete picture of children's mathematical experiences. This has implications for consultation, assessment and early intervention processes. EPs may encourage schools to consider emotional wellbeing, confidence, self-efficacy and children's subjective experiences alongside measures of academic performance.

At the system level, EPs can work with senior leaders and families to challenge fixed ability narratives, grouping practices, curriculum pacing, and assessment expectations that reinforce evaluative threat. The analysis suggests that children's emotional experiences of maths cannot be fully understood as residing solely within the child. Across themes, participants frequently linked their feelings to classroom practices, peer relationships, teacher interactions, time pressure and wider beliefs about mathematical ability. These findings support ecological conceptualisations of maths anxiety discussed within the literature review (Bronfenbrenner & Morris, 2006), suggesting that children's experiences emerge through interactions between individual, relational and contextual factors. EPs can support change across micro-, meso-, exo- and macro-systems, addressing classroom norms, home–school messages, structural pressures, and cultural discourses such as “maths brains” or “cleverness.” This ecosystemic perspective

shifts the question from *“Does this child have maths anxiety?”* to *“How is maths anxiety being constructed here?”* and positions EPs as key agents in promoting relational safety, inclusive pedagogy, and emotionally attuned maths practices. This highlights the potential contribution of EPs as systemic practitioners. Rather than focusing exclusively on individual interventions, EPs may support schools in reflecting upon aspects of classroom environments that may influence children's emotional experiences of maths. This may include consultation regarding classroom cultures of mistake-making, assessment practices, opportunities for collaboration, adult responses to difficulty and the meanings attached to success within maths lessons.

A recurring finding concerned children's developing beliefs about themselves as mathematical learners. Participants frequently described themselves and others using language such as "brainy," "clever," "good at maths" or "not very good at maths." At the same time, many children demonstrated emerging growth-oriented beliefs that ability could improve through practice and support. These findings suggest that mathematical identity may already be forming during Key Stage 1. EPs may therefore be well positioned to support adults in understanding how children's self-concepts develop and how messages about ability, effort and competence are communicated within educational contexts. From this perspective, supporting maths learning may involve not only developing skills and knowledge but also supporting children to construct more adaptive and flexible understandings of themselves as learners.

Children consistently positioned teachers, peers and supportive resources as central to their experiences of maths. Learning was rarely described as an individual process; instead, participants frequently referred to adults and peers who provided

explanations, encouragement, clues and reassurance. This finding reinforces the relevance of relational approaches within EP practice. EPs may support schools to consider how relationships function as protective factors within maths learning and how collaborative approaches may facilitate both learning and emotional wellbeing. The findings also suggest potential value in considering mathematical learning through relational and sociocultural frameworks, rather than viewing difficulties solely in terms of individual cognitive processes. Something that is discussed further in the conceptual framework section below.

Collectively, the findings suggest that EPs may have an important role in helping schools understand maths anxiety as an emotional, relational and contextual experience rather than solely a problem of mathematical attainment or individual deficit. For this group of Year 2 children, experiences of maths appeared closely connected to evaluation, identity, relationships, challenge and support. Consequently, EP involvement may be particularly valuable in facilitating child-centred understanding, promoting psychologically safe learning environments, supporting positive mathematical identities and encouraging systemic responses that address both the emotional and educational dimensions of children's experiences of maths. Given the small and context-specific nature of this study, these implications should be regarded as tentative and exploratory rather than prescriptive. However, this research supports the need for early, preventative, and systemic approaches to maths anxiety. Year 2 appears to be a critical developmental window in which children’s beliefs about maths, mistakes, and themselves as learners are forming. EPs are well placed to intervene at this stage, supporting schools to design environments that reduce evaluative threat, foster agency, and promote resilience rather than performance.

Conceptual framework

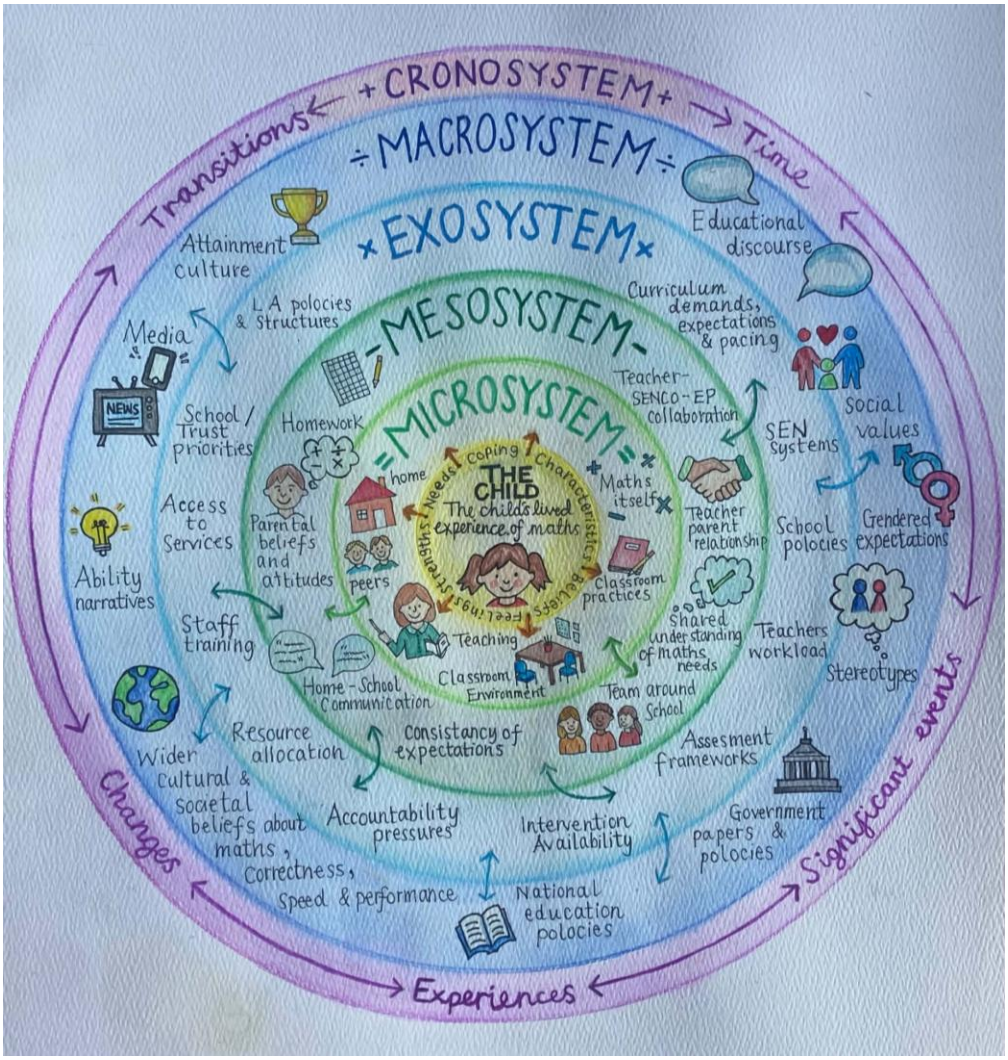
Drawing together the empirical findings and theoretical perspectives informing this study, this section proposes the MATH Bioecological Framework as a theoretically grounded and practice-oriented model for EP enquiry. The framework was developed from the five themes generated through RTA and is intended to show how early maths anxiety may be constricted through the interaction of emotional meaning, perceived task demands, developing maths identity, relational support and protective coping responses. Presented in Figure 6, the framework draws on Bronfenbrenner's bioecological systems theory (Bronfenbrenner & Morris, 2006) to conceptualise young children's maths anxiety as emerging through reciprocal interactions between the developing child and the relational, pedagogical, institutional and wider sociocultural contexts in which maths is encountered. Consistent with Bronfenbrenner's emphasis on proximal processes, development is understood as occurring through repeated and increasingly complex interactions between an active child and the people, practices, objects and systems within their environment. The framework therefore resists locating maths anxiety solely within the child, instead positioning children's mathematical experiences as dynamically shaped across nested ecological levels over time.

For clarity, the framework comprises two interrelated elements: a bioecological architecture, represented through nested ecological levels adapted from Bronfenbrenner's theory, and the MATH dimensions (Meaning, Affect, Transactions and Horizons) which provide a practice-oriented lens for EP enquiry within and across those levels. The framework conceptualises early maths anxiety as a recursive process rather than a single cause-and-effect pathway. Children's emotional responses to maths are shaped by classroom conditions and relational

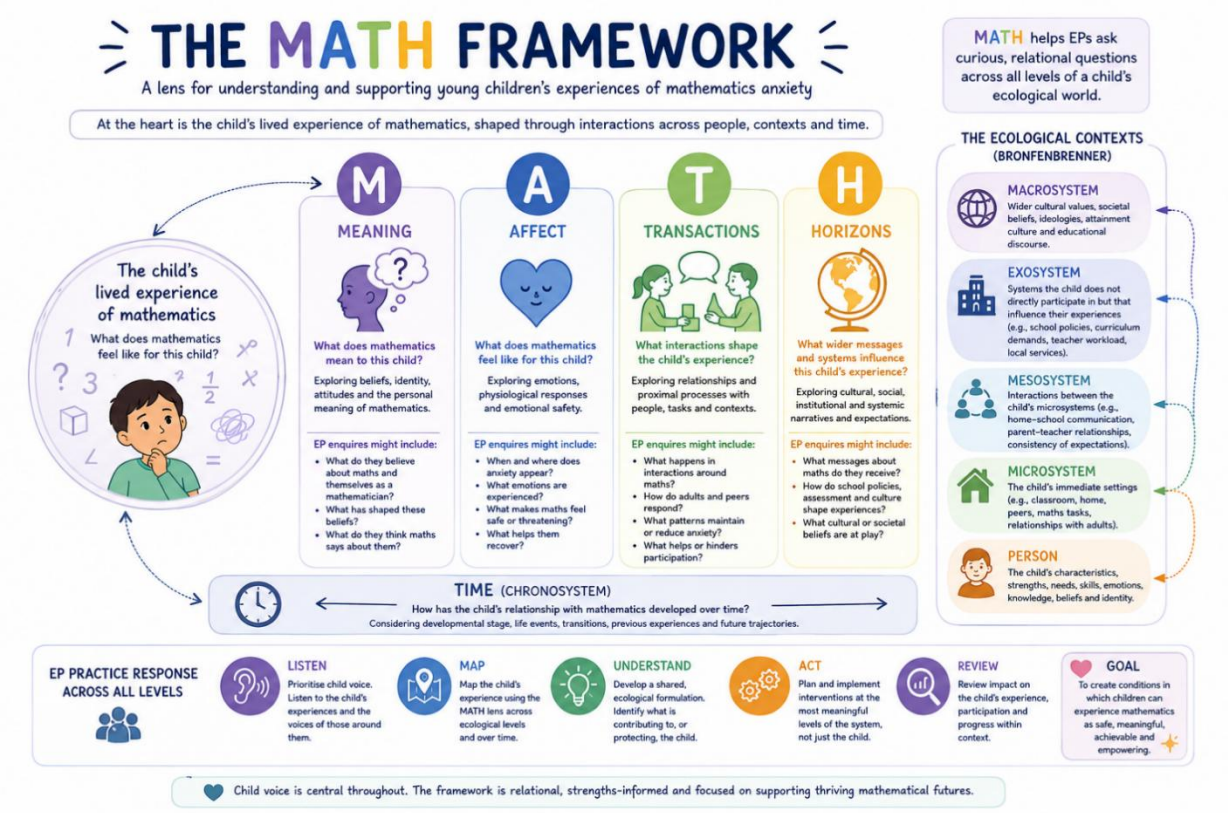
experiences, but these responses also feed back into developing self-efficacy, mathematical identity, and future engagement. In this way, early maths anxiety may become reinforced when difficulty, error, speed, or comparison are repeatedly interpreted as evidence of low competence.

Figure 6.

The MATH Bioecological Framework (Haynes, 2026): a bioecological framework for understanding and supporting maths anxiety in young children through EP practice comprising of the bioecological concentric circles and the MATH dimensions.



Author-designed diagram, illustrated by Annabelle Daintree (2026), reproduced with permission.



At the centre of the framework is the child: their developing relationship with maths, their embodied and emotional experience of mathematical activity, and the meanings they attach to success, difficulty, mistakes, support and capability. The guiding question is not simply whether the child is anxious about maths, but what maths feels like for this child within the contexts in which they encounter it. This framing deliberately resists deficit-based explanations and aligns with childist and child-centred approaches by treating the child's perspective as a legitimate and necessary source of knowledge. For EPs, this level invites direct exploration of the child's meaning-making, including when feelings of threat or safety arise, how they interpret mistakes and challenge, what helps them to feel competent, what they believe about their mathematical ability, and how they seek, accept or avoid support. It also requires attention to the child's strengths, needs and characteristics, including emotional, cognitive, motivational, developmental and identity-related factors, and to

how these interact with the surrounding environment. The focus is therefore on understanding the child as an active meaning-maker whose maths experiences are constituted through the ongoing interaction between personal characteristics, relational contexts and wider educational systems.

The overall model is referred to here as the MATH Bioecological Framework. Its bioecological architecture organises enquiry across nested ecological levels, while the MATH dimensions – Meaning, Affect, Transactions and Horizons – provide a practice-oriented lens for exploring the child's lived experience of maths within and across those levels. The framework conceptualises maths anxiety as relational, contextual and developmental, rather than as a difficulty located solely within the individual child. This distinction is important because an individualised framing may lead assessment and intervention to focus primarily on emotional regulation, cognitive functioning or mathematical attainment. Although these dimensions remain relevant, such a focus risks obscuring the relational and contextual processes through which children's experiences of maths develop. The framework therefore supports enquiry into what a child experiences, how those experiences have developed, with whom they occur, where they are situated, and how they may change over time. Its concentric structure retains Bronfenbrenner's theoretical commitments by representing nested ecological contexts, while avoiding any implication that influence operates in a simple linear direction from outer to inner levels. Rather, the levels are dynamically interconnected: children's characteristics shape the environments in which they participate, while those environments simultaneously shape children's beliefs, emotions, behaviours and emerging mathematical identities. For EPs, the framework provides a structured means of organising consultation, assessment, formulation and intervention planning across

ecological levels. It foregrounds the child's voice and meaning making, identifies risk and protective factors across systems, supports multi-level intervention and advocacy, and encourages review over time as children's needs and contexts evolve. In this sense, it shifts enquiry from "what is happening within this child?" to "what is happening across the systems around this child, and where might change be possible?"

- children's developing self-concept, attributional reasoning, and early identity formation.
- classroom structures, pedagogical practices, and performance-oriented norms
- emotional and cognitive responses to evaluation, uncertainty, and perceived threat
- wider ecological systems and cultural narratives surrounding ability, intelligence, and mathematical competence.

The MATH dimensions are:

Meaning concerns what maths represents to the child and how they make sense of themselves as a maths learner. This dimension includes the child's developing mathematical identity, beliefs about competence, attributional explanations for success and failure, perceptions of challenge, and the meanings attached to being correct or incorrect. Maths may be constructed as enjoyable, interesting and achievable, or as threatening, evaluative, difficult or indicative of personal inadequacy. EP enquiry within this dimension therefore prioritises the child's own account of their experience, including what they believe mistakes signify, how they describe themselves as a learner, whether success or failure becomes

linked to self-worth, what they believe others think about their ability, and what experiences have enabled them to experience competence.

Affect refers to the emotional, physiological and embodied dimensions of the child's experience of maths. It asks what maths feels like for this child, what emotions and bodily responses it evokes, and under what conditions it feels safe, threatening or enjoyable. This encompasses anxiety, apprehension, frustration, shame, embarrassment, excitement, enjoyment, confidence and emotional regulation. Affect is not treated as an isolated internal state; rather, emotional responses are understood in relation to the contexts and interactions in which they occur. EPs are therefore encouraged to move beyond asking whether a child is anxious and instead explore when, where, with whom and under what conditions anxious feelings emerge, how the child responds to difficulty or mistakes, what supports recovery, and whether adults may be interpreting anxiety as avoidance, low motivation or lack of effort.

Transactions represent the relational core of the framework and connect closely with Bronfenbrenner's concept of proximal processes. This dimension considers the interactions and relationships through which mathematical beliefs, emotions and identities are co-constructed over time. Children's experiences of maths develop through repeated encounters with teachers, parents, peers, mathematical tasks, classroom routines, assessment practices and evaluative language. These interactions are reciprocal: children respond to their environments, while their responses shape how others respond to them. For example, a child who becomes anxious when asked to answer publicly may avoid participation; adults may then reduce demands or provide increased prompting, which may alleviate immediate distress but inadvertently reinforce the child's belief that they cannot

manage maths independently. EP enquiry within this dimension therefore attends to interactional patterns, including how adults and peers respond to mistakes, how the child seeks or avoids help, which proximal processes appear protective, and where small changes in interaction might alter the child's developmental trajectory.

Horizons refer to the wider messages, expectations and systems that shape the child's experience of maths. This dimension includes educational discourse, cultural beliefs about mathematical ability, attainment expectations, assessment practices, gendered or ability-based stereotypes, school policies and wider societal narratives. For example, culturally familiar claims that some people are naturally "maths people" may contribute to fixed mathematical identities, while high-stakes assessment practices may intensify the emotional significance attached to performance. EP enquiry within this dimension considers what messages about maths the child encounters, how success is defined within school and home contexts, whether mistakes are positioned as part of learning or as evidence of failure, and how systemic pressures may be transmitted to the child through adults, routines and institutional practices. This enables EPs to consider how wider systems become translated into children's everyday mathematical experiences.

Taken together, the MATH dimensions provide a holistic account of children's lived experiences of maths within their bioecological contexts.

The bioecological architecture of the framework illustrates how these influences may interact through reciprocal feedback loops, including how evaluative sensitivity and avoidance can become self-reinforcing over time. Its childist orientation positions children as active meaning-makers and emphasises that maths anxiety is not merely experienced, but interpreted, negotiated and constructed within

ecological contexts. The MATH Framework does not seek to establish a new causal model of maths anxiety. Rather, it provides an EP practice framework for organising enquiry, formulation and intervention. It supports a shift from individualised questions such as “why is this child anxious about maths?” towards ecological questions such as “how has this child’s relationship with maths developed through interactions between person, process, context and time, and where might change be possible?”

EPs can use the framework to inform case formulation, guide consultation with teachers and parents, identify systemic barriers to maths participation, support early intervention where evaluative vulnerability is emerging, and challenge assumptions that children attaining at expected levels do not require emotional support.

By positioning maths anxiety as a relational and systemic phenomenon, the framework encourages EPs to adopt a holistic, ecological approach to assessment, formulation, and intervention. Rather than asking *whether* a child has maths anxiety, EPs can explore how experiences of anxiety are being constructed, maintained, or mitigated across multiple systems. This includes examining classroom cultures around mistakes, speed, and performance; parental beliefs and home–school narratives; and broader school policies related to assessment and attainment.

The framework also foregrounds children’s attributional beliefs, enabling EPs to support schools in fostering adaptive narratives around effort, strategy use, and learning from mistakes. By identifying early primary age as a developmental period in which self-concept and competence beliefs are still emerging and malleable, the model highlights the value of early, preventative intervention. EPs are therefore well positioned to advocate for emotionally safe, mastery-oriented learning environments

that promote resilience, reduce evaluative threat, and ensure children's lived experiences remain central to understanding and addressing maths anxiety.

In addition, the framework supports EPs to work across ecological levels:

- Parents and home–school partnerships: helping families reduce anxiety transmission, adopt process-focused praise, and understand that struggle is a normal part of learning.
- Policy and leadership: advocating for evidence-informed, child-centred policies that emphasise mastery, exploration, real-world application and emotional safety over speed and performance.
- Statutory and casework practice: encouraging EPs to ask about emotional experiences during assessments, amplify pupil voice, and remain curious about the meaning behind avoidance or disengagement, even when attainment appears secure.

The following sections show how the framework can support understanding of the child's lived experience, the ecological systems shaping that experience, and the EP's practice response across systems.

Within the child level, enquiry focuses on the child's developing relationship with maths, including prior mathematical experiences, knowledge and skills, self-efficacy, beliefs and attributions, emotional regulation, working memory and attentional demands, motivation, emerging mathematical identity, developmental characteristics, strengths and protective factors. This level positions the child as an active participant rather than a passive recipient of environmental influence. It also includes the coping strategies children use to manage anxiety or difficulty, including behavioural manifestations such as avoidance or task withdrawal. For EPs, the

emphasis is on understanding how the child constructs maths, what experiences have shaped their sense of competence, and how their personal characteristics interact with relational and systemic contexts.

At the microsystem level, attention turns to the child's immediate environments, including home, classroom, peer relationships and maths learning itself. This encompasses teacher-child relationships, classroom emotional climate, pedagogy, mathematical tasks, peer interactions, family experiences of maths, opportunities for success and challenge, assessment and feedback, and experiences of mistakes and correction. EP enquiry at this level examines the day-to-day conditions of maths learning, including the emotional and social climate of the classroom, the structure and difficulty of tasks, the nature of peer comparison, the availability of resources and manipulatives, and the evaluative feedback, praise or critique the child receives from adults.

At the mesosystem level, the focus is on the relationships between the child's key environments and the extent to which these systems are working together. Relevant questions include whether home and school share consistent understandings of maths, whether adults communicate effectively about the child's needs, and how parental beliefs and attitudes align or conflict with school expectations. A central EP question is whether the important adults around the child are constructing a shared understanding of the child's mathematical experience and needs. Divergent interpretations may be particularly significant: for example, avoidance may be understood by one adult as low confidence and by another as lack of effort, leading to markedly different responses.

At the exosystem level, enquiry considers policies, practices and external demands that influence the child's mathematical experiences, attitudes and access to support, despite the child not necessarily participating directly in these systems. This includes curriculum requirements, assessment systems, school priorities, staff training, resourcing and available support structures. EPs may therefore consider how institutional expectations shape classroom practice, what resources enable or constrain support, and whether wider organisational demands are contributing to the child's experience of maths.

At the macrosystem level, the framework considers the cultural and societal messages about maths that the child receives directly or indirectly. This includes stereotypes about ability, narratives of innate talent, attainment discourses, and systemic pressures such as testing and accountability. This level foregrounds the ways in which meanings of maths are produced through language, relationships and social practices, and how these meanings shape expectations for both the child and the adults around them. The arrows flow inward toward classroom culture and then toward the child visually showing that macro beliefs about ability shape classroom discourse which shape child attributions which shape anxiety.

At the chronosystem level, EPs explore how the child's relationship with maths has developed over time. This includes early experiences of number and maths, transitions into and across formal schooling, changes in teachers or classrooms, previous experiences of success and failure, assessment experiences, intervention histories, significant life or school transitions, and changes in family or school contexts. This shifts formulation from a snapshot of anxiety towards an account of a developing mathematical relationship and its possible future trajectory if current patterns continue.

Across all levels, the EP's role is to listen, map, formulate, act and review, while maintaining the child's perspective as central. Listening involves understanding maths from the child's point of view through developmentally appropriate approaches to pupil voice, such as "maths and me" cards. Mapping involves identifying relevant influences and interactions across ecological levels. Formulation brings this information together to consider the processes that may be contributing to, maintaining or protecting against the child's experience of maths anxiety. Action may occur at the level where change is most meaningful: supporting the child's self-efficacy, emotional regulation or metacognitive strategies; reducing unnecessary evaluative threat in the classroom; changing responses to mistakes; increasing opportunities for autonomy and competence; strengthening teacher awareness and responsive pedagogy; supporting positive family conversations about maths; reviewing school assessment practices; or challenging deficit narratives at a systems level. Review then considers change across outcomes such as the child's reported emotional experience, willingness to engage with challenge and shifts in the learning environment. This maintains the ecological principle that meaningful change may involve adaptation around the child as well as within the child.

The framework is grounded in the thematic findings. Theme 1 showed that children often encountered maths as emotionally and relationally risky. Theme 2 demonstrated that this risk was intensified by difficulty, time pressure and task accessibility. Theme 3 showed how these experiences became internalised into fragile mathematical identities and belief systems. Theme 4 highlighted the protective role of relational and material scaffolding. Theme 5 showed how children attempted to manage perceived threat through coping and avoidance. Taken together, these themes suggest that early maths anxiety develops through the

interaction of classroom experience, social meaning, emotional response and emerging self-concept.

Overall, the MATH Bioecological Framework positions EPs as facilitators of systemic meaning-making and change. Drawing together Bronfenbrenner's ecological architecture, the MATH dimensions and the child's lived experience, it conceptualises maths anxiety as emergent, relational and developmental. This shifts the focus from individual pathology towards the dynamic interplay of children's characteristics, everyday interactions, contextual conditions and wider meanings attached to mathematical competence. In doing so, the framework supports preventative, contextually responsive practice that strengthens emotionally safe maths cultures and promotes children's wellbeing, participation and developing mathematical identities.

2.7 Final comments.

This empirical paper has presented the rationale, methodology, analytical process, and findings of a qualitative study exploring the lived experiences of Year 2 children in relation to maths, maths anxiety, and negative emotional responses to maths. The findings suggest that children's experiences of maths are shaped by complex interactions between classroom practices, developing self-concept, attributional beliefs, and wider ecological influences. Whilst many children described positive experiences of maths, others reported feelings of worry, frustration, pressure, and self-doubt, highlighting the presence of anxiety-related experiences even at an early stage of schooling. The themes generated through the analysis demonstrate that children are active meaning-makers who interpret and respond to mathematical experiences in diverse ways, with implications for both learning and emotional wellbeing.

These findings contribute to the growing body of literature on early maths anxiety by foregrounding the voices and perspectives of young children, a population that has been comparatively underrepresented in existing research. The study also highlights the importance of considering maths anxiety as a relational and contextual phenomenon rather than solely an individual characteristic. Further research is needed to deepen understanding of how maths anxiety develops during the early primary years, how children's experiences vary across different educational contexts, and which approaches are most effective in preventing and responding to emerging anxiety. Such research has the potential to inform EP practice, classroom pedagogy, and wider educational policy, supporting the development of emotionally safe and inclusive maths learning environments in which all children can participate, develop confidence, and thrive.

Chapter 3: Reflective Chapter

This chapter presents a reflexive account of my personal and professional journey throughout the research process. Reflexivity has been central to my development as both a researcher and a TEP, shaping how I approached each stage of the study and how I made sense of the decisions taken along the way. The chapter traces how my thinking developed from an initial interest in maths anxiety towards a more nuanced understanding of children's emotional experiences of maths as socially constructed, relational and context dependent. It also considers how the process shaped my emerging professional identity, particularly my commitment to pupil voice, ethical practice, and working with uncertainty.

Holding the dual role of researcher and TEP/practitioner psychologist required careful navigation of ethical, relational, and interpretative complexities, particularly when working with young children and seeking to represent their lived experiences with sensitivity and integrity. Reflexivity supported me in remaining attuned to issues of power, influence, and positioning, prompting me to ask not only what decisions were made, but why they were made at particular moments. This reflective chapter therefore documents the uncertainties, challenges, learning, and growth that shaped my thinking and methodological choices, and illustrates how the research journey contributed to my development as an EP. Appendix L provides an example of my reflective memoing during my initial familiarisation with the interview accounts, showing how I engaged closely with individual transcripts through early note-making, reflective observations and tentative analytic questions. Rather than representing a final stage of analysis, the appendix demonstrates how I began to notice provisional ideas, emotional emphases and patterns within each individual interview, while also remaining alert to similarities, divergences and developing connections across

interviews. In this way, Appendix L evidences the early interpretative work that informed subsequent coding and theme development, while contributing to the transparency and trustworthiness of the analytic process.

Identifying a research topic

My interest in maths anxiety began during my master's studies at Derby University, where I explored teachers' maths anxiety and maths teaching anxiety. Disseminating this work through the Maths Anxiety Research Group (MARG), my Educational Psychology Service (EPS) team, a blog, and a webinar sparked rich discussions with teachers, psychologists, and individuals (adults) who had personally experienced maths anxiety or who have children who have experience maths anxiety or maths difficulties. Many described "lightbulb moments" during these conversations, recognising emotions they had never previously labelled or understood fully. These interactions deepened my curiosity and highlighted the importance of continuing to explore this area.

However, I became increasingly aware that one perspective was consistently missing: the child's. As a practitioner who places high value on pupil voice, this absence felt significant. I found myself asking how children themselves make sense of their emotional experiences in maths, and what support they feel would genuinely help them. Even though I am personally confident with maths, I have experienced my own anxieties around teaching maths, delivering interventions, and even completing a maths assessment during an interview. These experiences reminded me that ability and anxiety are not always linked, and that emotional responses to maths can be shaped by context, expectations, and interactions rather than competence alone.

A pivotal moment came when I listened to a colleague present her doctoral research during our EPS CPD Celebration Day in 2025. She introduced the concept of childism, which challenges adult-centric assumptions and foregrounds children as competent meaning makers. This resonated deeply with me. I realised that much of the existing research in maths, and indeed much of everyday practice, relies heavily on adult interpretations of children's experiences. Even within EP work, children's voices can be diluted through layers of adult filtering. Childism offered a theoretical grounding for my long-held belief that children's perspectives should be central, not peripheral, in research and practice.

My own educational experiences also shaped this interest. I am privileged to have had a very positive experience of education, and I attribute much of my love of learning to my own educational journey and to the teachers who supported me along the way. This has influenced my wish to promote a love of learning in the children and young people (CYP) I work with, to remove barriers to learning, and to contribute to making schools more accessible and emotionally safe. This applies strongly to maths. I was successful in maths at school, yet I have still experienced worries around teaching maths, delivering interventions, and being assessed in maths-related contexts. I also remember engaging with The Maths Curse by Jon Scieszka in Year 5 and 6, a book that presents maths as connected to everyday life. During this thesis journey, I bought my own copy and took it with me to school visits and training where maths was discussed. This early exposure to meaningful, engaging maths experiences contrasted with later moments of anxiety around teaching maths, reinforcing my view that emotional responses to maths are shaped by context, interaction and meaning, rather than ability alone. I also developed my understanding of how important it is that children see the purpose, the real-life

application of maths, especially as The Maths Curse documents, maths is all around us and in everyday activities. Therefore, being avoidant of maths or having overwhelming anxiety around maths can have huge daily implications.

My route into educational psychology was not linear. Something I have dubbed the “scenic route”. After completing a non-BPS accredited undergraduate degree and becoming pregnant with my eldest daughter, the conversion route was not feasible. I worked in a PR agency for thirteen years alongside completing diplomas in hypnotherapy and counselling, before returning to education as a school secretary, TA, and later HLTA. During this time, I was asked whether I wanted to deliver maths or literacy interventions. Despite being competent in maths, I chose literacy because I worried about teaching maths “wrong” and inadvertently creating anxiety for children. This mirrored concerns expressed by teacher colleagues during maths SKEWs (Subject Knowledge Enhancement and Workgroups), highlighting how adult anxieties can shape the classroom and teaching.

Another formative experience came when I began to collaborate with Dominic Petronzi on research exploring the lived experiences of GCSE aged pupils with dyscalculia. Although the project did not progress due to recruitment challenges, the early narratives had a profound impact on me. One young person described struggling to calculate change on a bus, and how the bus driver’s impatience intensified their anxiety. Eventually, they avoided using the bus altogether, which restricted their work and social opportunities. This story illustrated how maths difficulties can ripple far beyond the classroom, gradually shrinking a young person’s world. It prompted deep reflexive consideration about the real-life implications of maths anxiety and reinforced my commitment to approaching children’s experiences with sensitivity, curiosity, and respect.

These experiences also shaped my emerging identity as an EP. I love the quote where EPs are described as hope catchers - professionals who notice and hold the small but significant moments that reveal a child's strengths, needs, and potential. Hearing how a single interaction on a bus could reshape a young person's confidence highlighted the importance of catching hope early, understanding the systems around the child, and advocating for environments that reduce anxiety rather than amplify it. These insights stayed with me as I moved into my research, informing both my methodological choices and my determination to represent and amplify children's voices.

Reviewing literature and generating initial research question

With a strong foundation of interest and experience, I began reviewing the literature to identify gaps and refine my research focus. Initially, I hoped to develop and test an intervention, but this was not feasible within the constraints of the educational psychology doctorate and time limits. Instead, my literature review revealed a striking absence of qualitative research exploring children's lived experiences of maths anxiety, particularly among younger age groups. Much of the existing research relied on adult reports, such as teachers' perceptions, parents' interpretations, despite evidence that adults can inadvertently influence children's emotional responses to maths.

Research also highlighted that children under seven are often considered difficult to study, which paradoxically strengthened my resolve. As someone who enjoys working with younger children, I have always found them capable of expressing their feelings and insights when given the right space and support. This

reinforced my belief that capturing children's voices directly was both necessary and valuable.

My initial research question: "What are the lived experiences of children in Key Stage 1 with maths anxiety/negative emotional responses to maths?" evolved as I became more familiar with the data and more attuned to the implications of my wording. I refined the question to focus specifically on Year 2 children for clarity and feasibility. I also recognised that framing the question around "maths anxiety" risked imposing a deficit-oriented, adult-defined construct onto children's experiences. Instead, I wanted to foreground emotional responses more broadly, allowing themes of anxiety, enjoyment, frustration, or pride to emerge naturally. I ensured that I was careful with the language used in my interview prompts, opting to keep the wording in line with existing research (such as Petronzi et al., 2019b) and asking around worry.

This led to the working research questions being: What are the lived experiences of maths for Year 2 children? And how do children in Year 2 working at expected attainment levels experience, make sense of, and emotionally respond to maths, including early signs of maths anxiety? This wording reflected a childist and social constructionist orientation. I wanted to avoid imposing an adult-defined or pathologising label onto children's experiences, while still allowing early signs of maths anxiety to be explored where they emerged. The phrasing "experience, make sense of, and emotionally respond to" was intentionally selected to make the idea of lived experience more developmentally accessible and analytically transparent. It enabled me to focus on children's meanings, feelings and situated understandings, while maintaining coherence with my professional values around pupil voice, equity and inclusion.

In the final write up, these research questions were further fine-tuned to:

1. How do children who are working at age expected levels in maths but score highly on a maths anxiety questionnaire describe their experiences of maths?
2. What do their responses suggest may be the factors that influence their feelings towards maths?

This refinement reflected the study's developing analytic focus on children who had scored within the high or moderate range on the CMAS-UK, indicating early signs of maths anxiety. The accounts of the two children who scored within the low range were not included in the main thematic analysis, as their responses sat outside the central analytic focus of the study. Consequently, the final analysis concentrated on children showing early signs of maths anxiety (scoring high or moderate on the CMAS-UK), rather than on all children's experiences of maths. The decision to hold the low-anxiety cases separately is discussed further in the 'Data Analysis and theme development' section, under 'Reflexive consideration of low-anxiety cases'.

Ethics

Working with younger children meant that ethical considerations were central from the outset. I was aware that research with children aged six and seven is often described as challenging, but rather than deterring me, this strengthened my resolve. For me, this age group represents a rich source of insight that is frequently overlooked or underestimated. My previous professional experience working with young children helped me feel confident in creating developmentally appropriate, safe, and engaging research encounters. I approached ethics not as a procedural hurdle but as an ongoing, relational commitment. Thankfully I had some good

research support and supervision. My first supervisor, Sarah Raspin, helped lay the foundations for this approach before her maternity leave, and my second supervisor, Alistair James, supported me in navigating the practical and philosophical complexities that emerged. Ethical practice required balancing formal requirements, such as detailed consent forms, with the realities of school contexts, where parents may not read lengthy documents and staff may be stretched for time. These tensions mirrored those I encounter in EP practice, where ethical ideals must be adapted to real-world constraints without compromising children's rights or wellbeing.

A core ethical aim was to represent children's views faithfully and respectfully. I wanted to understand how they experience maths, what helps them, and what makes things harder, not filtered through adult assumptions, but in their own words. This required sensitivity to power dynamics, careful phrasing of questions, and an awareness of how easily adults can unintentionally shape children's responses. My own children often comment humorously on adults describing tasks as "fun" when they are anything but, reminding me how easily adult perspectives can overshadow children's realities. This reinforced my commitment to designing a research process that aimed to genuinely centre children's voices.

Ontology, epistemology and researcher positionality

Doctoral training required me to engage deeply with ontological and epistemological questions. As a cohort, we asked endless questions, something our lecturer Ryan Cullen patiently supported. This is because we wanted to understand not just what these concepts meant, but how they shaped our research identities. Through this process, I became increasingly aware of how my own experiences, values, and professional commitments influence the way I approach research.

My ontological and epistemological stance is grounded in social constructionism. Ontologically, I do not view maths anxiety as a fixed entity residing within the child. Epistemologically, I understand knowledge about maths anxiety as something co-constructed through interactions, language, and cultural expectations. This stance aligns closely with childism and with my practice as a TEP, where I aim to move away from deficit-based, diagnostic framings and towards contextual, relational understandings of children's experiences.

Within this study, I therefore worked from a definition of maths anxiety as a developmentally situated, socially constructed and context-dependent emotional response to maths. Rather than treating maths anxiety as a fixed trait, diagnostic category or difficulty located within the child, I conceptualised it as emerging through the interaction between children's meanings, classroom experiences, relationships, expectations, language and wider discourses around mathematical ability. In this sense, maths anxiety was understood as potentially expressed through worry, fear, frustration, sadness, avoidance, pressure, uncertainty or heightened emotional vulnerability in maths-related contexts. This definition allowed me to explore children's own accounts and meanings without assuming that adult-defined constructs fully capture how young children experience and communicate their emotional relationship with maths. This working definition was developed from the literature reviewed in Chapter 1, which suggested that maths anxiety cannot be adequately understood as a purely cognitive difficulty or as an individual characteristic residing within the child. While earlier definitions have often emphasised worry, tension, fear, panic or interference with mathematical performance, more recent literature positions maths anxiety as multidimensional, involving emotional, cognitive, behavioural and physiological elements. The literature

review also highlighted that maths anxiety may vary according to task, context, timing, classroom conditions and developmental stage. A child may therefore experience anxiety in relation to particular situations, such as timed tasks, public answers, written calculations, fear of mistakes or perceived evaluation, rather than in relation to maths as a whole. This supported my decision to define maths anxiety as situated and context-dependent rather than uniform, stable or wholly internal. The definition was also shaped by developmental literature indicating that early signs of maths anxiety may be present in children as young as four to seven, but that young children may not experience or communicate anxiety in the same way as older learners or adults. This was particularly important when working with Year 2 children, whose accounts were likely to be brief, concrete, relational and developmentally mediated. This definition is also consistent with my childist position. Much of the existing evidence base relies on adult-defined questionnaires, psychometric measures and performance data, which can identify patterns of concern but cannot fully capture how young children understand, negotiate and communicate their experiences. The literature reviewed in Chapter 1 repeatedly indicated the limited representation of young children's voices within maths anxiety research and strengthened the rationale for positioning children as active meaning-makers. Defining maths anxiety in this way was therefore methodologically and epistemologically coherent with the study's aims. It enabled me to remain open to the ways Year 2 children themselves described and made sense of maths-related emotional experiences, without imposing a fixed diagnostic or adult-defined construct onto their accounts. Overall, the working definition brought together the main conclusions of the literature review: that maths anxiety is multidimensional, developmentally situated, relationally shaped and ecologically embedded. This felt

particularly appropriate for a study concerned with young children's lived experiences, pupil voice and preventative EP practice.

Social constructionism also aligns with Reflexive Thematic Analysis (RTA), which rejects the idea that themes "exist" within data waiting to be discovered. Instead, themes are actively generated through the researcher's interpretive engagement. This requires acknowledging my subjectivity as a resource rather than a bias. In my EP practice, I am frequently told that I am a reflexive practitioner, and this research process has further strengthened that aspect of my professional identity.

My positionality as a TEP shaped the research in several ways. I brought experience of working with young children, which helped me build rapport and create a safe space for expression. I also brought awareness of how systems (schools, families, policies) shape children's experiences. At times, I noticed tensions between wanting to identify maths anxiety as something "within" the child and recognising it as something emerging through interaction. Sitting with this tension became an important reflexive practice, prompting me to remain open to multiple interpretations rather than seeking singular explanations.

Engaging reflexively with my philosophical stance helped me recognise how deeply context shapes children's emotional experiences of maths. Classroom norms, pedagogical practices, family discourses, and societal narratives about ability and success do not simply influence maths anxiety; they help constitute it. This means that children's accounts are not neutral reflections of internal states but are produced within the research encounter itself, shaped by my language, my responses, and the relational dynamics between us.

This awareness strengthened my commitment to transparency. I tried to use children's own words wherever possible and encouraged them to "tell me more" to deepen their meaning-making. I became increasingly mindful of how even small choices, such as introducing the word "maths" or asking about "worry" could shape their responses. This reflexive stance aligns with EP practice, where we are encouraged to question assumptions, sit with uncertainty, and consider how our own positioning influences the stories we co construct with children and families.

My use of quantitative measures (teacher assessment data and CMAS UK scores) also required reflexive consideration. Within a social constructionist framework, these measures are not objective indicators of an underlying truth but socially situated representations shaped by assessment practices and adult interpretations. Initially, I felt a pull to analyse these scores more deeply, but I reminded myself that they were included solely for participant selection. This helped me hold the scores cautiously, recognising their limitations and avoiding the temptation to treat them as definitive reflections of children's experiences.

Power dynamics were another important reflexive consideration. As an adult researcher and TEP, I occupy a position of authority. Despite my efforts to adopt a childist approach, I cannot fully remove these dynamics. Children may have oriented their responses towards what they believed I wanted to hear. A parent contacting me to ask whether questions would be phrased negatively reinforced the importance of careful, non-leading phrasing and of viewing the data as co-constructed rather than as direct access to children's "true" experiences.

This study is underpinned by an explicit axiological stance. Research is inherently value-laden, and my decision to adopt a childist lens reflects my ethical

and professional values as a TEP, particularly my commitment to pupil voice, equity and inclusion. Prioritising children's lived experiences challenges the adult-centric perspectives that often dominate educational research and practice and aligns with the BPS Code of Human Research Ethics (2021b) and BERA Guidelines (2024), which emphasise respect for participants and the importance of empowering children as active contributors. Childism became a powerful theoretical lens throughout this research because it articulated values I had intuitively held for many years. I have long been aware of adultism within school systems, where adult perspectives, assumptions and priorities can be privileged over children's meanings. This is something I frequently encounter in EP practice, particularly when gently challenging adult-centric assumptions in consultations and reports. Being introduced to childism gave language and theoretical grounding to this professional commitment. It strengthened my resolve to centre children's voices in this research, even when alternative suggestions involved focusing more heavily on parents' or teachers' views. It also helped me recognise how childhood has historically been constructed in ways that can limit children's agency, and how passive gatekeeping may unintentionally restrict their participation. Adopting a childist stance therefore meant actively resisting these patterns and designing a study that positioned children as competent meaning-makers whose experiences deserved to be heard directly. Although childism aligns closely with my personal and professional values and it felt conceptually intuitive, enacting it within the constraints of doctoral research was not always straightforward. I found it easier to adopt a childist stance when designing the child-friendly prompts and engaging relationally with the participants, but more challenging when navigating the university ethics, school gatekeeping and adult-defined expectations about what constitutes valid and sufficient data. These

moments highlighted the difference between valuing children's perspectives in principle and operationalising that value within adult-structured and -dominated systems. Overall, I believe I enacted childism with consistency, particularly in the relational and interpretive aspects of the research. I created space for children to express their feelings about maths in their own terms and resisted adultist tendencies to categorise, correct or sanitise their accounts. However, I also recognise that childism was constrained by institutional structures and by my own adult positionality. My success was therefore partial but meaningful: I feel I was able to foreground children's lived experiences while remaining critically aware of the limits of my agency within an adult-organised research system.

Axiology is also embedded in my methodological choices. RTA acknowledges that the researcher's values shape interpretation rather than being bracketed out. Being transparent about my values enhances the trustworthiness of the research and reflects the wider role of EPs in ensuring practice is ethically grounded, socially just, and guided by principles of respect, fairness, and collaboration.

Recruitment

Recruiting young children for research required patience, flexibility, and a realistic understanding of school systems. Although I anticipated challenges, the process highlighted how structural, systemic and relational factors shape access to children's voices. Schools are busy environments, and research participation often competes with curriculum demands, staffing pressures, and parental availability. These contextual constraints are rarely acknowledged in methodological textbooks but are central to real-world research with children. Drawing on ecological and systems theory, the delays and non-responses can be understood not as individual

reluctance, but as a function of schools operating within complex, pressured systems where research competes with multiple demands that the schools and headteachers are already facing. This mirrors EP practice, where progress is often contingent on organisational readiness and capacity rather than solely on professional intent.

I became increasingly aware of passive gatekeeping, not deliberate exclusion, but subtle, everyday barriers that limit children's participation. Consent forms not being returned, staff forgetting to pass information on, or parents feeling unsure about research involving emotions all contributed to delays. These experiences reinforced my childist stance: children's voices are often unintentionally filtered or silenced through adult processes long before a researcher meets them.

My (T)EP identity helped me navigate these challenges. I drew on my experience of building relationships with schools, communicating clearly, and adapting sensitively to context. I approached recruitment as a collaborative process, ensuring staff felt supported rather than burdened. When delays occurred, I reflected on how systems shape participation and how research design must remain flexible and responsive. Ultimately, recruitment became a reflexive exercise in understanding the realities of accessing children's lived experiences within institutional structures.

In school 1, I delivered the research presentation to both Year 2 classes after a tour of the school. One child asked a question that stayed with me: "but how is this actually going to help?" I explained that research had often asked teachers or parents about children's feelings towards maths, but that fewer studies had asked children directly. His question was an important reflexive moment because it reminded me that children are not passive participants; they are capable of questioning purpose, relevance and impact. This strengthened my commitment to

ensuring that the research did not simply extract children's views but used them to inform understanding and practice.

The SENDCo's role as a link person also highlighted the relational nature of school-based research. Their knowledge of families, communication systems and likely barriers to consent was invaluable. This mirrored consultative models of EP practice, where effective work is often mediated through trusted professionals who understand the local context. It reinforced my view that relationships are not an "add-on" to research or EP practice, but a mechanism through which ethical access, shared understanding and meaningful participation become possible.

In school 1, consent forms were distributed to the full Year 2 cohort, including children educated within Enhanced Specialist Provision and Specialist Resource Bases. Twelve consent forms were returned. Within a social constructionist framework, I came to understand this not simply as a recruitment limitation, but as part of the social processes shaping the research itself. Consent return was situated within home–school relationships, parental perceptions of research, accessibility of ethical documentation, and wider pressures on families and schools. This reminded me that the sample was not neutral or naturally occurring; it was co-constructed through institutional routines, communication systems and adult-mediated access to children's participation.

The need to recruit a second school marked an important moment of reflection in this research journey. Initially, I had felt confident that recruitment through one school would be sufficient; however, the low return of consent forms required me to reconsider this assumption. In reflecting on this, I have begun to recognise how the ethical demands of research, particularly the need to provide

comprehensive, transparent information, may have unintentionally reduced accessibility for parents and carers. While considerable thought had been given to making the children's materials developmentally appropriate and inclusive, I had not fully accounted for parents' own cognitive, time, and literacy demands, as well as other needs such as mental health and anxiety. This has highlighted a tension frequently noted in ethical research practice between procedural ethics and relational or "ethics-in-practice" considerations, prompting deeper reflexivity around inclusivity and power in research participation.

Importantly, this low return rate contrasted sharply with children's visible enthusiasm following the classroom presentation. Children expressed interest and engagement with the research focus on maths experiences. The disparity between child interest and parental consent suggests that recruitment barriers were not rooted in children's reluctance but in adult-mediated processes surrounding participation.

Reflecting on recruitment, I recognise that my initial response was to problem-solve procedurally by seeking ways to increase return rates or streamline processes. The nature of the sample that could be recruited changed the scope of the research as I originally intended to have a broader exploration of children's lived experiences across a more diverse and larger group. With fewer participants, the study naturally shifted from this breadth. This also means my claims became contextual rather than more generalisable, however this is still appropriate for RTA and childist research. Whilst a larger sample would have allowed me to compare experiences across groups e.g. high versus low maths anxiety, the reduced sample limited my ability to do this. The smaller sample limited my ability to explore variability across anxiety levels but allowed me to attend more closely to the relational and emotional

elements of the children's accounts. Over time, however, I began to see recruitment as something to be interpreted rather than simply "fixed". This shifted my thinking towards questions of accessibility, power and participation: whose needs were prioritised in the consent process, whose voices became easier or harder to hear, and how ethical safeguards might unintentionally constrain children's opportunities to contribute. This learning has clear implications for my future EP practice. It has reminded me to approach delays and non-responses with curiosity rather than frustration, and to consider the systemic pressures shaping participation before locating difficulty within individuals.

Research extension

Requesting an extension represented another emotionally complex juncture. While there was a sense of relief in having a clear plan in place and feeling able to proceed with the research in a more contained and realistic way, this was accompanied by feelings of disappointment and a sense of perceived failure. Succumbing to an extension felt, at times, like a deviation from an internalised narrative of competence and progress. However, drawing on reflective models of professional development and self-compassion frameworks, I have come to view this decision as an adaptive and values-led response rather than a deficit. Accepting the extension has allowed space to prioritise the production of research that is ethically sound, methodologically robust, and meaningful, both to participants and to my own developing professional identity. Discussing this in both university and placement supervision helped me reframe the extension as a responsive and ethical decision rather than a personal failure.

These experiences have contributed significantly to my development as both a practitioner and a researcher. Navigating uncertainty, responding flexibly to barriers, and tolerating ambiguity align closely with models of reflective practice and systemic thinking that underpin educational psychology. This process has strengthened my capacity to adapt, reinforcing the importance of reflexivity, responsiveness, and collaboration when working within complex systems. While this stage of the journey has challenged my sense of confidence, it has also deepened my understanding of research as a relational, iterative process - one that requires humility, persistence, and an openness to learning.

Confirmation of the second school at the end of January marked a significant moment for me. Again, this was a school with which I had an existing relationship, reinforcing the importance of trust, familiarity and relational continuity in both research and EP practice. The need to recruit a second school also challenged my assumptions about timescales and certainty. It required me to move away from an internal narrative of “I should have been able to do this within the original plan” towards a more realistic understanding of research as iterative, relational and shaped by systems beyond my control.

The schools were selected using a pragmatic purposive sampling approach. Both were infant schools and therefore provided access to the Year 2 cohort central to the research focus. Their willingness to participate may also reflect a degree of self-selection, particularly given their existing interest in SEND and inclusive practice. I acknowledge that this may limit transferability, as schools with fewer resources, less capacity or different relationships with maths may not have engaged in the same way. However, the decision was coherent with the purpose of the study, which

prioritised depth, contextual understanding and children's lived experiences rather than statistical representativeness.

Research design

The original design aimed to recruit a larger and more varied sample of children representing high, moderate, and low levels of maths anxiety. This would have enabled a comparative exploration of how children with different anxiety profiles describe their emotional experiences of maths, and whether distinct patterns emerged across these groups about how they made sense of their emotional experiences of maths despite all working towards expected levels according to teacher assessment data. However, recruitment constraints within schools meant that the final sample consisted almost entirely of children with high maths anxiety. This necessarily altered the design of the study: rather than conducting a cross-group comparison, the research shifted toward a more focused exploration of the experiences of the children who were available to participate. Although this limited the comparative element of the original design, it strengthened the alignment with both RTA and childist principles by allowing me to attend closely to the nuanced, emotionally rich accounts of children who were already experiencing elevated levels of maths anxiety, despite being at a working towards level of attainment. The adaptation ensured methodological integrity while remaining responsive to the realities of recruitment and the voices of the children themselves.

Participants

In designing this study, I made a deliberate decision not to collect individual demographic information such as gender or ethnicity, despite evidence that some literature explores associations between these variables and maths anxiety. This

decision was grounded in both methodological coherence and ethical proportionality. My research question centres on children's lived experiences of maths anxiety, rather than on comparative group differences or demographic patterning. Collecting such data would therefore have extended beyond what was necessary to address the stated aims of the study.

Consistent with the data minimisation principle (UK GDPR and the Data Protection Act 2018), BPS and BERA guidance (2024), and a childist ethical stance, I sought to avoid gathering personal information that was not directly required to answer my research question. Requesting demographic details may have positioned children within categorical frames that were not analytically central and risked shifting the focus towards between-group comparison rather than meaning-making and experience. Instead, contextual information was drawn from publicly available school-level data to situate findings ecologically, while recognising that this approach may obscure within-school diversity and individual socio-cultural positioning.

This decision reflects an axiological commitment to proportionality, privacy, and clarity of purpose. While demographic variables may be important in other forms of inquiry, they were not central to the explanatory aims of this study. Remaining disciplined in data collection ensured alignment between the research question, methodological choices, and ethical responsibility to minimise intrusion into children's personal information. It also linked to EP practice and guidance from the AEP and HCPC which emphasises taking the least intrusive approaches to assessment and respecting the CYP's rights to privacy and only gathering information necessary for the purpose in hand.

I recognise, however, that this decision was not straightforward. Structural categories such as gender, ethnicity and socio-economic context can shape meaning-making, and therefore their absence limits what can be claimed about how maths anxiety may be differently experienced across groups. Future research could ethically and proportionately incorporate demographic variables where they are theoretically justified. For this study, remaining disciplined in data collection helped maintain alignment between the research question, methodological choices and my ethical responsibility to minimise intrusion into children's personal information.

Data collection

The process of gathering data with the Year 2 children was one of the most personally and professionally meaningful aspects of this research. Spending extended time with the children, listening to their views and supporting them to share their experiences of maths, was both enjoyable and affirming, and frequently reminded me of my previous role as a HLTA. This prior teaching experience supported my confidence within the classroom context and enabled me to draw on established skills in managing groups, scaffolding understanding, and responding flexibly to children's needs and questions. At times during data collection, I was responsible for a group of twelve Year 2 children, including one child who accessed a nurture-based specialist in-school provision. My familiarity with classroom routines, behaviour support strategies, and inclusive practice was particularly valuable in these moments, allowing the session to remain calm, supportive, and purposeful while ensuring that all children were able to participate meaningfully.

Alongside my schools background, my role as a TEP also strongly informed my approach to data gathering. Skills routinely used in EP practice, such as

attunement to children's emotional states, sensitivity to power dynamics, and reflective awareness of how adult presence may influence children's responses, were central to how I facilitated the sessions. In line with Braun and Clarke's emphasis on "being yourself" in research encounters, I adopted an authentic and relational interactional style, drawing on my professional strengths in rapport-building. Establishing psychological safety was particularly important given the use of a self-report questionnaire with young children. I therefore repeatedly emphasised that there were no right or wrong answers, that children should respond honestly, and that different people could feel differently about maths. This was a deliberate attempt to counter classroom norms that often privilege correctness and adult approval, particularly in maths, where children may experience answers as simply right or wrong. Practical support was also needed to ensure children understood the task, such as checking that they had answered all items and selected one response per question.

Seven-year-olds may communicate their thoughts more briefly or through simple constructs, but these responses still provide insight into how they experience maths in their everyday classroom lives. To support this, the research design incorporated age-appropriate language, contextual prompts, and scaffolding that enabled children to express their ideas more comfortably. These strategies are commonly used in childhood research to ensure that methods are developmentally appropriate.

Data collection of the CMAS-UK was conducted in small groups, a decision shaped by practical and feasibility constraints within the school environment. However, this raised considerations around peer influence, particularly given children's tendency to seek reassurance from peers or mirror others' responses.

Although children were regularly reminded to use their own answers, moments of peer referencing were observed. Reflecting on this, individual administration of the questionnaire may have further reduced peer influence and supported greater independence of responses. However, such an approach would have been significantly more time-intensive and less feasible within the constraints of the school day. This tension between methodological ideal and practical reality was a recurring feature of the data-gathering process and required ongoing reflexive consideration.

Attention was also paid to the language used during CMAS-UK questionnaire administration. When reading items aloud, I substituted the terms “maths” and “number work” in place of “numeracy”, reflecting the terminology commonly used within the school. This decision was informed by my classroom experience and aimed to reduce potential confusion, ensuring that children were responding to concepts that felt familiar and meaningful within their everyday learning context, especially given that the CMAS-UK items themselves are designed specifically to reflect and ground answers in the children’s everyday school experiences such as coming into the classroom and finishing work.

To address potential variability in how children interpret emoticon-based response scales, additional steps were taken to enhance shared understanding. Before completing the questionnaire, children were asked to describe what they thought each emoticon represented. This discussion allowed children’s interpretations to be foregrounded and supported greater consistency in how the scale was understood. This strategy also aligned with a child-centred and childist approach, recognising children as meaning-makers rather than assuming adult-defined interpretations.

The semi-structured interviews were conducted individually on a separate day. To support engagement, interviews were kept relatively short and supplemented with visual and interactive prompts, including the ‘My Maths and Me’ cards, emotion fans, dice and cards to support emotional expression. These resources were available for children to use freely, allowing them to communicate in ways that felt accessible and comfortable. Some children engaged readily with the maths prompt cards, while others relied more on the emotion fan. This reinforced an important learning point for me: child-centred methods require flexibility rather than a single assumed route into expression. The prompts were therefore not simply methodological tools, but part of an ethical commitment to making participation accessible and responsive to individual children.

I remained mindful of the potential power dynamics inherent in conducting one-to-one interviews with young children in a separate room with a relatively unfamiliar adult. Although the children had encountered me on two previous occasions for similar research activities, my positioning as both a TEP and researcher may have influenced their responses, with children potentially perceiving me as an authority figure. potentially influencing children’s responses in line with social desirability or compliance (Christensen & Prout, 2002). Drawing on reflexive qualitative practice, I sought to mitigate this imbalance through adopting a warm and informal stance, using open-ended and non-leading questions, and explicitly reinforcing that there were no right or wrong answers. This was intended to create a psychologically safe space that encouraged authentic pupil voice. I also carefully considered my physical positioning and sat alongside the child on the same height chairs.

Consistent with a childist framework, I sought to privilege children's perspectives not only during data collection but also in how their views were shared afterwards. Following the debrief process, I reported back to class teachers only what individual pupils had explicitly stated they were happy for me to share. This became a significant point of tension between my researcher role and my TEP identity. It did not sit comfortably with my values to identify that a child might be experiencing anxiety or difficulty in maths and then do nothing with that information. At the same time, I needed to work within the boundaries of ethical approval and respect children's agency over their own disclosures. Negotiating this tension helped me understand ethical research as more than procedural compliance; it required careful consideration of care, consent, action and impact.

Reflecting on the children's responses, I was struck by the variability in how they were able to express and reflect on their experiences of maths. Some children offered rich and detailed accounts, while others gave brief, concrete and developmentally appropriate responses. One child frequently moved into tangential topics, requiring gentle redirection back to maths-related discussion. At times, the interview appeared to function not only as a research encounter, but also as a valued opportunity for individual adult attention. This raised a methodological and ethical tension between maintaining focus on the research question and honouring a childist commitment to listening to children as they chose to communicate. I sought to navigate this by acknowledging children's contributions respectfully while using open prompts to return to maths-related experiences, rather than imposing abrupt redirection.

From a childist perspective, I did not interpret this variability as evidence that young children are unable to contribute meaningfully to research. Rather, it

highlighted that children's meaning-making is relational, situated and developmentally mediated. Their accounts were not always linear or elaborated in adult-like ways, but they nonetheless communicated important insights into how maths was experienced emotionally, socially and pedagogically. To avoid researching young children because their accounts may be brief, fragmented or methodologically challenging risks reproducing the adult-centred assumptions that childist research seeks to challenge. Instead, the responsibility sits with the researcher to design developmentally attuned methods and to interpret children's accounts with both openness and caution.

This became an important reflexive learning point for me as a TEP. In practice, I often find that children are able to identify what helps them, what makes learning feel harder, and what they need from adults, even when this is communicated briefly, indirectly or through concrete examples. The interviews reinforced this professional understanding. Several children were able to articulate more about their experiences than some adults might initially expect, suggesting that assumptions about young children's limited reflective capacity can risk underestimating their competence. At the same time, not all children demonstrated deep or sustained reflection, and this needs to be understood in light of their developmental stage, the unfamiliarity of the research context and the relational dynamics of speaking with an adult researcher.

I interpreted the children as showing emerging metacognitive awareness that was broadly consistent with their age and developmental stage. Some children could comment on what made maths easier or harder, identify forms of support they found useful, or recognise when mistakes, uncertainty or time pressure affected how they felt. Others expressed this awareness more implicitly, through examples rather than

abstract explanation. This variation was important because it reminded me that metacognition in six- and seven-year-olds is still developing and is likely to be uneven across children, contexts and tasks. I therefore needed to be cautious not to impose adult expectations of reflection onto children's accounts, while still recognising the meaningful early self-awareness that was present.

The use of prompts and scaffolds was particularly significant in supporting access to the interview. The 'My Maths and Me' prompt cards were useful because they provided a tangible and concrete focus that children could return to when they needed additional support to think or communicate. The emotion-based resources were used less frequently, but they remained valuable for some children and helped signal that feelings and emotional experiences were legitimate topics for discussion. This was important because emotions, like many mathematical concepts, can be abstract and difficult for young children to verbalise without support. In the same way that manipulatives and concrete resources are often used in schools to support children's understanding of mathematical ideas, visual and tactile scaffolds appeared to support some children in accessing and communicating less tangible emotional experiences.

A possible criticism of a childist approach with children aged seven and below is that young children may lack the linguistic, cognitive or metacognitive capacity to provide sufficiently rich or reliable accounts of their experiences. Others might argue that their responses are too easily shaped by adult questioning, social desirability, limited attention, or the novelty of one-to-one adult interaction. My experience suggests that these criticisms are partially valid but can be overstated. Young children's accounts are undoubtedly shaped by developmental, relational and contextual factors, and researchers must be careful not to treat them as transparent

or complete reflections of inner experience. However, this is not unique to children; all qualitative accounts are co-constructed within particular contexts. The implication is not that young children should be excluded, but that methods must be developmentally attuned, ethically sensitive and reflexively interpreted. From this perspective, the limitations often attributed to young children may say as much about adult expectations and research design as they do about children's competence. If richness is defined only as extended verbal explanation, then young children's contributions may appear limited. However, if researchers attend to brief comments, embodied engagement, choice of examples, use of prompts, silences, tangents and affective cues, children can communicate meaningful and analytically valuable insights. My experience therefore supports a childist position while also requiring a cautious and reflexive one: children's voices should not be discounted because they do not conform to adult modes of expression. The key issue, therefore, is not whether young children can reflect, but whether adults are willing and able to recognise reflection when it is expressed in developmentally situated ways.

During interviews, I made brief reflective notes about early impressions, including children's fears of mistakes, links between maths and being "clever", the emotional impact of repeated curriculum content, and limited spontaneous reference to real-world applications of maths. At this stage, I treated these not as findings, but as analytic invitations that would need to be revisited carefully during familiarisation and coding. This helped me remain open to the data while also noticing the areas where my professional experiences and interests might make me particularly attentive.

I felt the interview methodology facilitated rich, child-centred insights into pupils' lived experiences of maths and maths anxiety. However, ongoing reflexivity

remained essential in recognising how my role, the research context, and methodological choices shaped both the data produced and the relational dynamics within the interviews.

Overall, the data-gathering process highlighted the relational and contextual nature of research with young children. My past teaching experience and current role as a TEP were instrumental in navigating moments of complexity, supporting inclusion, and maintaining an environment in which children felt safe to share their views. These experiences reinforced my understanding of data collection as a co-constructed process, shaped by relationships, language, context, and professional identity, rather than a neutral or purely technical exercise.

A second phase involving teacher focus groups had been included in my ethical approval in case the children's data lacked sufficient richness. In supervision, this prompted useful challenge around whether young children's shorter, scaffolded responses could be considered analytically adequate. I reflected carefully on this because I did not want to dismiss developmental differences, but I also did not want to treat children's communication as deficient simply because it did not resemble adult explanation. From a childist perspective, the aim was not to obtain adult-like accounts, but to understand how Year 2 children express meaning within their developmental context. Their responses were sometimes brief, but they were still meaningful, situated and emotionally revealing.

Although adult perspectives could have offered contextual depth, I decided not to pursue teacher focus groups as a primary means of strengthening the study. This was partly pragmatic, as schools were under considerable pressure and staff capacity was limited. More importantly, it was a theoretical and ethical decision.

Existing research on maths anxiety has often privileged adult interpretations of children's experiences, and I did not want adult accounts to become the lens through which children's voices were validated. This decision was not a rejection of teacher perspectives, which remain valuable for future research and practice, but a commitment to maintaining the conceptual focus of this study: that children's accounts are sufficient and valuable in their own right.

This reflection also strengthened my understanding of scaffolding. In this study, scaffolding was not used to shape responses but to support expression. The aim was not to eliminate developmental differences, but to design methods that allowed children to communicate within them. This has clear implications for my EP practice: children's views do not need to be polished, lengthy or adult-like to be meaningful. They need to be listened to with methods, expectations and interpretations that are developmentally attuned.

The learning I take from data collection is that eliciting young children's voices requires more than developmentally appropriate materials; it requires ongoing attention to power, pace, relationship and the meanings children attach to the research encounter. As a TEP, this reinforced my belief that children's views are most meaningful when gathered through flexible, relational and ethically attuned approaches.

Data Analysis and theme development

Working with CMAS-UK scores

A significant methodological decision within this research concerned how to interpret and use scores from the CMAS-UK, particularly in relation to whether and how children might be grouped according to levels of maths anxiety. This decision

required careful consideration, as the literature offers no agreed or validated cut-off points for interpreting CMAS-UK scores beyond broad guidance that mean item scores closer to 1 indicate little or no maths anxiety, while scores closer to 3 suggest higher levels of anxiety. Other studies have suggested grouping children relative to the distribution of scores within a given sample, for example by classifying the top 25% proportion of scores as ‘high’ anxiety, the middle range (50%) as ‘moderate’, and the lowest 25% as ‘low’. Importantly, such approaches are explicitly sample-dependent, rather than reflective of maths anxiety within the wider population or indicative of any clinical threshold.

The absence of externally validated criteria required a reflexive and ethically informed approach. From the outset, it was clear that the CMAS-UK could not be treated as a diagnostic tool. This was important both methodologically and professionally. As a TEP, my work is grounded less in diagnosis and more in formulation: understanding the interaction between individual experience, context and systems. Maths anxiety was therefore conceptualised as a continuous and contextually situated construct, rather than a categorical or fixed trait.

Initially, I considered grouping children using distribution-based categories derived from total CMAS-UK scores, following approaches that classify children into low, moderate, and high anxiety groups based on where their scores fall within the sample (for example, with the top 25% of scores representing higher anxiety, the middle 50% moderate anxiety, and the bottom 25% lower anxiety). While this approach is present in the literature and offers analytic clarity, reflecting on this decision raised concerns about how such categorisation might sit alongside a childist methodological stance. In particular, grouping children in this way risked reifying

anxiety levels as stable labels, despite being relative, sample-specific, and potentially sensitive to small variations in score.

As a result, I chose to operationalise maths anxiety primarily through mean item scores, rather than relying solely on total scores or categorical groupings. The CMAS-UK was designed for children aged 4–7 years and employs a three-point, emoticon-based response format to support young children's understanding and expression of feelings. Using mean item scores preserves this original response scale, allowing interpretation to remain closer to the child's chosen responses. This was important in ensuring that children's reported experiences were not transformed into abstract numerical totals that may obscure their meaning, particularly given the lack of validated thresholds associated with those totals. This decision aligns with a childist research framework, which foregrounds children's lived experiences and resists adult-imposed categorisation that may oversimplify or pathologise children's emotional responses. Mean item scores allow for a more nuanced reading of children's responses, recognising that emotional experiences of maths in early childhood are often fluid, situational, and relational. Rather than positioning children as having or not having maths anxiety, this approach supports an understanding of anxiety as something that may be experienced to varying degrees across contexts and moments.

Ethical considerations were central to this decision-making process. In the absence of validated clinical cut-offs, categorising young children into anxiety "groups" carried a risk of unintended pathologisation or deficit framing. Using mean item scores enabled me to describe relative patterns of affect without attaching labels that implied disorder or fixed difficulty. This aligned with the EP profession's emphasis on systemic and individualised formulation: not simply asking whether a

child is anxious or underperforming, but exploring how and why particular experiences arise, and what adults can do in response. In this sense, the analytic decision was linked to the wider “so what” of EP work: using information to create understanding and meaningful change, rather than leaving children reduced to scores.

Where grouping was required for analytic purposes, this was undertaken cautiously and reflexively, drawing on the distribution of scores within the sample and with explicit acknowledgement that such groupings were relative and context bound. However, these groupings were treated as analytic tools rather than definitive classifications and were always interpreted alongside qualitative data and contextual information.

Overall, the use of mean item scores reflects a methodological commitment to interpreting maths anxiety in ways that are developmentally meaningful, ethically cautious, and congruent with a childist emphasis on children’s voices and lived experiences. Within this study, the CMAS-UK functioned not as an authoritative measure of anxiety, but as one lens among many through which children’s experiences of maths could be explored and understood.

I explored both approaches to grouping before deciding that mean item scores offered the most coherent fit with the study’s aims. When grouping the children based on relative scores within the sample, it became clear how much the interpretation of “high,” “moderate,” and “low” anxiety depends on the group context rather than any absolute standard. Using the top 25% of scores as high anxiety and the bottom 25% as low anxiety highlighted differences between children within this cohort but also demonstrated the ethical and conceptual limitations of imposing

categorical labels on young children. For example, the presence of tied scores around the boundary between categories (mean score of 2.05 which would have appeared in both the high and moderate groups) highlighted how arbitrary and fragile distribution-based grouping could become within a small sample. In practice, the children's experiences of maths are continuous and context-dependent, and these groupings functioned more as a tool for analysis than a fixed classification. Reflecting on this, I recognised the importance of maintaining a child-centred perspective and interpreting findings with caution, emphasising relative patterns rather than pathologising individual children.

I then considered the mean item score approach. This would then be more comparable across the two schools. For the mean item score approach, the scores are interpreted directly on the 1–3 scale to reflect children's reported anxiety. Using a loose guide from the literature:

- High anxiety: ≥2.0
- Moderate anxiety: 1.5–1.99
- Low anxiety: <1.5

Using mean item scores allowed for a more developmentally meaningful interpretation of children's experiences, preserving the original 1–3 scale and remaining close to the children's own responses. This approach highlighted the gradient of anxiety across the sample without forcing arbitrary cut-offs or overemphasising relative rankings. It reinforced the importance of interpreting children's responses as individual experiences rather than as fixed labels and supported my childist approach by maintaining nuance and respecting variability. Using the mean item score approach also meant that the two tied scores were

classified the same and it was more comparable across the two settings where I was conducting my research as the interpretations of High, moderate, low would be consistent. Reflecting on this, I appreciated how this method aligns with ethical and developmental considerations, providing a clear yet flexible framework for analysing children's self-reported maths anxiety.

A later conversation with an EP colleague helped me recognise a significant shift in my thinking. Earlier in my training, I had been drawn towards quantitative data because it seemed to offer clarity, rigour and legitimacy; there was, in some ways, "safety in numbers". Teacher assessment data and standardised questionnaires can feel reassuringly concrete, particularly within educational systems that often privilege what can be counted, compared and ranked. However, through this research and through my wider development as a TEP, I have become more aware of the limitations of numerical data when the aim is to understand lived experience. Scores can indicate patterns, but they cannot show how a child makes sense of maths, how anxiety is felt in the classroom, or how particular stories about being a maths learner are formed and sustained.

This was not a rejection of quantitative data. Rather, it marked a move towards understanding quantitative measures as one layer of a larger narrative. In this study, the CMAS-UK and teacher assessment data helped situate and select participants, but they could not be allowed to dictate the conclusions. The children's accounts offered something different: insight into emotion, meaning, identity, support, classroom interaction and context. In my view, maths anxiety lives in the stories as well as the scores. This shift has strengthened the coherence of the research by aligning the methods more closely with the research question, the childist framework and my ethical commitment to amplifying children's voices.

Initial familiarisation

As I began familiarising myself with the data by reading, listening to and re-reading the transcripts, I was struck by how differently children with similar attainment, and high CMAS-UK scores constructed their experiences of maths. This raised an important question for me: what does “high maths anxiety” mean if children experience and explain maths so differently? Some children described fear of mistakes, worries about adult reactions, or frustration with repeated curriculum content. Others appeared more affected by missing play, losing autonomy, time pressure, ambiguity, or not knowing what was expected. This early familiarisation reinforced the importance of exploring lived experience at an individual level rather than assuming that similar scores reflect similar experiences. It also strengthened my understanding of maths anxiety as relational, contextual and meaning-based, rather than a fixed trait located within the child. I was also taken aback by how the children expressed their emotions/feelings around maths – the language used – the shock of how negative focused it was and how extreme in some cases. It made me feel that this is something that is having such a huge impact on our young children and spurred me on to want to support more in this area.

Familiarisation also highlighted the developmental and relational nature of interviewing young children. Some participants engaged enthusiastically but moved between topics in expansive and loosely connected ways, which made transcription and analysis more challenging. Rather than interpreting this as a lack of focus, I came to understand it as potentially developmentally congruent communication. At six or seven years old, skills such as inhibition, topic maintenance and structured narrative sequencing are still emerging. Their talk sometimes appeared associative rather than linear, and the interview space may have been experienced as a valued

opportunity for individual adult attention. This reminded me that coherence may be an adult analytic preference rather than a child's communicative priority.

This also had implications for coding. While RTA typically works with data at the level of the sentence or expressed idea, some of the children's meanings were communicated through single words, short phrases, repetitions or brief affective expressions rather than coherent sentences. I therefore sometimes needed to move to the word or phrase level when coding. I recognise this as a necessary adaptation when analysing young children's accounts, but also as one that introduced a risk of reduced clarity or over-interpretation. To manage this, I continually returned to the wider transcript context, including the question asked, the surrounding dialogue and my reflective notes, rather than treating isolated words as transparent units of meaning. This point will be addressed more fully in the empirical chapter, where I discuss the analytic implications of working with developmentally situated child data.

This created a methodological tension. My childist commitment required me to listen carefully and avoid prematurely narrowing children's contributions, yet the research question also required sufficient focus on maths and emotional experience. I therefore used gentle redirection where needed, while trying to preserve the authenticity of children's accounts. This taught me that working child-centrally does not mean abandoning structure; rather, it involves using structure responsively so that children's voices can be heard without being over-shaped by adult priorities.

Two participants were siblings, and their contrasting experiences of maths became particularly striking during familiarisation. Despite both being assessed as working at the expected level, they appeared to occupy very different positions on a spectrum of emotional response and perceived competence. One child described

maths as enjoyable and easy, reported low levels of maths anxiety, and appeared to construct mathematical ability as something relatively inherent, referring to it as being linked to their “brain”. They also commented that their sibling found maths difficult, needed teacher support and sometimes used the “easy sheet”. In contrast, the other sibling reported higher levels of maths anxiety and described maths as making them feel sad and angry, with mistakes appearing to carry greater emotional weight. This comparison prompted me to reflect on how broad and potentially misleading categories such as “working at expected level” can be, and how similar attainment data may mask very different emotional, relational and identity-based experiences of maths.

This section of the data also challenged some of my own assumptions about mathematical supports, particularly manipulatives. One child identified that practical resources could be helpful but also anticipated that a bead string might be distracting. This unsettled my existing position, as I have often drawn on guidance, including the Education Endowment Foundation (EEF), to advocate for manipulatives being used until children no longer need them, rather than withdrawn at a particular age. I still hold that principle, but this child’s account reminded me that support is not experienced uniformly. A resource intended to enable access may be experienced as distracting, infantilising, stigmatising, or mismatched to the way a child thinks and works. This led me to reflect more critically on how pedagogical tools are introduced, interpreted and made available, and on how adult assumptions about “helpful support” may not always align with children’s lived experiences. As well as the need to ensure that behaviour policies account for things such as distractibility.

This reflection connected with my wider experiences as a TEP. I thought about a previous piece of case work where a child who was independently working with

high numbers was being taught using low-level manipulatives and part-whole models that did not match their current understanding. This raised a familiar tension in education: how to provide approaches that support the majority while remaining responsive to individual needs, strengths and preferences. It also prompted me to think about the ways in which children may be expected to use one prescribed method, even when another route may be more meaningful or accessible to them. For me, this reinforced the importance of considering the whole system around the child, including pedagogy, emotional climate, identity, prior experiences, attentional needs and how support is perceived. It is not only what support is offered that matters, but how the child experiences that support. The siblings' different accounts therefore opened up wider questions about nature, nurture, classroom positioning and what it means to be "good at maths".

I made familiarisation notes and visual maps for each individual dataset, in line with Braun and Clarke's emphasis on immersive engagement with the data. This helped me attend to each child's account before moving to the dataset as a whole. During this process, I was struck by the emotional intensity of children's accounts of maths. Maths was rarely positioned as neutral; instead, it was associated with anxiety, frustration, sadness, overwhelm and pressure, alongside more conditional positive feelings when tasks were easy, complete or answered correctly. This early familiarisation shifted my thinking further away from seeing maths anxiety as solely cognitive and towards understanding children's relationships with maths as deeply affective, relational and shaped by classroom conditions. Which aligns with some of the research presented in Chapter 1, particularly the evidence that early maths anxiety may first appear through affective, physiological and confidence-based responses rather than cognitive worry alone, and that children's emotional

relationships with maths are shaped by feedback, comparison, classroom climate and wider relational ecologies.

When considered collectively, the participants appeared to illustrate a continuum of emotional safety in relation to maths. The children with low reported maths anxiety tended to describe maths as making them feel happy or neutral; mistakes were not emotionally foregrounded, and their confidence appeared relatively stable. The child with moderate reported maths anxiety offered a more mixed account, where enjoyment co-existed with nervousness, correctness was linked with being “clever”, and worry appeared to be triggered by novelty, uncertainty or perceived risk. In contrast, the majority of children, who reported higher levels of maths anxiety (n=8), appeared to describe a more fragile maths identity, characterised by anticipatory stress, concern about consequences, sadness following mistakes and heightened reliance on teacher validation. This pattern was important in my familiarisation because it suggested that early maths anxiety may not always present as a straightforward dislike of maths. Rather, even children who like maths may experience threat when uncertainty, risk or evaluation becomes salient. For me, this raised the possibility of understanding early maths anxiety as a form of evaluative vulnerability, with emotional responses becoming most intense for those reporting higher anxiety. This has important implications for early identification and intervention, as children may need support before negative emotional associations with maths become more visible or embedded in their learner identities.

One early analytic reflection was that children’s positive emotions often appeared conditional. Several described liking maths when it was “easy”, “fun”, or when they could complete the task successfully. This made me think more critically about how young children experience challenge. Rather than always functioning as

productive struggle, challenge may at times be experienced as a threat to competence, particularly when children already feel uncertain or exposed. This connected with my EP practice, where I often draw on ideas such as the Zone of Proximal Development and window of tolerance to consider how challenge can be pitched in ways that stretch rather than overwhelm.

I also noticed recurring talk about fixed and malleable ability. Some children referred to practice helping them improve, while others used language such as being “good at maths”, “brainy”, or having a “not good brain”. This made me question how far growth-oriented messages are genuinely internalised by children, and how far they are socially reproduced as phrases children have heard from adults. Familiarisation therefore prompted me to consider how classroom discourse, feedback and comparison may contribute to children’s developing maths identities.

Time pressure also emerged as an important early pattern. One child linked this to other subjects as well as maths, prompting me to consider whether the issue related not only to maths content but to speeded, performative conditions more broadly. I reflected on how timed tasks, mental maths, expectations of pace and future test conditions may inadvertently increase cognitive load and reduce children’s access to thinking. Drawing on psychological understandings of anxiety, working memory and cognitive load, alongside Chinn’s work on maths difficulties and anxiety, I began to consider whether practices intended to develop fluency may unintentionally heighten pressure and strengthen negative emotional associations with maths for some learners.

Social relationships were another important area of early reflection. Children’s accounts suggested that peers, teachers and family members all shaped how they

understood their mathematical competence. I noticed a distinction between support that enabled thinking, such as clues, scaffolding and worked examples, and support that reduced agency, such as simply being given the answer. This suggested that even young children may be developing awareness of process, independence and help-seeking. Their references to peers also indicated emerging social comparison and classroom positioning, reinforcing my understanding of maths anxiety as co-constructed through interaction, discourse and relationships rather than located solely within the individual child.

Linked to the earlier reflection on manipulatives, I also noticed a recurring tension between the supports children identified as helpful and the extent to which they felt able to access or use them. Several children referred to resources such as manipulatives, visuals or additional time, yet their accounts suggested that access was sometimes shaped by implicit classroom norms, such as being “nearly in Year 3”, or by task-based conditions, such as resources being available only for “tricky” work. This raised further questions for me about how support is framed, legitimised and experienced within the classroom. A resource may be pedagogically useful in principle, but if it is positioned as something younger children use, or as something only needed when work is difficult, it may carry meanings that influence whether children feel entitled to use it. In this sense, pedagogical decisions and age-related expectations may shape not only learning, but also children’s identities as maths learners and their perceptions of what kinds of help are acceptable.

Children’s descriptions of maths in “real life” were relatively limited and tended to be instrumental or future-education focused. Where meaningful everyday connections were made, such as measuring in gardening or thinking about force in football, they appeared tentative. This made me reflect on whether maths is often

experienced by children as something done in school for school, rather than as a lived and meaningful practice. If children do not see maths as connected to their everyday worlds, this may have implications for engagement, motivation and willingness to persist when learning feels difficult.

Reflexively, I recognise that my background as a TEP, alongside my interest in maths anxiety and my classroom experience, may sensitise me to noticing difficulty, anxiety, unmet need and systemic influences. I found myself particularly drawn to moments where classroom or teaching practices appeared to shape children's experiences, such as grouping, access to resources and time pressure. Holding this awareness was important because I needed to remain open to the full range of children's accounts, including moments of enjoyment, agency and creativity. This helped me keep children positioned as active meaning-makers rather than passive recipients of pedagogy.

Overall, early familiarisation taught me that children's lived experiences of maths were varied, affective and relational. It also helped me recognise my responsibility to move slowly from noticing patterns towards generating themes, rather than allowing my initial professional interpretations to become premature conclusions. This became an important learning point for me as a researcher: familiarisation was not simply a first step before analysis, but a reflexive space in which my assumptions, interests and developing interpretations needed to be examined.

Reflexive consideration of low-anxiety cases

During data analysis, I became aware of an important distinction within the interview sample. One child in each school reported low levels of maths anxiety and

expressed extremely positive views about maths. These two children with low reported maths anxiety both described maths in notably positive terms and made broader connections to the application of maths beyond the immediate classroom context. One child spoke about being “best in the class” and frequently referred to their “brain”, suggesting that mathematical competence was being constructed in ways that differed markedly from the accounts of children who reported higher levels of anxiety. These accounts stood apart from the majority of the data. While I initially attempted to bring the low-anxiety children’s ideas into the wider thematic structure, their experiences did not cohere with the developing themes in the same way as the accounts of the children with moderate and high reported maths anxiety. This prompted a significant analytic decision.

Following discussion in supervision, I decided not to include the two low-anxiety cases within the main thematic analysis. This was not a decision I took lightly. I was conscious of my childist commitment to valuing all children’s voices and felt some discomfort about excluding any participant’s account from the primary analysis. However, I also recognised that including these cases within themes primarily generated from children with moderate and high anxiety risked blurring the analytic focus and diluting the depth with which those lived experiences could be explored.

Methodologically, this decision reflected the need to work with a sufficiently homogeneous analytic group. Although qualitative research does not seek statistical representativeness in the same way as quantitative research, coherence within the participant group remained important for the integrity of the analysis. The central aim of this study was to explore the lived experiences of children who were showing moderate or higher levels of maths anxiety while working at expected attainment

levels. Including the two low-anxiety children within the main thematic analysis would have broadened the focus towards general experiences of maths, rather than allowing a more detailed exploration of how maths anxiety shaped children's meanings, emotions and classroom experiences. I therefore viewed their accounts as analytically important, but not central to the primary focus of this study.

This decision also highlighted important implications for future research. The two low-anxiety children were not a homogeneous group in themselves, and with only two cases it would not have been methodologically appropriate to develop a separate thematic account of low maths anxiety. However, their markedly positive views suggest that further research could usefully explore how children with low, moderate and high levels of maths anxiety experience and perceive maths differently, ideally while also considering attainment. Such research could offer greater insight into whether more confident maths learners make broader real-life connections, experience challenge differently, or construct mathematical competence in more positive and agentic ways. It would also allow closer examination of whether low reported anxiety is associated with more positive attitudes towards maths, or whether some tensions remain even for children who appear confident and engaged.

I found it striking that the low-anxiety children's accounts were so positive, particularly given that all participants were working at expected levels of attainment. This suggested to me that attainment alone could not account for children's emotional relationship with maths. At the same time, their accounts were not without complexity. For example, one child with low maths anxiety still suggested that they would make maths easier if they could change anything, indicating that challenge remained salient even within an otherwise positive account. There were also references to teacher support and helping peers, which suggested that confidence in

maths may still be relationally and socially constructed rather than simply located within the individual child. These cases therefore offered a useful counterpoint to the main analysis, reminding me that positive experiences of maths are also worthy of closer investigation.

As a researcher, this decision taught me that methodological rigour sometimes involves making difficult choices about what to include and what to hold separately. My initial instinct was to include every child's account equally within the analysis, but supervision helped me recognise that inclusion does not always mean analytic integration. In this study, respecting the low-anxiety children's voices meant acknowledging their difference and reflecting on them transparently, rather than forcing their accounts into themes where they did not fit. As a TEP, this learning also resonates with practice. Children who appear confident, successful or positive about learning may still have important things to say about challenge, support and classroom experience. This has reinforced the importance of remaining curious about all learners' perspectives, not only those whose needs are more immediately visible, and of considering how confidence, competence and anxiety are shaped through relationships, expectations and classroom systems. The one child with moderate maths anxiety held views that were more similar to the majority in the study and therefore this case was included in the final analysis. Their account may illustrate a point at which maths anxiety is beginning to emerge, particularly as social awareness, peer comparison and perceptions of competence become more salient. This highlighted for me the importance of early identification and intervention, before negative emotional associations with maths become more embedded in children's learner identities.

Coding and theme development

I made a conscious effort to keep returning to the interviews and to the children's own language. This was a deliberate childist strategy to reduce the risk of adult interpretations becoming dominant too early. At times, I noticed myself gravitating towards explanations that aligned with my professional experiences or beliefs about maths learning. When this happened, I paused and asked whose voice was being centred: mine or the child's. I also revisited coded excerpts within the wider context of each full interview, recognising that meaning was relational and situated rather than contained in isolated sentences. This contextual checking helped me avoid overinterpreting brief comments or attributing meanings that were not supported by the broader account.

RTA required active, interpretative engagement, and I found that my own values and experiences surfaced at various points in the coding process. I noticed moments where I was drawn towards interpretations that aligned with my professional experiences as a TEP, my reading of the literature, or my personal beliefs about maths learning. When this happened, I paused and asked myself whose voice was being centred and whether I was privileging an adult interpretation over the child's account. This became a deliberate reflexive strategy and also reminded me how easily adult assumptions can shape professional practice if they are not kept in view.

The process of grouping codes and developing themes was slow and iterative. It involved moving back and forth between data, codes and early theme drafts, continually refining and questioning my interpretations. Although software may have supported organisation, I chose to work physically with paper, pen and highlighters because it helped me feel closer to the data and more attuned to the

texture of the children's accounts. At times, I felt a tension between wanting to produce clear, coherent themes and wanting to honour the complexity and individuality of each child's experience. This tension was productive, prompting deeper reflexivity and encouraging me to hold multiple possibilities in mind before settling on thematic structures that felt both rigorous and respectful.

Throughout the analysis, I remained mindful that themes in RTA are not found but actively created through the researcher's engagement with the data. Acknowledging my role in shaping the themes helped me to be transparent about the interpretative nature of the process. Rather than trying to separate out my subjectivity, I worked reflexively with it, questioning how my professional identity, personal experiences with maths, and commitment to child voice influenced the decisions I made. This reflexive stance strengthened the analysis, ensuring that the final themes were not only analytically robust but also aligned with the values of childism, social constructionism, and ethical EP practice.

Ultimately, my aim in developing themes was not simply to organise the data, but to create an analytic story that genuinely encapsulated the children's experiences. I wanted the themes to retain the emotional texture of the interviews: the contradictions, small moments of pride, uncertainty, worry and resistance that children shared with me. Throughout the process, I held in mind the responsibility that comes with representing children's voices, particularly in a field where adult interpretations can easily dominate. This strengthened my commitment to developing themes that would not only be analytically coherent but would also invite adults to listen more carefully to what children communicate about their learning worlds.

There were points where I felt frustrated by the time the analysis was taking, particularly because I had already taken an extension. However, I also felt a responsibility to do justice to the children's contributions. They had shared their thoughts openly with me, and I experienced this as a privilege. At times, I had to sit with the discomfort of not yet being finished rather than rushing towards closure. As I worked, I kept returning to the idea of EPs as hope catchers: professionals who listen carefully for the small sparks of possibility, resilience and insight that children offer, often quietly and in passing. My hope is that these themes will not only contribute academically, but will also encourage adults to pause, reflect and genuinely hear what children are communicating about their learning worlds.

The key learning I take from coding is that rigour in reflexive qualitative analysis does not come from removing myself from the process, but from making my interpretative role visible, questioned and accountable. As a TEP, this has strengthened my confidence in using curiosity, uncertainty and formulation as professional tools rather than seeking premature certainty.

Dissemination

Following successful submission of the thesis, I will produce a one-page summary of the research findings to share with the school and the participants' parents who indicated via their consent form that they wished to be informed of the results of the study. Further support has been offered to the schools if maths anxiety-related difficulties were highlighted. I believe that the themes identified during the data analysis can give us good insight on how to best support CYP going forward, therefore I aim to integrate this into my day-to-day working as an EP as well as disseminate to my EPS so to help my educational psychology and specialist teacher

colleagues when supporting schools. This is likely to be in form of a presentation during a CPD day. I will also consider sharing this research more widely, perhaps through journal publication. My hopes are that the research will benefit CYP. We as EPs have the privilege to hear CYP's voices, and it is our job to amplify them and ensure that they are not lost.

As I have kept in contact with colleagues at Derby University, Maths Anxiety Research Group there is scope for further dissemination and future collaboration in research. This is something I feel very positive and hopeful about. I have already been approached about a potential project that will use my research findings from this project to inform a research-informed storybook style intervention. So already there is practical use for my findings that will hopefully benefit CYP.

I am already disseminating my research in my service through our maths development group. In terms of this it has been focused on practical implications for our work, particularly around supporting emotional experiences in maths. This has been integrated into a training package as well as tools to give schools. Highlighting the child's voice has been useful in getting teachers to recognise the impact and has brought the experiences to life. This has helped adults to put themselves in the child's shoes to really think about how it feels for the child in the classroom and what can be done to support. I have also trialled the use of my "maths and me" cards (Appendix B) by sharing with a couple of EP and Specialist Learning Support Teacher Colleagues, so that I can get first-hand feedback on their usefulness. So far, the feedback has been positive, and I will look to widen the use of these among other team members. In my service I have also been positioned as someone for colleagues to come to when it comes to supporting CYP and schools with maths.

This has enabled me to have opportunities to engage in maths discussions across the LA and begin to network with others with shared interests.

I have also developed a conceptual framework that I feel will be useful in supporting EPs and other colleagues in education to see how the different levels of Bronfenbrenner's bioecological systems (Bronfenbrenner & Morris, 2006) can impact children's experiences of maths, which hopefully will support early identification of needs and factors, as well as informing support. This framework can help explore contributing factors and guide questioning to unpick feelings towards maths and understand maths difficulties in better detail.

Personal and professional development

During the doctorate and the research journey, things have not always been straightforward in my personal life. My family, friends, and EPS colleagues have been a significant source of support, and this has deepened my awareness of my own resilience. The process has therefore been one of self-discovery as well as professional development. It has reminded me that relationships matter profoundly, both for adults and for CYP. In EP practice, we often think carefully about the trusted adults around a child and the importance of connection; this research journey has made that learning personally meaningful for me. It has also strengthened my understanding of wellbeing as an ethical and professional responsibility, in line with HCPC standards, and reinforced the value of supervision as a space for both professional reflection and personal containment.

Professionally I have really grown in confidence and ability developing a deeper trust in my judgement and a stronger sense of myself as an emerging EP, becoming more grounded in my identity as a reflective, child-centred researcher and

practitioner. I have solidified how I want to continue to hold children's voices at the centre of my work and translate their experiences into meaningful insights for practice. How I wish to stay hopeful that things can be better – that we can make a positive difference to CYP and how they view and experience learning, but also that there is hope that we can shift some of the negative discourse around maths in a way that can make a true difference in how it is viewed and experienced. I feel that through this research journey and the doctorate as a whole I have discovered my strength, learnt to navigate uncertainty and sit in silence and discomfort at times.

The shift from privileging quantitative certainty towards valuing qualitative complexity has also contributed significantly to my professional growth. It has encouraged me to hold hypotheses lightly, use data to guide rather than close down inquiry, and remain curious when accounts are partial, ambiguous or conflicting. This aligns closely with my developing identity as an EP, where formulation, meaning-making and systemic thinking are often more useful than categorisation alone. I feel more confident now in challenging within-child narratives and in supporting schools to think beyond assessment scores towards context, experience and action.

Conclusion

The last three years have shaped both the EP I am becoming and the researcher I want to continue to be. The doctorate has strengthened my ability to think systemically, drawing on frameworks such as Bronfenbrenner's bioecological systems theory (Bronfenbrenner & Morris, 2006) and the Interactive Factors Framework to understand the interaction between children, adults, environments and wider contexts. In relation to this research, it has moved my thinking away from asking whether maths anxiety sits "within" the child, towards asking what it is about

maths, teaching, relationships, classroom practices and wider cultural narratives that shapes how children experience maths. This feels especially important given the centrality of maths in everyday life and the potential for negative discourses to be passed across generations.

This research has taught me that children's accounts may be brief, partial and developmentally situated, but they are no less valuable for that. It has also taught me to tolerate uncertainty more fully: to resist rushing towards neat categories, to sit with complexity, and to trust that stories can be rigorous as well as human. Although numbers can offer a form of certainty, there must also be space for individual experiences, contextual meaning and children's right to be heard. This is the learning I will carry forward into my EP practice: to keep amplifying children's voices, to use research as a form of ethical action, and to remain hopeful that educational systems can change when adults listen carefully enough.

Appendices

Appendix A: Example interview question prompts

1. What do you think of when you hear the word “maths”? What is maths used for in real life? What is maths? What is not maths? (prompts of pictures of maths activities may be used here)

2. Can you tell me about a time when you really enjoyed doing maths?

3. What does a maths lesson at school feel like for you? (e.g., fun, boring, tricky)

Exploring Feelings Around Maths

4. How do you feel when you’re doing maths in class?

o (Use emotion cards or emoji faces to support expression)

5. Have you ever felt worried or nervous about maths? What happened?

6. If maths was a character, what kind of character would it be? Why?

Attributions and Beliefs

7. Why do you think some people find maths tricky or scary?

8. What do you think makes someone “good” at maths?

9. Can people get better at maths? How do they do that?

Support and Strategies

10. Who helps you when maths is hard? What do they do that helps?

11. If your friend was feeling worried about maths, what would you say to them?

Hopes and Wishes

12. If you could change one thing about how you do maths at school, what would it be?

13. What would make maths more fun or easier for you?

Appendix B: Maths and Me Prompt Cards

FEELINGS

I FEEL HAPPY WHEN I DO MATHS



FEELINGS

I FEEL ANNOYED WHEN I DO MATHS



FEELINGS

I FEEL SAD WHEN I DO MATHS



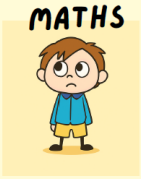
FEELINGS

I FEEL CONFUSED WHEN I DO MATHS



FEELINGS

I FEEL WORRIED WHEN I DO MATHS



FEELINGS

I FEEL HURT WHEN I DO MATHS



FEELINGS

I FEEL CROSS WHEN I DO MATHS



FEELINGS

I FEEL CALM WHEN I DO MATHS



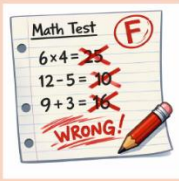
FEELINGS

I FEEL CALM WHEN I UNDERSTAND WHAT TO DO



FEELINGS

I GET CROSS WHEN I CAN'T GET IT RIGHT



FEELINGS

MY TUMMY FEELS FUNNY BEFORE MATHS



FEELINGS

I FEEL OKAY IF I MAKE MISTAKES



FEELINGS

I GET STUCK DOING MATHS



FEELINGS

I FEEL LIKE MY BRAIN IS TOO FULL IN MATHS



FEELINGS

I FEEL SCARED TO GET THE ANSWER WRONG



FEELINGS

I FEEL PROUD WHEN I FINISH A MATHS TASK



FEELINGS

I FEEL FOCUSED WHEN I DO MATHS



FEELINGS

I FEEL TERRIFIED WHEN I DO MATHS



FEELINGS

I FEEL SICK WHEN I DO MATHS



FEELINGS

I FEEL SILLY WHEN I DO MATHS



FEELINGS

I FEEL FRUSTRATED WHEN I DO MATHS



FEELINGS

I FEEL TIRED WHEN I DO MATHS



FEELINGS

I FEEL MAD/ANGRY WHEN I DO MATHS



FEELINGS

I FEEL EXCITED WHEN I DO MATHS



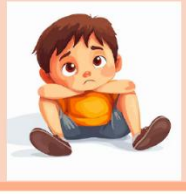
FEELINGS

I TRY MY BEST



FEELINGS

I GIVE UP WHEN IT FEELS HARD



FEELINGS

I AVOID DOING MATHS



FEELINGS

I AM GOOD AT MATHS



FEELINGS

I LEARN FROM MY MISTAKES



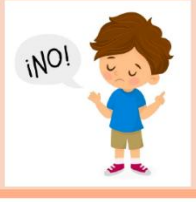
FEELINGS

IF I GET STUCK I DON'T ASK FOR HELP



FEELINGS

I DON'T TRY IF I MIGHT GET IT WRONG



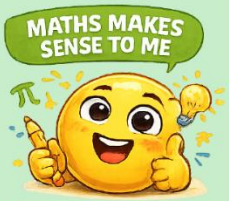
FEELINGS

I KEEP GOING EVEN WHEN I MAKE MISTAKES



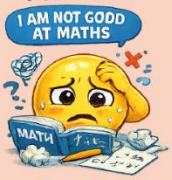
FEELINGS

MATHS MAKES SENSE TO ME



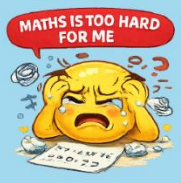
FEELINGS

I AM NOT GOOD AT MATHS



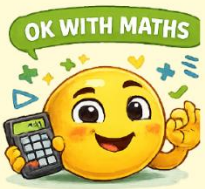
FEELINGS

MATHS IS TOO HARD FOR ME



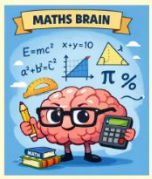
FEELINGS

I AM OK AT MATHS



FEELINGS

I HAVE A MATHS BRAIN



FEELINGS

I CAN DO IT IF I HAVE HELP



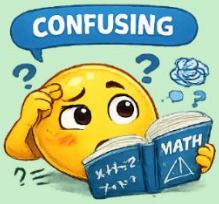
FEELINGS

I DON'T HAVE A MATHS BRAIN



FEELINGS

MATHS IS CONFUSING



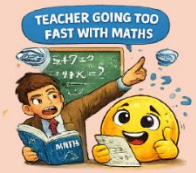
FEELINGS

ADULTS HELP ME WHEN I AM STUCK



FEELINGS

MY TEACHER GOES TOO FAST



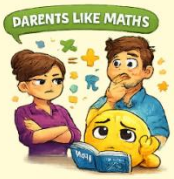
FEELINGS

MY TEACHER DOESN'T LIKE MATHS



FEELINGS

MY PARENTS LIKE MATHS



FEELINGS

MY PARENTS DON'T LIKE MATHS



FEELINGS

I DON'T LIKE PUTTING MY HAND UP IN MATHS



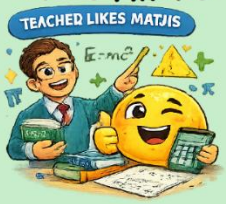
FEELINGS

I GET WORRIED IF THE TEACHER ASKS ME A QUESTION



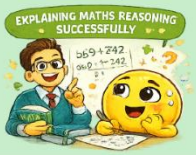
FEELINGS

MY TEACHER LIKES MATHS



FEELINGS

I CAN EXPLAIN HOW I WORKED IT OUT



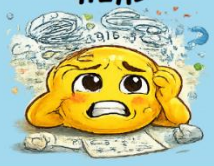
FEELINGS

I FIND IT HARD TO REMEMBER NUMBER FACTS



FEELINGS

I FIND IT HARD TO KEEP MATHS IN MY HEAD



FEELINGS

I CAN DO IT IF I SEE AN EXAMPLE IN FRONT OF ME



FEELINGS

I FORGET WHAT TO DO SOMETIMES



FEELINGS

I GET UPSET IF I GET IT WRONG OR MAKE A MISTAKE



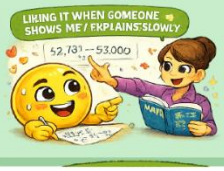
FEELINGS

I GET MIXED UP WITH BIG NUMBERS



FEELINGS

I LIKE IT WHEN SOMEONE SHOWS ME SLOWLY



HOW I LIKE TO LEARN

I LIKE USING BLOCKS OR COUNTERS



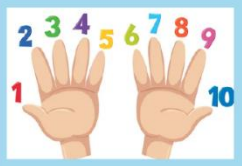
HOW I LIKE TO LEARN

I LIKE DRAWING PICTURES OR NUMBER LINES



HOW I LIKE TO LEARN

I LIKE USING MY FINGERS TO HELP ME



HOW I LIKE TO LEARN

I LIKE PLAYING MATHS GAMES



HOW I LIKE TO LEARN

I LIKE WORKING WITH A PARTNER



HOW I LIKE TO LEARN

I LIKE USING AN IPAD OR COMPUTER FOR MATHS



HOW I LIKE TO LEARN

I LIKE MATHS WHEN IT LINKS TO REAL LIFE



HOW I LIKE TO LEARN

I LIKE LEARNING MATHS SONGS



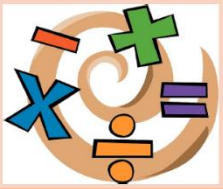
HOW I LIKE TO LEARN

I LIKE HAVING TIME TO WORK OUT THE ANSWER



HOW I LIKE TO LEARN

I LIKE DOING MATHS QUICKLY



HOW I LIKE TO LEARN

I LIKE DOING MATHS IN MY HEAD



HOW I LIKE TO LEARN

I LIKE DOING MATHS ON PAPER



HOW I LIKE TO LEARN

I LIKE WORD PROBLEMS



HOW I LIKE TO LEARN

I LIKE TIMES TABLE PRACTICE



HOW I LIKE TO LEARN

I LIKE DOING DIFFERENT SORTS OF MATHS



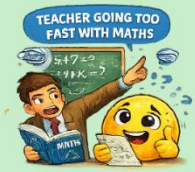
HOW I LIKE TO LEARN

I LIKE A MATHS CHALLENGE



WHAT MAKES MATHS HARD

WHEN THE TEACHER GOES FAST



WHAT MAKES MATHS HARD

PEOPLE WATCHING ME



WHAT MAKES MATHS HARD

WHEN I FORGET WHAT THE QUESTION MEANS



WHAT MAKES MATHS HARD

WHEN THERE ARE LOTS OF NUMBERS



WHAT MAKES MATHS HARD

WHEN THERE ARE LOTS OF WORDS



WHAT MAKES MATHS HARD

WHEN YOU HAVE TO DO MATHS FAST



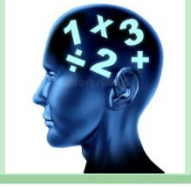
WHAT MAKES MATHS HARD

WHEN YOU HAVE TO WRITE IT DOWN



WHAT MAKES MATHS HARD

WHEN YOU HAVE TO DO IT IN YOUR HEAD



WHAT MAKES MATHS HARD

WHEN I WORK ON MY OWN



WHAT MAKES MATHS HARD

WHEN I WORK IN A GROUP



WHAT MAKES MATHS HARD

WHEN I WORK WITH A PARTNER



WHAT MAKES MATHS HARD

WHEN I HAVE TO SPEAK INFRONT OF THE CLASS



WHAT MAKES MATHS HARD

WHEN I GET IT WRONG OR GET STUCK



WHAT MAKES MATHS HARD

WHEN IT IS TOO HARD SO I STOP TRYING



WHAT MAKES MATHS HARD

WHEN THERE IS TOO MUCH TO REMEMBER



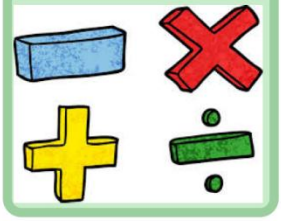
WHAT MAKES MATHS HARD

WHEN I DON'T HAVE ADULT HELP



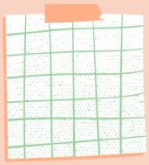
WHAT MAKES MATHS HARD

WHEN THERE ARE SYMBOLS



WHAT MAKES MATHS HARD

WHEN WE DO DIFFERENT METHODS



WHAT MAKES MATHS HARD

WHEN I HAVE TO COPY FROM THE BOARD



WHAT MAKES MATHS HARD

WHEN I HAVE TO ESTIMATE/ GUESS



WHAT MAKES MATHS HARD

WHEN IT IS A CHALLENGE



WHAT MAKES MATHS HARD

WHEN THERE ARE MULTIPLE STEPS



WHAT MAKES MATHS HARD

WHEN WE LEARN SOMETHING NEW



WHAT MAKES MATHS HARD

WHEN I RUN OUT OF TIME



WHAT HELPS ME

I LIKE IT WHEN ADULTS CHECK I UNDERSTAND



WHAT HELPS ME

I LIKE HAVING EXTRA TIME



WHAT HELPS ME

I LIKE IT WHEN MATHS IS FUN



WHAT HELPS ME

I LIKE IT WHEN SOMEONE HELPS ME START



WHAT HELPS ME

I LIKE IT WHEN PEOPLE SAY WELL DONE



WHAT HELPS ME

I LIKE IT WHEN IT IS QUIET



WHAT HELPS ME

I LIKE USING PICTURES



WHAT HELPS ME

I LIKE USING COUNTERS AND OBJECTS



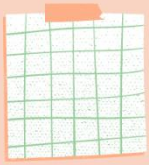
WHAT HELPS ME

I LIKE USING A CALCULATOR



WHAT HELPS ME

I LIKE WRITING MY WORKING OUT



WHAT HELPS ME

I LIKE PRACTICING



WHAT HELPS ME

I LIKE REPEATING THINGS



WHAT HELPS ME

I LIKE DOING EXAMPLES AS A CLASS



WHAT HELPS ME

I LIKE HAVING ADULT HELP



WHAT HELPS ME

I LIKE IT WHEN WE CAN TALK



WHAT HELPS ME

I LIKE WORKING ON MY OWN



FEELINGS

I AM BETTER AT MATHS THAN SOME OF MY FRIENDS



FEELINGS

OTHER CHILDREN ARE BETTER AT MATHS THAN ME



FEELINGS

I LIKE WORKING WITH MY FRIENDS



FEELINGS

I LIKE HELPING OTHERS IN MATHS



FEELINGS

I FIND MATHS EASY



FEELINGS

I AM GETTING BETTER AT MATHS



FEELINGS

I FIND MATHS HARD



FEELINGS

I AM PROUD OF MY MATHS ABILITY



IS THIS MATHS

DOING NUMBER SUMS ON A WORKSHEET



IS THIS MATHS

COUNTING



IS THIS MATHS

MEASURING HOW TALL YOU ARE



IS THIS MATHS

WEIGHING INGREDIENTS WHEN BAKING



IS THIS MATHS

USING MONEY TO BUY SOMETHING IN A SHOP



IS THIS MATHS

SHARING SWEETS EQUALLY BETWEEN FRIENDS



IS THIS MATHS

LOOKING AT SHAPES AND NAMING THEM



IS THIS MATHS

TELLING THE TIME ON A CLOCK



IS THIS MATHS

READING NUMBERS ON A BUS OR HOUSE DOORS



IS THIS MATHS

SORTING TOYS BY COLOUR OR SIZE



IS THIS MATHS

PLAYING A BOARD GAME AND COUNTING SPACES



IS THIS MATHS

MAKING PATTERNS WITH BLOCKS

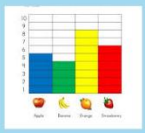


IS THIS MATHS

FILLING CUPS WITH WATER TO SEE WHICH HOLDS MORE

IS THIS MATHS

LOOKING AT A GRAPH OR CHART (E.G. FAVOURITE FRUIT IN THE CLASS)



IS THIS MATHS

GUESSING WHICH JAR HAS MORE SWEETS BEFORE COUNTING



IS THIS MATHS

FOLLOWING A RECIPE AND USING NUMBER



IS THIS MATHS

YES THIS IS MATHS

WHY IS IT MATHS?



IS THIS MATHS

NO THIS IS NOT MATHS

WHY IS IT NOT MATHS?



IS THIS MATHS

NOT SURE IF THIS IS MATHS OR NOT



SOMETIMES LIKE ME

NOT LIKE ME

LIKE ME

Appendix C: Ethical Approval

Outlook

Decision - Ethics ETH2425-2560 : Ms Kyli Haynes

From no-reply@ethicsreview.uea.ac.uk <no-reply@ethicsreview.uea.ac.uk>
Date Mon 27/10/2025 13:33
To Kyli Haynes (EDU - Postgraduate Researcher) <Kyli.L.Haynes@uea.ac.uk>

University of East Anglia

Study title: Understanding Young Childrenâ€™s Lived Experiences of Mathematics and Maths Anxiety

Application ID: ETH2425-2560

Dear Kyli,

Your application was considered on 27th October 2025 by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee).

The decision is: **approved**.

You are therefore able to start your project subject to any other necessary approvals being given.

This approval will expire on **31st August 2026**.

Please note that your project is granted ethics approval only for the length of time identified above. Any extension to a project must obtain ethics approval by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) before continuing.

It is a requirement of this ethics approval that you should report any adverse events which occur during your project to the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) as soon as possible. An adverse event is one which was not anticipated in the research design, and which could potentially cause risk or harm to the participants or the researcher, or which reveals potential risks in the treatment under evaluation. For research involving animals, it may be the unintended death of an animal after trapping or carrying out a procedure.

Any amendments to your submitted project in terms of design, sample, data collection, focus etc. should be notified to the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) in advance to ensure ethical compliance. If the amendments are substantial a new application may be required.

Appendix D: Headteacher (Gatekeeper) Information and Consent

Doctorate in Educational Psychology (EdPsyD) Post Graduate Programme

School of Education and Lifelong Learning (EDU)

University of East Anglia

Norwich Research Park

Norwich NR4 7TJ

United Kingdom

Email: Kyli.L.Haynes@uea.ac.uk

Web: www.uea.ac.uk

Study Title: **Understanding Young Children's Lived Experiences of Mathematics and Maths Anxiety**

HEADTEACHER INFORMATION STATEMENT

(1) What is this study about?

As part of my doctoral thesis research, I am exploring the views and lived experiences of young children in relation to mathematics and maths anxiety. Following a review of the existing literature, I identified a gap in research involving the voices of children under the age of 7. As such, I am hoping to work with Year 2 pupils to gain insight into their experiences and emotional responses related to maths.

I am currently looking to recruit two schools who would be willing to support this research by allowing me to work with one of their Year 2 classes during the Autumn term.

Please be assured that:

• All data collected will be anonymised.

• Any potentially identifying information will be carefully reviewed and mitigated.

• Participation is entirely voluntary and schools are under no obligation to take part.

• Any existing relationship between your school and myself will in no way be affected by your decision to participate or not.

If you are happy for your school to take part, please reply to this email confirming your consent, or alternatively use the link or QR code below to complete a brief online consent form. As recruitment will take place on a first-come, first-served basis, early responses are encouraged.

If you agree to take part, I will follow up with further details and arrange a time to provide an overview of the project, either in person or virtually, depending on what suits your school best. Consenting to this research taking place also includes consenting to the researcher accessing maths attainment data from the Year 2 class teacher for the children for whom parental and child consent is obtained. This data just needs to be as simple as working towards, below, at, above age-expected levels.

I have attached an information sheet and consent form for your reference. Please note that these documents are for your use only at this stage and should not be shared more widely until further steps have been agreed.

Should you have any questions or wish to discuss any aspect of the project, please don't hesitate to get in touch.

Thank you for considering this opportunity to support research that seeks to centre and value young children's voices in education.

Participation in this research study is voluntary. By giving consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree for your child to take part in the research study as outlined below.
- ✓ Agree to the use of your child's personal information as described.
- ✓ You have received a copy of this Participant Information Statement to keep.

(2) Who is running the study?

The study is being carried out by the following researcher(s): Kyli Haynes (Trainee Educational Psychologist).

This study will take place under the supervision of Dr Alistair James, Academic and Professional Tutor on the Doctorate in Educational Psychology (EdPsyD) (Alistair.James@uea.ac.uk).

(3) What will the study involve for my school/staff?

This study is being carried out by a Trainee Educational Psychologist (TEP) as part of their doctoral research. The aim is to better understand children's experiences of

maths and, in particular, any feelings of anxiety or discomfort. The focus is on amplifying pupil voice and gaining insight into how children make sense of their experiences with maths, to help inform how we support learning in this area.

The research will entail all the children in the class (for whom I have parental and child opt in via the consent form) completing a maths anxiety screener questionnaire, that should take no longer than half an hour. This asks how they feel in common maths-related situations (e.g., “If I make a mistake in maths, I feel...”), using simple emoji faces to express their feelings. This is not a test or diagnosis, but a way of understanding how maths is experienced in the classroom.

The class teacher will be asked to provide attainment data for each pupil in terms of working towards, below or above age-expectations. This information, alongside the questionnaire results, will be used to select small groups of children to take part in interviews.

Following this, interviews will be created with some of the children in the class to discuss views and feelings around maths. Each interview will last approximately 15-20 minutes. I would be looking to interview 15 children across two schools. These interviews will be made up of children of the same ability but with different levels of maths anxiety (low anxious, moderately anxious, high anxious). These interviews will be held in school, in a familiar environment, and will last no longer than 15-20 minutes. Children will be supported with prompts (such as emotion fans) and will be free to leave at any point. Interviews will be audio recorded to help with analysis, and no visual recordings will be made. Not all children will be required to attend an interview.

The data from the maths anxiety questionnaire and the teacher ratings will also be used to provide insight into how ability and maths anxiety relate. Data from the maths anxiety questionnaire will not be directly shared with school for anonymity reasons, but with consent the researcher will flag to school children who may need extra support around their feelings around maths (note: this is not a diagnostic questionnaire and information is gathered at a snapshot in time). Any follow up monitoring with regards to this is the responsibility of the school and parents will be made aware that they will not be given the results of the questionnaire, but the information given to inform in school support. Children will be asked at the end of the interview how they wish school/home to be notified of their worries and they will be supported in asking for this help.

Participation is voluntary. Parents will be asked to opt in via a consent form. This also includes a section for the child to sign once the parent has discussed the research

with them. I have also produced a child-friendly presentation that I can share in class so that the children are aware of what the research is about.

(4) How much time will the study take?

The completion of the questionnaire will take a child approximately 30 minutes maximum to complete. The interview will take no longer than 15-20 minutes each.

The researcher is also proposing a second phase of research where teachers from different schools will be asked to join focus groups to discuss children's views around maths. Further information can be provided following this initial phase.

(5) Are there any benefits associated with my school taking part in the study?

There will be benefits to the school as if there is an area of need identified around maths anxiety, then support/training can be provided via the school's usual processes for accessing Educational Psychology support from the Local Authority. Parents will be informed that the questionnaire is a screener and not a diagnostic tool and that they will not directly receive results of this. Overviews of the findings can be provided to school to support staff's understanding of how pupils feel about maths, and to inform classroom-based strategies. If the results highlight that some children are showing signs of higher maths anxiety, schools can use this information to monitor and explore whether further support is needed. In these cases, discussions may be held with parents via the school's usual communication channels.

Taking part in this study gives the children the valuable opportunity to talk about and reflect on their own feelings about maths with a researcher who is a Trainee Educational Psychologist. These conversations can help children feel heard and understood in relation to their learning experiences.

Participation will also contribute directly to important research aimed at understanding how maths anxiety presents in Year 2 children. The study will explore key factors influencing these feelings and support the development of effective strategies to help children who may feel anxious or worried about maths. The researcher is also proposing a second phase of research where teachers from different schools will be asked to join focus groups to discuss children's views around maths. Further information can be provided following this initial phase.

(6) What will happen to information provided by and data collected during the study?

Children's personal data and information will only be used as outlined in this Participant Information Statement, unless you consent otherwise. Data management will follow the Data Protection Act 2018 (DPA 2018) and UK General Data Protection

Regulation (UK GDPR), and the University of East Anglia's Research Data Management Policy.

Once the data from teacher assessments and the questionnaires have been matched and interview participants identified, the data will be anonymised.

Information will be stored securely, and children's identities will be kept strictly confidential, except as required by law. Study findings will be used for the purposes of my doctoral thesis and may also be used for other scholarly and educational purposes such as research publications and in teaching, but your school and the children will not be identifiable. The data will be kept for at least 10 years beyond the last date the data were used.

(7) What if we would like further information about the study?

When you have read this information, the researcher (see below) will be available to discuss it with you further and answer any questions you may have about the study.

(8) Will we be told the results of the study?

I can feedback to school the overall results of this study. Parents have an option on the consent form as to whether they wish to receive feedback. This feedback will be in the form of a one-page summary and will be available following thesis submission, marking, and approval. This is likely to be by September 2026.

If a child is flagged as being maths anxious, they will be encouraged to seek help and support from parents and school staff.

(9) What if I have a complaint or any concerns about the study?

If there is a problem, please let me know. You can contact the University of East Anglia at

the following addresses:

Researcher

Ms Kyli Haynes

School of Education and Lifelong Learning

University of East Anglia

Norwich

NR4 7TJ

Kyli.L.Haynes@uea.ac.uk

Research Supervisor

Dr Alistair James

Academic and Professional Tutor

Doctorate in Educational Psychology (EdPsyD)

School of Education and Lifelong Learning

University of East Anglia

Norwich

NR4 7TJ

Alistair.James@uea.ac.uk

If you are concerned about the way this study is being conducted, or you wish to make a

complaint to someone independent from the study, please contact the Head of School of

Social Work, Sociology and Education:

Head of School of Social Work, Sociology and Education

Professor Christine Cocker

School of Social Work, Sociology and Education

University of East Anglia

Norwich

NR4 7TJ

Christine.cocker@uea.ac.uk

(10) How do we know that this study has been approved to take place?

To protect your safety, rights, wellbeing and dignity, all research in the University of East Anglia is reviewed by a Research Ethics Body. This research was approved by EDU SREC

(School of Education and Lifelong Learning Research Ethics Subcommittee).

As Headteacher you would be acting as the gatekeeper for the setting.

(11) What is the general data protection information I need to be informed about?

According to data protection legislation, we are required to inform you that the legal basis for processing your data as listed in Article 6(1) of the UK GDPR is because this allows us to process personal data when it is necessary to perform our public tasks as a university.

In addition to the specific information provided above about why children's personal data is required and how it will be used, there is also some general information which needs to be provided for you:

- The data controller is the University of East Anglia.
- For further information, you can contact the University's Data Protection Officer at dataprotection@uea.ac.uk
- You can also find out more about your data protection rights at the Information Commissioner's Office (ICO).
- If you are unhappy with how your personal data has been used, please contact the University's Data Protection Officer at dataprotection@uea.ac.uk in the first instance.

(12) OK, I am happy for my school to take part – what do I do next?

If you are happy for your school to take part, please can you complete and return the attached consent form to Kyli via email at Kyli.L.Haynes@uea.ac.uk. Please keep the letter, information sheet and a second copy of the consent form for your information.

As recruitment will take place on a first-come, first-served basis, early responses are encouraged.

Please mention the research to your Year 2 Teacher so they are aware that I will be coming into school to work with them.

If you agree to take part, I will follow up with further details and arrange a time to provide an overview of the project, either in person or virtually, depending on what suits your school best. Consenting to this research taking place also includes consenting to the researcher accessing maths attainment data from the Year 2 class

teacher for the children for whom parental and child consent is obtained. This data just needs to be as simple as working towards, below, at, above age-expected levels.

(16) Further information

This information was last updated on 28th September 2025.

If there are changes to the information provided, you will be notified by the researcher on the email address above.

This information sheet is for you to keep.

HEADTEACHER/GATEKEEPER CONSENT FORM (First Copy to Researcher)

I, ...[PRINT HEADTEACHER'S NAME], consent to my school …… [PRINT SCHOOL NAME] participating in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what it entails for the children, teachers and my school, and any risks/benefits involved.
- I have read the Information Sheet and have been able to discuss my school's involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and no child has to take part. The decision whether a child takes part in the study or not will not affect any relationships with the researchers or anyone else at the University of East Anglia or Norfolk County Council now or in the future.
- I understand that the results of this study will be used in the way described in the information sheet.
- I understand that information about my school and children that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to.
- I agree to sending parents the participant information and consent form and acting as a gatekeeper in the research process.
- I consent to the Year 2 teacher providing basic maths attainment data for the children for whom parental and child consent is obtained.
- I agree to the researcher coming in to school to present the research, conduct the questionnaire and conduct interviews.
- I agree to school following up any concerns and needs raised in line with the schools usually procedures for liaising with parents and accessing external support (e.g. training, etc.)

I consent to:

Sending information to parents YES ☐ NO ☐

Acting as gatekeeper for the research YES ☐ NO ☐

My school and staff taking part in the research YES ☐ NO ☐

Year 2 teachers providing basic maths attainment data YES ☐ NO ☐

The researcher having access to school to conduct the research YES ☐ NO ☐

.....

Headteacher Signature

....

PRINT name

.....

Date

HEADTEACHER/GATEKEEPER CONSENT FORM (Second Copy to be kept by school/Headteacher)

I, ...[PRINT HEADTEACHER'S NAME], consent to my school …… [PRINT SCHOOL NAME] participating in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what it entails for the children, teachers and my school, and any risks/benefits involved.
- I have read the Information Sheet and have been able to discuss my school's involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and no child has to take part. The decision whether a child takes part in the study or not will not affect any relationships with the researchers or anyone else at the University of East Anglia or Norfolk County Council now or in the future.
- I understand that the results of this study will be used in the way described in the information sheet.
- I understand that information about my school and children that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to.
- I agree to sending parents the participant information and consent form and acting as a gatekeeper in the research process.
- I consent to the Year 2 teacher providing basic maths attainment data for the children for whom parental and child consent is obtained.
- I agree to the researcher coming in to school to present the research, conduct the questionnaire and conduct interviews.
- I agree to school following up any concerns and needs raised in line with the schools usually procedures for liaising with parents and accessing external support (e.g. training, etc.)

I consent to:

Sending information to parents YES ☐ NO ☐

Acting as gatekeeper for the research YES ☐ NO ☐

My school and staff taking part in the research YES ☐ NO ☐

Year 2 teachers providing basic maths attainment data YES ☐ NO ☐

The researcher having access to school to conduct the research YES ☐ NO ☐

.....

Headteacher Signature

....

PRINT name

.....

Date

Appendix E: Parent and Child Information and Consent

Kyli Haynes

Trainee Educational Psychologist (TEP)

Doctorate in Educational Psychology (EdPsyD) Post Graduate Programme

School of Education and Lifelong Learning (EDU)

24.07.2025

Understanding Young Children's Lived Experiences of Mathematics and Maths Anxiety

PARENTAL/GUARDIAN INFORMATION STATEMENT

(5) What is this study about?

Your child is invited to take part in a research study about their feelings around maths and potential sources of anxiety. Your child has been invited to participate in this study because their school have agreed for their Year Two class to be a part of this project. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to let your child take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary. By giving consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree for your child to take part in the research study as outlined below.
- ✓ Agree to the use of your child's personal information as described.
- ✓ You have received a copy of this Participant Information Statement to keep.

(6) Who is running the study?

The study is being carried out by the following researcher(s): Kyli Haynes (Trainee Educational Psychologist).

This study will take place under the supervision of Dr Alistair James, Academic and Professional Tutor on the Doctorate in Educational Psychology (EdPsyD) (Alistair.James@uea.ac.uk).

The Headteacher of your child's school has given permission for this study to take place in the school, acting as the gatekeeper for the setting.

(7) What will the study involve for my child?

Your child is invited to take part in a research study exploring how Year 2 children feel about maths. This study is being carried out by a Trainee Educational Psychologist (TEP) as part of their doctoral research. The aim is to better understand children's experiences of maths and, in particular, any feelings of anxiety or discomfort. The focus is on amplifying pupil voice and gaining insight into how children make sense of their experiences with maths, to help inform how we support learning in this area.

During the normal school day, your child will be invited to complete a short questionnaire. This asks how they feel in common maths-related situations (e.g., "If I make a mistake in maths, I feel..."), using simple emoji faces to express their feelings. This is not a test or diagnosis, but a way of understanding how maths is experienced in the classroom.

Teachers will also provide an overview of how each child is currently performing in maths (e.g., working at, above or below expected levels). This information, alongside the questionnaire results, will be used to select small groups of children to take part in interviews.

These interviews will be held in school, in a familiar environment, and will last no longer than 15-20 minutes. Children will be supported with prompts (such as emotion fans) and will be free to leave at any point. Interviews will be audio recorded to help with analysis, and no visual recordings will be made. Not all children will be required to attend an interview. There will not be an opportunity for parents/guardians to review questionnaires or interview transcripts for accuracy prior to publication. This is because children's answers will be kept anonymous and looked at together (at group level) to explore and understand overall patterns, rather than focusing on individual responses. Sharing transcripts for checking could affect confidentiality and the fairness of the research, as well as introducing bias and delaying the research process.

Participation is voluntary. If you would like your child to take part, please sign and return the attached consent form via email or to the school office. Please can you also discuss this with your child and get them to also sign the consent form.

(8) How much of my child's time will the study take?

The completion of the questionnaire will take a child approximately 30 minutes maximum to complete.

The interview will take no longer than 15-20 minutes.

(9) Does my child have to be in the study? Can my child withdraw from the study once they have started?

Being in this study is completely voluntary and your child does not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of East Anglia or Norfolk County Council.

If you decide to let your child take part in the study and then change your mind later (or they no longer wish to take part), they are free to withdraw from the study at any time and, you can withdraw your consent up to the point that the data is fully anonymised. If your child takes part in an interview, they are free to stop participating at any stage or to refuse to answer any of the questions. Children will be made aware of where they can leave and go to and which adult will be available to support them. You can withdraw consent by emailing the researcher at Kyli.L.Haynes@uea.ac.uk .

(6) What are the consequences if my child withdraws from the study?

Your child's questionnaire responses can be withdrawn after submission and will not be included in any publications, up to the point they have been anonymised.

If your child takes part in an interview, they are free to stop participating at any stage or to refuse to answer any of the questions. Unless you say that you want us to keep them, any recordings will be erased and the information your child has provided will not be included in the study results. Your child may also refuse to answer any questions that you do not wish to answer during the interview. If you decide at a later time to withdraw your child from the study your information will be removed from our records and will not be included in any results, up to the point they are anonymised.

(7) Are there any risks or costs associated with my child being in the study?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study for your child.

However, discussing children's emotional wellbeing associated with maths could be considered a sensitive topic. If you feel that discussing these topics has caused your child distress in any way, please contact the researcher for a supportive discussion and seek the support from school and professional organisations, such as:

- Just One Norfolk https://www.justonenorfolk.nhs.uk/
- JustOneNumber Call: 0300 300 0123

More details can be found here: https://www.ormiston.org/wp-content/uploads/2024/08/Norfolk-Waveney-CYP-MH-support.pdf

Please note, that the researcher and the University of East Anglia are not responsible for the

support that these external services provide.

(8) Are there any benefits associated with my child being in the study?

Taking part in this study gives your child the valuable opportunity to talk about and reflect on their own feelings about maths with the researcher. The researcher is a Trainee Educational Psychologist (TEP) who is trained to support children and young people in talking about their learning experiences and feelings, even though they are acting as a researcher in this study. These conversations can help children feel heard and understood in relation to their learning experiences. As talking about feelings can cause worry and upset, these conversations will be handled sensitively.

Your child's participation will also contribute directly to important research aimed at understanding how maths anxiety presents in Year 2 children. The study will explore key factors influencing these feelings and support the development of effective strategies to help children who may feel anxious or worried about maths.

The overall findings will be shared with school staff in a way that helps them better understand how pupils in general feel about maths, which may inform future classroom approaches. Individual responses on the maths anxiety questionnaire will not be shared with school, however if suggested elevated levels of maths anxiety are identified in the questionnaire or interview processes your child will be supported to seek further support by telling trusted adults, with support from the researcher if they wish. If a generally need for supporting maths anxiety is identified in the class, this will be shared with the class teacher for monitoring and support purposes. Information will be shared sensitively and without disclosing individual questionnaire answers. Please note: the results from the maths anxiety questionnaire will not be shared directly with parents, as they are not diagnostic and are only meaningful when considered alongside information held by the school. The information obtained only reflects a snapshot in time and may not reflect fully the child. Beyond the study, if there are any ongoing concerns, they will be addressed through the school's usual communication channels (e.g., during parent-teacher meetings) and intervention processes.

The processes on how children flagged as potentially maths anxious will be supported, will be discussed and agreed in advance with the school and class teacher. This includes ensuring that any child identified as needing additional support in this area will be monitored by staff and, where appropriate, classroom-based strategies for support will be put in place.

If maths anxiety appears to be a broader issue within a class or year group, the researcher can offer staff advice about accessing staff training and/or whole-class support strategies in collaboration and consultation with the school.

(9) What will happen to information provided by my child and data collected during the study?

Your child's personal data and information will only be used as outlined in this Participant Information Statement, unless you consent otherwise. Data management will follow the Data Protection Act 2018 (DPA 2018) and UK General Data Protection Regulation (UK GDPR), and the University of East Anglia's Research Data Management Policy.

Once the data from teacher assessments and the questionnaires have been matched and interview participants identified, the data will be anonymised.

Your child's information will be stored securely and their identity will be kept strictly confidential, except as required by law. Study findings will be used for the purposes of my doctoral thesis and may also be used for other scholarly and educational purposes such as research publications and in teaching, but your child will not be identified if you and your child decide to participate in this study. The data will be kept for at least 10 years beyond the last date the data were used.

(10) What if we would like further information about the study?

When you have read this information, the researcher will be available to discuss it with you further and answer any questions you may have about the study.

(11) Will my child be told the results of the study?

You and your child have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box on the Consent Form. This feedback will be in the form of a one-page summary and will

be available following thesis submission, marking, and approval. This is likely to be by September 2026.

(12) What if I have a complaint or any concerns about the study?

If there is a problem, please let me know. You can contact the University of East Anglia at

the following addresses:

Researcher

Ms Kyli Haynes

School of Education and Lifelong Learning

University of East Anglia

Norwich

NR4 7TJ

Kyli.L.Haynes@uea.ac.uk

Research Supervisor

Dr Alistair James

Academic and Professional Tutor

Doctorate in Educational Psychology (EdPsyD)

School of Education and Lifelong Learning

University of East Anglia

Norwich

NR4 7TJ

Alistair.James@uea.ac.uk

If you are concerned about the way this study is being conducted or you wish to make a

complaint to someone independent from the study, please contact the Head of School of

Social Work, Sociology and Education:

Head of School of Social Work, Sociology and Education

Professor Christine Cocker

School of Social Work, Sociology and Education

University of East Anglia

Norwich

NR4 7TJ

Christine.cocker@uea.ac.uk

(13) How do we know that this study has been approved to take place?

To protect your safety, rights, wellbeing and dignity, all research in the University of East Anglia is reviewed by a Research Ethics Body. This research was approved by EDU SREC

(School of Education and Lifelong Learning Research Ethics Subcommittee).

The Headteacher for your child's school has also reviewed the research and has given permission for this study to take place in the school, acting as the gatekeeper for the setting.

(14) What is the general data protection information my child needs to be informed about?

According to data protection legislation, we are required to inform you that the legal basis for processing your data as listed in Article 6(1) of the UK GDPR is because this allows us to process personal data when it is necessary to perform our public tasks as a University.

In addition to the specific information provided above about why your child's personal data is required and how it will be used, there is also some general information which needs to be provided for you:

- The data controller is the University of East Anglia.
- For further information, you can contact the University's Data Protection Officer at dataprotection@uea.ac.uk
- You can also find out more about your child's data protection rights at the Information Commissioner's Office (ICO).
- If you are unhappy with how your child's personal data has been used, please contact the University's Data Protection Officer at dataprotection@uea.ac.uk in the first instance.

(15) OK, I am happy for my child to take part – what do I do next?

If you are happy to take part, please can you complete and return the attached consent form

to Kyli via email at Kyli.L.Haynes@uea.ac.uk . Please keep the letter, information sheet and a second copy of the consent form for your information. If you are unable to submit the consent form via email, please complete a hard copy and return to the school for my attention. Please put it in a sealed envelope for maintaining your anonymity and confidentiality.

Please mention the research to your child so they are aware that I will be coming into school to work with them. I also require your child to sign the attached consent form so that they given permission to take part.

(16) Further information

This information was last updated on 27th September 2025.

If there are changes to the information provided, you will be notified by the researcher on the email address above.

This information sheet is for you to keep

PARENTAL/GUARDIAN CONSENT FORM (First Copy to Researcher)

I, ...[PRINT PARENT'S/GUARDIAN'S NAME], consent to my child …… [PRINT CHILD'S NAME] participating in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what my child will be asked to do, and any risks/benefits involved.
- I have read the Parental/Guardian Information Sheet and have been able to discuss my child's involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and my child does not have to take part. My decision whether to let them take part in the study will not affect our relationship with the researchers or anyone else at the University of East Anglia or Norfolk County Council now or in the future.
- I understand that my child can withdraw from the study at any time.
- I understand that my child is completing a non-anonymous questionnaire they can withdraw from the study at any time, up until the questionnaire is anonymised.
- I understand that my child may stop the interview at any time if they do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study results. I also understand that my child may refuse to answer any questions they don't wish to answer.
- I understand that the results of this study will be used in the way described in the information sheet.
- I understand that personal information about my child that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about my child will only be told to others with my permission, except as required by law.

I consent to:

My child's brief maths assessment data being shared with the researcher (working below, at or exceeding age-related levels) YES ☐ NO ☐

My child completing a questionnaire YES ☐ NO ☐

Audio-recording of my child YES ☐ NO ☐

My child being involved in an interview YES ☐ NO ☐

Would you like to receive feedback about the overall results of this study?

YES ☐ NO ☐

If you answered **YES**, please indicate your preferred form of feedback and address:

☐ Postal: _____

_____

☐ Email: _____

I have discussed this research with my child and they are happy to take part ☐ (please tick)

.....

Parental Signature

....

PRINT name

.....

Date

Child consent

I know what this project is about because my parent or trusted adult has talked to me about it. I understand that if I take part, I am helping with the project.

☐ Yes, I want to take part
☐ No, I don’t want to take part

I can write my name here to show I choose/agree to take part/help (it doesn’t have to be a special signature):

.....

Child Signature/name

.....

Date

PARENTAL/GUARDIAN CONSENT FORM (Second Copy to Parent/Guardian)

I, ...[PRINT PARENT'S/GUARDIAN'S NAME], consent to my child …… [PRINT CHILD'S NAME] participating in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what my child will be asked to do, and any risks/benefits involved.
- I have read the Parental/Guardian Information Sheet and have been able to discuss my child's involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and my child does not have to take part. My decision whether to let them take part in the study will not affect our relationship with the researchers or anyone else at the University of East Anglia or Norfolk County Council now or in the future.
- I understand that my child can withdraw from the study at any time.
- I understand that my child is completing a non-anonymous questionnaire they can withdraw from the study at any time, up until the questionnaire is anonymised.
- I understand that my child may stop the interview at any time if they do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study results. I also understand that my child may refuse to answer any questions they don't wish to answer.
- I understand that the results of this study will be used in the way described in the information sheet.
- I understand that personal information about my child that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about my child will only be told to others with my permission, except as required by law.

I consent to:

My child's brief maths assessment data being shared with the researcher (working below, at or exceeding age-related levels) YES ☐ NO ☐

My child completing a questionnaire YES ☐ NO ☐

Audio-recording of my child YES ☐ NO ☐

My child being involved in an interview YES ☐ NO ☐

Would you like to receive feedback about the overall results of this study?

YES ☐ NO ☐

If you answered **YES**, please indicate your preferred form of feedback and address:

☐ Postal: _____

_____

☐ Email: _____

I have discussed this research with my child and they are happy to take part ☐ (please tick)

.....

Parental Signature

....

PRINT name

.....

Date

Child consent

I know what this project is about because my parent or trusted adult has talked to me about it. I understand that if I take part, I am helping with the project.

☐ Yes, I want to take part
☐ No, I don't want to take part

I can write my name here to show I choose/agree to take part/help (it doesn't have to be a special signature):

.....

Child Signature/name

.....

Date

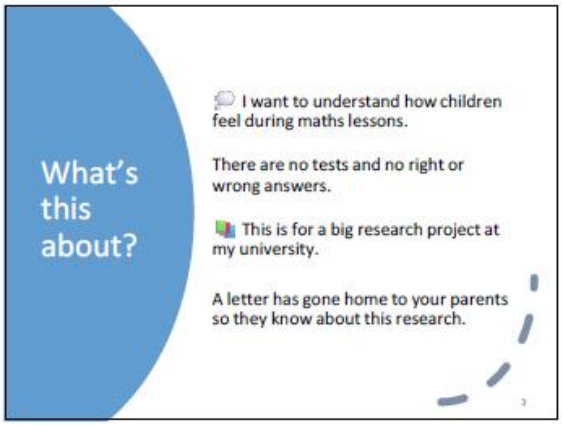
Appendix F: PowerPoint Presentation Delivered to Children



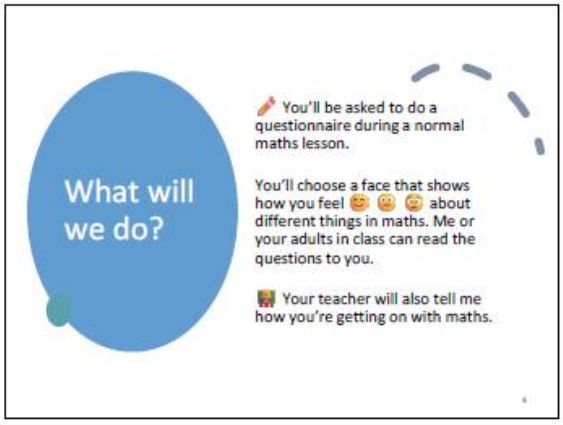
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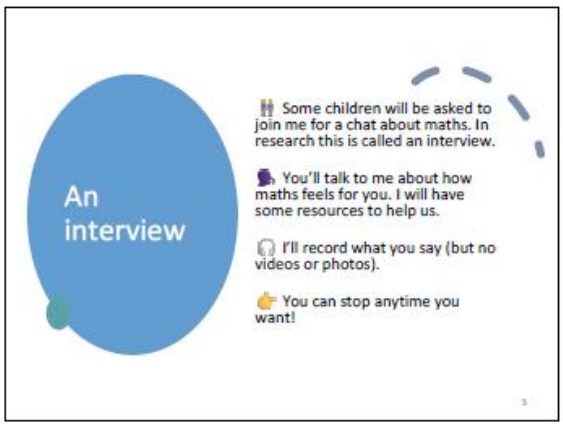
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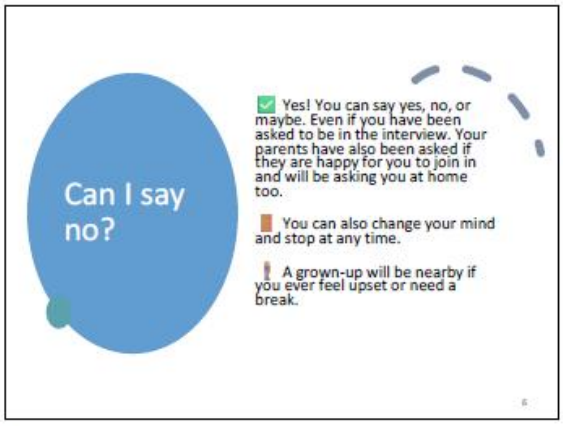
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5



6

Will other people know what I say?

- No – your answers to the questionnaire are private and will only be seen by me. I will give a little bit of information to school/your teacher if I think you might need some help, but I will not tell them about your individual answers to the questions.
- I'll only tell someone if you talk about someone being hurt. Or if you ask me to help you ask someone for support.
- In the interview only the people in the room (me and you) will know what has been said. At the end I'll write a big report – but your name will not be in it.

7

7

Do you want to take part?

- Yes – I want to help!
- I'm not sure yet.
- No thank you.
- Whatever you choose is absolutely okay.

10

10

Why is this helpful?

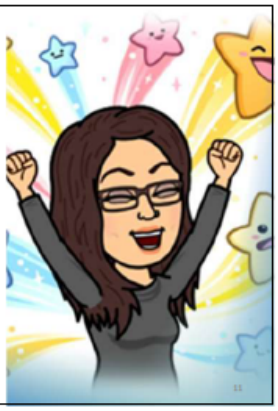
- This will help teachers and other adults understand how children feel about maths in general.
- If the results of the questionnaire/interview make me feel that you might need some help, then I will ask you what you would like me to do next. This might be helping you to tell a teacher.
- It will help make maths feel better for more children in the future.

8

8

Thank you!

- Thank you for listening!
- If you want, I can tell you what I learn at the end of my project.
- You can talk to me, your teacher or family if you have questions.



11

11

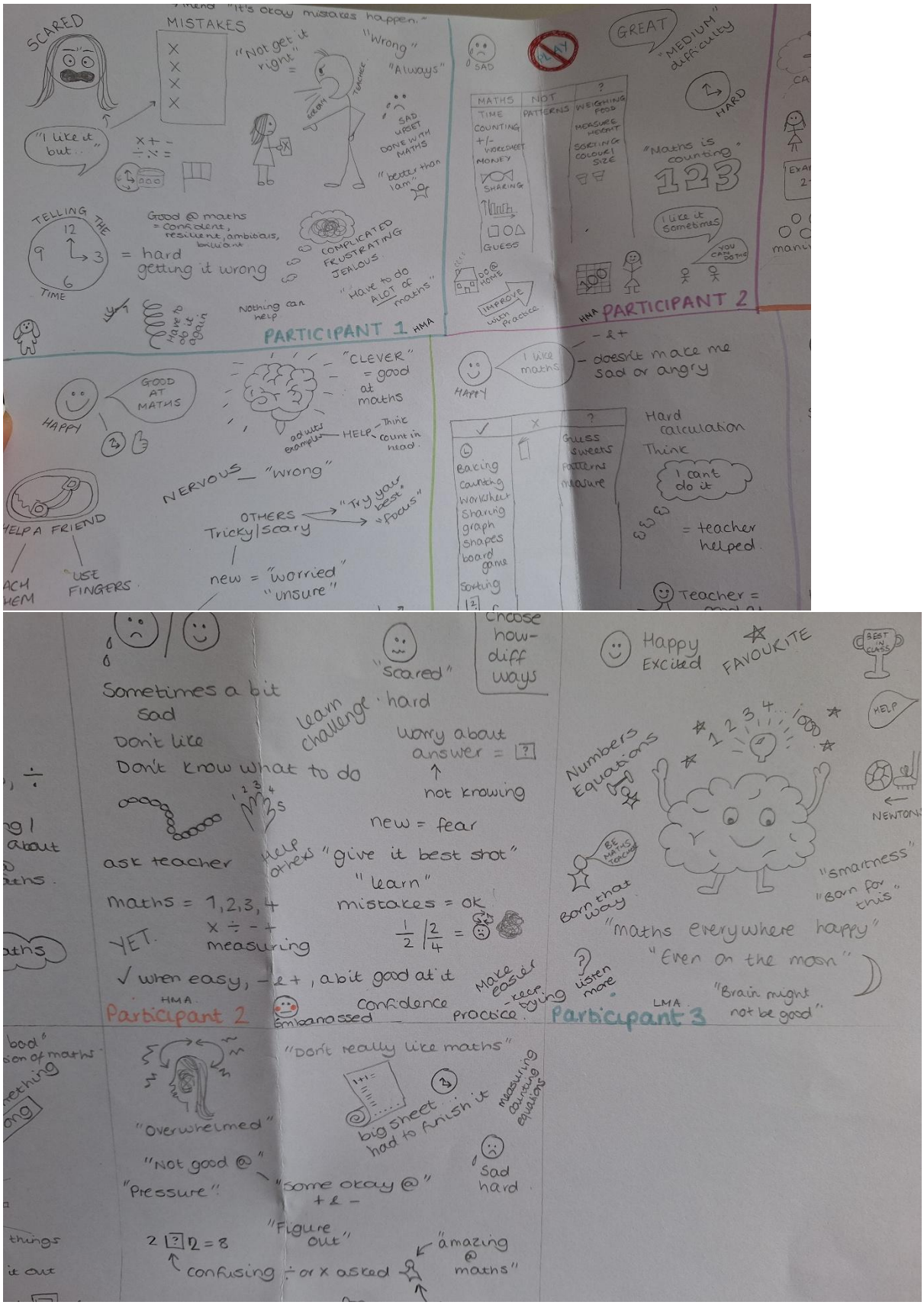
What if I feel worried or upset?

- That's okay – sometimes talking about feelings can be tricky.
- You can tell me or a grown-up at school. As well as your parents or trusted adults. If you like I can tell them for you or we can together. I will give you the choice at the end of the research.
- There will be a quiet space to go if you want a break.

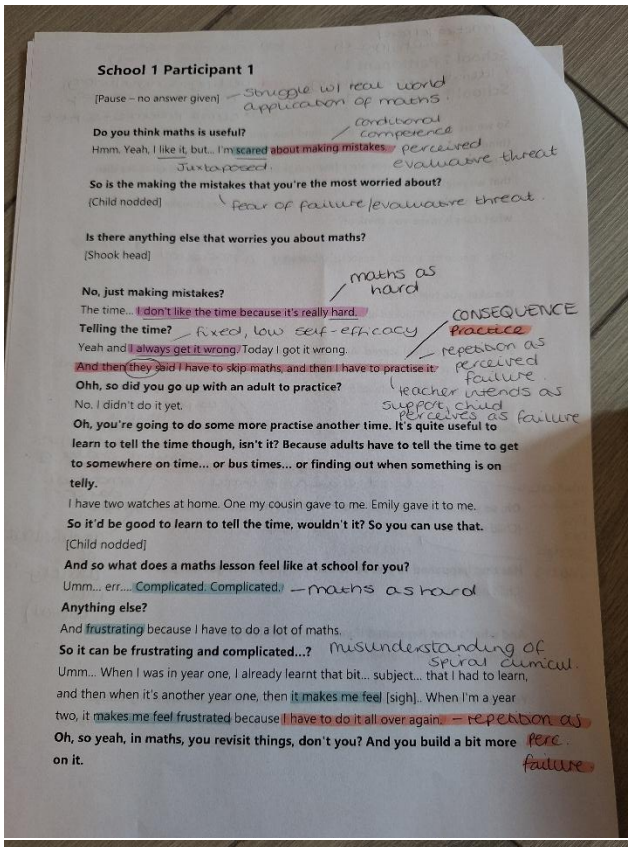
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9

Appendix G: Familiarisation Doodles Example



Appendix H: Brief Analytical Notes Example from Initial Data Analysis



School 1 Participant 1

[Pause – no answer given] — struggle w/ real world application of maths

Do you think maths is useful?

Hmm. Yeah, I like it, but... I'm scared about making mistakes. — perceived evaluative threat

Juxtaposed. — contrastive competence

So is the making the mistakes that you're the most worried about?

[Child nodded] — fear of failure/evaluative threat

Is there anything else that worries you about maths?

[Shook head]

No, just making mistakes? — maths as hard

The time... I don't like the time because it's really hard.

Telling the time? — fixed, low self-efficacy

Yeah and I always get it wrong. Today I got it wrong.

And then they said I have to skip maths, and then I have to practise it. — CONSEQUENCE / Practice

Ohh, so did you go up with an adult to practice? — repetition as perceived failure

No. I didn't do it yet. — teacher intends as support, child perceives as failure

Oh, you're going to do some more practise another time. It's quite useful to learn to tell the time though, isn't it? Because adults have to tell the time to get to somewhere on time... or bus times... or finding out when something is on telly.

I have two watches at home. One my cousin gave to me. Emily gave it to me.

So it'd be good to learn to tell the time, wouldn't it? So you can use that.

[Child nodded]

And so what does a maths lesson feel like at school for you?

Umm... err.... Complicated. Complicated. — maths as hard

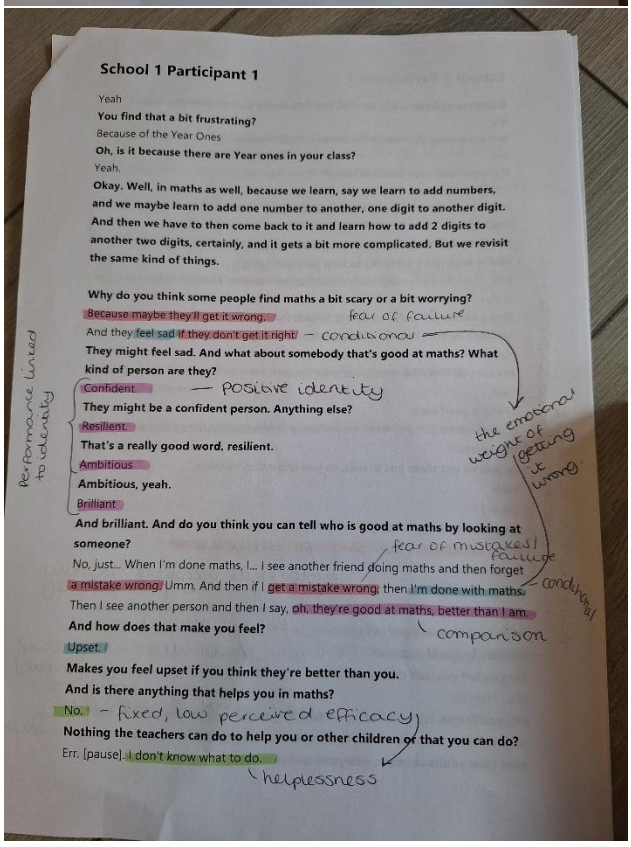
Anything else?

And frustrating because I have to do a lot of maths.

So it can be frustrating and complicated...? — misunderstanding of spiral curricul.

Umm... When I was in year one, I already learnt that bit... subject... that I had to learn, and then when it's another year one, then it makes me feel [sigh].. When I'm a year two, it makes me feel frustrated because I have to do it all over again. — repetition as fere. failure

Oh, so yeah, in maths, you revisit things, don't you? And you build a bit more on it.



School 1 Participant 1

Yeah

You find that a bit frustrating?

Because of the Year Ones

Oh, is it because there are Year ones in your class?

Yeah.

Okay. Well, in maths as well, because we learn, say we learn to add numbers, and we maybe learn to add one number to another, one digit to another digit. And then we have to then come back to it and learn how to add 2 digits to another two digits, certainly, and it gets a bit more complicated. But we revisit the same kind of things.

Why do you think some people find maths a bit scary or a bit worrying?

Because maybe they'll get it wrong. — fear of failure

And they feel sad if they don't get it right. — conditional

They might feel sad. And what about somebody that's good at maths? What kind of person are they?

Confident. — positive identity

They might be a confident person. Anything else?

Resilient.

That's a really good word, resilient.

Ambitious

Ambitious, yeah.

Brilliant.

Performance linked to identity

And brilliant. And do you think you can tell who is good at maths by looking at someone?

the emotional weight of getting it wrong

No, just... When I'm done maths, I... I see another friend doing maths and then forget a mistake wrong. Umm. And then if I get a mistake wrong, then I'm done with maths. — fear of mistakes/failure — conditional

Then I see another person and then I say, oh, they're good at maths, better than I am.

And how does that make you feel? — comparison

Upset.

Makes you feel upset if you think they're better than you.

And is there anything that helps you in maths?

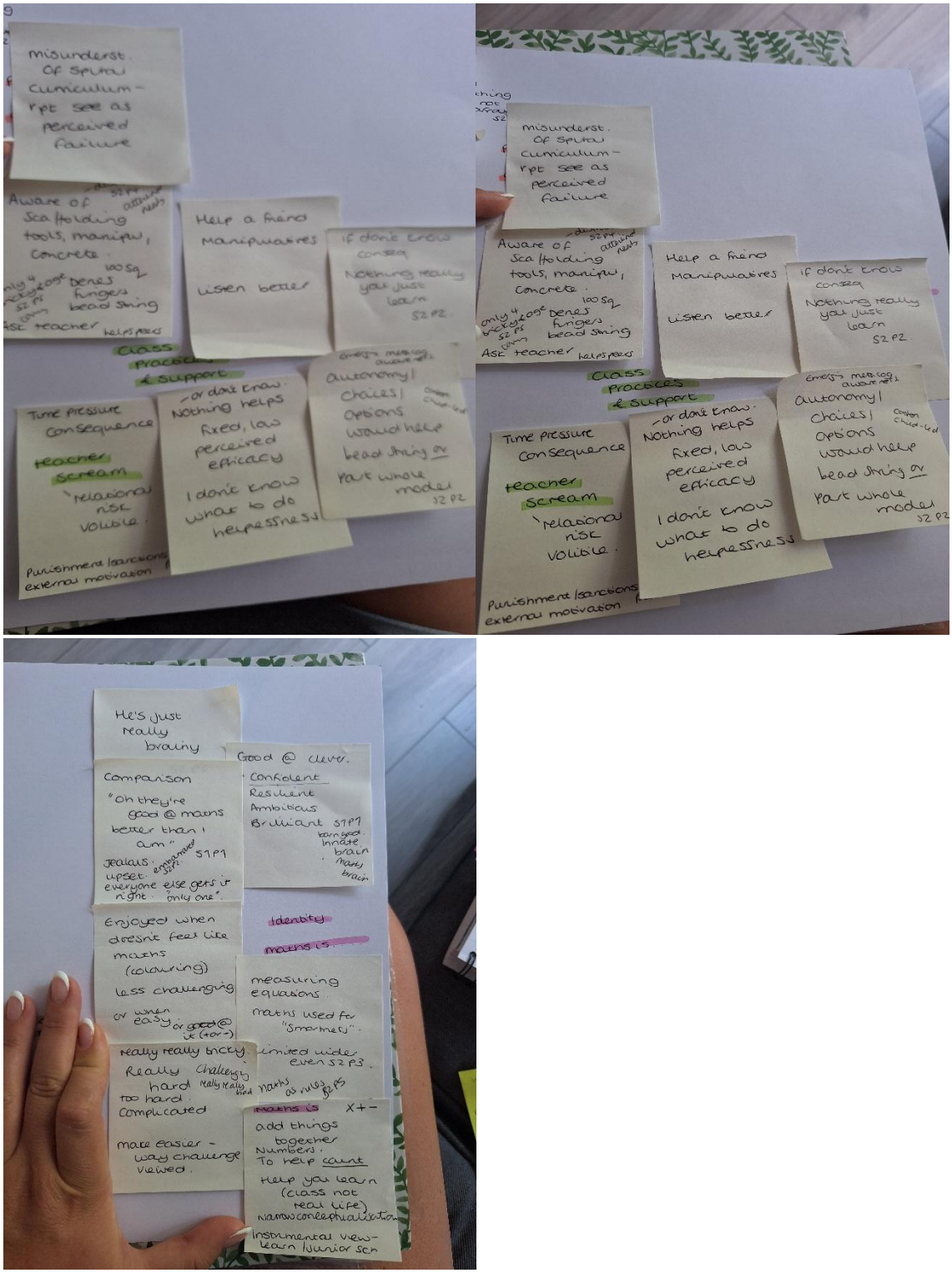
No. — fixed, low perceived efficacy

Nothing the teachers can do to help you or other children or that you can do?

Err, [pause]. I don't know what to do. — helplessness

Appendix I: Worked Coding Examples

Example of reflexive engagement with interview data showing movement from transcript extract to initial coding, reflexive memoing and initial theme development.



Appendix J: Coding Conceptual Map

THEME 1: "I'm going to maybe not get it right and the teacher's going to scream at me" (Participant 1)- Maths as Emotionally and Relationally Risky (Maths feels scary and people might judge me)

Children experience maths not only as cognitively demanding but as emotionally charged, identity-relevant, and socially risky.

Subtheme 1.1: "When I had to go up and do something in the front… I had to solve a maths problem. It wasn't adding or subtraction…. It was dividing. And that maybe I would get it wrong" (Participant 7) - Evaluative Threat & Emotional Danger

- Fear of judgement
- Perceived Evaluative Threat
- Mistakes = "I'm not good"
- Emotional weight of right/wrong (and anticipation)
- Negative perceived consequences linked to error (punishments, teacher scream….)
- Shame, embarrassment
- Teacher cross / sanctions
- Negative feedback
- Mistakes = "I'm done with maths"
- Emotional positioning of own mistakes

Subtheme 1.2: "Then I see another person and then I say, oh they're good at maths, better than I am" (Participant 7) - Conditional Self-Worth & Fragile Identity

- Conditional self-worth tied to task success
- "I'm not very good" – negotiating perceived competence and identity (fragile mathematical identity)
- Happiness contingent on task completion
- Ability comparisons
- Fixed ability narrative ("brainy", "born good")
- Behaviour = cause of difficulty
- Conditional competence ("I like it but…") – linked to perceived ability
- Comparison to peers

- Behaviour/compliance narrative for those not good at maths

Subtheme 1.3: "I feel a bit overwhelmed and frustrated and sad…. If I've finished my sheet, I'm feeling quite happy and impressed with myself" (Participant 11)- Emotional Overload & Situational Anxiety

- Emotional/cognitive overload
- Anxiety and difficulty situationally triggered by error risk, novelty, or perceived support
- Repetition perceived as failure
- Misunderstanding of spiral curriculum
- Maths difficulty linked with loss of social connection or play.

THEME 2: "When it's easy, like, I really like it… because I think I'm a bit good at it" (Participant 8) Challenge, Difficulty & Performance Conditions (Maths is hard when it is tricky or too fast)

Children's emotional responses are shaped by how challenge is perceived, task accessibility, and situational conditions such as time pressure. Avoidance results in reinforcing that maths is unsafe.

Subtheme 2.1: "I would change that, that we're not going to do division" (Participant 7) - Perceived Difficulty & Reduced Tolerance

- Negativity linked to perceived task difficulty
- Reduced tolerance to challenge and way challenge is perceived.
- Enjoyment linked to low cognitive demand (easy is fun, shorter maths preferred)
- Avoidance of difficult concepts (division, time)
- Difficulty is concept-dependent.

Subtheme 2.2: "We had to finish it that day and because we weren't allowed to finish it any other day. So, it was a bit… a bit of pressure on me because I'm not very good at maths" (Participant 11)- Time Pressure as Amplifier

- Time constraints
- Preference for unlimited/extended time
- Speeded performance anxiety
- Countdown mentality – maths as something to get over with and "get done".

Subtheme 2.3: "But I do get a little stressed if I don't know what to do" (Participant 6) - Classroom Structures & Task Accessibility

- Missing input due to interventions/time out of class

- Worked examples help.
- Focus on answer not process.
- New learning linked with uncertainty
- Maths as rules
- Limited conceptualisation of maths (number, counting, key functions)
- Limited wider/real-life application
- Maths as externally imposed, not meaningful.
- Instrumental view (“helps you learn”)

THEME 3: “I learned something new and now I’m not afraid of that thing. But then I am still afraid of it now” (Participant 8) Identity, Efficacy & Belief Systems

Subtheme 3.1: “Well sometimes I get them wrong and that makes me middle… But then when I get all of them wrong. I get. I get super angry” (Participant 10) - Low Self-Efficacy & Conditional Confidence

- Low academic self-concept
- Low perceived efficacy
- Confidence and happiness fluctuate with task success, accessibility and perceived efficacy.
- Conditional competence and enjoyment (“I like it but…”)
- Emotional consequences of “getting it wrong”.

Subtheme 3.2: “They could like practise at home. That’s what I am trying to do, but I just keep messing up” (Participant 11) - Emerging but Fragile Growth Beliefs

- Fragile and emerging growth mindset
- Practice helps.
- Negative feedback can discourage.
- Effort and perseverance - “Just keep trying till you get it right”.
- Power of “yet” – “You keep on practicing, and then you just get good at it and you’re not good yet, but you will be good later” (Participant 8)
- Aware of challenges help you to learn but still want easier maths.

Subtheme 3.3: “He is just really brainy” (Participant 11) - Fixed Ability & Social Positioning

- Clever/fixed ability narrative (Inbuilt ability beliefs)
- Reserve challenges for those “good at maths”.

- Behaviour/compliance linked to success.
- Peer comparison shaping identity.

THEME 4: “They help me work it out” (Participant 2) Socially Co-Constructed Learning & Support

Children understand learning as relational, scaffolded, and dependent on the availability and responsiveness of others.

Subtheme 4.1: “I had to do some really really tricky maths, and I just couldn’t do it… Mrs X who’s our teacher, helped me” (Participant 5) - Teacher Support & Relational Safety

- Teacher as primary support but availability matters
- Perceived relational risk of teachers response to mistakes.
- Consequences – missed maths/play. Support perceived as punishment or highlighting difference.
- Classroom practices shape access

Subtheme 4.2: “And they just give me a clue. [Named child] gives me a clue to work it out, but [child] just gives me the answer” (Participant 11) - Peer Support & Social Scaffolding

- Happiness linked to peer support
- Peer talk/support as coping
- Learning as socially scaffolded – Peer support “They give me a clue” versus telling the answer.
- Self–other compassion gap (kinder to others than self)

Subtheme 4.3: “Like you could work it out with a bead string or a part whole model” (Participant 8) - Tools, Manipulatives & Autonomy

- Strong awareness and preference for manipulatives
- Underutilisation of manipulatives (tools perceived seen as for “tricky maths”, younger children and being teacher-led).
- Manipulatives as distraction (attentional needs)
- Emerging metacognitive awareness (Wanting autonomy/choice)
- Nothing helps / unsure what helps.
- Over reliance on adults

THEME 5: “They help you when you’re stuck on an answer. When you’re confused on it” (Participant 3) - Coping, Protection & Avoidance

Children use protective strategies to manage emotional risk, maintain social belonging, and reduce exposure to perceived failure.

Subtheme 5.1: “If I, If I didn’t have to do it” (Participant 7) - Protective Avoidance

- Maths as something to get done.
- Avoidance of challenge or difficulty - Wanting shorter/easier maths, avoiding difficult concepts. However, avoidance reinforces maths as risky.
- Wanting to avoid maths completely
- Wanting to avoid certain concepts e.g. division

Subtheme 5.2: “I think it means that just keep on trying until you get it right” (Participant 8) - Emotional Coping

- Self-talk (“over soon”)
- Peer support
- Reward focus
- Focus on task completion.
- Seeking social time after maths
- Environmental coping (Quiet helps)

Subtheme 5.3: “Do you want to do this or do that. Like, there’s a few options that you could pick… Like you could work it out with a bead string or a part whole model” (Participant 8)- Safety, Control & Autonomy

- Wanting autonomy and choice over tools and strategies
- Emerging metacognitive awareness
- Maths as externally imposed.
- Limited sense of agency

Appendix K: CMAS-UK Questionnaire (Petronzi et al., 2019b).

NAME_____ Total Score_____

The Children's Mathematics Anxiety Scale UK (CMAS-UK)

The items in the questionnaire refer to day-to-day numeracy situations that may cause anxiety for children aged 4-7 years. For each item, children can place a circle around the face which describes how they feel in relation to the situation.

1. When my friends finish their number work before me, I feel...			
2. If I am the last to finish numeracy work on my table, I feel...			
3. If I make a mistake in numeracy, I feel...			
4. When I can't do my numeracy work, I feel...			
5. When I have to explain a numeracy problem to my teacher, I feel...			
6. If I think I can't do my numeracy work, I feel...			
7. When I see lots of numbers, I feel...			
8. When I have to explain a numeracy problem to my friends, I feel...			
9. If I have to finish all my numeracy work in lesson, I feel...			
10. Listening to the teacher in my numeracy class makes me feel...			

11. If I answer questions and get them wrong, I feel...			
12. If I have to tell the teacher that I don't understand my numeracy work, I feel...			
13. If other children know that I find numeracy hard, I feel...			
14. When I watch or listen to my teacher explain a numeracy problem, I feel...			
15. If I don't finish my numeracy work in class, I feel...			
16. If other children finish their numeracy very quickly, I feel...			
17. When I explain how I got my answer to my teacher, I feel...			
18. When my teacher wants me to do numeracy at home, I feel...			
19. Walking into the numeracy class makes me feel...			

The Children's Mathematics Anxiety Scale UK (CMAS-UK)

The items in the questionnaire refer to day-to-day numeracy situations that may cause anxiety for children, typically aged 4-7 years. For each item, children can place a circle around the face which describes how they feel in relation to the situation. Younger children may require some guidance, e.g. if there are difficulties with reading.

To score, each item corresponds to a number (1-3):

1 

2 

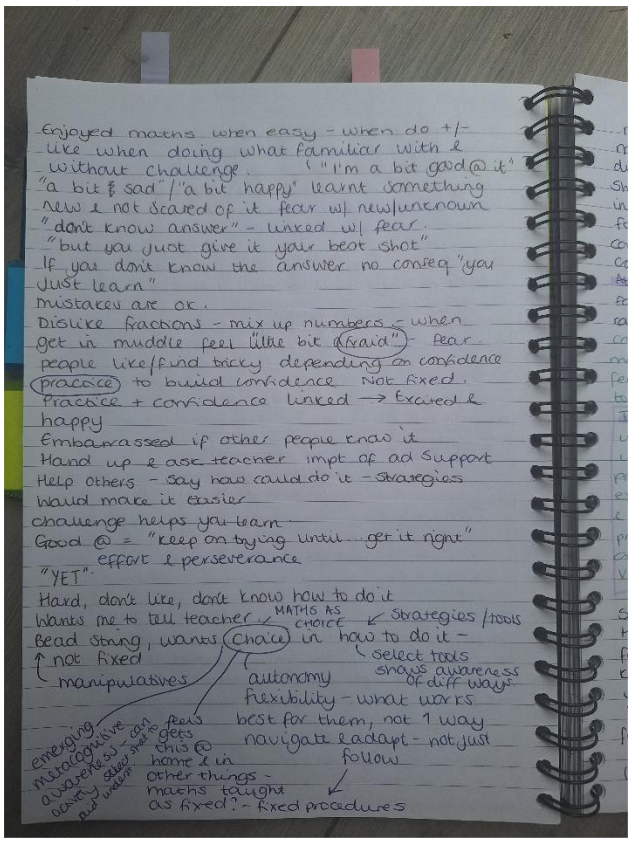
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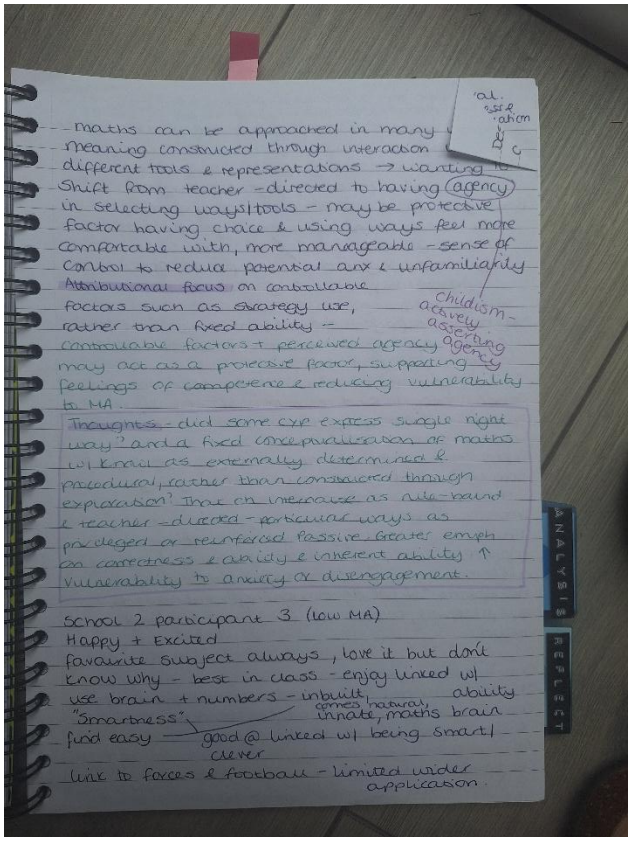
Add up all the scores to create a total. The minimum score is 19 and the maximum is 57.

To support understanding of an individual's level of maths anxiety, a mean score can be created by dividing their total by 19. There are no set labels for representing the mean scores, but a mean close to one would indicate little-to-no maths anxiety, whereas a mean closer to 3 would indicate a high level of maths anxiety.

Appendix L: Reflective notes.

Examples of the researchers reflexive and reflective engagement with the research process.





References

Adams, W. C. (2015). Conducting semi-structured interviews. *Handbook of practical program evaluation*, 492-505. https://doi-org.uea.idm.oclc.org/10.1002/9781119171386.ch19

Adelson, J. L., & McCoach, D. B. (2011). Development and psychometric properties of the math and me survey: Measuring third through sixth graders' attitudes toward mathematics. *Measurement and Evaluation in Counseling and Development, 44*(4), 225–247. https://doi.org/10.1177/0748175611418522

Ahmed, W. (2018). Developmental trajectories of math anxiety during adolescence: Associations with STEM career choice. *Journal of Adolescence, 67*, 158–166. https://doi.org/10.1016/j.adolescence.2018.06.010

Alanazi, H. M. N. (2020). The effects of active recreational math games on math anxiety and performance in primary school children: An experimental study. *Multidisciplinary Journal for Education, Social and Technological Sciences, 7*(1), 89–112. https://doi.org/10.4995/muse.2020.12622

Alderson, P. (2008). *Young children's rights: Exploring beliefs*. Jessica Kingsley Publishers.

Alderson, P., & Morrow, V. (2020). *The ethics of research with children and young people: A practical handbook.* Sage.

Altman, D. G., & Royston, P. (2006). The cost of dichotomising continuous variables. *BMJ*, *332*(7549), 1080. https://doi.org/10.1136/bmj.332.7549.1080

Apostolidu, M., & Johnston-Wilder, S. (2023). Breaking through the fear: Exploring the mathematical resilience toolkit with anxious FE students. *Research in*

Post-Compulsory Education, 28(2), 330–347. https://doi.org/10.1080/13596748.2023.2206704

Arda Tuncdemir, T. B. (2025). Integrating social-emotional learning through play: Perspectives from early childhood educators. *Journal of Research in Childhood Education*, 1–19. https://doi-org.uea.idm.oclc.org/10.1080/02568543.2025.2567504

Arslan, C., Deringol-Karatas, Y., Yavuz, G., & Erbay, H. N. (2015). Analysis of research on mathematics anxiety in selected journals (2000–2013). *Procedia-Social and Behavioral Sciences, 177*, 118–121. https://doi-org.uea.idm.oclc.org/10.1016/j.sbspro.2015.02.355

Ashby, B. (2009). Exploring children's attitudes towards mathematics. *Proceedings of the British Society for Research into Learning mathematics*, *29*(1), 7-12. https://www.bsrlm.org.uk/wp-content/uploads/2016/02/BSRLM-IP-29-1-02.pdf

Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181–185. https://doi.org/10.1111/1467-8721.00196

Ashcraft, M. H., & Faust, M. W. (1994). Mathematics anxiety and mental arithmetic performance: An exploratory investigation. *Cognition & Emotion, 8*(2), 97-125. https://doi-org.uea.idm.oclc.org/10.1080/02699939408408931

Ashcraft, M. H., & Kirk, E. P. (2001). The relationships among working memory, math anxiety, and performance. *Journal of experimental psychology: General*, *130*(2), 224. https://doi.org/10.1037/0096-3445.130.2.224

Ashcraft, M. H., Kirk, E. P., & Hopko, D. (1998). On the cognitive consequences of mathematics anxiety. In C. Donlan (Ed.), *The development of mathematical skills* (pp. 175–196). Psychology Press/Taylor & Francis (UK).

Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. *Psychonomic Bulletin & Review, 14*(2), 243–248. https://doi.org/10.3758/BF03194059

Ashcraft, M. H., & Moore, A. M. (2009). Mathematics anxiety and the affective drop in performance. *Journal of Psychoeducational Assessment, 27*(3), 197–205. https://doi.org/10.1177/0734282908330580

Ashcraft, M.H., Krause, J., & Hopko, D. (2007) Is math anxiety a mathematical learning disability? In D. B. Berch & M.M. Mazzocco (eds) *Why is math so hard for some children? The nature and origins of mathematical learning difficulties and disabilities* (pp 329-348). Paul Brooks Publishing.

Aydın, U., Özgeldi, M., & Dalkılınç, F. (2025). Translation, adaptation, and validation of the Children's Mathematics Anxiety Scale into Turkish. *Pegem Journal of Education and Instruction*, *15*(3), 99-111. https://doi.org/10.47750/pegegog.15.03.11

Backett, K., & Alexander, H. (1991). Talking to young children about health: methods and findings. *Health Education Journal*, *50*(1), 34-38. https://doi.org/10.1177/001789699105000110

Balt, M., Börnert-Ringleb, M., & Orbach, L. (2022). Reducing math anxiety in school children: A systematic review of intervention research. In *Frontiers in Education* https://doi.org/10.3389/feduc.2022.798516

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bandura, A., & Wessels, S. (1997). *Self-efficacy* (Vol. 10). Cambridge: Cambridge University Press.

Baptist, J., Minnie, L., Buksner, S., Kaye, R., & Morgan, J. (2007). Screening in the early years for mathematics difficulties and disabilities: Identifying red flags to support early learners at risk. *Orbit*, *37*(1), 14-19.

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic.* Guilford.

Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin*, *147*(2), 134. https://doi.org/10.1037/bul0000307

Bartley, S. R., & Ingram, N. (2018). Parental modelling of mathematical affect: Self-efficacy and emotional arousal. *Mathematics Education Research Journal*, *30*(3), 277-297. https://doi-org.uea.idm.oclc.org/10.1007/s13394-017-0233-3

Baumeister, R. F., & Leary, M. R. (1997). Writing narrative literature reviews. *Review of General Psychology, 1*, 311–320. https://doi.org/10.1037/1089-2680.1.3.311

Beck, A. T., & Clark, D. A. (1997). An information processing model of anxiety: Automatic and strategic processes. *Behaviour research and therapy*, *35*(1), 49-58. 10.1016/S0005-7967(96)00069-1

Beilock, S. L., & Willingham, D. T. (2014). Math anxiety: Can teachers help students reduce it? ask the cognitive scientist. *American Educator*, *38*(2), 28. https://eric.ed.gov/?id=EJ1043398

Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences, 107*(5), 1860–1863. https://doi.org/10.1073/pnas.0910967107

Bell, D. (2018). *Maths Anxiety Summit 2018: Summit report and key messages*. Maths Anxiety Trust & Learnus. https://mathsanxietytrust.com/Maths-Anxiety-Summit-2018-Report-Final-2018-08-29-1.pdf

Beresford, B. (1997). Personal Accounts: Involving Disabled Children in Research. Social Policy Research Unit https://pure.york.ac.uk/portal/en/publications/personal-accounts-involving-disabled-children-in-research/

Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Anchor Books.

Bergin, C., & Bergin, D. (2009). Attachment in the classroom. *Educational psychology review*, *21*(2), 141-170. https://doi-org.uea.idm.oclc.org/10.1007/s10648-009-9104-0

Berkowitz, T., Gibson, D. J., & Levine, S. C. (2021). Parent math anxiety predicts early number talk. *Journal of Cognition and Development*, *22*(4), 523-536. https://doi-org.uea.idm.oclc.org/10.1080/15248372.2021.1926252

Berkowitz, T., Schaeffer, M. W., Maloney, E. A., Peterson, L., Gregor, C., Levine, S. C., & Beilock, S. L. (2015). Math at home adds up to achievement in school. *Science, 350*(6257), 196–198. https://doi.org/10.1126/science.aac7427

Besenski, L. J., Forsyth, S. J., & Von Baeyer, C. L. (2007). Screening young children for their ability to use self-report pain scales. *Pediatric Pain Letter*, *9*(1), 1-7. https://www.researchgate.net/profile/Carl-Von-Baeyer/publication/255608785_Screening_young_children_for_their_ability_to_use_self-report_pain_scales/links/663bb20b35243041537f1973/Screening-young-children-for-their-ability-to-use-self-report-pain-scales.pdf

Bibby, T. (2002). Shame: An emotional response to doing mathematics as an adult and a teacher. *British Educational Research Journal*, *28*(5), 705–721. https://doi-org.uea.idm.oclc.org/10.1080/0141192022000015543

Bion, W. R. (1962). *Learning from Experience.* Heinemann.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246–263. https://doi.org/10.1111/j.1467-8624.2007.00995.x

Boaler, J. (2002). *Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning.* Routledge.

Boaler, J. (2005, September). The 'psychological prisons' from which they never escaped: The role of ability grouping in reproducing social class inequalities. In *Forum* (Vol. 47, No. 2, pp. 125-134). Lawrence and Wishart. https://scholar.google.com/scholar_url?url=http://www.youcubed.org/wp-content/uploads/psychogicalprisons2005.pdf&hl=en&sa=T&oi=gsb-

ggp&ct=res&cd=0&d=15460144367571802851&ei=vjR6au6HDpXXieoPoeSC4QQ&scisig=AM1tuoN9-XBArca1BeoXWdHqfqcj

Bonnett, V., Yuill, N., & Carr, A. (2017). *Mathematics, Mastery and Metacognition: How Adding a Creative Approach can Support Children in Maths.*

Brady, P., & Bowd, A. (2005). Mathematics anxiety, prior experience and confidence to teach mathematics among pre-service education students. *Teachers and Teaching, 11*(1), 37–46. https://doi.org/10.1080/1354060042000337084

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2020). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*. *18*(3), 328–352. https://doi.org/10.1080/14780887.2020.1769238

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. Sage.

British Educational Research Association (BERA). (2024). *Ethical Guidelines for Educational Research* (5th ed.). bera.ac.uk

British Psychological Society (BPS). (2021a). *BPS Code of Ethics and Conduct*. https://www.bps.org.uk/guideline/code-ethics-and-conduct

British Psychological Society (BPS). (2021b). *BPS code of human research ethics*. https://www.bps.org.uk/guideline/bps-code-human-research-ethics

Bronfenbrenner, U., & Morris, P. A. (2006). The Bioecological Model of Human Development. In R. M. Lerner & W. Damon (Eds.), *Handbook of child*

psychology: Theoretical models of human development (6th ed., pp. 793–828). John Wiley & Sons, Inc.

Brown, M., Brown, P., & Bibby, T. (2008). “I would rather die”: Attitudes of 16-year-olds towards their future participation in mathematics. *Research in Mathematics Education*, *10*(1), 3-18.

Brunyé, T. T., Mahoney, C. R., Giles, G. E., Rapp, D. N., Taylor, H. A., & Kanarek, R. B. (2013). Learning to relax: Evaluating four brief interventions for overcoming the negative emotions accompanying math anxiety. *Learning and Individual Differences*, *27*, 1-7. https://doi-org.uea.idm.oclc.org/10.1016/j.lindif.2013.06.008

Buckley, S. (2020). *Using picture books to reduce math anxiety*. ACER Discover. https://www.acer.org/au/discover/ article/using-picture-books-to-reduce-math-anxiety

Burr, V. (2015). *Social Constructionism* (3rd ed.). Routledge.

Carey, E., Hill, F., Devine, A., & Szücs, D. (2016). The chicken or the egg? The direction of the relationship between mathematics anxiety and mathematics performance. *Frontiers in Psychology, 6*, Article 1987. https://doi.org/10.3389/fpsyg.2015.01987

Carey, E., Hill, F., Devine, A., & Szűcs, D. (2017). The modified abbreviated math anxiety scale: A valid and reliable instrument for use with children. *Frontiers in Psychology, 8*, 11. https://doi.org/10.3389/fpsyg.2017.00011

Cargnelutti, E., Tomasetto, C., & Passolunghi, M. C. (2017). How is anxiety related to math performance in young students? A longitudinal study of grade 2 to grade

3 children. *Cognition and Emotion, 31*(4), 755–764. https://doi.org/10.1080/02699931.2016.1147421

Cassidy, S. (2015). Resilience building in students: The role of academic self-efficacy. *Frontiers in Psychology, 6*, Article 1781. https://doi.org/10.3389/fpsyg.2015.01781

Caviola, S., Primi, C., Chiesi, F., & Mammarella, I. C. (2017). Psychometric properties of the Abbreviated Math Anxiety Scale (AMAS) in Italian primary school children. *Learning and Individual Differences, 55*, 174–182. https://doi.org/10.1016/j.lindif.2017.03.006

Chang, H., & Beilock, S. L. (2016). The math anxiety-math performance link and its relation to individual and environmental factors: A review of current behavioral and psychophysiological research. *Current Opinion in Behavioral Sciences*, *10*, 33-38. https://doi-org.uea.idm.oclc.org/10.1016/j.cobeha.2016.04.011

Children & Families Act (2014) (UK). https://www.legislation.gov.uk/ukpga/2014/6/contents

Chinn, S. (2009). Mathematics anxiety in secondary students in England. *Dyslexia*, *15*(1), 61-68. https://doi-org.uea.idm.oclc.org/10.1002/dys.381

Chinn, S. (2012). Beliefs, anxiety, and avoiding failure in mathematics. *Child Development Research*, *2012*(1), 396071. https://doi-org.uea.idm.oclc.org/10.1155/2012/396071

Chiu, L.-H., & Henry, L. L. (1990). Development and validation of the mathematics anxiety. *Measurement & Evaluation in Counseling & Development*, *23*(3), 121. https://research.ebsco.com/c/u4fajs/search/details/urizs5sobf?request-context=plink&db=asn&auth-callid=3ed3650e-2c0e-4a5f-84d7-331eb5bf3e43

Christensen, P., & James, A. (2000). Some methodological insights. In P. Christensen & A. James (Eds.), *Research with children: Perspectives and practices* (p. 160). Falmer Press.

Christensen, P., & Prout, A. (2002). Working with ethical symmetry in social research with children. *Childhood*, *9*(4), 477-497. https://doi.org/10.1177/0907568202009004007

Cipora, K., Szczygieł, M., Willmes, K., & Nuerk, H. C. (2015). Math anxiety assessment with the Abbreviated Math Anxiety Scale: Applicability and usefulness: Insights from the Polish adaptation. *Frontiers in Psychology*, *6*, 1833. https://doi.org/10.3389/fpsyg.2015.01833

Codding, R. S., Goodridge, A. E., Hill, E., Kromminga, K. R., Chehayeb, R., Volpe, R. J., & Scheman, N. (2023). Meta-analysis of skill-based and therapeutic interventions to address math anxiety. *Journal of School Psychology*, *100*, 101229. https://doi-org.uea.idm.oclc.org/10.1016/j.jsp.2023.101229

Cohen, J. (1983). The cost of dichotomization. *Applied psychological measurement*, *7*(3), 249-253. https://doi.org/10.1177/014662168300700301

Collingwood, N., & Dewey, J. (2018). 'Thinking Your Problems Away': Can maths interventions be developed to address both the academic and affective aspects of learning in primary aged children? *Educational & Child Psychology*. https://www.researchgate.net/profile/Nikki-Collingwood-

3/publication/367109024_'Thinking_Your_Problems_Away'_Can_maths_interventions_be_developed_to_address_both_the_academic_and_affective_aspects_of_learning_in_primary_aged_children/links/654659f13fa26f66f4d366bb/Thinking-Your-Problems-Away-Can-maths-interventions-be-developed-to-address-both-the-academic-and-affective-aspects-of-learning-in-primary-aged-children.pdf

Cooper, S., Rogers, R. M., Purdum-Cassidy, B., & Nesmith, S. M. (2020). Selecting quality picture books for mathematics instruction: What do preservice teachers look for? *Children's Literature in Education*, *51*(1), 110-124. https://doi-org.uea.idm.oclc.org/10.1007/s10583-018-9363-9

Cropp, I. (2017). Using peer mentoring to reduce mathematical anxiety. *Research Papers in Education*, *32*(4), 481-500. https://doi-org.uea.idm.oclc.org/10.1080/02671522.2017.1318808

Crotty, M. J. (1998), The Foundations of Social Research: Meaning and Perspective in the Research Process. SAGE Publications Ltd.

Curry, S. L., & Russ, S. W. (1985). Identifying coping strategies in children. *Journal of Clinical Child Psychology*, *14*(1), 61-69. https://doi-org.uea.idm.oclc.org/10.1207/s15374424jccp1401_10

Darcy, L., Enskär, K., & Björk, M. (2019). Young children's experiences of living an everyday life with cancer - A three year interview study. *European Journal of Oncology Nursing, 39,* 1-9. 10.1016/j.ejon.2018.12.007

Data Protection Act 2018, c. 12. https://www.legislation.gov.uk/ukpga/2018/12/contents

Davis, J. M. (1998). Understanding the meanings of children: a reflexive process. Children & Society, 12: 325-335. https://doi-org.uea.idm.oclc.org/10.1111/j.1099-0860.1998.tb00089.x

Davis, T., & Kahn, S. (2018). Management of mathematics anxiety: Virtual relaxation interventions. *International Journal of Education and Social Science*, *5*(7), 38-44. https://ijessnet.com/wp-content/uploads/2022/10/6-37.pdf

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian psychology/Psychologie canadienne*, *49*(3), 182. https://doi.org/10.1037/a0012801

DeCosta, P., Skinner, T. C., Sørensen, J. L., Krogh Topperzer, M., & Grabowski, D. (2023). Narrative and play-based interviewing-a framework for eliciting the perspectives of young children. *Qualitative Research in Psychology*, *20*(3), 337-362. https://doi-org.uea.idm.oclc.org/10.1080/14780887.2023.2195366

Denham, S. A., Wyatt, T. M., Bassett, H. H., Echeverria, D., & Knox, S. S. (2009). Assessing social-emotional development in children from a longitudinal perspective. *Journal of Epidemiology & Community Health*, *63*(Suppl 1), i37-i52. https://doi.org/10.1136/jech.2007.070797

Department for Education & Department of Health. (DfE & DoH, 2015). *Special educational needs and disability code of practice: 0 to 25 years: Statutory guidance for organisations which work with and support children and young people who have special educational needs or disabilities*. GOV.UK.

Department for Education. (DfE, 2021). *National curriculum in England: Mathematics programmes of study*. GOV.UK.

https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study

Department for Education. (DfE, 2022). *Opportunity for all: Strong schools with great teachers for your child.* GOV.UK https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063602/Opportunity_for_all_strong_schools_with_great_teachers_for_your_child__print_version_.pdf

Department for Education. (DfE, 2023). *Special educational needs and disabilities (SEND) and alternative provision improvement plan*. GOV.UK. https://www.gov.uk/government/publications/send-and-alternative-provision-improvement-plan

Diaz Soto, L., & Swadener, B. B. (2005). *Power and voice in research with children.* Peter Lang.

Di Leo, I., & Muis, K. R. (2020). Confused, now what? A Cognitive-Emotional Strategy Training (CEST) intervention for elementary students during mathematics problem solving. *Contemporary Educational Psychology*, *62*, 101879. https://doi-org.uea.idm.oclc.org/10.1016/j.cedpsych.2020.101879

Dove, J., Montague, J., & Hunt, T. E. (2021). An exploration of primary school teachers' maths anxiety using interpretative phenomenological analysis. *International Online Journal of Primary Education*, *10*(1), 32-49. https://izlik.org/JA66WE93SH

Dowker, A. (2026). Mathematics anxiety: Effects of age, gender and culture. *British Journal of Educational Psychology*, *96*(2), 896-921. https://doi.org/10.1111/bjep.70057

Dowker, A., Bennett, K., & Smith, L. (2012). Attitudes to mathematics in primary school children. *Child Development Research*, *2012*(1), 124939. https://doi-org.uea.idm.oclc.org/10.1155/2012/124939

Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years? *Frontiers in Psychology, 7,* 508. https://doi.org/10.3389/fpsyg.2016.00508

Dreger, R. M., & Aiken Jr, L. R. (1957). The identification of number anxiety in a college population. *Journal of Educational psychology*, *48*(6), 344. https://doi.org/10.1037/h0045894

Dweck, C. S. (2008). *Mindsets and math/science achievement.* Carnegie Corporation of New York; Institute for Advanced Study; Commission on Mathematics and Science Education.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109-132. https://doi.org/10.1146/annurev.psych.53.100901.135153

Eccles, J., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences in children's self-and task perceptions during elementary school. *Child Development* 64(3): 830–847. https://doi-org.uea.idm.oclc.org/10.2307/1131221

Education Endowment Foundation (EEF). (2020). Improving mathematics in Key Stages 2 and 3. London: EEF. http://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/maths-ks-2-3

Efklides, A., and P. Metallidou. 2020. Applying metacognition and self-regulated learning in the classroom. *Oxford Research Encyclopedia of Education*. 1st ed., 1–15. Oxford: Oxford University Press (OUP). https://doi-org.uea.idm.oclc.org/10.1093/acrefore/9780190264093.013.961.

Einarsdóttir, J. (2010). Children's experiences of the first year of primary school. *European Early Childhood Education Research Journal*, 18(2), 163–180. https://doi-org.uea.idm.oclc.org/10.1080/13502931003784370

Elliott, V., Baird, J., Hopfenbeck, T. N., Ingram, J., Thompson, I., Usher, N., Zantout, M., Richardson, J., & Coleman, R. (2016). *A marked improvement? A review of the evidence on written marking*. Education Endowment Foundation. https://www.angelsolutions.co.uk/wp-content/uploads/2017/11/EEF_Marking_Review_April_2016.pdf

Ellis, A., & Bernard, M. E. (2006). Rational emotive behavioral approaches to childhood disorders. *New York*.

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition & Emotion*, *6*(6), 409-434. https://doi-org.uea.idm.oclc.org/10.1080/02699939208409696

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: attentional control theory. *Emotion*, *7*(2), 336. https://doi.org/10.1037/1528-3542.7.2.336

Felce, D., Lewis, A., & Porter, J. (2002, March). Gaining views from people with learning disabilities: Authenticity, validity and reliability. In *ESRC Seminar Series: Methodological Issues in Interviewing Children and Young People with Learning Difficulties, School of Education, University of Birmingham, Birmingham, March*.

Fennema, E., & Sherman, J. A. (1976). Fennema-Sherman mathematics attitudes scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *Journal for Research in Mathematics Education*, *7*(5), 324-326. https://doi.org/10.5951/jresematheduc.7.5.0324

Ferguson, R. D. (1986). Abstraction anxiety: A factor of mathematics anxiety. *Journal for Research in Mathematics Education*, *17*(2), 145-150. https://doi.org/10.5951/jresematheduc.17.2.0145

Festinger, L. (1954). A theory of social comparison processes. *Human relations*, *7*(2), 117-140. https://doi.org/10.1177/001872675400700202

Field, A. P., Evans, D., Bloniewski, T., & Kovas, Y. (2019). Predicting maths anxiety from mathematical achievement across the transition from primary to secondary education. *Royal Society Open Science, 6*(11), Article 191459. https://doi.org/10.1098/rsos.191459

Finlay, L. (2002). Negotiating the swamp: the opportunity and challenge of reflexivity in research practice. *Qualitative Research*, *2*(2), 209-230. https://doi.org/10.1177/146879410200200205

Finlayson, M. (2014). Addressing math anxiety in the classroom. *Improving Schools*, *17*(1), 99-115. https://journals.sagepub.com/doi/abs/10.1177/1365480214521457

Firouzian, F., Fadaei, M., Ismail, Z., Firouzian, S., & Yusof, Y. M. (2015). Relationship of mathematics anxiety and mathematics confidence among engineering students. *Advanced Science Letters*, *21*(7), 2400-2403. https://doi.org/10.1166/asl.2015.6290

Fivush, R., & Hamond, N. R. (1990). *Autobiographical memory across the preschool years: Toward reconceptualizing childhood amnesia.* Cambridge University Press.

Foley, A. E., Herts, J. B., Borgonovi, F., Guerriero, S., Levine, S. C., & Beilock, S. L. (2017). The math anxiety-performance link: A global phenomenon. *Current Directions in Psychological Science*, *26*(1), 52-58. https://doi.org/10.1177/0963721416672463

Ford, C. M. (2021). *The development of mathematical anxiety and its relationship with mathematical performance leading up to National Testing in primary aged children*. Doctoral Thesis. Nottingham Trent University (United Kingdom). https://www.proquest.com/openview/bc389418353ea7218aa92cfa5443d09e/1?pq-origsite=gscholar&cbl=2026366&diss=y

Fraser, H., & Honeyford, G. (2013). *Children, parents and teachers enjoying numeracy: Numeracy hour success through collaboration.* Routledge.

Galla, B. M., & Wood, J. J. (2012). Emotional self-efficacy moderates anxiety-related impairments in math performance in elementary school-age youth. *Personality and Individual Differences, 52*(2), 118–122. https://doi.org/10.1016/j.paid.2011.09.012

Gan, S. K. E., Lim, K. M. J., & Haw, Y. X. (2016). The relaxation effects of stimulative and sedative music on mathematics anxiety: A perception to physiology

model. *Psychology of Music*, *44*(4), 730-741. https://journals.sagepub.com/doi/abs/10.1177/0305735615590430

Ganley, C. M., & McGraw, A. L. (2016). The development and validation of a revised version of the math anxiety scale for young children. *Frontiers in psychology*, *7*, 1181. https://doi.org/10.3389/fpsyg.2016.01181

Geen, R. G. (1991). Social motivation. *Annual Review of Psychology*.

Gergen, K. J. (2009). *An Invitation to Social Construction* (2nd ed.). Sage.

Gest, S. D., & Rodkin, P. C. (2011). Teaching practices and elementary classroom peer ecologies. *Journal of Applied Developmental Psychology*, *32*(5), 288-296. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0193397311000219

Gierl, M. J., & Bisanz, J. (1995). Anxieties and attitudes related to mathematics in grades 3 and 6. *The Journal of experimental education*, *63*(2), 139-158. https://doi-org.uea.idm.oclc.org/10.1080/00220973.1995.9943818

Gottfried, A. E., Marcoulides, G. A., Gottfried, A. W., Oliver, P. H., & Guerin, G.W. (2007). Multivariate Latent Change Modeling of Developmental Decline in Academic Intrinsic Math Motivation and Achievement: Childhood through Adolescence. *International Journal of Behavioral Development* 31(4): 317–327. https://doi-org.uea.idm.oclc.org/10.1177/0165025407077752

Gripton, C. (2020). Children's lived experiences of 'ability' in the Key Stage One classroom: life on the 'tricky table.' *Cambridge Journal of Education*, *50*(5), 559–578. https://doi-org.uea.idm.oclc.org/10.1080/0305764X.2020.1745149

Grootenboer, P., & Marshman, M. (2016). Mathematics, affect and learning. *Middle school students' beliefs and attitudes about mathematics education.* Springer.

Guimarães, A. P. L., Haase, V. G., & Neufeld, C. B. (2021). Cognitive-behavioral intervention for math anxiety in childhood: A case report. *Dementia e Neuropsychologia, 15*(2), 286–290. https://doi-org.uea.idm.oclc.org/10.1590/1980-57642021dn15-020018

Gunderson, E. A., Park, D., Maloney, E. A., Beilock, S. L., & Levine, S. C. (2018). Reciprocal relations among motivational frameworks, math anxiety, and math achievement in early elementary school. *Journal of Cognition and Development* 19(1): 21–46. https://doi-org.uea.idm.oclc.org/10.1080/15248372.2017.1421538.

Guntur, M., & Wahyu Purnomo, Y. (2026). Unravelling the interplay of self-efficacy, self-regulation, metacognition in alleviating math anxiety among primary school student: a conditional process analysis. *Education 3-13*, *54*(5), 1088–1104. https://doi-org.uea.idm.oclc.org/10.1080/03004279.2024.2396096

Hackett, G. (1985). Role of mathematics self-efficacy in the choice of math-related majors of college women and men: A path analysis. *Journal of Counseling Psychology*, *32*(1), 47–56. https://doi.org/10.1037/0022-0167.32.1.47

Harari, R. R., Vukovic, R. K., & Bailey, S. P. (2013). Mathematics anxiety in young children: an exploratory study. *Journal of Experimental Education* 81(4): 538–555. https://doi-org.uea.idm.oclc.org/10.1080/00220973.2012.727888.

Harper, N. W., & Daane, C. J. (1998). Causes and reduction of math anxiety in preservice elementary teachers. *Action in Teacher Education*, *19*(4), 29-38. https://doi-org.uea.idm.oclc.org/10.1080/01626620.1998.10462889

Harrell, M. C., & Bradley, M. A. (2009). Data collection methods. Semi-structured interviews and focus groups. https://www.rand.org/pubs/technical_reports/TR718.html

Harter, S. (1999). *The construction of the self: A developmental perspective*. Guilford press.

Harter, S. (2012). Emerging self-processes during childhood and adolescence. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (2nd ed., pp. 680–715). The Guilford Press.

Harter, S. (2015). *The construction of the self: Developmental and sociocultural foundations*. Guilford Publications.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1992). Primitive emotional contagion. *Emotion and social behavior, 14,* 151-177. http://www.elainehatfield.com/ch46.pdf

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81-112. https://doi.org/10.3102/003465430298487

Health & Care Professions Council (HCPC). (2023). *Standards of proficiency: Practitioner Psychologists.* https://www.hcpc-uk.org/standards/standards-of-proficiency/practitioner-psychologists/

Health & Care Professions Council. (HCPC). (2024). *Standards of conduct, performance and ethics*. https://www.hcpc-uk.org/standards/standards-of-conduct-performance-and-ethics/

Helmane, I. (2016). Emotions of primary school pupils in mathematics lessons. *Signum Temporis*, *8*(1), 22.

http://archive.sciendo.com/SIGTEM/sigtem.2016.8.issue-1/sigtem-2016-0013/sigtem-2016-0013.pdf

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21*(1), 33–46. https://doi.org/10.2307/749455

Hill, F., Mammarella, I. C., Devine, A., Caviola, S., Passolunghi, M. C., & Szűcs, D. (2016). Maths anxiety in primary and secondary school students: Gender differences, developmental changes and anxiety specificity. *Learning and Individual Differences* 48: 45–53. https://doi-org.uea.idm.oclc.org/10.1016/j.lindif.2016.02.006.

Hines, C. L., Brown, N. W., & Myran, S. (2016). The effects of expressive writing on general and mathematics anxiety for a sample of high school students. *Education*, *137*(1), 39. https://openurl.ebsco.com/EPDB%3Agcd%3A14%3A6023086/detailv2?sid=ebsco%3Aplink%3Acrawler-gcd&id=ebsco%3Agcd%3A118494314&crl=c&jrnl=00131172&link_origin=scholar.google.com

Hodgen, J., Foster, C., & Brown, M. (2022). Low attainment in mathematics: An analysis of 60 years of policy discourse in England. *The curriculum journal*, *33*(1), 5-24. https://doi.org/10.1002/curj.128

Holmes, A. G. D. (2020). Researcher Positionality--A Consideration of Its Influence and Place in Qualitative Research--A New Researcher Guide. *Shanlax International Journal of Education*, *8*(4), 1-10. https://eric.ed.gov/?id=EJ1268044

Hopko, D. R., Mahadevan, R., Bare, R. L., & Hunt, M. K. (2003). The abbreviated math anxiety scale (AMAS) construction, validity, and reliability. *Assessment*, *10*(2), 178-182. https://doi.org/10.1177/1073191103010002008

Huang, Y. M., Huang, S. H., & Wu, T. T. (2014). Embedding diagnostic mechanisms in a digital game for learning mathematics. *Educational Technology Research and Development* 62(2): 187–207. https://doi-org.uea.idm.oclc.org/10.1007/s11423-013-9315-4.

Hubbard, J., & Russo, J. (2026, May). Motivational shifts experienced by Year 2 students when learning mathematics through sequences of challenging tasks. In *Frontiers in Education* (Vol. 11, p. 1820424). Frontiers Media SA. https://doi.org/10.3389/feduc.2026.1820424

Hughes, E. K., Gullone, E., Dudley, A., & Tonge, B. (2010). A case-control study of emotion regulation and school refusal in children and adolescents. *The Journal of Early Adolescence*, *30*(5), 691-706. https://doi.org/10.1177/0272431609341049

Hunt, T. E., & Maloney, E. A. (2022). Appraisals of previous maths experiences play an important role in maths anxiety. *Annals of the New York Academy of Sciences, 1* – 12 https://doi.org/10.1111/nyas.14805

Hunt, T. E., & Petronzi, D. (2024). Recognising and measuring mathematics anxiety and resilience. In S. Johnston-Wilder., & C. Lee (Eds), The Mathematical Resilience Handbook: How everyone can progress in mathematics. Routledge

Hunt, T. E., Bagdasar, O., Sheffield, D., & Schofield, M. B. (2019). Assessing domain specificity in the measurement of mathematics calculation anxiety. *Education*

Research International, *2019*(1), 7412193. https://doi-org.uea.idm.oclc.org/10.1155/2019/7412193

Hunt, T. E., Bhardwa, J., & Sheffield, D. (2017). Mental arithmetic performance, physiological reactivity and mathematics anxiety amongst UK primary school children. *Learning and Individual Differences*, *57*, 129-132. https://doi-org.uea.idm.oclc.org/10.1016/j.lindif.2017.03.016

Hunt, T. E., Clark-Carter, D., & Sheffield, D. (2011). The development and part validation of a UK scale for mathematics anxiety. *Journal of Psychoeducational Assessment*, *29*(5), 455-466. https://doi.org/10.1177/0734282910392892

Hunt, T. E., Clark-Carter, D., & Sheffield, D. (2015). Exploring the relationship between mathematics anxiety and performance: An eye-tracking approach. *Applied Cognitive Psychology*, *29*(2), 226-231. https://doi-org.uea.idm.oclc.org/10.1002/acp.3099

Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, brain, and education*, *1*(1), 3-10. https://doi-org.uea.idm.oclc.org/10.1111/j.1751-228X.2007.00004.x

Ismail, N., Garba, A., Osman, S., Ibrahim, N. H., & Bunyamin, M. A. H. (2022). Exploring teacher effects on intensifying and minimizing mathematics anxiety among students in Sokoto State, Nigeria. *International Journal of Evaluation and Research in Education*, *11*(1), 161-171. https://eric.ed.gov/?id=EJ1341215

James, A., & Prout, A. (2015). Re-presenting childhood: Time and transition in the study of childhood. In *Constructing and reconstructing childhood* (pp. 202-219). Routledge.

Jameson, M. (2014) Contextual factors related to math anxiety in second grade children. *Journal of Experimental Education, 82 (4),* 518-536.

Jansen, B. R., Louwerse, J., Straatemeier, M., Van der Ven, S. H., Klinkenberg, S., & Van der Maas, H. L. (2013). The influence of experiencing success in math on math anxiety, perceived math competence, and math performance. *Learning and Individual Differences*, *24*, 190-197.

Jansen, B. R., Schmitz, E. A., & Van der Maas, H. L. (2016). Affective and motivational factors mediate the relation between math skills and use of math in everyday life. *Frontiers in Psychology*, *7*, 513.

Johnston-Wilder, S., & Marshall, E. (2017). Overcoming affective barriers to mathematical learning in practice. https://ima.org.uk/2996/mathematics-education-beyond-16-pathways-transitions/

Johnston-Wilder, S., Baker, J. K., McCracken, A., & Msimanga, A. (2020) A toolkit for teachers and learners, parents, carers and support staff: Improving mathematical safeguarding and building resilience to increase effectiveness of teaching and learning mathematics. *Creative Education*, *11*(08), 1418-1441. https://elibrary.ru/item.asp?id=77759242

Justicia-Galiano, M. J., Pelegrina, S., Lechuga, M. T., Gutiérrez-Palma, N., Martín-Puga, E. M., & Lendínez, C. (2016). Math anxiety and its relationship to inhibitory abilities and perceived emotional intelligence. *Anales de Psicología*, *32*(1), 125-131.

Kam Chi and Cameron-Flitcroft (2025). Exploring primary teachers' understanding and support of children with Mathematics Anxiety. *Educational & Child Psychology*, *49*(2), 4. 10.53841/bpsecp.2025.42.4.4

Kamann, M. P., & Wong, B. Y. (1993). Inducing adaptive coping self-statements in children with learning disabilities through self-instruction training. *Journal of learning disabilities*, *26*(9), 630-638. https://doi.org/10.1177/002221949302600913

Kaskens, J., Goei, S. L., Van Luit, J. E., Verhoeven, L., & Segers, E. (2020). Impact of children's math self-concept, math self-efficacy, math anxiety, and teacher competencies on math development. *Teaching and Teacher Education* 94: 103096. https://doi-org.uea.idm.oclc.org/10.1016/j.tate.2020.103096.

Kim, J., Shin, Y. J., & Park, D. (2023). Peer network in math anxiety: A longitudinal social network approach. *Journal of Experimental Child Psychology*, *232*, 105672. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0022096523000486

Kirkland, H. R. (2020). An exploration of maths anxiety and interventions in the Primary classroom. Doctoral dissertation. University of Leicester. https://doi.org/10.25392/leicester.data.12659741

Kirkland, H., & Hunt, T. (2025). *Maths anxiety: Solving the equation*. Routledge.

Kortesluoma, R. L., Hentinen, M., & Nikkonen, M. (2003). Conducting a qualitative child interview: Methodological considerations. *Journal of advanced nursing*, *42*(5), 434-441. 10.1046/j.1365-2648.2003.02643.x

Krinzinger, H., Kaufmann, L., & Willmes, K. (2009). Math anxiety and math ability in early primary school years. *Journal of Psychoeducational Assessment* 27(3): 206–225. https://doi-org.uea.idm.oclc.org/10.1177/0734282908330583.

Kross, E., & Ayduk, O. (2011). Making meaning out of negative experiences by self-distancing. *Current Directions in Psychological Science* 20(3): 187–191. https://doi-org.uea.idm.oclc.org/10.1177/0963721411408883.

Kunwar, R. (2022). Impacts of Dyscalculia in Learning Mathematics: Some. *Learning disabilities: Neurobiology, Assessment, Clinical Features and Treatments*, *235*.

Larkin, K., & Jorgensen, R. (2016). "I hate maths: Why do we need to do maths?' Using IPad video diaries to investigate attitudes and emotions towards mathematics in Year 3 and Year 6 students. *International Journal of Science and Mathematics Education,* 14(5): 925–944. https://doi-org.uea.idm.oclc.org/10.1007/s10763-015-9621-x.

Leach, G. (2026). Grouping for equity in mathematics classrooms: Taking a strengths-based approach. *Mathematics Education Research Journal*, 1-26. https://link-springer-com.uea.idm.oclc.org/article/10.1007/s13394-026-00583-2

Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences, 19,* 355365. Doi: 10.1016/j.lindif.2008.10.009

Lundy, L. (2007). 'Voice' is not enough: conceptualising Article 12 of the United Nations Convention on the Rights of the Child. *British Educational Research journal*, *33*(6), 927-942. https://doi.org/10.1080/01411920701657033

Luo, R., Zhang, A., Wang, Y., Li, H., Xu, Y., Guo, K., & Si, J. (2024). Math attitudes and math anxiety predict students' perception of teacher support in primary school, but not vice versa. *British Journal of Educational Psychology*, *94*(1), 6-21. https://doi.org/10.1111/bjep.12628

Luo, X., Wang, F., & Luo, Z. (2009). Investigation and analysis of mathematics anxiety in middle school students. *Journal of mathematics Education*, *2*(2).

Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on math anxiety. In *Psychology Research and Behavior Management*. Vol. 11, 311–322. Graz: Dove Medical Press Ltd.

Lyons, I. M., & Beilock S. L. (2012). Mathematics anxiety: Separating the math from the anxiety. *Cerebral Cortex,* 22(9): 2102–2110. https://doi-org.uea.idm.oclc.org/10.1093/cercor/bhr289

Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education*, *30*(5), 520-540. https://doi.org/10.2307/749772

Ma, X., & Kishor, N. (1997). Assessing the relationship between attitude toward mathematics and achievement in mathematics: A meta-analysis. *Journal for Research in Mathematics Education*, 26-47. https://doi.org/10.2307/749662

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, *7*(1), 19. https://psycnet.apa.org/buy/2002-00925-002

MacNaughton, G. (2003). Eclipsing voice in research with young children. *Australasian Journal of Early Childhood*, *28*(1), 36-43. https://doi.org/10.1177/183693910302800108

Maloney, E. A. (2016). Math anxiety: Causes, consequences, and remediation. In K. R. Wentzel & D. B. Miele (Eds.), *Handbook of Motivation at School* (2nd ed., 408–423). Routledge.

Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. *Trends in Cognitive Sciences,* 16(8): 404–406. https://doi-org.uea.idm.oclc.org/10.1016/j.tics.2012.06.008

Maloney, E. A., Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science*, *26*(9), 1480-1488. https://doi.org/10.1177/0956797615592630

Marks, R. (2014). Educational triage and ability-grouping in primary mathematics: a case-study of the impacts on low-attaining pupils. *Research in Mathematics Education*, *16*(1), 38-53. https://doi-org.uea.idm.oclc.org/10.1080/14794802.2013.874095

Marsh, H. W., & Craven, R. G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science*, *1*(2), 133-163. https://doi.org/10.1111/j.1745-6916.2006.00010.x

Marshall, L., Wishart, R., Dunatchik, A., & Smith, N. (2017). Supporting mental health in schools and colleges. *Quantitative Survey: NatCen Social Research*. Department for Education (DfE). Gov.uk

https://www.gov.uk/government/publications/supporting-mental-health-in-schools-and-colleges

Mattarella-Micke, A., Mateo, J., Kozak, M. N., Foster, K., & Beilock, S. L. (2011). Choke or thrive? The relation between salivary cortisol and math performance depends on individual differences in working memory and math-anxiety. *Emotion*, *11*(4), 1000. https://doi.org/10.1037/a0023224

Mazzocco, M. M., Hanich, L. B., & Noeder, M. M. (2012). Primary School Age Students′ Spontaneous Comments about Math Reveal Emerging Dispositions Linked to Later Mathematics Achievement. *Child Development Research*, *2012*(1), 170310. **https://doi-org.uea.idm.oclc.org/10.1155/2012/170310**

McKenna, L., Johnston, J., Cross, R., Austerberry, J., Mathew, T., & McKenzie, G. (2022). Mathematics anxiety and associated interventions in nursing: A scoping review. *Nurse Education Today* 112: 105335. https://doi-org.uea.idm.oclc.org/10.1016/j.nedt.2022.105335

Meece, J., Wigfield, A., & Eccles, J. (1990) Predictors of math anxiety and its influence on young adolescents' course enrolment intentions and performance in mathematics. *Journal of Educational Psychology, 82,* 60-70.

Mehdizadeh, S., Nojabaee, S. S., & Asgari, M. H. (2013). The effect of cooperative learning on math anxiety, help seeking behavior. *Journal of basic and applied science research*, *3*(1), 1185-1190.

Miller, P. H., & Seier, W. L. (1994). Strategy utilization deficiencies in children: When, where, and why. *Advances in child development and behavior*, *25*, 107-156. https://doi-org.uea.idm.oclc.org/10.1016/S0065-2407(08)60051-8

Moliner, L., & Alegre, F. (2020). Peer tutoring effects on students' mathematics anxiety: A middle school experience. *Frontiers in Psychology*, *11*, 1610. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2020.01610/full

Moore, T. J., Johnson, C. C., Peters-Burton, E. E., & Guzey, S. S. (2015). The need for a STEM road map. *STEM road map: A framework for integrated STEM education*, *1*.

Murphy, R. (2022). How children make sense of their permanent exclusion: a thematic analysis from semi-structured interviews. *Emotional and Behavioural Difficulties*, *27*(1), 43–57. https://doi-org.uea.idm.oclc.org/10.1080/13632752.2021.2012962

Mutodi, P., & Ngirande, H. (2014). Perception of secondary school teachers towards the use of concrete materials in constructing mathematical meaning. *International Journal of Educational Sciences*, *7*(3), 449-461.

Namkung, J. M., Peng, P., & Lin, X. (2019). The relation between mathematics anxiety and mathematics performance among school-aged students: A meta-analysis. *Review of Educational Research*, *89*(3), 459-496. https://doi.org/10.3102/0034654319843494

National Numeracy (2022). New survey shows Brits are not as good at maths as they think. https://www.nationalnumeracy.org.uk/news/new-survey-uk-numeracy

National Numeracy (2024). Young adults suffering poor mental health due to lack of maths. https://www.nationalnumeracy.org.uk/news/young-adults-poor-mental-health-due-lack-maths

National Numeracy. (2023). A third of adults are nervous about numbers. https://www.nationalnumeracy.org.uk/news/third-adults-are-nervous-about-numbers

Navarro, D., González-Campos, J. A., & Perines, H. (2026). Advances and perspectives in research on math anxiety: A systematic review and a bibliometric analysis. *International Electronic Journal of Mathematics Education*, *21*(3), em0893. https://www.iejme.com/article/advances-and-perspectives-in-research-on-math-anxiety-a-systematic-review-and-a-bibliometric-19017

Nelson, K. 1993. *Events, narratives, memory: What develops. The Minnesota symposia on child psychology: Vol. Memory and affect in development*. Hillsdale, NJ: Erlbaum. https://www-taylorfrancis-com.uea.idm.oclc.org/chapters/edit/10.4324/9781315806846-1/events-narratives-memory-develops-katherine-nelson

Niaei, S., Imanzadeh, A., & Vahedi, S. (2021). The effectiveness of flipped teaching on math anxiety and Math Performance in 5th Grade Students. Journal of Technology of Education (Journal of Technology and Education), 15(3 (59), 419-428. SID. https://sid.ir/paper/376317/en

Nicolaidou, M., & Philippou, G. (2003). Attitudes towards mathematics, self-efficacy and achievement in problem solving. *European Research in Mathematics Education III*, *1*(11), 1-12. https://www.academia.edu/download/76849571/TG2_nicolaidou_cerme3.pdf

Newstead, K. (1998). Aspects of children's mathematics anxiety. *Educational Studies in mathematics*, *36*(1), 53-71. https://link-springer-com.uea.idm.oclc.org/article/10.1023/A:1003177809664

O'Connor, P. A., Morsanyi, K., & McCormack, T. (2023). Basic symbolic number skills, but not formal mathematics performance, longitudinally predict mathematics anxiety in the first years of primary school. *Journal of Intelligence*, *11*(11), 211. https://doi.org/10.3390/jintelligence11110211

Ofsted. (2021). *Research review series: Mathematics*. https://www.gov.uk/government/publications/research-review- series-mathematics/research-review-series-mathematics

Oh, D. D., Barger, M. M., & Pomerantz, E. M. (2022). Parents' math anxiety and their controlling and autonomy-supportive involvement in children's math learning: Implications for children's math achievement. *Developmental Psychology*, *58*(11), 2158. https://doi.org/10.1037/dev0001422

Orbach, L., Herzog, M., & Fritz, A. (2019). Math anxiety during the transition from primary to secondary school. In *Inclusive Mathematics Education: State-of-the-Art Research from Brazil and Germany* (pp. 419-447). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-11518-0_25

Organisation for Economic Co-operation and Development. (2013). *OECD skills outlook 2013: First results from the survey of adult skills*. OECD Publishing.

Paechter, M., Macher, D., Martskvishvili, K., Wimmer, S., & Papousek, I. (2017). Mathematics anxiety and statistics anxiety. Shared but also unshared components and antagonistic contributions to performance in

statistics. *Frontiers in Psychology* 8: 1196. https://doi-org.uea.idm.oclc.org/10.3389/fpsyg.2017.01196

Pajares, F., & Graham, L. (1999). Self-Efficacy, Motivation Constructs, and Mathematics Performance of Entering Middle School Students. *Contemporary Educational Psychology*. Vol. 24, 124–139. Atlanta: Elsevier. https://doi-org.uea.idm.oclc.org/10.1006/ceps.1998.0991

Pantino, F. O., & Hondrade Pantino, J. (2021). Effects of creative writing activities on students' mathematics anxiety. *Journal of International Education*, *3*, 22-42.

Para, T., & Johnston-Wilder, S. (2023). Addressing mathematics anxiety: A case study in a high school in Brazil. *Creative Education*, *14*(2), 377-399. 10.4236/ce.2023.142025

Park, D., Ramirez, G., & Beilock, S.L. (2014). The role of expressive writing in math anxiety. *Journal of Experimental Psychology: Applied,* 20(2): 103–111. https://doi-org.uea.idm.oclc.org/10.1037/xap0000013

Passolunghi, M. C., De Vita, C., & Pellizzoni, S. (2020). Math anxiety and math achievement: The effects of emotional and math strategy training. *Developmental Science*, *23*(6), e12964. https://doi-org.uea.idm.oclc.org/10.1111/desc.12964.

Patton, M. Q. (2015). Sampling, qualitative (purposeful). *The Blackwell Encyclopedia of Sociology.* https://doi.org/10.1002/9781405165518.wbeoss012.pub2

Perry, R. P., Hladkyj, S., Pekrun, R. H., Clifton, R. A., & Chipperfield, J. G. (2005). Perceived academic control and failure in college students: A three-year study

of scholastic attainment. *Research in Higher Education*, *46*(5), 535-569. DOI:10.1007/s11162-005-3364-4

Petronzi, D. (2016). *The development of the numeracy apprehension scale for children aged 4-7 years: qualitative exploration of associated factors and quantitative testing*. University of Derby (United Kingdom). https://www.proquest.com/openview/5e78211e7232b6c1ea6fc9375895aa03/1?pq-origsite=gscholar&cbl=2026366&diss=y

Petronzi, D. (2017). Numeracy apprehension in young children: Insights from Children Aged 4-7 Years and Primary Care Providers Dominic Petronzi, BSc. (Hons), MRes, PhD, Paul Staples, David Sheffield, Thomas Hunt, & Sandra Fitton-Wilde. *Psychology and Education*, *54*(1). https://www.researchgate.net/profile/Dominic-Petronzi/publication/312596519_Numeracy_apprehension_in_young_children_Insights_from_children_aged_4-7_years_and_primary_care_providers/links/5d8e3ee0a6fdcc2554a0f882/Numeracy-apprehension-in-young-children-Insights-from-children-aged-4-7-years-and-primary-care-providers

Petronzi, D., Hunt, T.E., & Sheffield, D. (2021). Interventions to Address Mathematics Anxiety: An Overview and Recommendations. *Current Studies in Educational Disciplines* 169: 169–194. https://www.researchgate.net/profile/Faruk-Hadzic-3/publication/383881738_Current_Studies_in_Educational_Disciplines/links/66dfcec4bd20173667c59cfd/Current-Studies-in-Educational-Disciplines.pdf#page=175

Petronzi, D., Schalkwyk, G., & Petronzi, R. (2024). A pilot math anxiety storybook approach to normalize math talk in children and to support emotion regulation. *Journal of Research in Childhood Education*, *38*(1), 145-163. https://doi.org/10.1080/02568543.2023.2214591

Petronzi, D., Staples, P., Sheffield, D., & Hunt, T. (2019a). Acquisition, development and maintenance of math anxiety in young children. In I. C. Mammarella, S. Caviola, & A. Dowker (Eds.), *Mathematics anxiety. What is known and what is still to be understood* (pp. 77–102). New York.

Petronzi, D., Staples, P., Sheffield, D., Hunt, T., & Fitton-Wilde, S. (2019b). Further development of the Children's Mathematics Anxiety Scale UK (CMAS-UK) for ages 4–7 years. *Educational Studies in Mathematics*, 100(3), 231–249. https://doi-org.uea.idm.oclc.org/10.1007/s10649-018-9860-1

Pizzie, R. G., McDermott, C. L., Salem, T. G., & Kraemer, D. J. (2020a). Neural evidence for cognitive reappraisal as a strategy to alleviate the effects of math anxiety. *Social Cognitive and Affective Neuroscience*, *15*(12), 1271-1287. https://doi.org/10.1093/scan/nsaa161

Pizzie, R. G., Raman, N., & Kraemer, D. J. (2020b). Math anxiety and executive function: Neural influences of task switching on arithmetic processing. *Cognitive, Affective, & Behavioral Neuroscience, 20*(2), 309–325. https://doi-org.uea.idm.oclc.org/10.3758/s13415-020-00770-z

Pletzer, B., Kronbichler, M., Nuerk, H. C., & Kerschbaum, H. H. (2015). Mathematics anxiety reduces default mode network deactivation in response to numerical tasks. *Frontiers in Human Neuroscience*, *9*, 202. https://doi.org/10.3389/fnhum.2015.00202

Pollard, A. (1996). *The social world of children's learning: Case studies of pupils from four to seven*. Cassell.

Ponizovsky-Bergelson, Y., Dayan, Y., Wahle, N., & Roer-Strier, D. (2019). A qualitative interview with young children: What encourages or inhibits young children's participation? *International Journal of Qualitative Methods*, *18*, 1609406919840516.

Popham, W. J. (2005). Students' Attitudes Count. *Educational Leadership*, *62*(5), 84. http://eric.ed.gov/?id=EJ725892

Primi, C., Donati, M. A., Izzo, V. A., Guardabassi, V., O'Connor, P. A., Tomasetto, C., & Morsanyi, K. (2020). The Early Elementary School Abbreviated Math Anxiety Scale (the EES-AMAS): A new adapted version of the AMAS to measure math anxiety in young children. *Frontiers in Psychology*, *11*, 1014. https://doi.org/10.3389/fpsyg.2020.01014

Quane, K. (2024). Rainbows, presents, zombies, and Frankenstein's Monster: Insights into young children's attitudes towards mathematics. *International Journal of Education in Mathematics, Science and Technology*, *12*(3), 725-749. https://eric.ed.gov/?id=EJ1434664

Rahim, M., & Koeslag, M. (2005). Math anxiety in Junior/Intermediate preservice teachers. *Alan Regerson. Reform, Revolution and Paradigm shifts in Mathematics Education*, 194-198.

Ramirez, G., Chang, H., Maloney, E. A., Levine, S. C., & Beilock, S. L. (2016). On the relationship between math anxiety and math achievement in early elementary school: The role of problem solving strategies. *Journal of*

Experimental Child Psychology, *141*, 83-100. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0022096515001812

Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition and Development*, *14*(2), 187-202. https://doi-org.uea.idm.oclc.org/10.1080/15248372.2012.664593

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational Psychologist, 53*(3), 145–164. https://doi-org.uea.idm.oclc.org/10.1080/00461520.2018.1447384

Rauscher, L., Kohn, J., Käser, T., Kucian, K., McCaskey, U., Wyschkon, A., Moraske, S., Esser, G. & von Aster, M. (2017). Effekte des Calcularis-Trainings. *Lernen und Lernstörungen*. https://doi.org/10.1024/2235-0977/a000168

Rattan, A., Good, C., & Dweck, C. S. (2012). “It's ok - Not everyone can be good at math”: Instructors with an entity theory comfort (and demotivate) students. *Journal of experimental social psychology*, *48*(3), 731-737. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0022103111003027

Richardson, F. C., & Suinn, R. M. (1972). The Mathematics Anxiety Rating Scale: Psychometric Data. *Journal of Counseling Psychology,* 19(6): 551. https://doi-org.uea.idm.oclc.org/10.1037/h0033456

Rossman, S. (2006). Overcoming math anxiety. *Mathitudes*, 1 [1], 1–4. https://www.academia.edu/36188181/Overcoming_Math_Anxiety

Ruark, A. (2021). Expressive writing as an intervention for math anxiety in middle school students. *MLET: The Journal of Middle Level Education in Texas*, *7*(1), 1. https://scholarworks.sfasu.edu/mlet/vol7/iss1/1

Rubie-Davies, C., Weinstein, R. S., Huang, F. L., Gregory, A., Cowan, P. A., & Cowan, C. P. (2014). Successive teacher expectation effects across the early school years. *Journal of Applied Developmental Psychology*, 35(3), 181–191. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0193397314000306

Rubinsten, O., Marciano, H., Eidlin Levy, H., & Daches Cohen, L. (2018). A framework for studying the heterogeneity of risk factors in math anxiety. *Frontiers in Behavioral Neuroscience*, *12*, 291. https://doi.org/10.3389/fnbeh.2018.00291

Salazar, L. R. (2019). Exploring the Effect of Coloring Mandalas on Students' math Anxiety in Business Statistics Courses. *Business, Management and Education*, *17*(2), 134-151. https://www.ceeol.com/search/article-detail?id=857634

Samuel, T. S., & Warner, J. (2021). "I can math!": Reducing math anxiety and increasing math self-efficacy using a mindfulness and growth mindset-based intervention in first-year students. *Community College Journal of Research and Practice*, *45*(3), 205-222. https://doi-org.uea.idm.oclc.org/10.1080/10668926.2019.1666063

Sarı, M. H., & Hunt, T. E. (2020). Parent-child mathematics affect as predictors of children's mathematics achievement. *International Online Journal of Primary Education*, *9*(1), 85-96. https://izlik.org/JA48LL93AK

Scalise, N. R., Santiago, I. M., & Canning, E. A. (2025). When we were young: memories of early mathematics experiences. *Journal of Numerical Cognition*, *11*, 1-14. https://doi.org/10.5964/jnc.14771

Schniering, C. A., Hudson, J. L., & Rapee, R. M. (2000). Issues in the diagnosis and assessment of anxiety disorders in children and adolescents. *Clinical Psychology Review*, *20*(4), 453-478. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0272735899000379

Segumpan, L. L. B., & Tan, D. A. (2018). Mathematics performance and anxiety of junior high school students in a flipped classroom. *European Journal of Education Studies*.

Sheffield, D., & Hunt, T. (2006). How does anxiety influence maths performance and what can we do about it? *MSOR connections*, *6*(4), 19.

Shi, Z., & Liu, P. (2016). Worrying thoughts limit working memory capacity in math anxiety. *PLoS One*, *11*(10). https://doi.org/10.1371/journal.pone.0165644

Shore, Ú., & Kelleher, S. (2024). Can early intervention for maths anxiety predict better affective and attainment outcomes at primary level? A systematic review. *Irish Educational Studies*, *43*(4), 1523–1544. https://doi-org.uea.idm.oclc.org/10.1080/03323315.2024.2352440

Short, D. S., & McLean, J. F. (2023). The relationship between numerical mapping abilities, maths achievement and socioeconomic status in 4-and 5-year-old children. *British Journal of Educational Psychology*, *93*(3), 641-657. https://doi.org/10.1111/bjep.12582

Siegel, D. J. (1999). *The developing mind: Toward a neurobiology of interpersonal experience*. Guilford Press.

Siegel, D. J. (2020, December 12). *Dr. Dan Siegel's hand model of the brain* [Video]. Dr. Dan Siegel. https://drdansiegel.com/hand-model-of-the-brain/

Skagerlund, K., Östergren, R., Västfjäll, D., & Träff, U. (2019). How does mathematics anxiety impair mathematical abilities? Investigating the link between math anxiety, working memory, and number processing. *PloS one, 14(1)*. https://doi.org/10.1371/journal.pone.0211283

Sloan, T. (2010). *The effects of teacher mathematics anxiety and mathematics teacher efficacy on mathematics performance and attitudes of elementary students.* Doctoral dissertation, University of Alabama.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Soll, B. A., Petronzi, D., & Hunt, T. E. (2026). The validation of a therapy dog intervention for math anxiety in early elementary school children. *Journal of Research in Childhood Education*, 1-24. https://doi-org.uea.idm.oclc.org/10.1080/02568543.2026.2648930

Solomon, Y. (2007). Experiencing mathematics classes: Ability grouping, gender and the selective development of participative identities. *International journal of educational research, 46*(1-2), 8-19. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0883035507000560

Soni, A., & Kumari, S. (2015). The role of parental math attitude in their children math achievement. *International Journal of Applied Sociology*, *5*(4), 159-163. https://link-springer-com.uea.idm.oclc.org/article/10.1007/s10763-015-9687-5

Sorvo, R., Koponen, T., Viholainen, H., Aro, T., Raikkonen, E., Peuro, P., Dowker, A., & Aro, M. (2017). Math anxiety and its relationship with basic arithmetic skills among primary aged children. *British Journal of Educational Psychology, 87*(3), 309–327.

Sorvo, R., Koponen, T., Viholainen, H., Aro, T., Raikkonen, E., Peura, P., Tolvanen, A., & Aro, M. (2019). Development of mathematics anxiety and its longitudinal relationship with arithmetic achievement among primary school children. *Learning and Individual Differences, 69*, 173–181.

Spielberger, C. D. (1972). Conceptual and methodological issues in anxiety research. *Anxiety: Current trends in theory and research*, *2*, 481-493.

Spyrou, S., Rosen, R., & Cook, D. (eds), (2019) *Reimagining Childhood Studies*. Bloomsbury Academic.

Stipek, D. (2002). Good instruction is motivating. In *Development of achievement motivation*, edited by A. Wigfield and J. S. Eccles, 309–332. San Diego: Academic Press. https://doi-org.uea.idm.oclc.org/10.1016/B978-012750053-9/50014-0.

Suinn, R. M., & Winston, E. H. (2003). The mathematics anxiety rating scale, a brief version: Psychometric data. *Psychological reports*, *92*(1), 167-173. https://doi.org/10.2466/pr0.2003.92.1.167

Suinn, R. M., Taylor, S., & Edwards, R. W. (1988). Suinn mathematics anxiety rating scale for elementary school students (MARS-E): Psychometric and normative data. *Educational and Psychological Measurement*, *48*(4), 979-986. https://doi.org/10.1177/0013164488484013

Sun, Y., Blewitt, C., Edwards, S., Fraser, A., Newman, S., Cornelius, J., & Skouteris, H. (2023). Methods and ethics in qualitative research exploring young children's voice: A systematic review. *International Journal of Qualitative Methods*, *22*, https://doi.org/10.1177/16094069231152449

Supekar, K., Luculano, T., Chen, L., & Menon, V. (2015). Remediation of childhood math anxiety and associated neural circuits through cognitive tutoring. *Journal of Neuroscience, 35,* 12574–12583. 10.1523/JNEUROSCI.0786-15.2015.

Svraka, B., Álvarez, C., & Szücs, D. (2024). Anxiety predicts math achievement in kindergarten children. *Frontiers in psychology*, *15*. https://doi.org/10.3389/fpsyg.2024.1335952

Sweller, J. (2020). Cognitive load theory and educational technology. *Educational Technology Research and Development*, *68*(1), 1-16. https://doi-org.uea.idm.oclc.org/10.1007/s11423-019-09701-3

Szczygiel, M. (2020a) Gender, general anxiety, math anxiety and math achievement in early school age children. Issues in Educational Research, 30(3) 1126-1142.

Szczygiel, M. (2020b). When does math anxiety in parents and teachers predict math anxiety and math achievement in elementary school children? The role of gender and grade year. Social Psychology of Education, 23, 1023–1054. https://doi.org/10.1007/s11218-02009570-29

Szczygieł, M., & Pieronkiewicz, B. (2022). Exploring the nature of math anxiety in young children: Intensity, prevalence, reasons. *Mathematical Thinking and Learning*, *24*(3), 248–266. https://doi-org.uea.idm.oclc.org/10.1080/10986065.2021.1882363

Szucs, D., & Toffalini, E. (2023). Maths anxiety and subjective perception of control, value and success expectancy in mathematics. *Royal Society Open Science*, *10*(11), 231000. https://doi.org/10.1098/rsos.231000

Thomas, G., & Dowker, A. (2000, September). Mathematics anxiety and related factors in young children. In *British Psychological Society Developmental Section Conference*.

Throop-Robinson, E., Husband, M., Tucker, A., & MacDonald, L. (2026). “It’s something in my head that thinks like that’s the one that’s most like mine”: Number talks, efficacy and enactivism. *Mathematics Education Research Journal*, 1-19.

Tobias, S. (1986) Anxiety and Cognitive processing of instruction. In R. Schwarzer (ed) *Self related cognitions in anxiety and motivation.* Lawrence Erlbaum associates.

Tobias, S., & Weissbrod, C. (1980). Anxiety and mathematics: An update. *Harvard Educational Review*, *50*(1), 63-70.

Tok, Ş. (2015). The effects of teaching mathematics creatively on academic achievement, attitudes towards mathematics, and mathematics anxiety. *International Journal of Innovation in Science and Mathematics Education*, *23*(4). https://openjournals.library.sydney.edu.au/CAL/article/view/7887

Toprak, E., & Yavuz, E. (2026). Academic motivation, fear of negative evaluation, self-efficacy, and self-regulated learning: Role of Affective Mechanisms in the Learning Process. *BMC Psychology*. https://doi-org.uea.idm.oclc.org/10.1186/s40359-026-04602-6

Trujillo, K. M., & Hadfield, O. D. (1999). Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachers. *College student journal*, *33*(2).

Tuohilampi, L., Hannula, M. S., & Laine, A. (2014). Examining Mathematics-Related Affect and its Development during Comprehensive School Years in Finland. *North American Chapter of the International Group for the Psychology of Mathematics Education*. https://eric.ed.gov/?id=ED599983

UK Government (n.d.). *Maths to 18 expert advisory group.* Retrieved October 17, 2024.

UK Government. (2023). *Prime Minister sets ambition of maths to 18 in speech*. https://www.gov.uk/government/news/prime-minister-sets-ambition-of-maths-to-18-in-speech

United Nations. (1989). *Convention on the Rights of the Child*.

Vanbecelaere, S., Matsuyama, K., Reynvoet, B., & Depaepe, F. (2021). The role of the home learning environment on early cognitive and non-cognitive outcomes in math and reading. *Frontiers in Education* https://doi.org/10.3389/feduc.2021.746296

Vanbecelaere, S., Van den Berghe, K., Cornillie, F., Sasanguie, D., Reynvoet, B., & Depaepe, F. (2020). The effects of two digital educational games on cognitive

and non-cognitive math and reading outcomes. *Computers & Education*, *143*, 103680. https://www-sciencedirect-com.uea.idm.oclc.org/science/article/pii/S0360131519302337

Viljaranta, J., Tolvanen, A., Aunola, K., & Nurmi, J.-E. (2014). The developmental dynamics between interest, self-concept of ability, and academic performance. *Scandinavian Journal of Educational Research*, 58(6), 734–756. https://doi-org.uea.idm.oclc.org/10.1080/00313831.2014.904419

Vukovic, R. K., Kieffer, M. J., Bailey, S. P., & Harari, R. R. (2013). Mathematics anxiety in young children: Concurrent and longitudinal associations with mathematical performance. *Contemporary Educational Psychology*, *38*(1), 1-10. https://doi-org.uea.idm.oclc.org/10.1016/j.cedpsych.2012.09.001

Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes*. Harvard University Press.

Wall, J. (2022). From childhood studies to childism: reconstructing the scholarly and social imaginations. *Children's Geographies*, *20*(3), 257-270. https://doi.org/10.1080/14733285.2019.1668912

Wang, M. T., Chow, A., Hofkens, T., & Salmela-Aro, K. (2015). The trajectories of student emotional engagement and school burnout with academic and psychological development: Findings from Finnish adolescents. *Learning and Instruction*, 36: 57–65. https://doi-org.uea.idm.oclc.org/10.1016/j.learninstruc.2014.11.004.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, *92*(4), 548. https://doi.org/10.1037/0033-295X.92.4.548

Weiner, B. (2010). The development of an attribution-based theory of motivation: A history of ideas. *Educational Psychologist*, *45*(1), 28-36. https://doi-org.uea.idm.oclc.org/10.1080/00461520903433596

Whitebread, D., & Pino-Pasternak, D. (2010). Metacognition, self-regulation and meta-knowing. *International handbook of psychology in education*, 673-711. https://researchportal.murdoch.edu.au/esploro/outputs/bookChapter/Metacognition-self-regulation-and-meta-knowing/991005540454107891

Wicks, K. (2025). *Tackling anxiety in primary mathematics teachers*. Taylor & Francis.

Wigfield, A., & Meece, J. L. (1988). Math anxiety in elementary and secondary school students. *Journal of educational Psychology*, *80*(2), 210. https://doi.org/10.1037/0022-0663.80.2.210

Wilson, S. (2009). “Better you than me”: Mathematics anxiety and bibliotherapy in primary teacher professional learning. In R. Hunter, B. Bicknell, & T. Burgess (Eds.), *Crossing divides: Proceedings of the 32nd annual conference of the mathematics education research group of Australasia* (Vol. 2 ,pp. 603–610). https://www.researchgate.net/profile/Sue-Wilson-13/publication/237102736_Better_You_Than_Me_Mathematics_Anxiety_and_Bibliotherapy_in_Primary_Teacher_Professional_Learning/links/546519c80cf2f5eb17ff368e/Better-You-Than-Me-Mathematics-Anxiety-and-Bibliotherapy-in-Primary-Teacher-Professional-Learning.pdf

Wilson, T. (2011). *Redirect: The Surprising New Science of Psychological Change*. Penguin UK.

Witt, M. (2012). The impact of mathematics anxiety on primary school children's working memory. *Europe's Journal of Psychology*, *8*(2), 263-274. https://doi.org/10.5964/ejop.v8i2.458

Wu, S. S., Barth, M., Amin, H., Malcarne, V., & Menon, V. (2012). Math anxiety in second and third graders and its relation to mathematics achievement. *Frontiers in Psychology*, *3*, 162. https://doi.org/10.3389/fpsyg.2012.00162

Yanuarto, W. N. (2016). Teachers awareness of students' anxiety in math classroom: Teachers' treatment vs students' anxiety. *Journal of Education and Learning (EduLearn)*, *10*(3), 235-243. https://edulearn.intelektual.org/index.php/EduLearn/article/view/3808

Yardley, L. (2000). Dilemmas in qualitative health research. *Psychology and health*, *15*(2), 215-228. https://doi-org.uea.idm.oclc.org/10.1080/08870440008400302

Yardley, L. (2017). Demonstrating the validity of qualitative research. *The Journal of Positive Psychology, 12*(3), 295–296. https://doi.org/10.1080/17439760.2016.1262624

Young, C. B., Wu, S. S., & Menon, V. (2012). The neurodevelopmental basis of math anxiety. *Psychological Science*, *23*(5), 492-501. https://doi.org/10.1177/0956797611429134

Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: A meta-analytic investigation. *Frontiers in Psychology*, *10*, 1613. https://doi.org/10.3389/fpsyg.2019.01613

Zuccollo, J., & Hutchinson, J. (2026). *Educational psychologists in England.* Education Policy Institute. https://epi.org.uk/wp-content/uploads/2026/04/EPs-in-England-April-2026.pdf