“Sometimes it’s hard and sometimes it’s easy because sometimes I know how to read” – Exploring metacognition in Primary 1 using Pupil Views Templates

Jennifer Zike

University of Strathclyde
School of Education
2020

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Education

Declaration of authenticity and author's rights

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:

Date:

Acknowledgements

I have been lucky enough to have support and encouragement from a great number of sources as I worked toward completing this thesis. First and foremost, I would like to thank my supervisors Professor Kate Wall and Dr Lorna Arnott for their helpful guidance and invaluable feedback along the way (particularly on those early long and rambling draft chapters loaded with academic jargon). Your encouragement and support have helped me to grow into the confident researcher that I am today, and I am infinitely thankful.

To the children and staff in the participating schools – this research could not have happened without your support. I am incredibly grateful for your interest in my research and for giving your time and enthusiasm to the project. I thoroughly enjoyed being back in the classroom and the reminder of the importance of staying connected with practice.

I am beyond grateful to the staff at Strathclyde who helped me to develop my skills as a researcher and university tutor. My work with Jonathan Firth on his module on memory, belief and misconceptions was instrumental in helping me to develop my thinking around metacognition in education. I would like to also thank Dr Farid Bardid for providing feedback on my quantitative analysis. Lastly, I am grateful to Dr Eleni Karagiannidou and Allan Blake, who have always encouraged me, showed interest in my work and spared time from their busy schedules to have a chat in the hallway. I probably would not have found my way to this doctorate without Allan, who encouraged me to apply while I was still working on my MSc and assured me that I was capable of doctoral work.

Last by certainly not least, I would not have gotten to where I am today without the support of my family and friends. My parents and stepparents have never doubted in my ability to finish this doctorate and my mom obligingly listened to me speak at length about my research in our weekly calls. My chats with Di and Lore throughout lockdown have helped keep me sane and have been invaluable to developing my ideas. My lovely colleagues and friends in the grad school have supported me and helped celebrate the milestones in this PhD. Lastly, to my Japanese meetup group – いつも PhD についての話を我慢してくれて本当にありがとうございました！（そしてすみません 笑）

Abstract

This thesis explores Primary 1 children's metacognition as expressed through pupil views templates (PVTs) (Wall & Higgins, 2006). PVTs are practice-based tools designed to facilitate verbal reflection on learning. The overall aim of the study was to develop a deeper understanding of how children understand learning at the beginning of primary school and what factors might impact on metacognitive development and its verbal expression in a facilitated context.

Grounded in critical realism, the mixed methods study employed visually-mediated interviews with 85 children from 6 Scottish primary schools and teacher/parent questionnaires. Drawing from previous studies using PVTs with young children, the study adopted a facilitative and semi-structured approach to discussion around the PVTs and children's responses were recorded using structured response sheets. Teacher and parent questionnaires contributed supplemental data on children's early skills (executive functioning, self-regulation and verbal skills) and early education and family circumstances (NS-SEC, parent education, age at start of nursery). In-depth qualitative analysis drew on thematic analysis (Braun & Clarke, 2006) using both deductive and inductive approaches. Qualitative data on children's metacognition was then transformed to be used in quantitative analyses to explore connections between children's early skills and family circumstances and their demonstration of metacognition in the PVT interactions.

This study's findings show that children demonstrated well-developed understandings of learning and still developing schemas of which they seemed only partly aware. Their knowledge and beliefs reflected how they made meaning of previous metacognitive experiences and the context the experiences took place in. Their emotions and attributions during these metacognitive experiences seemed to impact the knowledge they constructed. Regression analysis showed that early skills matter when demonstrating metacognition. In the early years, reflection on learning can be facilitated using pedagogically-appropriate tools. Facilitated reflections may help to increase/clarify children's metacognitive knowledge and encourage more positive and accurate attributions, particularly when experiencing difficulties. These findings suggest that the contexts developed by researchers and practitioners are vitally important to children's expression and development of metacognitive knowledge and skills.

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

Metacognition is inarguably important in education because insight into one's own mental processing allows for better control over these processes and improved learning as a result (Desautel, 2009; Higgins et al., 2016; Schneider, 2010). Flavell (1979) defined metacognition as "knowledge and cognition about cognitive phenomena" (p 906). Given the focus on cognitive processing, it is perhaps unsurprising that metacognition has also been heavily researched in psychology. The fact that metacognition spans multiple fields means that researchers have a variety of interests and ways of investigating these interests (Gascoine et al., 2017). This has made it a complex area of research with active debates around how to best define and explore the phenomenon.

I used Flavell's (1979) definition in this thesis while acknowledging that it has limitations for my work. It implies the exclusion of non-cognitive processes like affect and motivation when these may substantially impact on and interact with cognition and metacognition (Blair, 2002; Efklides, 2006). Cognition also implies an internal focus when social metacognition is not only possible, but vitally important to metacognitive development (Efklides, 2008, 2014). These themes will be explored further in chapter 3. Nevertheless, Flavell's (1979) definition is inclusive of a broader range of cognitive processes, which was useful in this thesis because it supported the study's messy conception of young children's metacognition (see section 2.1). Other less formal definitions have been used in education such as thinking about thinking or higher order thinking (Desautel, 2009; Larkin, 2010). However, these were somewhat too constrained for the study in that they focus on thinking when there are many cognitive processes that could be the focus of metacognition – attention, comprehension, learning and believing to name a few.

In this thesis I explore metacognition in children starting primary school in Scotland using Pupil Views Templates (PVTs) (Wall & Higgins, 2006). Although educationally oriented, the study straddles education and psychology in that it draws on theory and concepts from both disciplines to develop understanding of young children's metacognition. This chapter lays out the background, context and rationale for the study. Chapter 2 examines in more depth how I conceptualised young children and metacognition.

1.1. Background and context for the study

Research on young children's metacognition has changed substantially since Flavell (1979) introduced it as a late-developing skill. Early metacognitive studies were particularly interested in development and were influenced by Piaget's staged model of cognitive development (Fox & Riconscente, 2008). This meant that young children were often involved in research, but it mostly highlighted their lack of insight into their mental processing (Brown, 1975; Flavell, 1979; Flavell et al., 1995). However, even early researchers like Rowe (1989) contested that young children could demonstrate substantial metacognitive competence in appropriate contexts. As more research has incorporated child-friendly methodologies, substantial evidence of young children's metacognitive competences has been recorded (H. Lewis, 2019; S. Robson, 2010; Wall et al., 2007; Whitebread et al., 2009). The literature review chapters (chapter 3 and 4) examine research on young children's metacognition and how researchers have explored the phenomenon.

Since their development, PVTs have been used to explore metacognition with children from age 4-16 (Gascoine et al., 2017). They were developed in collaboration with teachers through the Learning to Learn project in the early 2000s (Higgins et al., 2007; Wall et al., 2010; Wall & Higgins, 2006). PVTs are a dual research and pedagogical tool that can be used to facilitate talk about learning, making them useful in both practice and research. As shown below in figure 1, they are cartoon depictions of learning situations with thought and speech bubbles to facilitate reflection and discussion. Many contain a predetermined cartoon picture of a learning situation selected by the researcher; however, blank PVTs that allow children to select their own learning situation for reflection have also been used (Wall et al., 2007).

Figure 1: Example of a completed PVT from Baumfield et al. (2009)

Previous research using PVTs will be examined in depth in chapter 4. However, it is important to highlight here that PVTs have not been used in Scotland before and have also not been used in an in-depth exploration of metacognition in young children specifically.

Although Scottish educational practice is not the primary focus of this thesis, practice does have important implications as a context for children's experiences and the metacognition they expressed in this study. Therefore, it is important to provide some context for the reader. Scottish children start primary school at age 4-5 and many schools are now shifting toward play-based provision for Primary 1 children, although this is not yet fully embedded and individual schools differ in the way they incorporate play (P. Duncan & Grogan, 2019). Nursery places are funded for all 3-5-year-old children (and some eligible 2-year-olds) and a total of 600 hours of provision for every child was in place from 2014. This has now been increased to 1400 hours of provision from August 2020, although in many cases this has been impacted by Covid-19 (Education Scotland, 2020). There is an emphasis on play-based provision in nurseries. Throughout this thesis, additional context will be added where it is important to the understandings that children expressed. For now, it is important to understand that most children who are born and raised in Scotland arrive at primary school with some early education experience. Through this experience, they will have developed some knowledge about learning. Additionally, although primary school practice is shifting toward play in primary 1, nursery and primary 1 practice still differ and the transition between the two represents a substantial transition in young children's lives (Education Scotland, 2020).

The reader will notice that throughout this thesis I do not strive to remove my perspective from the research. Instead, I reflexively examine my decisions and how my perspective on young children and metacognition informed these decisions. Chapter 2 is a detailed examination of my positionality, focusing on how I conceptualised young children, metacognition and the context. Therefore, it is important that the reader has some background about me because my background inevitably impacted on the way I approached this research, carried out the study and interpreted the data (Berger, 2015). My background is in primary teaching and I have taught in different capacities – as a classroom teacher in Scotland, assistant English language teacher in Japan and immersion language teacher at summer camps in America and South Korea. I qualified as a primary teacher in Scotland in 2016 and it was through my experiences in practice that I ultimately became interested in educational research. This interest led me to pursue a Master's in educational research where I had the opportunity to carry out a small-scale case study exploring how primary children with English as an additional language were supported in a local school. Consequently, I approached this doctoral project from a dual teacher-researcher perspective.

1.2. Rationale

This section details the rationale for the study. Since the broad aim of the study is to explore metacognition in children at the beginning of school using PVTs, this forms the basis of the rationale. At the heart of it, there are two main questions: why is it important to study metacognition in children at the beginning of school and why were PVTs chosen as the research tool?

1.2.1. The importance of studying metacognition at the beginning of school

Recent research has refuted claims that young children are not metacognitive (H. Lewis, 2019; Wall & Higgins, 2006; Whitebread et al., 2009) and established that early metacognition is important for children at the beginning of school. Research has indicated that metacognitive skills are vital to school readiness (Basilio & Rodríguez, 2017; Willis & Dinehart, 2014). Children's early abilities to regulate their own learning have been linked to later academic competences, including learning to learn skills and complex problem solving skills (R. J. Duncan et al., 2018; Vainikainen et al., 2015). Given the suggested relationship between early metacognitive skills and academic outcomes, early development of metacognitive competencies is of great importance to educators.

Modern educationalists acknowledge that children do not arrive at school as blank slates and understand that learning is situated (Wallerstedt et al., 2011). This meas that children make sense of new learning through the lens of their previous experiences and with the help of others (Piaget, 1969; Vygotsky, 1978). Carrying this through to metacognition, children form new metacognitive knowledge and skills through the lens of their previous experiences and knowledge (Dunphy, 2004). This means that understanding children's early conceptions of learning is important for their future knowledge construction. Exploratory studies like this one are useful in understanding what kinds of knowledge and skills children arrive at school with. Understanding these early conceptions of learning can be useful in improving early years practice and transitions between nursery and primary school. Chapter 3 will particularly highlight the issue of transferring knowledge between the play contexts that are the norm in nursery and the more formal learning in primary school.

Lastly, although young children have not been actively excluded from metacognitive literature, many studies focus on developmental comparisons or set out to evidence young children's metacognitive abilities (or lack of) in some area (i.e. Bryce et al., 2015; Clerc et al., 2014; van Loon, Destan, et al., 2017). PVT studies have also tended to concentrate on developmental comparisons (Gascoine, 2016; Wall et al., 2013). Although establishing evidence of young children's metacognitive abilities and understanding their developing qualities is important, it is only one piece of the puzzle. The need for different perspectives in understanding young children's metacognition is further explored in the next chapter. There is ample evidence that young children are metacognitive and that their abilities are often underestimated (Destan et al., 2014; H. Lewis, 2019; S. Robson, 2010; Vo et al., 2014; Whitebread et al., 2009). However, there is need for more qualitative exploration of what their early metacognition is like. This is an area where this study adds valuable insight.

1.2.2. PVTs as a tool for exploring metacognition

PVTs are a useful tool for talking to children about learning and exploring their metacognition (Wall & Higgins, 2006). They have been used with children as young as 4, so they can be considered pedagogically appropriate tools for this study's age group (Gascoine, 2016; Wall, 2019). PVTs have been used flexibly by teachers and researchers to elicit children's perspectives on learning in a broader sense (Gascoine, 2016; Higgins et al., 2007; Wall et al., 2010) as well as their perspectives on specific learning situations and using particular tools (Erikson & Grant, 2007; Hanke, 2014). PVT research will be considered further in section 4.2.1. For the purpose of this introduction, it is enough to understand that because their primary function is to elicit talk about learning, they have great potential as an exploratory tool, making them suited to this study's exploratory orientation. They can be used to talk about a wide variety of learning situations, allowing children to bring together different kinds of knowledge. Chapter 4 will explore PVTs as a method for eliciting metacognition in depth, including their affordances and limitations.

In the early years, teachers have employed more supportive approaches to the discussion around PVTs, which was useful for this study (Wall et al., 2007). Supportive approaches allow for the use of metacognitive prompts and cues (Hacker & Dunlosky, 2003; Holton & Clarke, 2006). In this study, metacognitive prompts were useful in getting children to think about the PVTs in particular ways and additional explanatory prompts helped to draw out their reasoning. This was useful in developing a deeper understanding of young children's metacognition by encouraging them to explain their judgments and thinking. The study's specific approach will be explored in 5.4.4.

Lastly, although supportive approaches to PVT interactions have been used before, there has not yet been a study that has specifically set out to develop and examine a particular early years approach. This study adds to the expanding body of PVT research by examining what features of facilitative PVT interactions were helpful and how they supported young children’s verbal expression of metacognition. Additionally, since the study focused on one age group, I was able to explore within-group differences where other PVT research has mostly concentrated on age-related differences (Gascoine, 2016; Wall, 2008; Wall et al., 2013). Section 4.2 further details how this study addresses gaps in PVT research on metacognition.

1.3. Research aims and questions

Other studies have proven that young children can be metacognitive, so this study set out with the assumption that the children would be capable of metacognition. Therefore, the study’s primary aim was to explore what their early metacognition was like and what impacted its verbal expression. Four research questions were developed to support this broad aim:

(1) What characteristics of facilitative PVT interactions impact on how children express their understandings of learning?
(2) How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?
(3) What are the key characteristics of children’s metacognition at the beginning of primary 1 in Scotland as demonstrated in PVT interactions?
(4) Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their:
    - family background;
    - early education;
    - early skills?

Section 5.1 will come back to the research questions and relate them to the literature that I review in chapters 3 and 4. The next chapter positions the study and is, in essence, a continuation of this introduction. It examines how I conceptualised three concepts that were central to this study: young children, metacognition and context.

Chapter 2. Navigating my position – theoretical and philosophical starting points

This chapter will examine the theoretical and philosophical frames for the study. Instead of speaking of theoretical and philosophical lenses abstractly, I will outline how I interpreted and used them to elaborate and justify my perspective on three central concepts in this study – young children, metacognition and context. Subsequent chapters draw heavily on these concepts, so I have chosen to present this chapter at the beginning of the thesis to provide the reader with insight into my thinking. My perspective impacted the way I reflected on how young children's metacognition was portrayed in the literature, designed and carried out the study and interpreted the findings.

My position throughout this research has been reflexive, so this chapter serves to establish that thread. Reflexivity has been defined as: "the process of a continual internal dialogue and critical self-evaluation of researcher's positionality as well as active acknowledgement and explicit recognition that this position may affect the research process and outcome" (Berger, 2015, p 220). Essentially, reflexivity serves as researcher metacognition (Wall & Hall, 2020) and assisted me in not only evaluating my own study but in critically engaging with other studies. By increasing awareness of my own ontological and epistemological beliefs, I monitored how these shaped my research. When reviewing literature on metacognition, I considered how other researchers' beliefs may have impacted their research approaches and subsequent knowledge claims. Through this monitoring process, I did not strive to remove my perspective from the research. Instead, throughout this thesis, I will examine the affordances and limitations inherent in the viewpoint I can offer on young children's metacognition.

It can be argued that metacognition is a phenomenon that stands in contention, pulled between the different perspectives and interests of various fields (Gascoine et al., 2017). The two central perspectives of interest in this study were developmental and sociological understandings of metacognition and of young children. Although often portrayed as two sides of a coin (Lee, 1998; Prout, 2011), throughout this thesis they are instead positioned as complementary perspectives. They were complementary in that they both offered useful perspectives for making sense of young children's metacognition. Critical realism was a useful lens in this study because it acknowledges that different kinds of research are useful in advancing our collective understanding of real phenomena. The first half of this chapter will further elaborate on the usefulness of critical realism in constructing a position that falls somewhere between sociological and psychological perspectives, drawing from both fields.

Within this thesis, I position young children as individuals who are still developing in many ways and actively making sense of their experiences using the information and understandings they have developed (Tizard & Hughes, 2002). I took the stance that children could competently communicate their perspectives if offered appropriate opportunities to do so. This study builds on the idea that concepts like competence that are usually presented as imbued properties are instead situational characteristics (Lee, 1998). Both adults and children can experience contexts where they are incompetent, and people continue to develop throughout their lives. The second half of this chapter will justify this position through discussion of critical works around the sociology of childhood (Lee, 1998; Prout, 2011; Tisdall & Punch, 2012).

2.1. Adopting a critical realist standpoint

I found critical realism to be useful in this study for two main reasons. It offers a philosophical framework that assumes there is an external reality but that our knowledge about reality is subjective (Maxwell & Mittapalli, 2010). This was helpful first in understanding metacognition as a phenomenon and second in providing an impetus for further critical reflection both on existing theory and on my own data and findings. In this study, I viewed metacognition as a complex and internal phenomenon that can be difficult to know about. Since multiple disciplines have a vested interest in developing knowledge about metacognition, critical realism was useful for its ability to integrate different kinds of knowledge.

Critical realism does not disregard any study that adds to our collective understanding of phenomena. Instead, it contends that there are multiple perspectives (Maxwell & Mittapalli, 2010) or levels of reality (Alderson, 2016) from which we can understand real phenomena. In this study, I viewed metacognition as a phenomenon that people experience differently, but that has common properties and processes. Researchers often explore it from different perspectives because they are interested in different aspects of the phenomenon. One study might explore children's knowledge about how they learn in maths, highlighting the highly individualistic and subjective construction of this knowledge. Another study might seek to understand wider developmental patterns by comparing the metacognitive strategies children of different ages demonstrated in a maths task. From a critical realist standpoint both studies are valuable because different kinds of knowledge can be brought together to build theories about metacognition as a common mental process that is subjectively experienced. It will become evident throughout this thesis that it was useful to position different kinds of knowledge developed by multidisciplinary fields as being about the same underlying real phenomenon. This was because different perspectives, specifically sociological and psychological perspectives, were useful in making sense of young children's metacognition.

As I will further explain in the next section, this study suggests there are both developed and developing aspects of metacognition (Lee, 1998) and both are important to understanding young children's metacognition. From a teaching perspective, it is important to know what children are capable of on their own, with help and what the developmental trajectory of their skills might look like (Vygotsky, 1978). There is a place for developmental studies to contribute knowledge about the developing aspects of metacognition. However, they should not be taken as complete explanations of young children's metacognition. This is supported by the critical realist stance because it positions theory as partial and incomplete explanations of reality (Maxwell & Mittapalli, 2010; Shannon-Baker, 2016). The same could be said of sociological perspectives of metacognition, which may neglect developing aspects of metacognition. I have chosen to highlight developmental studies here because there is a heavy skew towards examining young children's metacognition in terms of how it contributes to the development of adult metacognition. This could be because metacognition research has historically been interested in development (Dinsmore et al., 2008). Nevertheless, this means that young children are often viewed in terms of what they cannot do rather than what they can. This will become apparent in the literature review (chapter 3), where many of the studies I examined came from this perspective.

As a teacher, I viewed context as important in this study and this view was supported by the critical realist stance, which emphasises the context in which a phenomenon takes place

(Maxwell & Mittapalli, 2010; Shannon-Baker, 2016). I adopted a broad view of context that drew on aspects of Bronfenbrenner's bioecological systems theory (Bronfenbrenner, 1979; Hayes et al., 2017) and situated learning (Wallerstedt et al., 2011). With a critical realist lens, I understood context as multi-layered. This meant I considered that any immediate context (i.e. a learner engaging in a learning episode) is enacted within wider micro and macrosystems (i.e. classroom culture and Scottish socio-cultural ideology). Instead of taking immediate understandings at face value, I found it useful to explore the micro and macro cultures these understandings were created and expressed within. This helped me to deepen my understanding of young children's metacognition throughout this study. This was particularly important during the analysis stage, but also informed how I unpacked concepts like assumptions about metacognitive competence in other studies. The importance of the context will become obvious as the reader progresses through this thesis.

Throughout this thesis, I take the view that metacognition is an internal and messy phenomenon that can be difficult to make causal inferences about. Moreover, metacognition must be inferred from a learner's behaviour or the learner has to imperfectly translate thought into words. This means that sometimes it can be difficult to know whether metacognition has occurred, which must be determined before researchers can consider what caused it. This important issue will be set aside for now and examined in chapter 4. Many different factors might impact whether a child demonstrates metacognition in a particular context (see section 3.1). Critical realism supports the view that causality is complex and problematic (Alderson, 2016; Morrison, 2009). Critical realist researchers can explore causal mechanisms, attempting to use contextual features to help explain why something has taken place while acknowledging other explanations (Maxwell & Mittapalli, 2010; Shannon-Baker, 2016). Critical realism draws on complexity theory's notion of closed and open systems (Alderson, 2016). The social sciences deal with open systems where multiple factors interact to influence outcomes (Alderson, 2016; Biesta, 2010). However, this does not mean that the same factors interact to influence outcomes in all social science studies. Instead, contextual features are viewed as important and causal inferences made in critical realist research are abductive (Shannon-Baker, 2016). This means that they rely on the most likely explanation, considering contextual features.

Lastly, critical realism positions theories as incomplete and partial explanations of real people's experiences, which was useful as part of the reflexive lens used in this study (Alderson, 2016; Maxwell & Mittapalli, 2010). According to critical realism, theories are insufficient to describe diverse manifestations of real phenomena because they are based on knowledge constructed from multiple subjective perspectives (Maxwell & Mittapalli, 2010; Alderson, 2016). Accepting theory as incomplete divests the study of the need to accept wholesale theoretical positions. Rather, I acknowledged theories for how they illuminated young children's metacognition while reflexively examining their limitations. Critical realism portrays reality as multi-layered and complex with enduring structures impacting collective knowledge about phenomena. This prompts the critical realist to continuously deconstruct knowledge claims by examining their underlying assumptions. In reviewing the literature, this meant deconstructing how different researchers positioned metacognition and how this impacted on their methods and results. Additionally, in analysing and writing up my own data, it meant digging deeper and considering how the way I positioned metacognition and carried out the project impacted the results.

2.2. Constructing a view of the child

In studies involving children, the view of the child and childhood permeates all aspects of the research (Dockett et al., 2011; Smith, 2011). It is important to unpack how I viewed children so that the reader can better understand how I analysed the background literature and made decisions throughout the study. I viewed children as active meaning-makers who may become metacognitive if provided with appropriate opportunities to demonstrate their emergent metacognition. This view was underpinned by aspects of critical realism as well as critiques from the sociology of childhood. Together they stressed anti-dualism and the importance of the context. Critiques of the sociology of childhood (i.e. Lee, 1998; Prout, 2011; Tisdall & Punch, 2012) contend that all individuals are complex and exist in a constant state of being and becoming. In this study, I adopt this stance, which helped me to problematise traditional dualist concepts like maturity, competence and agency. Following Lee's (1998) position, I repositioned these as situational rather than imbued characteristics. This section serves to further explain and justify my position.

Before discussing the critiques of the sociology of childhood that formed the basis of this study's view of children, it is important to summarise some key points from the sociology of childhood. Table 1 summarises key points in relation to the view of the child and theoretical assumptions.

Table 1: Summary of key points from the sociology of childhood

View of the child	1) Children are beings, not becomings and have rights (Harcourt & Conroy, 2011; Kanyal, 2014). 2) Children are social actors who are competent and assert their agency and competence in various ways (James et al., 1998; Qvortrup et al., 2009). 3) Children's understandings are not deficient, but rather an attempt at active meaning-making within a particular context (Donaldson, 1978; Wallerstedt et al., 2011).
Theoretical assumptions	4) Childhood is situated in a historical, cultural and social context (James et al., 1998; Qvortrup et al., 2009). 5) Children's social experiences will "differ because of factors such as gender, ethnicity, disability and social and economic inequalities" (Christensen & Prout, 2002, p. 484). 6) Children are not a homogenous group, but children living in similar sociological contexts will have certain things in common (Christensen & Prout, 2002; James et al., 1998).

In this study, I emphasised the active nature of children, moving away from a passive, deficit view of the child. This did not mean that I viewed children as active and agentic in all situations, just that I endeavoured to emphasise these qualities throughout the study. Drawing from table 1 above, the view of the child emerging from the childhood studies discourse is active, competent and agentic. Although "sociology of childhood" may imply that an active view of children is tied to the field of sociology, this is not the case. It is important to note that a deficit view is not inherently tied to particular fields or methods, but rather how the data is interpreted and transformed into knowledge claims. Although methods like testing and correlational analysis have traditionally been viewed as inherently positivist and tied to a deficit view, it is an active researcher who imposes this view on the data (Bracken, 2010). Bracken (2010) asserts that deficit interpretations of data stem from the view that data elicited from people in the social sciences can be treated to the same analyses and interpretations as data from objects (i.e. cells in a medical study). This approach disregards or trivialises the agency of individual actors (both adults and children) and treats them as passive recipients of structure. It was this approach that I endeavoured to avoid throughout this study.

In line with critical realism, I viewed the underlying dichotomies reflected in traditional understandings of competence, being and agency as reductionist, oversimplifying children's (and adults') real lived experiences. A major criticism of the sociology of childhood's view of the child is that it continues to privilege the complete (Lee, 1998; Prout, 2011). It positions children as competent and mature beings like adults rather than problematising how we conceptualise notions like competence, agency and being. The problem with positioning children as competent beings is that it disregards their developing qualities and situations where they may still be incompetent. Even adults retain many aspects of becoming and everyone experiences situations where they feel incompetent (F. Thomson, 2007). This is an important point to take forward about children's competence and agency to demonstrate metacognition in this study. If metacognitive competence is a possession and children are free to demonstrate it without constraint, children's non-demonstration of metacognition in the study would have to be taken to mean they are not metacognitive. In reality, many situational factors may impact an individual's metacognitive knowledge and skill use (see section 3.1).

Throughout this study, I drew on anti-dualist ideas that reposition dichotomies like competence/ incompetence as ends of a continuum, where an individual's capacities may shift and change depending on the situation (Prout, 2011; Tisdall & Punch, 2012). Both children and adults may be situationally competent or incompetent as they are always "only partially aware of what is going on, in and through them" (White & Choudhury, 2010, p. 47). This is not to say that I viewed children as being no different than adults. Most children will have had fewer experiences than most adults, meaning fewer opportunities to become familiar and develop their competence in a variety of situations. Childhood is not homogenous, so the individual experiences children are able to draw from will be different. However, children's relative lack of experience compared to most adults is something they share.

This study builds on the idea that children become competent depending on the situation. This idea will become more apparent throughout this thesis, but it is worth stressing from the beginning that context was an important concept throughout the study. Lee (1998) provides an example of children "becoming witness" at a trial, where contextual mediators such as interview prompting by police and social workers promote the child's agency. However, this agency is dependent on the contextual mediators. The result is that children are simultaneously considered competent to testify in a trial while their aspects of becoming and dependence are acknowledged and supported. Using this analogy, this study conceptualised competence as situational and assumed that both adults and children can "become competent" depending on the situation. Children's competence can be supported and facilitated through contextual mediators while acknowledging areas where they are not yet competent.

I do not argue in this study that children's metacognitive competences are the same as adults' metacognitive competences. Rather, I viewed young children's metacognition as worth studying in its current form, not only in comparison with adult and older children's metacognition. This was an important precursor to the study because it explores metacognition in one age group (age 4-5) without making age-related comparisons. There is general consensus that metacognition develops and changes as individuals age (e.g. Cobb, 2017; Schneider, 2008, 2010; Veenman, Kok, & Blöte, 2005). It is not a static quality of being, but constantly changes and develops throughout life. This means that presenting adult metacognition as a kind of developmental destination is a fallacy. Indeed, the increasing amount of literature on adults' developing metacognition (e.g. Wozniak, 2015) clearly demonstrates that the phenomenon is not complete even in adults. While adults are almost certainly more experienced users of metacognition, this does not diminish the value of studying children's emerging metacognitive skills and knowledge. Children actively use their metacognitive skills and knowledge to make sense of and act on their learning experiences, so information about their current capacities is of high value to researchers, educators and other professionals working with children.

2.3. Summary

This chapter has examined the theoretical and philosophical frameworks in relation to three central concepts in this study – young children, metacognition and context. This study assumes that metacognition is experienced subjectively but exists outside individual subjective perceptions as a mental process that has common properties and processes. This aligns with critical realism's view that an external reality exists (ontology), but it is only possible to know about it through an amalgamation of multiple and subjective perspectives of reality (epistemology). By investigating individuals' subjective experiences in different ways, it is possible to paint a broad stroke outline of what metacognition is like as a common mental process. In this study, both sociological and developmental perspectives will be important to constructing an understanding of young children's metacognition. I have positioned young children's metacognition as having being and becoming aspects, meaning that research from different perspectives yields valid and valuable knowledge.

Theories will logically fall short of a complete description of the complex reality of children's metacognitive experiences because that is the nature of theories. Instead being discouraging, conceptualising reality as multi-layered and complex prompts the critical realist researcher to consider their data and data from other studies from different levels of reality. Experiences take place within surrounding micro and macrosystems (Hayes et al., 2017), so understanding the context will be important throughout the study in terms of making inferences. This critical and reflective perspective will be taken forward in examining literature around young children's metacognition and in examining the perspective that this study is able to offer on this phenomenon.

Regarding young children as sources of knowledge, this study progresses with the view that young children (and adults) have the potential to be competent and reliable sources of knowledge about their own lives. Concepts like maturity, competence and agency should be viewed critically as situational characteristics that exist on a continuum rather than possessions of individual actors. This position re-stresses that the context is important, and the reader will notice that this is returned to throughout the thesis. Future chapters will stress the situated nature of young children's metacognition both in the literature and in this study.

Chapter 3. Conceptualising metacognition in the early years

This literature review contains two parts, which have been divided into two chapters. This first chapter explores what empirical and conceptual literature has to say about metacognition in the early years. This chapter serves as a background for the study. It highlights relevant issues and debates within the field and provides a critical analysis of metacognitive research from an early years perspective. The next chapter investigates how researchers have explored children's metacognition, focusing specifically on pupil views templates (PVTs) since they were the tools used in this study. Together, they survey the field and outline gaps for this study to fill.

This chapter's purpose is to review empirical and conceptual literature on metacognition, focusing on young children at the point of school entry (age 4-5). I discuss the conceptual model of metacognition and review empirical and theoretical accounts of metacognition in young children. While the discussion in this chapter is focused on metacognition in young learners, some of the research discussed in this chapter was conducted with older children. Additionally, much of the theoretical literature about metacognition tends not to mention any specific age group or refers broadly to school-aged learners. In these cases, I have endeavoured to explain how the key findings presented might relate to younger children. I use learners and young learners throughout this chapter. To clarify, I use learners where the metacognitive concepts I address could apply to learners of any age group. I use young learners or refer to a specific age range where the literature or concept I am addressing concerns young children specifically. There are ongoing debates and disagreement around issues with conceptualising metacognition which are acknowledged throughout this chapter. This review serves as an overview of metacognitive research to set the scene for the study.

In this study, I drew on Flavell's (1979) original definition of metacognition as "knowledge and cognition about cognitive phenomena" (p 906). I have chosen to adopt this definition because it provides space for metacognition to take different forms, including both brief and sustained instances (Larkin, 2010). Cognition is a broad term that refers to mental processes like paying attention, remembering, believing, learning and thinking. Metacognition is then any cognitive process that takes another cognitive process as its object. Therefore, metacognition could be a brief instance of attention to how learning is going during a task or a longer reflection on how you learn best so that you can plan how to study for a big exam. The word cognition excludes non-cognitive processes like affect and motivation. However, metacognition is not an isolated process and interacts with other internal and external factors (Arango-Muñoz, 2014; Efklides, 2006, 2008; Heyes et al., 2020; Zimmerman, 1995). Although metacognition itself is a cognitive process, it is important to acknowledge that it impacts and is impacted by non-cognitive processes like affect and motivation (Arango-Muñoz, 2014; Efklides, 2006) and the socio-cultural context it takes place in (Efklides, 2008; Heyes et al., 2020). This means that metacognition can be a messy process that takes different forms as will be detailed in this chapter.

3.1. Components of metacognition

Metacognition is a messy process and there are areas of debate around its conceptualisation, which will be addressed throughout this chapter. Nevertheless, researchers generally agree that metacognition contains two components – knowledge and regulation (Education Endowment Foundation, 2018; Efklides, 2008; Flavell, 1979; Schraw & Moshman, 1995; Whitebread et al., 2009). Metacognitive knowledge includes knowledge and beliefs about cognitive processes such as learning, thinking and remembering. Metacognitive regulation involves conscious attempts to monitor and control these cognitive processes. Researchers tend to explore metacognition under these two components including those working with young children (H. Lewis, 2019; Marulis et al., 2016; S. Robson, 2010, 2016a) and older children and adults (Veenman et al., 2004; Wozniak, 2015).

Preferred terminology and conceptual differences between researchers do exist. Veenman, Kok and Blöte (2005) use the term ‘metacognitive skilfulness’ in reference to metacognitive regulation. Metacognitive skilfulness is conceptually different from metacognitive regulation because it includes strategy knowledge, which falls under metacognitive knowledge in the traditional conceptual model. In this study, I used the traditional conceptual model with knowledge and regulation components. This was because conceptualising them as different components helped to understand instances where children might know how to use a strategy but fail to use it in a learning situation (Clerc & Miller, 2013).

There was initially speculation that metacognition might begin as a unidimensional construct in early childhood before later developing into a multidimensional construct with knowledge and regulatory components (Fritz et al., 2010; Haberkorn et al., 2014). However, the distinction between metacognitive knowledge and regulation has been empirically validated in Australian children (age 6-7), lending support to a two-component model in early childhood (Fritz et al., 2010). These metacognitive components interact with each other, forming a reciprocal relationship. Knowledge informs the decisions a learner makes in regulation and regulation builds new knowledge and modifies existing knowledge (Flavell, 1979; Larkin, 2010).

3.1.1. Metacognitive knowledge

The metacognitive knowledge component includes knowledge and beliefs about cognitive processes and people as cognitive processors. Figure 2 shows an overview diagram of metacognitive knowledge.

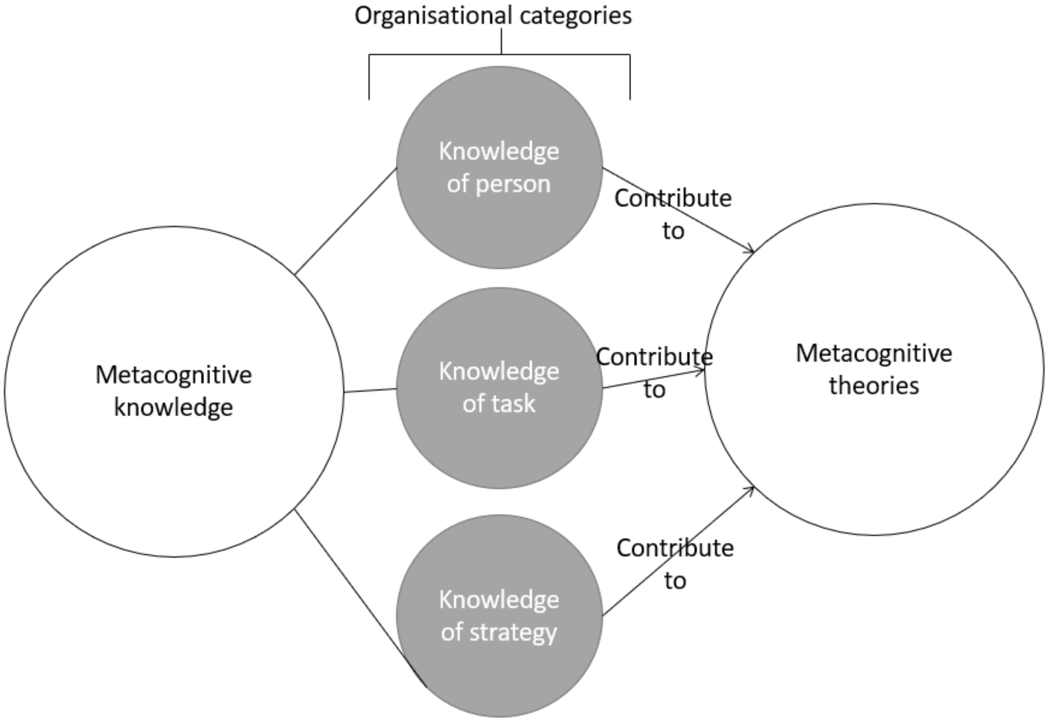


Figure 2: Overview of metacognitive knowledge

Metacognitive knowledge tends to be described as containing different kinds of knowledge including knowledge about persons, tasks/goals, and strategies (Efklides, 2008; Schneider, 2008; Whitebread et al., 2009). This division is useful in conceptual models to explain different types of knowledge and for researchers interested in investigating a specific type of knowledge. However, learners tend to use metacognitive knowledge in a theory-like way rather than drawing on different components separately (Moshman, 2017; Schraw & Moshman, 1995). For instance, a child facing a new task may draw on previous experiences of similar tasks. He could recognise different aspects of the task (task knowledge), which might activate his belief that he is good at this kind of task (person knowledge). He may also remember strategies that he has used before which may be transferrable (strategy knowledge). This section discusses metacognitive knowledge of person, task and strategy separately because this is a useful way to organise the review. However, I also acknowledge that different types of knowledge are drawn on in a theory-like way. Figure 3 provides an overview of the concepts that I will cover in this section in relation to metacognitive knowledge.

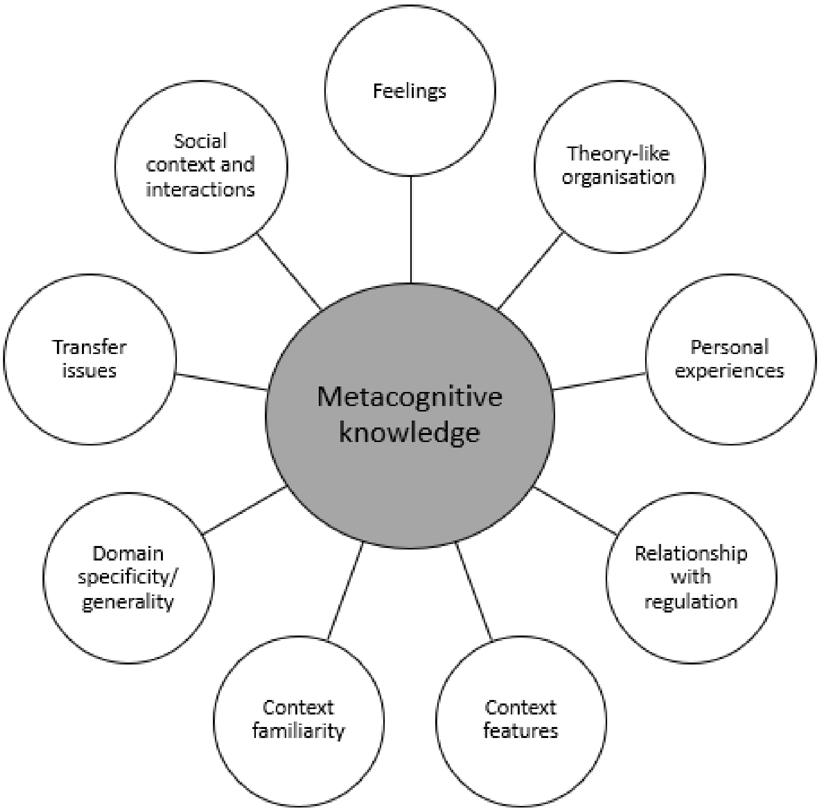


Figure 3: Overview of concepts covered in relation to metacognitive knowledge

It is important to keep in mind that metacognitive knowledge is fallible and prone to bias since it is subjectively constructed through the lens of an individual's experiences (Bjork, 2018; Finn & Tauber, 2015). Dunphy's (2004) phenomenological research with young children (age 4-5) suggests that children's metacognitive knowledge frameworks are highly personal and intimately connected to their personal lives and past experiences. Because metacognitive knowledge is formed through experiences, both tacit and explicit understandings are possible (Schraw & Moshman, 1995; van Velzen, 2016). Learners can acquire incorrect and unproductive metacognitive knowledge that is linked to their experiences. This could be due to the feelings they associate with their experiences or because they have picked up information through social interaction without questioning the credibility of the knowledge source (Desautel, 2009; Efklides, 2008; Heyes et al., 2020;

Veenman et al., 2005). Research suggests that learners often rely on subjective feelings of ease and difficulty to assess whether learning has gone well (Bjork, 2018; Finn & Tauber, 2015; Reber & Greifeneder, 2017). This could lead learners to reject strategies that lead to a sense of difficulty even though they have been proven more effective in long-term retention of learning than strategies that seem easier (Bjork, 2018).

Metacognitive knowledge of person includes intra-individual and inter-individual knowledge and beliefs about oneself and others and universals of cognition (Flavell, 1979). Self-concept includes beliefs about oneself as a learner, including inter-individual and intra-individual knowledge. For example a learner might perceive that they are "cleverer" at maths than reading or compare their perceived "cleverness" at a subject with their peers (Cohrssen et al., 2016; Flavell, 1979). These beliefs can be impacted by other internal processes such as affect (Arango-Muñoz, 2014; Efklides, 2008; Finn & Tauber, 2015) or socio-cultural factors (Heyes et al., 2020; Jansen et al., 2014; Slee & Shute, 2003). A child may have a negative perception of herself as a maths learner due to previous experiences in undertaking maths tasks. She may have also internalised societal perceptions that boys are better at maths and therefore it is acceptable that she is "hopeless" at maths.

Cohrssen, Niklas, Logan and Tayler (2016) demonstrate that at the pre-school stage, academic self-concept is developing as a global construct and is generally high. However, alarmingly some four-year-old children already reported low academic self-concept when comparing themselves to their peers. Self-concept was not connected to actual performance or specific subject areas as pre-school provision is largely play-based and does not differentiate subject areas. Nevertheless, studies have indicated that academic self-concept starts to impact on actual performance and motivation later in school (Cohrssen et al., 2016; Efklides & Vlachopoulos, 2012). Arango-Muñoz (2014) adds that beliefs about self can impact how learners respond to and interpret their feelings during learning episodes. For example, if a learner believes that they are not good at remembering, it may trigger strong feelings of uncertainty that may interfere with their normal performance.

Since metacognitive knowledge includes knowledge about other people's cognitive abilities, there is crossover with theory of mind (Larkin, 2010). Theory of mind can be defined as knowledge of the mental world integrated into a theory and used to estimate the mental states of others and predict their performances based on these judgments (Misailidi, 2010; Nelson, 1996). It usually becomes more stable throughout early childhood and informs daily social interactions, allowing us to relate to other people (Larkin, 2010). Theory of mind development depends on the understanding that two people can hold different beliefs, allowing the child to ascribe different mental states than their own to others (Kuhn, 2000). For now, it is important to highlight that there is crossover between theory of mind and metacognitive knowledge of person and that researchers acknowledge that their development is intertwined (Lockl & Schneider, 2007; Misailidi, 2010; Sodian & Kristen, 2010). It is acknowledged that theory of mind research has a broader interest than solely metacognitive knowledge of person. Further crossovers between theory of mind and metacognition will be examined in section 3.3.2.

Understanding that people's beliefs can differ allows learners to develop an understanding of the nature of knowledge and beliefs, usually referred to as epistemological beliefs (Kuhn & Dean, 2004; Lunn Brownlee et al., 2017). Epistemological beliefs are defined as "beliefs about the nature of knowing and knowledge and are considered to influence all other knowledge and beliefs"(Lunn Brownlee et al., 2017, p. 192). These beliefs form the basis for enabling judgments and "critical appraisal of one's and others' thinking, knowledge, beliefs and theories about the world" (Efklides, 2008, p. 279). As a person's epistemological beliefs become more sophisticated, they are increasingly able to make more subtle and nuanced evaluations of information, knowledge, and beliefs. Research about epistemological beliefs tends to focus on adolescents and adults, meaning that more research is needed to better understand young children's epistemological understandings (Lunn Brownlee et al., 2017). Hofer (2004) stresses that even if young children's epistemological judgments are not as sophisticated as those of older children and adults, they do weigh competing knowledge claims and make conscious decisions about which to believe. Empirical research supports this position, indicating that young children are capable of appraising someone's trustworthiness as a knowledge source and deciding whether to retain their original belief (Guerrero et al., 2017; Mills, 2013). For example, a child might need to decide whether to believe their teacher who claims that dinosaurs had feathers or the various images they have seen portraying dinosaurs with scaly skin.

An epistemological development stance contends that people progress through stages of epistemological understanding (Kuhn & Dean, 2004; Lunn Brownlee et al., 2017). The young child described above can weigh two sources of information and decide which to believe. She is at the absolutist stage since she has accepted that beliefs can differ, but only because one answer in wrong. The epistemological stages of development include realism, absolutism, relativism and evaluative epistemology (see table 2 below).

Table 2: Epistemological stages of development

Stage	Description
1) Realism	Before false belief understanding – perceptions and beliefs reflect reality, and everyone perceives reality the same.
2) Absolutism	After false belief understanding – beliefs can differ between people, but only because one answer is wrong.
3) Multiplism/relativism	Usually described in older children and some adults – knowledge is subjective, and all opinions are equally right.
4) Evaluative epistemology	Usually described in adults (although some never reach this stage) – opinions can be evaluated based on support from reasoning and evidence.

*Stages and descriptions adapted from Kuhn and Dean (2004, p. 272)

Absolutism also seems to correspond with a objectivist view of the learning process, meaning that young learners attach the highest importance to external factors and view themselves as taking a more passive position (Lunn Brownlee et al., 2017). As children move toward multiplism, they start to develop a more constructivist view of learning, attaching more importance to internal factors and their own role in learning.

An epistemological beliefs perspective contrasts the epistemological development model and considers epistemological beliefs as individual and unintegrated (Hofer, 2004). This opens space for the possibility that people may have some beliefs that reflect an absolutist attitude and other beliefs that reflect a more relativist attitude, depending on the context. Hofer's (2004) epistemological theories model offers a middle ground by portraying personal epistemology as composed of individual beliefs that can be integrated to function as a theory. Importantly, these conceptualisations move away from the staged development model portraying the young child as someone who can only see knowledge as objective and knowledge acquisition as a passive process. Lunn Brownlee et al.'s (2017) study explored the epistemological beliefs of elementary school children in fourth and sixth grade in Australia (age 9/10 and 11/12). They found that while most of the children still held objectivist beliefs about learning, some engaged with constructivist views as well. Indeed, young children come to school with a range of experiences and perspectives from which to judge and interpret new knowledge and the process of learning.

Metacognitive knowledge of task consists of knowledge from previously encountered tasks and goals, which can be used when approaching new tasks. Flavell (1979) gives the example of knowledge about implications of available information including the quality, accessibility, trustworthiness, and level of familiarity and engagement. This knowledge can be used as a basis in making judgments about the task, which can be accurate or skewed (Destan et al., 2014; Whitebread & Basilio, 2011). For example, a child might receive a new subtraction worksheet and knowing that she has done subtraction before (task knowledge) decides that the worksheet will be easy because she already knows how to subtract. However, she might not immediately realise that the new subtraction worksheet involves subtracting from numbers higher than 10, excluding her preferred strategy of using her fingers to figure out the answer. This hypothetical example also shows how task knowledge incorporates person knowledge. This is because the learner builds up metacognitive knowledge through experiences, meaning that learners construct knowledge of the task as experienced by themselves.

Task knowledge and strategy knowledge are also intimately connected. Judgments about the task based on task-related knowledge can activate knowledge of strategies that have been useful for that task in the past (Nelson, 1996; Schneider, 2008). The young learner mentioned above has done subtraction before and knows that this entails counting down rather than counting up (task knowledge). From here, she may remember any number of strategies that have been useful in helping her subtract such as using her fingers, a number line or objects (strategy knowledge). Flavell (1979) highlights that metacognitive knowledge of strategies can include both metacognitive strategies (e.g. strategies for monitoring understanding like quizzing yourself) and cognitive strategies (task-specific strategies like reading a difficult paragraph again).

Strategy knowledge and strategy implementation (part of metacognitive regulation, see section 3.1.2) have significant overlaps. Some researchers incorporate aspects of strategy knowledge into the regulatory component (Veenman & Spaans, 2005). Indeed, Brown

(1987) conceptualises knowledge and implementation as “incestuously related” (p 68). Strategy knowledge is often separated into declarative, procedural and conditional components (Cobb, 2017; Cross & Paris, 1988; Paris & Winograd, 1990). This compartmentalises strategy knowledge by function – knowing that (declarative), knowing how (procedural), and knowing when and why (conditional) (Cross & Paris, 1988). The overlap between strategy knowledge and implementation is especially clear here because effectively using a strategy generally requires declarative, procedural and conditional knowledge. For example, a child could know that looking at pictures in a book facilitates comprehension (declarative). However, they also need to know how to effectively use the technique (procedural), since it requires skill to focus on key details that might relate to the story. Furthermore, they need to know when and why they should use the technique (conditional) as it is likely more useful for storybooks and narrative material than for non-fiction books.

There is evidence to show that children often know how a strategy works, but fail to produce it in contexts where it would be useful (Brown, 1987; Clerc et al., 2014; Clerc & Miller, 2013). Veenman et al.’s (2005) results indicated that failure to use a strategy might be attributed to production deficiency. In their study, children implemented more strategies when they were cued to use them in a word problems task. This finding implies that declarative and procedural knowledge can be present, but conditional knowledge may be lacking. Therefore, although a child may know about strategies and how to use them, he may still fail to implement them in situations where they would be useful since he lacks knowledge about when the strategy should be used and why. This may particularly be the case when children are taught how to use strategies, but the reasons for using the strategy are not clearly explained and/or understood.

Context familiarity and experience seem to impact whether children demonstrate conditional knowledge in a study. Cobb’s (2017) study explores conditional strategy knowledge by looking at primary school children’s knowledge of reading strategies at different stages (kindergarten to Grade 5). The findings indicated that the youngest children (age 5-7) were aware of reading strategies, but named the same strategies for before, during and after reading. This implied that they lacked conditional knowledge about when the reading strategies were most useful. In contrast, Wall (2008) found evidence of metacognitive knowledge and associated skilfulness in children aged 4-5 using PVTs. Wall’s

(2008) study was linked to the Learning to Learn project (Higgins et al., 2007; Wall et al., 2010) where children's teachers used PVTs in ways they found useful, meaning they could use templates depicting contexts that were familiar to children. Conversely, in Cobb's (2017) study children were presented the same task and context regardless of stage. It is likely that context familiarity and experience played an important part in producing these seemingly contrasting findings. The young children in Wall's (2008) study demonstrated conditional strategy knowledge, presumably in a context they were familiar with. Conversely, Cobb's (2017) kindergarten and first grade pupils would have been less familiar with the context as beginning readers.

It is not implausible to conclude that conditional knowledge is constructed as children become more familiar with different contexts and that they can demonstrate conditional knowledge around familiar contexts. Wall (2008) acknowledges that there is a possibility that her findings are a result of the Learning to Learn project's metacognitive focus. This would correspond with findings indicating that metacognitive training promotes internalisation of strategies and conditional knowledge (Williams & Grant Atkins, 2009). This increases children's ability to transfer strategy use to novel learning situations.

Researchers emphasise that transferring knowledge to new contexts is difficult for all learners, but particularly for young children (Barnett & Ceci, 2002; Chen & Klahr, 2008; Clerc et al., 2014; McGregor, 2007). Barnett and Ceci's (2002) taxonomy for transfer describes transfer as taking place on a continuum from near to far transfer, with farther transfer being substantially more difficult. Chen and Klahr (2008) outlined the key dimensions in defining transfer distance, with a specific interest in young children's far transfer of problem-solving and reasoning skills (see table 3 below).

Table 3: Dimensions for defining transfer distance

Dimension of transfer	Description
Task similarity	If the tasks share superficial features and /or structural similarities, transfer is nearer. Overlapping superficial features or common structures might cue the learner to retrieve knowledge and apply it. Superficial features might include storylines and characters and the task domain (i.e. maths/reading). Structural similarities refer to sharing the same structure for solving a task (i.e. selecting items from one category and not items from other categories).
Context similarity	When the physical and social contexts are similar, the transfer is nearer. This is because the context can be a cue to retrieve information from memory and apply it. Physical context refers to the location (i.e. classroom, playground) and social context refers to the people and activities associated with the learned skill/knowledge.
Time interval	If there is a longer time gap between learning the target skill/knowledge and applying it, it will be more difficult to retrieve.

*Adapted from Chen and Klahr (2008, p 423-424)

Considering difficulties with transfer, it is not difficult to understand why early studies using decontextualized and unfamiliar tasks failed to find evidence of metacognitive knowledge in young children (Louca, 2019). Rowe's (1989) study found evidence of all three sub-dimensions of metacognitive knowledge in pre-schoolers (age 3-4), which she claims is largely due to using a familiar activity (children's self-chosen writing activities). As young children prepare to enter school, there is evidence that they possess metacognitive knowledge of person, task and strategy (Marulis et al., 2016; S. Robson, 2010, 2016c; Rowe, 1989). However, as the typical play-based and free-flow nature of pre-school education can differ greatly from the often more formal learning in primary school, it is necessary to ask whether metacognitive knowledge children have constructed through play activities will transfer to learning activities in primary school. Brown (1987) indicates that children's lack of experience with school typified learning experiences can cause their metacognitive knowledge to be relatively unstable. As presented in table 3, transfer could be difficult between play and academic contexts because the tasks and contexts may not share many similarities (Barnett & Ceci, 2002; Chen & Klahr, 2008). Spontaneous transfer might not happen because there may not be many cues for children to retrieve knowledge and skills from play to apply in academic learning.

There has been considerable debate around whether metacognition is domain-specific or domain-general, particularly from a developmental perspective. Domain-general indicates that metacognition is a global skill that can be applied across domains while domain-specific indicates that metacognitive ability could vary depending on the domain (Geurten et al., 2018). Some researchers (Sperling et al., 2002) have argued that young children's metacognition is domain-general and develops to be domain-specific with age. Meanwhile, others argue for a more context-dependent picture of young children's metacognition developing to become more domain-general as young learners explore the usefulness of different strategies in different contexts (Brown, 1987; Geurten et al., 2018; Veenman & Spaans, 2005). Geurten et al.'s (2018) study explored metacognitive knowledge of strategy across different ages (8-13) indicated that metacognition may start to shift to domain-general around the age of 10. While there is an assumption that metacognition is domain-general in adults, the evidence is not completely clear (Geurten et al., 2018).

Research has indicated that metacognitive knowledge is most useful when approaching novel tasks where domain-specific knowledge is lacking and there is "initially no material for the cognitive toolbox to operate upon" (Veenman & Spaans, 2005, p. 171). This means that the learner would need to rely on more general knowledge about how to approach and complete tasks because they have no subject-specific knowledge. General knowledge about how to solve problems would likely be most useful in these cases. The above discussion about transfer is relevant in these cases as well because it tells us that the new context will impact on what kind of knowledge a learner retrieves. Cues arising from the new task – structural similarities, superficial features, physical and social contexts and time interval – would likely impact on the metacognitive knowledge the child is able to transfer and use.

3.1.2. Metacognitive regulation – Monitoring and control of cognition

Some researchers have argued that metacognitive knowledge emerges before regulation (Brown, 1987; Schraw & Moshman, 1995), but there is disagreement about when regulation can first be observed. Some indicate that regulation is late-developing in line with the formal operations stage of Piaget's model of cognitive development (Brown, 1987; Cross & Paris, 1988; Veenman & Spaans, 2005) (see also section 3.2). Conversely, other studies have found evidence of regulation in young children (S. Robson, 2010, 2016c; Rowe, 1989; Whitebread & Basilio, 2011). Similar to the above discussion about children's metacognitive knowledge, it is likely that early studies failed to find evidence of metacognitive regulation in young children because they used contexts that were unfamiliar to children or not suited to their age and stage (Donaldson, 1978; Louca, 2019). Figure 4 provides an overview of the concepts related to metacognitive regulation covered in this section.

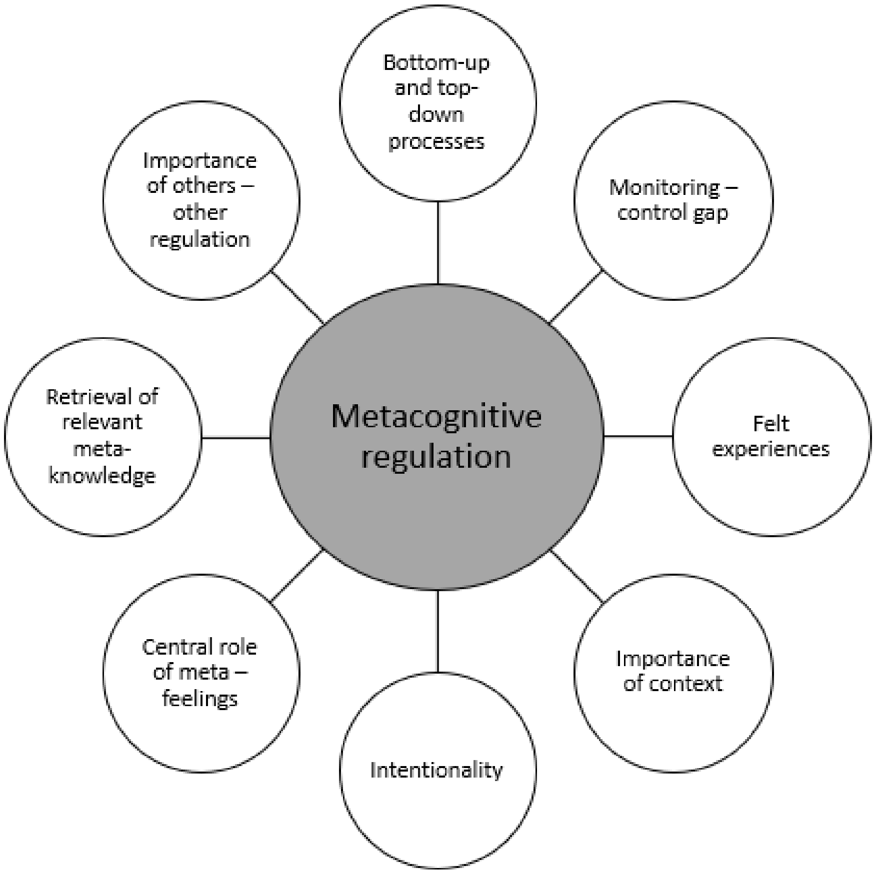


Figure 4: Overview of concepts covered in relation to metacognitive regulation

As mentioned before, metacognitive knowledge and regulation are intimately related and can have a reciprocal relationship, particularly in expert users. Schneider (2010) indicates that regulation is the procedural component, operationalising knowledge and contributing to building further knowledge. However, cognitive, affective and environmental factors have the potential to impact on any learner's ability to operationalise metacognitive knowledge. These may include:

- Inflexibility when applying a learned skill,
- Lack of conditional knowledge,
- Task difficulty leading to cognitive overload (Veenman et al., 2005),
- Flawed metacognitive knowledge (Efklides, 2008, 2014),
- Motivation and affective factors (Neuenhaus et al., 2011; Schmitt & Sha, 2009),
- Context (Auspurg & Jäckle, 2017; Hofer, 2004; Rowe, 1989) and
- Learning environment (Borkowski et al., 2000; Wall & Hall, 2016).

Cognitive overload is especially pertinent to exploring metacognition in young children as their still-developing working memory capacity tends to be more limited than adults and older children (Diamond, 2013; Thiede et al., 2009). Working memory matters to metacognitive performance because it involves a person's ability to hold information in mind and work with it (Diamond, 2013). Therefore, when there is limited capacity the metacognitive knowledge that can be retrieved from long-term memory and used during a task is restricted, often causing performance errors (Clerc et al., 2014). Working memory and other executive functioning skills will be further discussed in section 3.3.3.

Metacognitive regulation involves skills like planning, monitoring, control and evaluation (Cross & Paris, 1988; Paris & Winograd, 1990; Schraw et al., 2006; Whitebread et al., 2009) (see table 4 below).

Table 4: Components of metacognitive regulation

Skill	Description
Planning	Identifying and selecting appropriate strategies and allocating resources (Lai, 2011).
Monitoring	Evaluates performance in relation to task requirements or goals. The mental equivalent to "quality control" (Flavell, 1979, p. 908).
Control	Directing cognitive processes, usually in response to monitoring (Whitebread & Basilio, 2011).
Evaluating	Reflecting on task performance, which may facilitate acquisition or refinement of metacognitive knowledge by "making the formerly unconscious, intangible, or reflexive processes or events explicit" (Desautel, 2009, p. 2001) and by incorporating meta-level feedback on the benefits and limitations of strategies (Kuhn, 2000).

Although the processes above seem to indicate a streamlined process beginning with planning and moving through evaluation, metacognitive regulation is often messier than this implies. Both top-down and bottom-up metacognition are possible, with the main difference being how regulation begins. Figure 5 shows Nelson and Narens' (1994) model of metacognitive regulation, where the learner's implicit and explicit monitoring of ongoing cognitive processes informs metacognitive control.

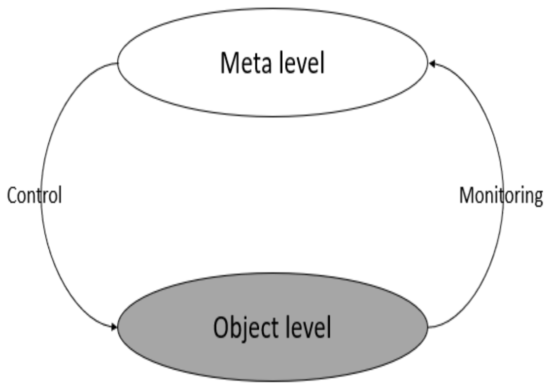


Figure 5: Nelson and Narens' (1994) model of metacognitive regulation (p 11)

Top-down regulation, or self-regulated learning, starts as an explicit and purposeful process with the learner attempting to control the learning from the beginning through planning (Follmer & Sperling, 2016; Garner, 2009). Bottom-up regulation is associated with implicit monitoring processes, with a central role for metacognitive experiences (Efklides, 2008; Schneider, 2010). Bottom-up regulation often starts with a feeling that learning is not going as expected, which can provide opportunities for control. Studies such as Rowe (1989) have found evidence of young children initiating a top-down process by using their judgments of task difficulty to plan for self-selected writing tasks and set up their environment to minimise distractions. Furthermore, Robson's (2010, 2016a) studies indicated that young children (age 3-5) are capable of evaluation, particularly in shared reflective dialogues with their teachers. However, it was not clear in these studies whether the same child initiated a top-down process with planning and carried it through to evaluation. Smoothly operationalising metacognitive knowledge through planning into monitoring and control and then reflecting on the learning process is more common in experienced learners.

In the metacognition literature, conceptual models distinguish between metacognitive monitoring and control (Efklides, 2008; Nelson, 1996; Nelson & Narens, 1994; van Velzen, 2016). This makes sense because although monitoring provides opportunities for learners to exert metacognitive control, this does not always automatically happen (Schneider, 2010; van Loon, de Bruin, et al., 2017). This literature review follows this distinction because it is useful for organising the review, but it is acknowledged that the monitoring and control processes often work together. The conceptual differentiation also helps make sense of young learners' metacognition because they often dip in and out of metacognition, with some experiences being sustained and others brief (Larkin, 2010). They might take up opportunities for metacognitive control afforded by monitoring in some situations and not in others.

Metacognitive monitoring refers to the learner's attempts to monitor ongoing cognitive activity while engaged in a task. Monitoring processes can involve: metacognitive feelings, metacognitive judgments, and task-specific metacognitive knowledge (Efklides, 2008). Task-specific metacognitive knowledge refers to knowledge the learner thinks is relevant to the task and retrieves from their long-term memory. Developmental studies have argued that monitoring precedes control because empirical findings have suggested a disconnect between monitoring and subsequent control decisions in young children (Schneider, 2008, 2010; van Loon, de Bruin, et al., 2017). However, it is important to note that the monitoring-control gap is less pronounced in some studies (Destan et al., 2014). Since metacognitive skill can be impacted by context and other external factors, the context created by researchers to explore metacognition is important (see chapter 4 for further discussion of methods of exploring metacognition).

Metacognitive feelings can include feelings related to knowing, familiarity, confidence, and difficulty (Arango-Muñoz, 2014; Efklides, 2008). For example, a child who loves dinosaurs might see a picture of a dinosaur in a new story book and feel that he knows the name of the dinosaur. However, even though he knows that he has heard the name before and it is somewhere in his memory, he cannot currently access the name. This is referred to as a positive feeling of knowing and describes the feeling that something not currently recallable is in your memory and worth searching for. Metacognitive feelings can be short and hardly noticed or sustained experiences. For example, the feeling of knowing could trigger the learner to retrieve the knowledge from memory quickly if the knowledge is accessible (Efklides, 2006; E. Norman et al., 2010). However, if the knowledge is not so easily accessible, it could also result in more sustained experiences such as the tip-of-the-tongue phenomenon, a feeling that retrieval is imminent as the learner tries to remember (Koriat, 2000; E. Norman et al., 2010).

The processes contributing to the formation of metacognitive feelings are implicit and below consciousness, but metacognitive feelings themselves are conscious and can contribute to control processes (Koriat, 2000; E. Norman et al., 2010; Reber & Greifeneder, 2017). These feelings arise from processing fluency, which is not directly accessible to consciousness (Reber & Greifeneder, 2017). To illustrate, when trying to learn something, a learner might experience a feeling that she is having a hard time. The feeling of difficulty is conscious, and she can interpret its source and choose to act by employing strategies. However, the feeling is the product of implicit monitoring as she was processing the information in the task she was working on. When she was processing the information fluently, she did not need to pay attention to how she was mentally processing the task. Conversely, when she started to struggle and her processing became disfluent, she noticed it and encountered a conscious feeling of difficulty.

Metacognitive feelings often have behavioural consequences, such as spending more time on aspects of a task or activity that provoke a positive feeling of knowing rather a negative feeling of knowing (Efklides, 2014; Koriat, 2000). Additionally, they may have affective consequences, such as experiencing decreased motivation and negative affect with strong feelings of difficulty. This can lead to the acquisition of skewed metacognitive knowledge. For example, a strong feeling of difficulty during a specific kind of task can encode metacognitive knowledge that this type of task is too difficult to be attempted (Efklides, 2008). Although metacognitive feelings become more accurate and frequent as children get older and gain more experience, there is evidence that young children experience and act on metacognitive feelings (Lyons & Ghetti, 2010; Wellman, 1977). Goupil et al.'s (2016) findings suggest that uncertainty monitoring may even be present in infants.

Metacognitive feelings and judgments are related and arise from the same monitoring processes (Efklides, 2014; Koriat, 2000). Returning to the earlier example of the child receiving the subtraction worksheet, she sees what she thinks is a familiar task (feeling of familiarity). Upon receiving the worksheet, implicit processes started the process of searching her memory for information related to the new task. Realising that relevant knowledge existed, a feeling of familiarity emerged before any actual information was retrieved from her memory (E. Norman et al., 2010). Based on this feeling, she makes a judgment that the task will be easy (ease of learning judgment). However, her judgment turns out to be overconfident since the task involves subtracting from numbers higher than 10, meaning that she cannot use her fingers to find out the answer. Ease of learning judgments can also draw on metacognitive knowledge – whether the learner has attempted this kind of task before and how successful the outcome was (Efklides & Touroutoglou, 2010; Finn & Tauber, 2015). These remembered experiences can be used to make prospective judgments about how successful the learner would be on a similar task.

Studies have indicated that young children can make accurate ease of learning judgments, indicating that they have an understanding of some of the characteristics that make something easy or difficult to learn (Lyons & Ghetti, 2010; Schneider, 2010). However, they were less likely to act effectively on these judgments (Schneider, 2008, 2010). Developmental studies (e.g. Thorpe & Satterly, 1990) suggest that as children get older, they are better able to articulate their rationale for judgments of task difficulty. However, it is also important to consider the entwined nature of language and metacognition (Schneider, 2008). Older children will not only be more experienced learners, but they will also generally have more metacognitive vocabulary available, making them better able to articulate their rationales for ease of learning judgments.

Judgments of learning usually take place during or soon after a learning experience and relate to how well a person thinks they will be able to recall something later (Schneider, 2010). Early studies (e.g. Flavell, 1979; Paris & Winograd, 1990) indicated that young children were ineffective and overconfident when gauging their own ability to remember. Conversely, more recent studies suggest that young children can demonstrate accurate judgments of learning, particularly when more child-friendly methods are used and the judgment is delayed instead of straight after the task (Destan et al., 2014; Schneider, 2008, 2010; Vo et al., 2014). This may be because when judgments of learning are made directly after the task, the information is still in working memory (Dunlosky & Nelson, 1992; van Loon et al., 2013). This means that the young learner is not basing the judgment off how well they can retrieve the information from long-term memory, which is a better indication of whether they will be able to retrieve it later. Delaying judgment until after the information has left working memory makes judgments more accurate. Roderer and Roeber (2014) also suggest that wishful thinking and the desire to do well may impact young children's metacognitive judgments more than adults' metacognitive judgments, causing them to make overconfident judgments. Nevertheless, it is generally acknowledged that judgments of learning become more accurate with age and experience (Destan et al., 2014; Schneider, 2008, 2010).

Metacognitive control refers to a learner's conscious attempts to control their cognitive processes during a task and can manifest in behaviours such as "stopping the activity, deciding to continue it, or changing it in mid-stream" (Dunlosky & Metcalfe, 2009, p. 3). The child attempting her subtraction worksheet might stop the activity when she realises that she cannot use her fingers. She might decide to ask for help or change the way she approaches the worksheet by using a number line to help her count backwards to find the answer. Both are control decisions based on her realisation that the task was not as easy as she expected based on her previous experiences.

Both cognitive and metacognitive strategies can be used in metacognitive control (Efklides, 2008; Flavell, 1979). Metacognitive feelings and judgments could trigger the learner to retrieve relevant strategy knowledge from their long-term memory and use it (E. Norman et al., 2010). Metacognitive control can be activated directly by metacognitive feelings and judgments in bottom-up metacognition or can be activated in top-down metacognition (Efklides, 2008). The top-down process may be enacted in situations where explicit awareness is required. The task may require holding some information and monitoring it in working memory, such as when task directions have multiple steps. A teacher might point out a mistake that a child's own monitoring processes missed (other-regulation) or critical thinking may be required when it is necessary to evaluate someone's thinking, argument, or a piece of knowledge (Efklides, 2008; Guerrero et al., 2017; Mills, 2013). Conversely, when metacognitive control is activated through bottom-up processes, it means that implicit processes have proven insufficient and lack of understanding or feeling of difficulty reaches conscious awareness in the form of metacognitive feelings (Efklides, 2008, 2014).

Despite assertions that metacognitive control is late-developing and not likely to be seen in children under eleven or twelve (Veenman & Spaans, 2005), metacognitive control has been documented in children as young as three using more child-friendly activities. These studies have explored strategic help-seeking (Bruce Thompson et al., 2012; Coughlin et al., 2015), declining to answer when uncertain (Lyons & Ghetti, 2013), making metacognitive bets in accordance with confidence (Destan et al., 2014; Vo et al., 2014), and problem solving while building a train track (Bryce et al., 2015). Some of these studies (Bryce et al., 2015) used observational methods to code for skill use, making it important to consider whether the observed actions correspond with metacognitive intentions (Veenman, 2007). However, others (Destan et al., 2014) explicitly prompted a control decision based on earlier confidence judgments, creating a stronger link between metacognitive judgments and control decisions. In the case of Destan et al. (2014), it is likely that the activity prompted uncertainty monitoring and its connection to control decisions. Instead of intentionality, it is necessary to consider whether the behaviour is representative of young children's spontaneous control decisions. It is clear that context is important to young children's metacognitive regulation and it may follow that their use of metacognitive control becomes more sophisticated and effective as they become increasingly familiar with different contexts. This also has implications for how metacognition is explored (see chapter 4).

3.2. Developing metacognition

Section 3.1 has incorporated some discussion of how metacognition is developed, particularly emphasising the importance of felt experiences. This section explores the creation of knowledge from experience more closely by examining the perspectives of Piaget and Vygotsky. The work of Piaget has been important in developmental research on metacognition because his staged model of development has implications for the development of abstract thinking. Vygotsky's work has been important in understanding how social interactions impact on developing metacognition. This should not be taken as a comprehensive discussion of Piaget or Vygotsky's work as this would be beyond the scope of the thesis. Rather, it summarises some of the main ideas from these authors that are important for understanding young children's metacognitive development and the context that metacognitive research takes place in.

Piaget's work was characterised by his staged model of development, which heavily impacted on early research on metacognitive development (Fox & Riconscente, 2008). Table 5 below provides a brief summary of Piaget's staged development model.

Table 5: Piaget's stages of development

Stage	Age	Description
Sensorimotor	Birth – 2 years	• Knowledge is gained through the senses and by acting on the world around them.
Pre-operational	2 – 7 years	• Children can use representations rather than just actions to think about objects and events. • Thinking is egocentric, rigid and focused on appearances. • Children become better able to de-centre and see things from other points of view in the latter half of the stage.
Concrete operational	7 – 11 years	• Children apply mental operations to real events and objects. • Thinking becomes more flexible and less egocentric.
Formal operational	11 – 15 years	• Can carry out mental operations on other mental operations. • Thinking becomes more logical and abstract.

*Adapted from Flavell, Miller & Miller (2002, p. 4)

This implies that metacognition does not truly emerge until the formal operational stage when children's mental operations can take another mental operation as an object (Fox & Riconscente, 2008). Piaget (1969) stated that

> "up to the age of 7, introspection seems to be completely absent, and that from 7-8 until 11-12 there is a consistent effort on the part of thought to become more and more conscious of itself" (p 143).

Since early researchers tended to adopt a Piagetian perspective, many argued that young children were incapable of metacognitive processes before the age of 7 when introspection was assumed to emerge (Fox & Riconscente, 2008; Marulis et al., 2016). This was because at age 7-8, children's mental processing was seen as becoming more controlled, whereas before this stage mental processing was assumed to be more automatic (Marulis et al., 2016).

Even early in the development of metacognition as an area of research, researchers challenged assertions that young children were not metacognitive, arguing that studies failed to find evidence of metacognition because they used inappropriate methodologies (Donaldson, 1978; Rowe, 1989). Rowe (1989) summarises this standpoint perfectly:

> "it is not that children do not have the capacity to monitor and direct their communication and learning, it is that they cannot do so without understanding the situation in which they are operating" (p 73).

This reinforces the study's conception of competence as a situational quality, highlighting that the context is important for metacognitive competence. Methods for exploring young children's metacognition will be further explored in chapter 4. For now, it is important to keep in mind that recent studies of young children's metacognition have made a greater effort toward adopting child-friendly methodologies (H. Lewis, 2019; Marulis et al., 2016; S. Robson, 2010; Vo et al., 2014; Wall & Higgins, 2006; Whitebread et al., 2009). These studies have been much more successful in developing evidence of young children's metacognitive competences.

Both Piaget and Vygotsky's perspectives have important implications for how young learners make sense of their experiences and construct knowledge from them. Piaget focuses on the young learner's internal construction and refinement of knowledge through experience and the processes of assimilation and accommodation (Flavell et al., 2002).

Assimilation involves incorporating new experiences into an already existing knowledge structure while accommodation involves adjusting existing knowledge to accommodate the special properties of new experiences. Piaget (1969) states that

> "the things which call forth a new adaptation on our part, and which consequently excite consciousness in us are always changes occurring in the external world in contrast to the inner vagaries of mental activity" (p 144).

This implies that it is contact with perspectives and experiences that contrast existing knowledge structures that promotes conscious awareness of previously implicit mental functions. It makes sense then that events in a child's life such as starting school would promote metacognitive awareness of learning. This is because starting school would increase their exposure to perspectives and experiences that might cause them to adapt their existing knowledge structures, increasing their awareness of their mental processing.

Vygotsky also highlighted the importance of school in the development of higher mental processes like metacognition (Fox & Riconscente, 2008). Vygotsky (1962) stated that

> "school instruction induces the generalizing kind of perception and thus plays a decisive role in making the child conscious of his own mental processes…reflective consciousness comes to the child through the portals of scientific concepts" (p 92).

Scientific concepts are explicit and able to be controlled due to their conscious nature. In contrast, spontaneous concepts are implicitly understood and able to be used in context, but more difficult to control and explain due to their tacit nature. This connects with Schraw and Moshman's (1995) differentiation between tacit metacognitive theories and informal/formal theories that are either fully conscious (formal) or have aspects that are conscious (informal). Although tacit metacognitive theories can be used and impact performance, it is difficult to evaluate them due to their implicit nature.

Vygotsky (1962) proposed that in the classroom, the teacher helps the child to clarify their concepts and make them conscious by explaining, questioning, correcting misconceptions and making the pupil explain. Before school, the important adults in a child's life will provide cognitive support during everyday tasks such as play through scaffolding (Bruner, 2006; Zhang & Whitebread, 2017). Scaffolding can take different forms and should be contingent on the child's understanding and performance to be most effective (Zhang & Whitebread, 2017). More explicit instruction should be used when the child's understanding is poor and more open questioning approaches should be used when the child’s understanding improves. Using questions instead of explicit instructions encourages the child to gradually become more independent as they start to internalise the scaffolding. Adult scaffolding helps the child to engage in tasks that are beyond their actual development level and work in the zone of proximal development (ZPD) (Vygotsky, 1978). The ZPD is “the distance between the actual developmental level…and the level of potential development…under adult guidance or in collaboration with more capable peers” (p 86).

Development of metacognitive regulation is seen as a process of transitioning from other regulation to self-regulation (Vygotsky, 1978; Zhang & Whitebread, 2017). Before a child is able to act metacognitively on their own, the regulatory role is filled by a more knowledgeable other, usually an adult (Vygotsky, 1962; Zhang & Whitebread, 2017). In other regulation, the adult monitors and regulates the child’s performance through scaffolding. As the child becomes more capable, scaffolding is reduced and the regulatory role may be shared before the child is eventually able to monitor and control their mental processes on their own (S. Robson, 2016c; Zhang & Whitebread, 2017). At this point, the scaffolding that previously characterised the social interaction between adult and child is internalised and the child is able to independently monitor and control their cognition. As Vygotsky (1962) highlights, the self-regulatory process becomes more generalised through school instruction as children learn to monitor and control cognition in different contexts.

Efklides (2008, 2014) also highlights the importance of social factors in her multi-level model of metacognition (see figure 6).

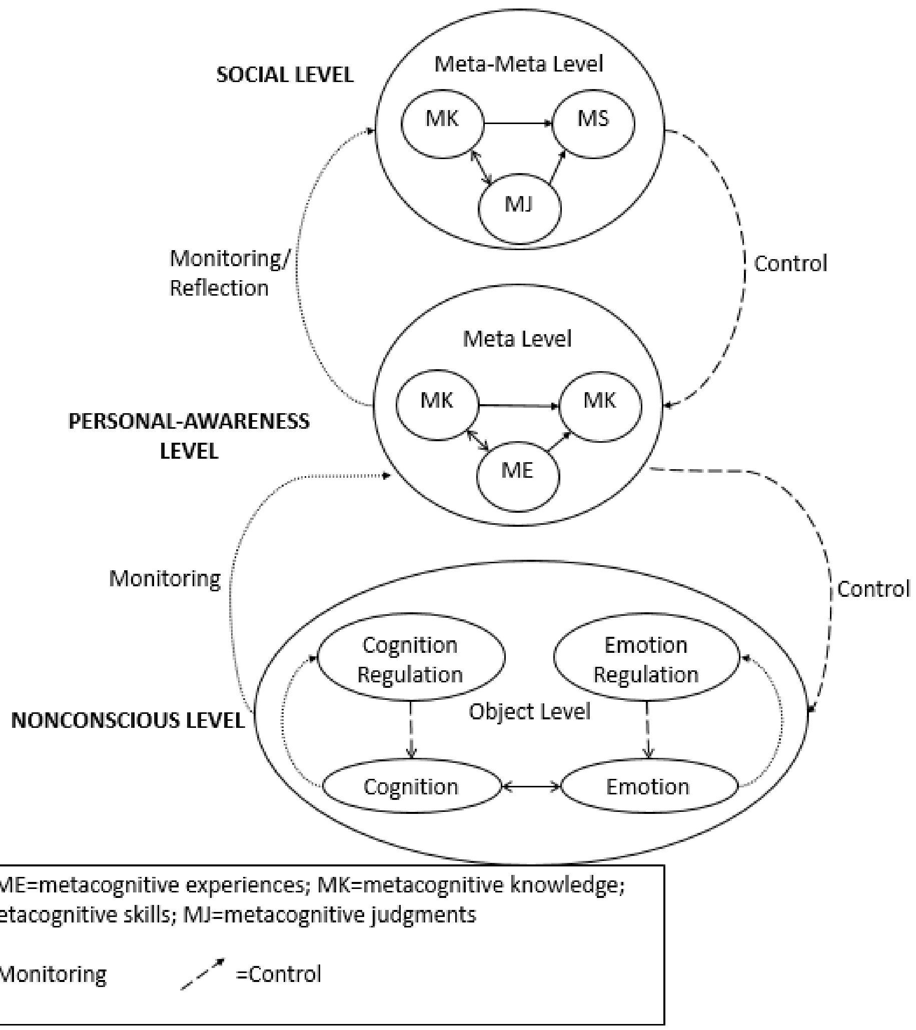


Figure 6: Efklides' (2008) multi-level model of metacognition (p 283)

This model is an expansion on Nelson and Narens' (1994) two level model (see figure 5) and adds a social or meta-meta level. The social level involves collaborative metacognition, which includes the other regulation and co-regulation described previously. It also has implications for the formation of metacognitive knowledge and how learners interpret their metacognitive experiences. Efklides (2014) states that "people can have MK [metacognitive knowledge] based on their experience and monitoring of their performance but this knowledge can be changed through instruction" (p 16). For example, Heyes (2020) asserts that learners often form metacognitive knowledge that if something was easy, they have gotten the answer right. This is because there is a predisposition to interpret feelings of ease as positive for learning. However, school-aged learners can learn to be suspicious of feelings of ease if their teacher teaches them that "when it's easy, it's often wrong" (Heyes et al., 2020, p. 354). Efklides (2014) highlights that while research on social metacognition is still relatively undeveloped, the effects of social factors are highly important to metacognition. This may include both conscious and nonconscious effects on metacognition. On an implicit level, social factors may impact on the formation of tacit metacognitive knowledge.

This discussion of the impact of social factors and interaction on metacognition implies that children's family circumstances and early experiences with education may impact their metacognition before they start primary school (Bronfenbrenner, 1979; Hayes et al., 2017). In terms of family circumstances, this could include the parents' education levels and social class, which are known to impact on achievement, cognitive skills and vocabulary skills in the early years (Bradshaw, 2011). Studies have shown that children from lower income families struggle more with self-regulation and benefit greatly from self-regulation interventions (R. J. Duncan et al., 2018). Language is considered to be important to clarifying and developing conscious awareness of concepts by both Vygotsky and Piaget, meaning that it may be important to developing metacognition (Desautel, 2009; Fox & Riconscente, 2008). Studies have indicated the intertwined nature of verbal skills and metacognition, although much of this is likely due to the tendency toward verbal methods of exploring metacognition (S. Robson, 2016a; Whitebread et al., 2009). Children with higher level verbal skills may find it easier to verbally express metacognition than children with lower level verbal skills. Since PVTs involve verbal expression of metacognition, this will be further discussed in chapter 4.

3.3. Blurred lines between metacognition and other constructs

When conceptualising young children's metacognition, it is important to understand how metacognition is interrelated to other constructs. This section aims to examine where the boundaries between metacognition and other constructs are blurred. It provides an overview of how self-regulation, executive functioning, theory of mind and educational thinking skills overlap with metacognition and what differentiates metacognition from these other constructs.

Metacognition has often been described as a fuzzy construct (Akturk & Sahin, 2011; Gascoine et al., 2017). Various fields are interested in developing knowledge about metacognition including education, psychology, cognitive neuroscience, and linguistics. These different fields offer their own definitions and explore metacognition in different ways, which often carry the epistemological and ontological assumptions of the dominant paradigms within their fields (Gascoine et al., 2017). Given the study's critical realist stance, these different kinds of knowledge are viewed as valuable for understanding young children's metacognition. As research has increasingly illuminated how metacognition is related to other constructs, boundaries have become blurred. However, it is still important to highlight the differences so that the study's stance is clear, and readers can see how this study conceptualised metacognition and how it fits into the broader field.

3.3.1. Self-regulation and self-regulated learning

Self-regulation and self-regulated learning overlap significantly with metacognition, particularly metacognitive regulation (Dinsmore et al., 2008; Gascoine et al., 2017). Dinsmore et al.'s (2008) paper explores the historical conceptual differences between metacognition, self-regulation and self-regulated learning. They describe them as having different foci (see table 6).

Table 6: Foci of metacognitive, self-regulatory and self-regulatory learning constructs

Construct	External/internal focus	Regulatory focus
Metacognition	Focus on internal learner development over learning-environment interactions	Primary focus is on regulation of cognition
Self-regulation	Focus on learners deriving knowledge from their environment	Primarily focused on regulation of emotions, behaviour and motivation
Self-regulated learning	Focus on the reciprocal relationship between internal development and learners deriving knowledge from their environment	Regulation of cognition, emotion and behaviour specifically within an academic context.

Dinsmore et al. (2008) emphasise that metacognition and self-regulation have different theoretical roots. They highlight that early metacognition researchers like Flavell were interested in internal cognitive development and heavily influenced by the work of Piaget. Meanwhile, early self-regulation researchers like Bandura were interested in interactions between internal person characteristics and external environment. Later, self-regulated learning incorporated aspects of both metacognition and self-regulation but focused specifically on an academic environment.

Nevertheless, Dinsmore et al. (2008) acknowledge that there is a conceptual core at the heart of all three constructs - “that individuals make efforts to monitor their thoughts and actions and to act accordingly to gain some control over them” (p 404). The difference between the constructs lies in what is regulated. Metacognition focuses on cognition while self-regulation was traditionally more associated with emotional and behavioural regulation. As these constructs have evolved, they have increasingly overlapped. Now, self-regulatory models tend to include cognitive regulation and some are even focused on this aspect (Whitebread et al., 2009). Likewise, metacognitive models have begun to acknowledge the reciprocal relationship between cognition and affect (Efklides, 2006, 2008). Metacognition research has also increasingly highlighted the role of social interactions and the learning environment in developing metacognitive competencies (Efklides, 2014; S. Robson, 2016c; Salmon & Lucas, 2011; Wall & Hall, 2016).

Neuropsychologists have explored connections between structures in the brain associated with emotion and cognition, providing evidence that emotion has a role in directing and organising cognition (Blair, 2002). Blair (2002) presents neurological research that indicates a reciprocal relationship between the subcortical limbic structures associated with emotion and the prefrontal cortex associated with higher-order cognition. This relationship between cognition and emotion is especially important in young children as “subcognitive processes relating to emotionality in young children may play a substantial role in the development of cognitive self-regulation,” (Blair, 2002, p. 114). This suggests a primary role for emotion in the development of metacognitive regulation, which resonates well with Efklides’ (2006, 2008, 2014) research. Her work emphasises the role of metacognitive feelings and judgments in metacognitive monitoring and control.

Research with young children tends to consider self-regulation holistically, including cognitive control (Blair, 2002; R. J. Duncan et al., 2018; Whitebread et al., 2009). Blair (2002) uses the term "cognitive self-regulation," which traditionally falls under metacognition and has a developmental air which aligns with metacognition's interest in development. However, like Duncan et al.'s (2018) article, Blair's (2002) article also incorporates emotion, which would traditionally fall under self-regulation. Articles like these show that there is substantial blurring of boundaries between these constructs. This has led to considerable debate around whether the constructs are nested in each other. Some researchers have described metacognition as essential to self-regulation (Efklides, 2008) and the development of self-regulated learning (Larkin, 2010). Dinsmore et al. (2008) assert that the literature they reviewed suggests self-regulated learning may be a special case of self-regulation in an academic context and that metacognition could be nested with them as well. The substantial overlap between constructs has clearly contributed to the use of different terminology in different projects. Additionally, some studies to not offer explicit definitions to clarify their stance to the reader (Dinsmore et al., 2008).

Moving forward, I acknowledge that metacognition interacts with self-regulation and self-regulated learning but that the distinction is important in some areas. Metacognitive research has increasingly incorporated aspects such as affect and motivation, which were traditionally differentiated as part of the self-regulatory realm. As highlighted in section 3.1.2, young children's metacognition is more likely to be a messy, bottom-up process initiated by feelings (Efklides, 2014; Larkin, 2010). This means that there is likely to be substantial blurring between the two constructs in the early years, particularly in the relationship between affect and cognition. However, it is important to remember that metacognition research still differs in some ways from self-regulation and self-regulated learning. It not only includes cognitive regulation, but also knowledge about cognition. Self-regulation research tends to focus more on online regulation and incorporates more than just cognition, making it broader than metacognitive regulation. Nevertheless, it focuses less on how knowledge interacts with regulatory processes, although it seems to take for granted that metacognitive knowledge is necessary for self-regulation (Efklides, 2008). The distinction between knowledge and regulation is especially important in young children because research has highlighted that issues like utilisation deficiency and transfer can be significant when they attempt to operationalise their knowledge (Chen & Klahr, 2008; Clerc & Miller, 2013). Moving forward with a non-deficit view of young children's metacognition, it is important to concentrate not just on what metacognitive knowledge they use in regulation but on what they know and may not be able to use yet.

3.3.2. Theory of Mind

As touched on in section 3.1.1, theory of mind has significant crossover with metacognitive knowledge. Theory of mind is defined as “the ability to attribute mental states (thoughts, knowledge, beliefs, emotions, desires) to oneself and others” (Sodian & Kristen, 2010, p. 189). Understanding that other people’s thoughts, knowledge, beliefs, emotions and desires often differ from our own is invaluable in social situations because it enables us to relate to other people (Larkin, 2010). This is because attributing different mental states to other people allows us to predict what they might do given what we know about their mental states (Sodian & Kristen, 2010). Theory of mind has also been linked to school readiness in that a child might not understand teaching if they are unable to attribute knowledge differences to themselves and others (Cavadel & Frye, 2017).

While theory of mind and metacognition are related, there are differences in focus between the two constructs. Misailidi (2010) outlines four differences between metacognition and theory of mind (see table 7 below).

Table 7: Differences in focus and domain in metacognition and theory of mind

Construct	Primary foci	Domain
Metacognition	(1) Knowledge of one’s own mind (2) Mental processes related to tasks (3) Focus on older children due to primary interest in knowledge and skills that require prior understanding of mental states	(4) Research tends to focus on application in academic contexts
Theory of Mind	(1) Knowledge of others’ minds (2) Existence of specific mental states (3) Focus on young children (6 and under) due to primary interest in the origin of knowledge about mental states	(4) Research tends to focus on application in social contexts

*Adapted from Misailidi (2010)

Although the foci differ, theory of mind and metacognitive knowledge share a core objective, namely an interest in children's "knowledge about and understanding of mental phenomena" (Lockl & Schneider, 2007, p. 149). Theory of mind could arguably be incorporated into metacognitive knowledge of person through Flavell's (1979) explanation that person knowledge includes inter-individual knowledge and beliefs about other people. Furthermore, although metacognitive research generally maintains an academic focus, researchers (e.g. Larkin, 2010) have highlighted its importance in facilitating social interactions. Cohrssen et al.'s (2016) results demonstrate that pre-school children compare themselves to their peers when engaging in self-appraisal. This indicates that social interactions contribute to how we form metacognitive knowledge about ourselves. A model of metacognition that incorporates social elements implies that metacognition is not a strictly internal process, and learning does not take place in a vacuum. Therefore, it follows that knowledge about others' mental states is important to forming self-concept, particularly knowledge about children and adults that the child often interacts with.

Empirical studies have found moderate links between metamemory and theory of mind, which may indicate that theory of mind facilitates development of metacognitive knowledge (Efklides, 2008). There has also been empirical evidence validating the link between theory of mind and understanding of metacognitive vocabulary (Misailidi, 2010). Metacognitive vocabulary enables children to think and talk about their mental states and is important to metacognitive development. Additionally, neurobiological research has indicated that theory of mind and metacognitive development are linked to changes in the pre-frontal cortex in pre-school (around age 4) (Sodian & Kristen, 2010). However, there has been debate about the nature of the developmental relationship between the two constructs (Misailidi, 2010). Lockl and Schneider's (2007) longitudinal study found that children's theory of mind scores at age four predicted their metacognitive ability at age five. However, Misailidi (2010) indicates that this model of theory of mind facilitating metacognitive development needs further testing as Demetriou's (2009) results indicated that the link may be bidirectional.

This study acknowledges that theory of mind and metacognition are related and that knowledge about others' mental states is metacognitive knowledge of person. As Cohrssen et al.'s (2016) study suggests, young children might better understand their own learning abilities by comparing their abilities with others. This means that theory of mind and especially understanding differences in knowledge could be especially important to young children's metacognition. I acknowledge that the interest in theory of mind research is broader and relates more to social interactions in general and not just specifically interactions that relate to metacognition. Nevertheless, young children's theory of mind is important to their social interactions, which form the basis of learning whether it is considered from a Piagetian or Vygotskian point of view as examined in section 3.2. As section 3.2 suggested, social interactions are important to both metacognitive knowledge construction and the development of metacognitive regulation in young children. Therefore, I progress with the acknowledgement that the relationship between theory of mind and metacognitive development is complex and important in the early years.

3.3.3. Executive functioning

Studies have indicated that executive functions are related to metacognitive control (Follmer & Sperling, 2016; Garner, 2009). It is commonly agreed that the

> "term describes self-regulatory and complex cognitive processes, including adaptive and flexible mental operations that are activated in new and demanding situations to improve performance on tasks" (Roebers & Feurer, 2016, p. 40).

Studies have linked young children's frequent monitoring-control gap to immature executive functioning (Bryce et al., 2015; Roebers et al., 2012). This indicates that, in young children, effective cognitive control may hinge on the stability of the child's executive functioning. Like other higher-order cognitive processes, neurobiological research suggests that executive functioning is also linked to the pre-frontal cortex, which undergoes rapid development in pre-school (Roebers & Feurer, 2016). The key executive functions are illustrated in table 8:

Table 8: Executive functioning skills and descriptions

Executive function	Description
Inhibitory control of attention and cognition	• The ability to focus on the most important information • The ability to inhibit a reflexive response in favour of another
Working memory	• The ability to hold "information in mind and mentally working with it"
Cognitive flexibility	• The ability to change "perspectives or approaches to a problem, flexibly adjusting to new demands, rules, or priorities"

*Descriptions from Diamond (2013, p. 137)

From the above descriptions, the application of executive functioning to metacognitive control is clear. A child with low inhibitory control may be unable to make effective control decisions because they struggle to focus on the most important information in a problem in order to assess which strategies would be effective. Additionally, a child with limited working memory capacity might struggle to hold information in mind to use when making control decisions. Low cognitive flexibility might make it difficult to change strategies in accordance with monitoring. Recent research on the connections between young children's executive functioning and metacognitive control have empirically validated links between metacognitive control and inhibition (Clerc & Miller, 2013; Roebers et al., 2012), working memory (Bryce et al., 2015), and cognitive flexibility (Roebers et al., 2012).

Despite the close links between executive functioning and metacognitive control, it would be simplistic to state that these skills can be entirely subsumed under the umbrella of metacognition. Top-down executive functioning processes deal not only with control of cognition, but also emotions and behaviour (Kloo & Sodian, 2017). This means they overlap with both self-regulation and metacognition, which together include control of emotion, behaviour and cognition (Dinsmore et al., 2008). Section 3.3.1 has clarified that emotion is particularly important to young children's metacognition and section 3.1.2 highlighted that metacognitive regulation can be significantly impacted by a learner's affective state. There may be learners of all ages who have difficulties with executive functioning, making it difficult for them to control their cognition, emotion and behaviour. However, this issue may be particularly important for the young children in this study since their executive functioning will likely still be in the rapid development phase (Roebers & Feurer, 2016). It is highly likely that the children in this study's age group will be at different stages in executive functioning development and that executive functioning will be important to their metacognition.

3.3.4. Thinking skills and other educational constructs

The educational field is populated by discussion and promotion of a variety of thinking skills, some of which overlap with metacognition. Teachers and researchers acknowledge that skills like higher-order thinking and critical thinking are important to promote in the classroom (Magno, 2010). Although there is a wealth of other thinking skills that may include aspects of metacognition, it is beyond the scope of this literature review to explore them all. Moseley et al.'s (2005) book provides an excellent in-depth exploration of different frameworks for thinking. Even an in-depth exploration of just critical thinking and higher-order thinking, which have both been highly prominent in educational literature, would deviate too far from the main purpose of this section. Rather, I will only attempt an overview, which relates thinking skills to early years education and serves to establish that metacognition is and has been present in educational literature by other names.

Metacognition and critical thinking are frequently conceptualised as higher-order thinking skills (Larkin, 2010; Livingston, 2003). In Bloom's revised taxonomy metacognition is denoted as the highest level of abstracted thinking (Krathwohl, 2002). Both higher-order thinking and critical thinking are considered to be effortful processes like metacognition (Magno, 2010). Lewis and Smith's (1993) paper suggests that although there are different definitions of higher-order thinking, it is generally initiated by a challenging task that necessitates productive thinking. Productive thinking goes beyond simply recalling and rehashing information exactly as it was previously learned or experienced (Moseley et al., 2005). This delineates higher-order thinking as a transition to a more complex way of thinking where one must draw on prior knowledge and adapt or integrate it in some way (A. Lewis & Smith, 1993). This characterisation frames higher-order thinking as less of a process and more of a classification system to delineate differences between levels of thinking.

Kuhn and Dean (2004) portray metacognition as a possible bridge between cognitive psychology and educational practice. They explain that researchers have traditionally shunned critical thinking in favour of constructs that can be more precisely measured and defined. This suggests that the critical thinking construct is ill-defined, with Johnson and Hamby (2015) asserting that there have been considerable issues with defining critical thinking. McGregor (2007) defines critical thinking generally as

> “the mental act of reviewing, evaluating or appraising something…in an attempt to make judgements, inferences or meaning about that something in a rational, reasoned way” (p 209).

Terms like reviewing, appraising and evaluating draw parallels with both metacognitive knowledge and regulation. Metacognitive knowledge is essentially the product of reviewing and reflecting on learning processes and self-appraisal (Hofer, 2004). Correspondingly, metacognitive regulation includes the process of evaluation.

There remains a connection between higher-order abstract thinking and Piaget’s formal operations stage of cognitive development (reached around age 11). At this stage it is posited that children start to rely less on concrete representations and are increasingly able to form more abstract representations (C. Gray & MacBlain, 2012). These abstract representations are considered necessary for higher order thinking. However, there has been mounting evidence that young children are capable of higher-order and critical thinking (Sargent, 2014). Sargent (2014) asserts that this can be fostered in the early years with sustained shared thinking (a type of co-regulation). In sustained shared thinking, children share their thinking with an adult or a group of children and all parties work to develop and extend the thinking and understanding. This would involve metacognitive vocabulary and reflection as discussing thinking processes involves the social level of metacognition where cognitive processes must be made explicit in order to verbalise them (Efklides, 2008). The Learning to Learn (L2L) project (Higgins et al., 2007; Wall, 2008), which used PVTs alongside other methods is a good example of using shared reflection in the classroom to develop metacognition and thinking skills.

This study draws on Moseley et al.’s (2005) framework for thinking (see figure 7) to differentiate between types of thinking and to understand how they contribute to metacognition. Their framework emerged from a systematic analysis of the strengths and weaknesses in other frameworks for thinking and aligns well with this study’s conceptualisation of young children’s metacognition as a messy process. Metacognition is represented in their model as strategic and reflective thinking.

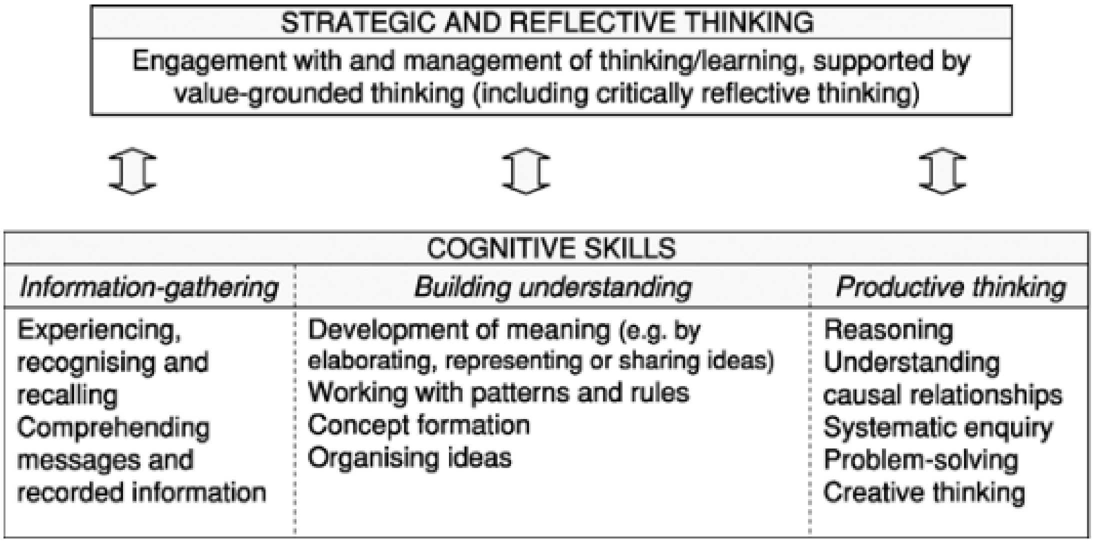


Figure 7: Moseley et al.'s (2005) Framework for thinking (p 314)

According to McGregor's (2007) definition, critical thinking aligns most with Moseley et al.'s (2005) productive thinking and strategic and reflective thinking categories. However, the Moseley et al. (2005) framework is more useful because it shows how more complex thinking like productive thinking and strategic and reflective thinking could build on cognitive skills that are not quite critical thinking. Moseley et al. (2005) argue that other thinking frameworks tend to frame metacognition as emerging from higher order thinking processes (i.e. productive thinking). Conversely, their framework acknowledges overlaps between different cognitive skills. It shows appreciation that different types of thinking can become metacognitive with its use of two-way arrows between strategic and reflective thinking and each cognitive skill. Unlike multilevel hierarchies, the boundaries between different skills are fluid, reflecting the messy nature of young children's emergent metacognition. Larkin (2010) states that children dip in and out of metacognition with some episodes being sustained and others brief. Situations that prompt reflective and strategic thinking in some learners may not prompt metacognition in other learners. Section 6.3.1 will explore how this framework was applied to the data from the study.

3.4. Summary

This chapter has provided an overview of how young children's metacognition has been conceptualised in research. For children at the beginning of primary 1, metacognition is likely to be a messy process that they dip in and out of (Larkin, 2010). As a process that relies on felt experiences, it is largely internal and may involve implicit knowledge. Given the messy nature of the phenomenon, it can be difficult to tell when, how and why an experience becomes metacognitive for a child. This means that researchers seeking to explore the phenomenon may encounter difficulties, which will be examined in further detail in the next chapter. Furthermore, this key point contributes to justifying the first research question. If metacognition is a messy process, it is therefore important to know what might facilitate its expression as more methods for eliciting and developing metacognition are developed by researchers and practitioners.

Although metacognition itself is a cognitive process, it is clear that it can impact on and be impacted by non-cognitive processes such as affect and motivation. Linking back to chapter 2, metacognition is viewed as a process that is situated in a context. Children develop metacognitive knowledge and skill by experiencing learning in different contexts. This means that the wider context of children's experiences is important, not just the metacognition but the affect and motivation that prompted that metacognitive regulation or helped to construct that metacognitive knowledge. The blurred lines between cognitive and non-cognitive processes and constructs will be important to consider going forward. Understanding that metacognitive experiences are not solely cognitive will be important for constructing an appropriate approach and for understanding the metacognition children express in this study.

This chapter demonstrated that metacognition is a complex process and provided an overview of concepts that are important to young children's developing metacognitive knowledge and regulation (see figures 3 and 4). The varied nature of these concepts (i.e. transfer, felt experiences, social interactions) has contributed to the careful wording of the third research question. This question is not constrained to examining specific aspects of metacognition, acknowledging that any of the concepts examined in this chapter may be important to understanding children's metacognition. There were some areas that were underdeveloped in the literature, one of which was research exploring young children's epistemological beliefs (Lunn Brownlee et al., 2017). The second research question seeks to address this gap by specifically exploring how children understand learning as a process and what characteristics they associate with it. Additionally, this chapter has highlighted that metacognition is formed and functions within a personal and social context and that individual contexts are important for understanding metacognition. Consequently, the second and third research questions concentrate on the metacognition and understandings that children express within the PVT interaction, framing them as situated knowledge and phenomena.

Metacognition is usually portrayed as an internal process, but social metacognition is important, particularly in the classroom and in early years settings. In the beginning of primary 1, children's early experiences with learning at nursery as well as their interactions with their parents or carers are important. Social interactions help the child to form new metacognitive knowledge, move from tacit knowledge to explicit knowledge and regulate their cognition as they learn. This means that the social context of children's metacognitive experiences will also be important in this study. The social context is relevant not only in constructing the approach, which is a social interaction, but also in analysing the metacognition children express, which will have been impacted by the social context it was constructed in.

As highlighted in sections 3.2 and 3.3, children's family circumstances, early education experiences and early skills are important to their developing metacognition. These are important to understanding children's metacognition because they contribute to shaping children's early experiences with learning. The fourth research question, therefore, aims to understand the connections between the metacognition children demonstrate in the study and their family circumstances, early education experiences and early skills.

The next chapter will examine methods used to explore young children's metacognition. The methods a researcher uses to explore metacognition are linked to how they conceptualise the phenomenon and participants (Gascoine et al., 2017). Therefore, it will be important to draw on concepts from this chapter as I review the methods most commonly used for eliciting evidence of young children's metacognition. In particular, this chapter and the last have stressed that metacognitive competence is situational. This will be important in analysing the contexts others have developed for eliciting metacognition and in analysing how PVT interactions facilitate talk about learning and metacognition.

Chapter 4. Evaluating methods for exploring metacognition

Drawing from the previous chapter, I have highlighted that young children's metacognition is a messy and largely internal process, making it difficult researchers to access and explore. This is because exploring metacognition usually either involves verbally describing internal processes or observing metacognitive behaviours. The first is problematic in young children because they might struggle to express themselves since their verbal skills and mental vocabulary are still developing. The second is also problematic because metacognitive intentions are often assumed from their cognitive and behavioural manifestations (Veenman, 2007). The contexts created by researchers for exploring metacognition are important because metacognitive competence is tied to the situation (Rowe, 1989). This prompts the question: what counts as evidence of metacognition in the early years and why? The answer is that it depends who you ask. Various fields with different interests and conceptualisations of young children's metacognition have had a stake in developing evidence of this phenomenon, meaning that an array of methods exist (Gascoine et al., 2017).

This second part of the literature review aims to overview various methods of exploring young children's metacognition and to provide a rationale for the use of PVTs (Wall & Higgins, 2006) in this study. First, I provide an overview of existing methods, concentrating on the issues with exploring young children's metacognition and the affordances and limitations of existing methods. The rest of the chapter is dedicated to examining the use of PVTs in existing metacognition literature, how PVT interactions elicit metacognition and their affordances and limitations.

4.1. Overviewing existing methods for exploring metacognition

It is necessary to set the stage for the subsequent in-depth rationale for the use of PVTs by examining existing methods for exploring young children's metacognition. This serves to position PVTs within the field. A systematic and in-depth consideration of methods is beyond the scope of this project and a recent systematic review already exists (Gascoine et al., 2017). This section will consider overarching issues in exploring and recording metacognition in the early years. Additionally, it will examine various methods for investigating metacognition with the objective of examining their affordances and limitations. It will also expand on the importance of using pedagogically appropriate methods for eliciting young children's metacognition.

4.1.1. What issues underlie the exploration of metacognition in the early years?

Metacognition studies come from different fields with different practical and historical core interests. For example, the ultimate aim of most education research is to impact and improve practice. Therefore, it tends to look at metacognition more holistically as it is enacted in classroom contexts (i.e. Desautel, 2009). Meanwhile, psychological research tends to be more theoretical or clinical in nature. Although these studies are sometimes carried out in classrooms, they tend to be more interested in specific aspects of metacognition like the accuracy of metacognitive judgments (van Loon, Destan, et al., 2017; Vo et al., 2014). Although this is a simplistic example because educational and psychological research does not exist on a binary, it does serve as an example of how the motivation for studies can differ. Not only do various fields sometimes conceptualise metacognition differently, they often rely on implicit definitions instead of setting out concrete definitions (Dinsmore et al., 2008). Furthermore, they carry ontological and epistemological assumptions from the dominant paradigms within their fields (Gascoine et al., 2017). It is not a long leap to say that theoretical baggage is often taken for granted and not reflexively examined in terms of what it means for the kind of metacognition the study is talking about.

One potential area of contention is using the term "measure" when talking about recording evidence of metacognition because it implies that there is something objective to simply be counted or otherwise measured numerically. It suggests a rather objective view of metacognition, which directly contradicts early childhood philosophy and the highly subjective and individually constructed view of metacognition that I have built on throughout the literature review. Although the study's critical realist perspective acknowledges that metacognition exists as a common mental process, the data that researchers collect about it is still considered to be subjective (Alderson, 2016). An individual's metacognition is subjectively constructed, but it is a real psychological phenomenon in that people's individual experiences of metacognition indicate the presence of a deeper mental process that we share.

Researchers can build conceptual models and study how metacognition functions by exploring commonalities in individuals' subjective knowledge and experiences. However, our knowledge and theories of metacognition are ultimately partial and imperfect at fully describing the deeper underlying mental process. Individual thinkers experience metacognition internally and (often imperfectly) translate their internal constructions into words or actions. To say that this can be "measured" would contrast the view of metacognition that this study subscribes to. Therefore, even though some of the studies that I will use as examples in the following sections would claim that they are measuring metacognition, I will instead position them as methods for exploring, investigating or recording metacognition.

Methodological choices can be made for various reasons, some of which may be examined in the study and some of which may be based in taken for granted assumptions of the researcher. For example, a study may explore metacognition using observation due to being nested in a positivistic framework – an external view of reality and strong emphasis on empirical, seemingly objective data (Cohen et al., 2018). However, this same method choice may indicate that the study's conceptualisation of metacognition includes implicit processes, which may be difficult to elicit using verbal and written instruments (Lai, 2011). Likewise, choosing observation could mean that the researchers are sensitive to the fact that verbal and written methods tend to underestimate the metacognitive abilities of young children due to their relatively limited literacy skills (Desautel, 2009; Pezzica et al., 2016).

Methodological concerns are an unavoidable issue given the complexities in investigating a primarily internal phenomenon in young children who have relatively limited verbal skills (Pezzica et al., 2016). Young children often possess limited and sometimes insufficient knowledge of mental language to discuss their thinking (Larkin, 2010). Robson (2016c) points out that a lack of verbal evidence of metacognition in young children should not be taken to indicate that metacognition is absent. In fact, Rowe (1989) asserts that early assumptions that metacognition is late developing may be because researchers employed decontextualized and unfamiliar methodologies designed for adults and older children with young children.

Young children's still developing verbal and cognitive skills raise additional questions of validity and reliability (Saraç & Karakelle, 2012). In research on early metacognition, one concern is that reliable methods used with adults and older children such as think-aloud protocols may present an overly high cognitive load for young children's limited working memory capacity (Gascoine et al., 2017; Haberkorn et al., 2014). Think aloud protocols require the participant to verbalise their thinking as they work on a task. The process of verbalising thinking can take up excessive space in working memory, meaning there is less space for children to actively monitor and control their mental processes. This means that think aloud protocols and other methods that impose a high cognitive load may not reliably elicit metacognition in young children. Furthermore, the interrelation between metacognition and language, particularly in the early years, can lead to issues of construct validity. Developmental studies have questioned whether results reflect patterns of language or metacognitive development (Thorpe & Satterly, 1990). The confounding effects of language may be especially impactful when attempting to use methodological tools that rely on verbal or written literacy with young children as their metacognitive vocabulary is less developed than older children (Larkin, 2010).

There has been considerable effort in designing different ways to explore metacognition in young children. These include both online and offline methods. Online metacognition tends to refer to metacognitive regulation while offline metacognition refers to metacognitive knowledge stored in long-term memory (Akturk & Sahin, 2011; Saraç & Karakelle, 2012). Likewise, methods are typically classified as online if they investigate metacognition while the person is engaged in an activity or task. Conversely, they are classified as offline if they ask the participant to reflect on general metacognition or engage in prospective or retrospective evaluation of their metacognitive performance. It has been stated that online methods are more reflective of children's actual use of metacognition than offline methods (Bryce & Whitebread, 2012).

The online/offline distinction is far from uncontentious and the traditional delineation between what can be characterised as online and offline has been called into question (Desautel, 2009; Gascoine et al., 2017). Online methods like think aloud protocols which require participants to talk about their thinking while performing a task, prompt the participant to stop and reflect on their actions, arguably transitioning from online to offline and then online again when the task is resumed (Gascoine et al., 2017). Additionally, offline reflective episodes may serve a double purpose as online metacognitive experiences promoting metacognitive evaluation which may build or refine metacognitive knowledge (Desautel, 2009). It is worth keeping in mind that metacognition is an internal and messy process, so researchers cannot see whether metacognition is online or offline by looking at it and the line between online and offline metacognition may be very thin indeed.

In terms of methods, the blurry line between online and offline metacognition implies that it cannot be put into separate online and offline boxes, although it often is. In chapter 3, I stressed that the components of metacognition do not function separately and emphasised that metacognition is a messy process. Larkin (2010) asserts that children slip in and out of the meta level. Therefore, I raise that it is possible to transition between online metacognition and reflective, offline metacognition depending on the context and the person. It may be that some methods are more suited to exploring and recording instances of the spontaneous use of metacognition and some methods are better suited to record reflective metacognition. However, due to the intertwined nature of the two components, it would be surprising if there was no crossover at all.

It is readily acknowledged in the literature that online use of metacognition incorporates the use of metacognitive knowledge retrieved from long-term (offline) memory. It is additionally widely accepted that while metacognition can stem from unconscious processes, metacognition itself is a conscious process that attention is directed toward. It seems nonsensical to then say that conscious metacognitive experiences cannot be remembered and reflected on and thus picked up by traditionally offline methods of exploring metacognition.

4.1.2. Affordances and limitations of methods for exploring young children's metacognition

In a systematic review, Gascoine et al. (2017) found that 61% of metacognition studies used self-report measures like questionnaires and Likert-style scales. In their traditional written format they are not generally used with children under the age of seven as verbal and written literacy demands are high (Gascoine et al., 2017). Researchers acknowledge that methods with high literacy demands tend to understate the metacognitive abilities of young children (Desautel, 2009; Whitebread et al., 2009). There has been some creative development around reducing the language demands of self-report measures and Likert-style scales to enable use with young children. One example is Lockl et al.'s (2016) picture-based questionnaire where children rated memory strategies with a star system (1-3 stars) which corresponded with a 3-point Likert scale. The purpose of the questionnaire was to ascertain whether children could judge which strategies were the most useful.

Picture-based questionnaires like Lockl et al.'s (2016) can be administered in a short space of time to a large number of children, meaning they can generate a large amount of data faster than studies requiring researchers to work with individual children or small groups. Questionnaires and self-report are considered to offline measures of metacognition and Veenman (2007) states succinctly that "people often do not do what they say they will do or have done" (p 182). Young children may claim that they use certain strategies on self-report instruments because they know that using strategies is a good thing and want to please the adult researcher (Larkin, 2010). This is not inherently negative with regard to metacognitive development as it means these children know about strategies and understand they are useful. However, it may not be an accurate representation of how they spontaneously use metacognition when they learn.

Another approach frequently used to explore young children's metacognition is adult reports on children's metacognitive abilities. These observation-based research instruments include researcher observation and teacher-report questionnaires. They have emerged as low-language demand methods for exploring metacognition in young children and are generally used for children age seven and under (Gascoine et al., 2017). Whitebread et al. (2009) developed an observation framework to explore young children's metacognition. The Cambridgeshire Independent Learning in the Foundation Stage (C.Ind.Le) coding framework sets out verbal and non-verbal indicators of metacognition for use with young children (age 3-5). It is generally used to code video of children's self-selected play activities by non-participant observers and has been adopted by others using observational methods such as Robson (2010, 2016a, 2016c). In some other studies observers have also been participants, as in Rowe's (1989) study of children's self-selected writing events, giving the researcher more opportunity to ask probing questions about children's actions. Whitebread et al. (2009) also developed the Children's Independent Learning Development (CHILD) instrument, which is a questionnaire meant for practitioners to rate children's self-regulation (cognitive, emotional and motivational) and social regulation.

Observation and teacher-report methods are related in that they both rely on third-party interpretation of children's actions and utterances. Observation is considered to be an online method while teacher-report would be considered to be offline like self-report methods. However, both methods present the challenge of misinterpreting reasons for a child's behaviour, resulting from observer bias (B. Johnson & Christensen, 2012). It is necessary to restate here the importance of considering intentionality – observation is a method that relies on external actions where metacognitive intentions are often inferred (Veenman, 2007). In some cases this is triangulated through discussions with children's teachers via questionnaires or supplemental data collection measures (S. Robson, 2010, 2016c; Whitebread et al., 2009). For example, Robson's (2010, 2016c) studies used reflective dialogues to probe children's thinking in the observed activities, allowing children to provide explanations for their actions in conversation with a practitioner.

Task-based and experimental methods are generally used to investigate specific sub-components of metacognition through tasks designed to prompt certain behaviours. They would be considered online methods because the child is engaged in a specific task, making the metacognition task-specific. However, the recorded metacognition is slightly less spontaneous than observation due to prompting. For example, Vo et al.'s (2014) study looked at 5-8 year old children's judgments of learning while playing a computer game. The game was designed to promote judgments of learning by asking children to wager virtual tokens on how accurate they thought their answers were. Destan et al.'s (2014) study explicitly prompted control decisions based on judgments of learning. In this study, children learned Japanese characters before being asked to make a judgment on the likelihood of remembering it later (judgment of learning). Next, they were given the opportunity to re-learn the characters and could choose how long to study each character, creating a stronger link between metacognitive judgments and control decisions (allocation of study time). This explicit prompting of metacognition can call into question the study's ecological validity and whether results accurately reflect children's spontaneous metacognition.

Think aloud protocols are another task-based method since they are specifically designed to explore metacognitive regulation while the child is engaged in a task (Veenman, 2007;

Veenman et al., 2005). In a think aloud protocol, the researcher records the child's verbal commentary on their thinking as they work through a task. The commentary is later analysed for evidence of metacognition. Gascoine et al. (2017) states that think aloud protocols have only been used with children as young as six, perhaps reflecting the linguistic and cognitive demands of the think aloud process. Although think aloud protocols do not include explicit prompts to think about something in a certain way or make a judgment or control decision, they do direct children's attention to their thinking which could prompt metacognition (Gascoine et al., 2017).

Although interview-based techniques of exploring metacognition also involve high linguistic demands, there has been considerable effort to make them more child-friendly. Reflective dialogues (S. Robson, 2010, 2016c) and PVTs (Wall, 2008; Wall & Higgins, 2006) both use visual aids to help mitigate language demands. PVT interactions use cartoon depictions of learning situations and reflective dialogues use video of children's learning episodes to facilitate talk about learning. Robson's (2010, 2016a, 2016b, 2016c) reflective dialogues use videos of children's self-selected play episodes, which the child reflects on with their teacher. The commentary and actions during the dialogue are then analysed for evidence of metacognition. The major difference between reflective dialogues and PVT interactions is that reflective dialogues focus on a specific episode of learning while PVT interactions use cartoon representations which could be reflective of various episodes of learning. PVTs will be examined in-depth in the second part of this chapter.

Interview-based techniques prompt children's reflection on different learning episodes, making them ostensibly offline measures of metacognition. This implies that they may be better at eliciting metacognitive knowledge rather than regulation. This was reflected in Robson's (2010) study where she found that reflective dialogues elicited more metacognitive knowledge than regulation. Studies using PVTs (Wall, 2008; Wall et al., 2013) have not faced this same problem. However, this may be because they have used Veenman and Spaans' (2005) metacognitive skilfulness to code instances of regulation, which includes procedural and conditional knowledge of strategies that would have been categorised as metacognitive knowledge in Robson's studies. Similar to self-report methods, it is possible that the metacognition recorded using interview methods may not reflect children's spontaneous use of metacognition in a task. However, since interview methods are more open-ended than questionnaire methods, they may capture more of the child's actual metacognitive knowledge rather than suggesting a list of statements or strategies for the child to choose from.

To summarise, an objective tool for capturing complete and objective evidence of young children's metacognition does not exist. Metacognition is a complex and largely internal phenomenon that is situated in context, as previously highlighted in chapters 2 and 3. This means that researchers need to think carefully about the contexts they create for metacognition because they have implications for the kind of metacognition that the study can discuss. It is important that the method is aligned with the study's aim and suited to study's participants, as the next section will demonstrate.

4.1.3. The importance of child-centred methods

The above discussion of the affordances and limitations of existing methods makes it clear that there is no perfect and objective tool for exploring young children's metacognition. This fits nicely with the study's critical realist perspective, which assumes that the knowledge and theories that we can construct about metacognition will always be imperfect. Rather than rejecting all tools for their imperfect nature, the position I advocate for here aligns with Desoete (2008) when she stated that "how you test is what you get" (p 204). In Rowe's (1989) study, she pushes back against the use of unfamiliar and decontextualized tasks to investigate children's metacognition. Indeed, Donaldson (1978) previously criticized researchers' frequent failure to decentre and look at tasks and tests from a young child's point of view to ensure that they are appropriate and understandable. If the child does not understand the task, it is highly unlikely that the study will record any evidence of metacognition. Context is important to exploring young children's metacognition and conscientious and intentional choice of a child-appropriate tool is more likely to elicit evidence of metacognition. It is vitally important, then, to start from the child's competences and use pedagogically-appropriate tools to elicit metacognition (Wall, 2019).

It is necessary to consider children's previous experience with the chosen contexts. Cobb's (2017) study used a child-friendly draw and talk method but found that young children lacked conditional knowledge in reading comprehension strategies. It is important to highlight that kindergarten and first grade children (who lacked conditional knowledge in the study) are beginning readers and tend to have limited experience with independent reading. It is not implausible that these same children may possess conditional knowledge in more familiar contexts as results from other studies have identified conditional knowledge in young children (e.g. Rowe, 1989; Wall, 2008). The children in Cobb's (2017) study may not have had conditional knowledge of reading comprehension strategies, but this does not mean that they lacked conditional knowledge altogether.

Recent studies have drawn on children's competences when designing experimental tasks to explore aspects of young children's metacognition. For example, Vo et al.'s (2014) study involved a computer game where children made metacognitive "bets" on the accuracy of their answers in a mathematics task. The results indicated that even the youngest children (age 5) showed evidence of metacognitive sensitivity. Additionally, Destan et al.'s (2014) study used a pictorial scale for children aged 5-7 to make judgments on how well they would remember Japanese characters (judgments of learning). They also used a treasure box and rubbish bin for children to judge whether they thought their answer was right (confidence judgment) after a subsequent test of these characters. Their findings indicated that even five-year-old children can make accurate judgments of learning and operationalise confidence judgments into control decisions when deciding where to place each character. Although there was still evidence of overconfidence, the findings still contrast other studies indicating that young children vastly overestimate their performance (Schneider, 2010). Vo et al. (2014) and Destan et al.'s (2014) studies both focus on the accuracy of young children's metacognitive judgments, which is a complex concept to understand. Decentring and starting from the child's point of view, the researchers endeavoured to ensure that the task they designed to elicit metacognition was comprehensible by using familiar visuals and aligning the tasks with games designed for children. After all, if children have not understood the task, it is unlikely that they will make accurate judgments regardless of whether they are able to or not.

Linking back to the last chapter, demonstration of metacognition is dependent on many factors and not solely on the child's ability to engage in metacognition. Chapter 2 established the study's view that metacognitive competence is situational. Therefore, when exploring metacognition, it is important to acknowledge that metacognition demonstrated in the study is bound within the context designed by the researcher. It may be demonstrated in other contexts and it may not be. If a participant does not demonstrate metacognition in the research, this does not mean that they would not demonstrate metacognition in other contexts. The point to take away here is not that using contexts familiar to children is a silver bullet that will never fail to elicit metacognition. Instead, I agree with Rowe (1989) that we should not be surprised when unfamiliar and decontextualized tasks do not record any evidence of metacognition. After all, children cannot reflect on learning in a context they have not experienced before and if they do not understand the task, they cannot be expected to think strategically about it.

4.2. Evaluating the use of Pupil Views Templates

This study uses PVTs to explore young children's metacognition, so it is necessary to further examine them and build a rationale for their use. This section discusses the use of PVTs in previous research, examines how they capture and promote children's metacognition and explores their various advantages and disadvantages as a method of collecting data about young children's metacognition.

4.2.1. Examining themes in previous PVT research

PVTs were initially developed as part of the Learning to Learn in Schools (L2L) project, which focused on centring the learning process – part of this involved reflecting on the role of metacognition (Wall et al., 2010). The research using PVTs produced as part of this project included a wide range of ages, from nursery (age 4) to secondary school (age 15) (Wall et al., 2010). The findings illustrated developmental trends and interactions between children's metacognition and their gender, their school's duration of participation in the L2L project and the socioeconomic status of the area (Wall, 2008; Wall et al., 2010, 2013). Although many of the articles produced as part of the L2L project used an exclusively deductive framework for analysis, one article compared deductive and inductive analysis frames, identifying inductive themes across age groups (Wall et al., 2013).

For the purposes of this study, one of the most important findings from the L2L project research is that even the youngest children (age 4/5) were able to use PVTs to reflect productively on learning and demonstrated metacognitive ability (Wall, 2008; Wall et al., 2010). Since PVTs have been effective for this age group in the past, they can be considered an appropriate tool for eliciting metacognition in this age group. Participating teachers in the L2L project could implement the templates in ways that fit with their practice, so some early years teachers chose a more supportive approach to discussing the template (Wall et al., 2007; Wall & Higgins, 2006). Previous applications of a supportive approach pave the way for the current study to draw on early years pedagogy in decisions made around how to facilitate the discussion (see section 5.5.4).

PVTs have continued to be used in research about metacognition and to elicit children's perspectives and experiences of learning in a variety of contexts. Table 9 shows an overview of how PVTs have been used in research outside the L2L project.

Table 9: Overview of PVT research outside the L2L project

Study	Age group	Country	Focus
Wall et al (2005)	9-11	England	Perceptions of interactive whiteboards
Erikson and Grant (2007)	10-13	Australia	Perceptions of learning with an interactive whiteboard
Symons and Currans (2008)	8-9	England	Perceptions of the use of marking ladders
Spinks (2012)	8-9	America	Perceptions of engagement in writing
Tiplady and Laing (Tiplady & Laing, 2012)	6-14	England	Perceptions of the Just for a Laugh? Intervention, which explored risk-taking with children
Whyburn and Way (2012)	10-11	Australia	Perceptions of using interactive whiteboards in maths
Durkin (2014)	8-9	England	Perceptions of a think-aloud paired problem-solving intervention
Gold (2014)	10-12	England	Metacognition in peer assisted writing
Hanke (2014)	4-7	England	Perceptions of guided reading

Gascoine (2016)	4-16	England	Developmental trends in metacognition and cognitive skills
Mulholland Shipley (2016)	9-11	England	Perceptions of learning in maths (in relation to a thinking skills intervention)
Joslin-Callahan (2018)	10-11	Germany	Perceptions of international mindedness
Otain et al. (2019)	10-11	Saudi Arabia	Perceptions of an intervention involving use of self-organised learning environments

This table makes it clear that PVTs have a range of uses and can be used with older and younger children. Most studies have tended to concentrate on older age groups, potentially because older children are able to use PVTs more independently since they can write without assistance. However, Hanke (2014) and Gascoine (2016) also used PVTs with this study's proposed age group. Gascoine's (2016) thesis further explored developmental trends in metacognition and relatively independent discussion around the PVTs. Some general prompts were used to facilitate discussion if the talk stalled. Hanke's (2014) study focused on young children's perceptions of guided reading using templates based on guided reading sessions in their classrooms. She also used minimal prompting, asking children to tell the story of a guided reading session. Some relatively small-scale studies (Hanke, 2014; Whyburn & Way, 2012) used audio recording to capture comments that children did not choose to write on their PVT. However, larger-scale studies like Gascoine (2016) or studies that use PVTs in addition to other data collection measures like Durkin (2014) tend to only use data written on the PVT in the analysis.

Considering existing PVT research, there is a gap where the current study can add knowledge. This study attends to 4/5-year olds as a specific age group rather than investigating developmental differences between age groups. Concentrating on one age group will allow this study to explore within group differences rather than pooling young children together to make developmental comparisons with older age groups. This means that this study can investigate individual and sub-group differences identified in the literature as impacting on children's metacognitive development. This includes individual differences in executive functioning and social differences such as social class. Second, there has not yet been a study using PVTs that has concentrated on young children's metacognition in a more general sense as Hanke's (2014) study focused specifically on guided reading. This study's more general focus on metacognition at the beginning of primary school will allow an in-depth exploration of metacognition as an early years phenomenon. This exploration has the potential to uncover themes and trends of relevance in the early years.

4.2.2. How do PVT interactions elicit metacognition and what kind of metacognition do they elicit?

Essentially, PVT interactions elicit metacognition by prompting children to reflect on learning in a pictured situation. These reflections may include metacognitive knowledge, experiences and skills that the child feels are related to the situation. An example of a completed PVT was presented in chapter 1 (see figure 1). PVT interactions provide an opportunity for children to draw together various experiences of the pictured situation when discussing the picture. This means that it is important that the child has experienced the learning situation in the PVT because it is impossible to reflect on a situation that has never been experienced. Previous studies using PVTs have been carried out by classroom teachers (Erikson & Grant, 2007; Whyburn & Way, 2012), analysed data collected by classroom teachers (Wall et al., 2013) or looked at children's perceptions of an intervention (Durkin, 2014; Otain et al., 2019). This has ensured that the learning situation is relevant and familiar to the children.

Selecting a familiar and relevant context is important as demonstration of metacognition is more likely in familiar contexts. Referring back to section 3.1.1, children are more likely to demonstrate sophisticated metacognitive knowledge, such as conditional knowledge in familiar situations. This is because it is seemingly developed and honed through repeated exposure and reflection on learning in different contexts (Rowe, 1989). Additionally, Hacker and Dunlosky (2003) contend that to reflect on and verbalise their reasoning and thinking, it is necessary for children to first develop some content knowledge in the area. This content knowledge provides children with a vocabulary they can use to describe their thinking and reasoning.

Illustrations like PVTs and other non-photographic representations may aid in the process of abstraction as "photos can be too detailed and particularistic" (Pauwels, 2011, p. 9).

Photos may prompt excessively literal and detailed recall of unrelated features of the situation such as who was there, what was happening and seemingly random stories about tangentially related behaviours. Although these features are certainly important to the children, the focus in this study is the thinking and learning that might be taking place and particularly on metacognition. Using a more abstract representation allows children to focus on the general thinking and learning and bring together relevant knowledge from their various experiences of the pictured situation.

PVTs could reasonably elicit both domain-general and domain-specific metacognitive knowledge (see section 3.1.1) because of their general nature. Methods that focus on a specific instance of learning such as reflective dialogues (S. Robson, 2010) or think aloud protocols (Veenman, 2007) could theoretically elicit both types of knowledge as well. However, the domain-specific knowledge that they elicit would be constrained to the learning situation they are engaged in or reflecting on. In PVT interactions, children can draw together knowledge from various experiences in a general situation (i.e. paired learning). Children using a PVT like the paired learning template (see figure 8) would presumably be able to draw on metacognitive knowledge from various domain areas (i.e. writing, drawing, doing a maths worksheet) as well as domain-general knowledge about learning in a pair.

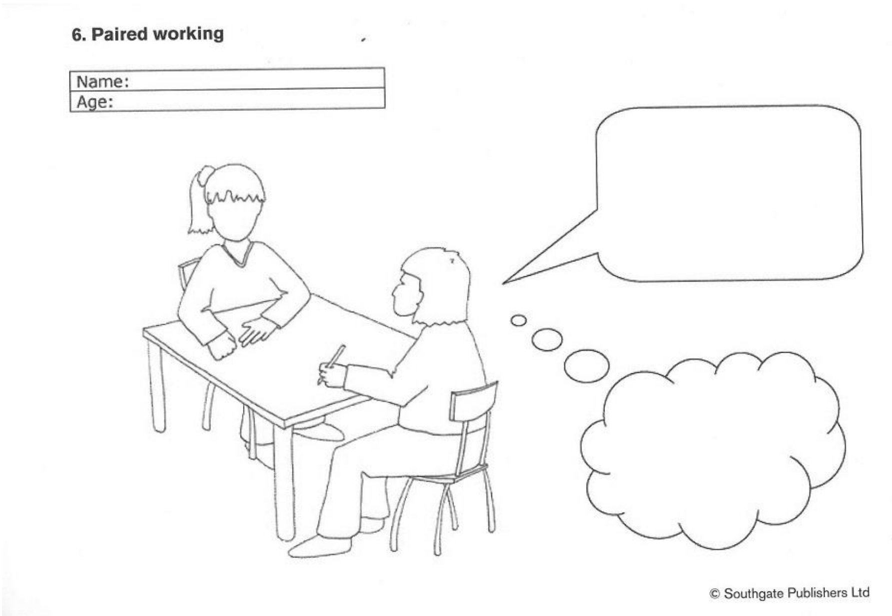


Figure 8: Paired working template

PVTs function as semiotic tools (Wall et al., 2007). They “mediate pupils' thinking about learning and support them in expressing their ideas about the processes involved" (Wall et al., 2013, p. 27). Visuals can quickly elicit “emotional responses as well as intellectual ones" (p 11) (P Thomson, 2008, p. 11) and support children’s abilities to tell complex stories (Angelides & Michaelidou, 2009). The speech and thought bubbles serve as a visual prompt to think about both external factors (speech bubble) and internal factors (thought bubble) related to the pictured learning situation (Wall & Higgins, 2006). Wall (2017) asserts that the familiar cartoon format and speech and thought bubbles in PVTs act as a space where children feel comfortable and supported in “engaging with something quite abstract and difficult to talk about: their learning” (p 321).

The interactive format adds scaffolding by incorporating the use of prompt questions and dynamic interaction between the researcher and children as well as between children (Wall et al., 2007). Researchers are able to use heuristic scaffolding, which focuses on ways of thinking rather than on helping the child to arrive at a specific solution (Holton & Clarke, 2006). A heuristic scaffolding question might be “what do you think is good about learning something new with a partner?” Rather than trying to lead the child to a particular answer or strategy, the question simply prompts the child to think about the situation in an evaluative way. This might prompt recall of metacognitive knowledge, experiences or previous strategy use. Wall et al. (2007) highlight that researchers can start with more concrete questions about the pictured situation (speech bubble) before moving onto questions requiring children to think more abstractly (thought bubble). This fits with Hacker and Dunlosky’s (2003) research which suggests using questions as metacognitive probes to encourage children to verbalise reasons for their thinking and explain how they know things. A small group format adds peer support for verbalising thoughts about learning since children can listen to what their peers say and question each other (Holton & Clarke, 2006). This can especially be helpful for children who struggle to verbalise their thoughts since it offers a social space to build on each other’s ideas and may prompt deeper reflection (Burke, 2008; Einarsdóttir, 2007).

4.3. Affordances and limitations in using PVTs

This section will discuss the affordances and limitations of using PVTs to elicit metacognition. PVT interactions are visually mediated encounters, so they involve a melding of visual methodology and interview methodology. It follows that they could benefit from the affordances and suffer from the limitations inherent in either methodology. This section will discuss these in terms of several issues that are important to this study. These are verbalising metacognition, the use of semi-open methods and the role of visuals in mitigating power disparity between researcher and participants.

4.3.1. Using a visually-mediated interview approach to elicit verbal metacognition

Incorporating a medium that children are interested in and familiar with is important both generally and for this study in particular. This has been highlighted in previous chapters, which have emphasised the importance of familiarity in promoting metacognition (see section 3.1.1) and competence (see section 2.2). Visual methods like PVTs have gained particular traction in educational research and have been popularised as effective for use with young children (Pauwels, 2011; Prosser, 2007; Wall et al., 2013). Although caution should be taken in generalising any method as inherently effective for use with young children (Dockett et al., 2011), it still stands that young children are familiar with images and regularly encounter them in their daily lives (Leitch, 2008; Punch, 2002a; P Thomson, 2008).

Using visuals in research draws on children's strengths and competences rather than expecting them to conform to adult methods. The use of visuals aligns with early years pedagogy, meaning that children are more likely to know what to do in an interaction involving visuals (Bath, 2012; Leitch, 2008; Steffani & Selvester, 2009). In the early years, children are used to using visuals as anchors for conversations with adults to draw out their knowledge, thoughts and feelings (Einarsdóttir et al., 2009; Wall et al., 2013). This means that visually-mediated interviews are a pedagogically appropriate way to explore metacognition with young children (Wall, 2019).

Due to their face-to-face nature, interviews benefit from the ability to probe participant responses, negotiate meaning and ultimately establish equivalence of meaning (Aronsson & Hundeide, 2002). Establishing equivalence of meaning is particularly important when discussing complex topics like learning with young children as their verbal skills are still developing and improving. Vogl (2015) indicates that children's verbal skills are impacted not only by factors such as age, but also by conversation settings and partners as well as how the child perceives the situation. Any verbal demonstration of metacognition will be at least partially dependent on the child's mental vocabulary, it is important that researchers understand what children are trying to communicate and that children understand the questions researchers ask (Aronsson & Hundeide, 2002; Larkin, 2010; Misailidi, 2010).

Visuals like PVTs provide a concrete context for researcher-child discussion which helps to establish "equivalence of meaning" between researcher and child (Vogl, 2015, p. 321). This can help researchers to understand children's often idiosyncratic use of language. Visuals are also said to enhance children's verbal skills. Leitch (2008) asserts that creative methods "possess latent capacity – as children picture inner experience they frequently become more verbally articulate" (p 51). The interactive format means that researchers are able to use metacognitive probes and heuristic scaffolding as discussed earlier (see section 4.2.2) to prompt metacognition (Hacker & Dunlosky, 2003; Holton & Clarke, 2006). This relates back to the study's view of competence as a context-dependent and interactional quality rather than a capacity that is either possessed or not possessed by individuals (see section 2.2) (Lee, 1998).

Researchers involved in PVT interactions are not detached observers and the children's resulting behaviour is considered elicited rather than spontaneous behaviour (Pauwels, 2011). The pictured situation and the researcher's facilitation can be expected to elicit discussion and reflection about the thinking and learning taking place in the situation, which may include metacognition. The potential benefit to using elicitation is that children may demonstrate more metacognition if they are encouraged to do so in an interaction that is focused on metacognition. However, it is important to note that elicited metacognition might not be representative of children's spontaneous metacognitive behaviour. Although this has implications for the type of metacognition this study can discuss, it is important to recall that metacognition is a context dependent phenomenon (see section 3.1). Metacognition in one context will not necessarily be representative of metacognitive behaviour in another context. Furthermore, this study's broad aim is to explore children's metacognition, so achieving this aim is contingent on children actually demonstrating metacognition. Therefore, the difference between spontaneous and elicited metacognitive behaviour is less important to the study than the potential of facilitative approaches to encourage more metacognitive behaviour.

Although visual methodologies are widely used to make research more inclusive of children who prefer non-verbal communication methods, PVT activities do not benefit from this to the same extent. This is because it is words – verbal discussion or written comments – that are prioritised for analysis rather than the image. However, even when visuals are the analytic focus, they usually still have to be translated into words because of academia's prioritisation of verbal and written forms of communication (Atkinson, 2006; Wall, 2017). Although this disadvantages children who prefer other forms of communication, the alternative seems to be analysing child-created visuals without children's input or excluding young children from research, neither of which avoids ethical issues or qualifies as inclusive (Thomson, 2008; Wall, 2017).

If the goal is to include young children in research, it follows that researchers' priority should be to find viable ways of supporting their participation and representing their voices (Wall, 2017). Although young children may not be able to write and may possess immature verbal skills, they "should not be denied access to the verbal arena simply because it is seen as an 'adult' domain" (Atkinson, 2006, p. 13). Their exclusion from this arena only serves to privilege the mature and complete, devaluing young children's thoughts and ideas and relegating their lives as not worthy of study (Lee, 1998).

4.3.2. Control issues and the case for a semi-open method

The process of producing PVTs involves a relatively high degree of control when compared with more open-ended visual methods like drawing or photo diaries (Wall, 2017). Visual methods exist on a spectrum where the researcher has increasing control over and knowledge about the context in which the visual was created (Pauwels, 2011). Although more open-ended methods also tend to be researcher-prompted, there is considerable scope for child participants to re-direct the focus according to their own interests and priorities. This is especially the case when the production of the visual happens in a space where the researcher is not present (i.e. Bragg & Buckingham, 2008).

The extent to which children are able to shift the focus to their own interests during a PVT interaction is limited. While PVTs allow space for children to personalise the template (i.e. adding in expressions and details), using an adult-selected context still bounds the discussion within that particular context and silences some narratives (Wall, 2017). Since the written comments are typically the analytical focus in PVT studies, even if children re-direct the verbal discussion to some degree, this often does not become part of the data. Additionally, since PVT interactions in the early years require a higher degree of support, the researcher's presence and scaffolding will naturally have an impact on the type of comments that children choose to write in their bubbles.

In the early years it is necessary for researchers to act as scribes for children since they cannot yet write without support, increasing the degree of control over PVT interactions. The school context also contributes to a bias toward socially acceptable responses and there may be a tendency for children to respond using a pedagogic voice (Shaw, Brady, & Davey, 2011; Thomson, 2008). Although it is impossible to eliminate bias in interview situations completely, there are ways to reduce bias (Lodico et al., 2010). PVTs are a pedagogically familiar activity and children at the start of school are accustomed to having adult support in writing (Wall, 2017). Withdrawing scribing support in the PVT interaction would be detrimental not only to data collection, but to children's confidence in being able to communicate their ideas and record them. Wall (2017) suggests ensuring that the researcher scribing for the children is "supportive of the voice agenda" (p 322) and adheres closely to the child's intended meaning.

In terms of metacognitive competence, there is a case for semi-open methods like PVT interactions. While open-ended visual methods give more power and control to the child over the direction of the research, this openness "can also feel overwhelming" (Wall, 2017, p. 318). Semi-open methods like PVT interactions align with the study's conceptualisation of competence as a situational quality and not an imbued characteristic (Lee, 1998). The visual acts as a prompt and facilitator of the child's metacognitive competence and their demonstration of metacognition is at least partly dependent on the visual's contextual mediation. Lee's (1998) paper highlights the importance of contextual mediators in supporting young children's competence and agency in complex and unfamiliar situations.

Metacognition is a complex phenomenon that can be difficult for children to express and verbalise, so the method for eliciting metacognition should support this process.

4.3.3. The role of visually-mediated group interviews in mitigating power disparity

One of the advantages of using group interviews is that children tend to be more powerful and comfortable in a group than one-to-one with an unfamiliar adult interviewer (Einarsdóttir, 2007; Greig et al., 2007; Jug & Vilar, 2015; Thomson, 2008). Research indicates that children are more receptive to group interviews and feel less pressured to answer every question (Jug & Vilar, 2015). Additionally, they can discuss questions, help with answers, remind each other of details, and keep answers truthful (Einarsdóttir, 2007).

Visual methods can be useful in addressing the power disparity between adults and children (Leitch, 2008; Wall et al., 2013). The cultural influence of school can be strong, and children often carry out research tasks in their roles as pupils rather than as social individuals. Therefore, research that positions children as experts may be in direct opposition to their pupil role, where knowledge is seemingly owned by adults and transferred to children through teaching and learning (Burke, 2008). In the school setting, visuals open a space where children can

> “express their opinion and explore their understanding of the concept (in these cases learning) with an openness to giving an authentic opinion with little direction to a right or wrong answer" (Wall, 2017, p. 328).

Leitch (2008) asserts that the main difference between standard interviewing and visually mediated interviews is that the visual itself becomes another participant in the exchange (see figure 9 below). This makes the interaction “a three-way dynamic engagement between researcher, participant and image” (p 54).

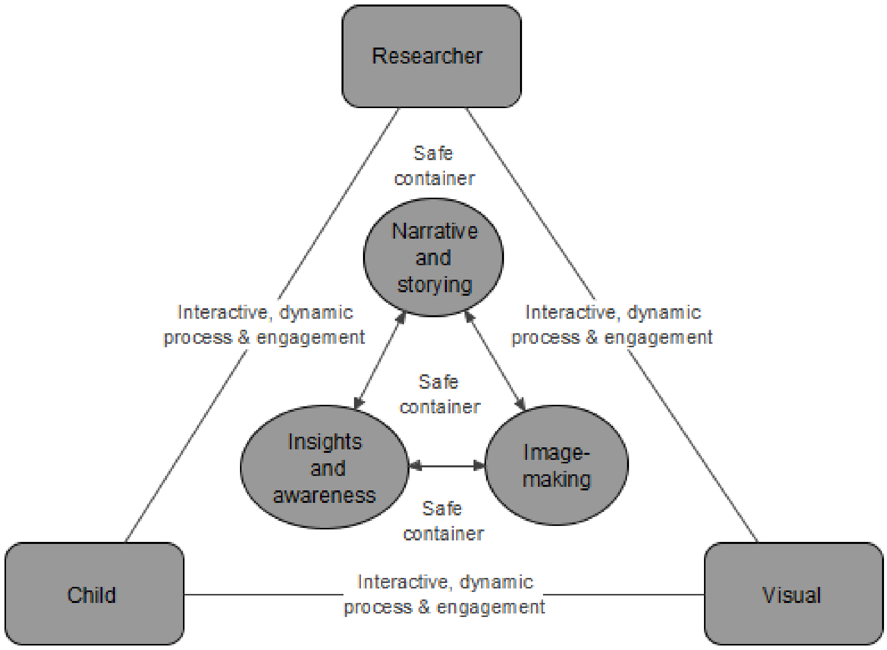


Figure 9: Visually-mediated encounter (Leitch, 2008, p. 54)

Leitch's (2008) figure illustrates the three way interaction between the researcher, child and visual. The figure notes the role of the visual in helping the researcher to create a safe space where the child can talk about their inner thoughts and feelings. This moderates the power differential between the adult and child by creating a context that is non-confrontational. Children have something to occupy their attention and do not need to feel pressured to maintain eye contact with an unfamiliar adult (Einarsdóttir et al., 2009).

Activity-based data collection methods can help reduce pressure and improve researcher-child interactions during an interview (Atkinson, 2006; Danby et al., 2011; Punch, 2002b; Wall et al., 2013). Visuals can be particularly useful in interviews with young children as research suggests that it is beneficial to have children engaged in doing something during the interview process (Atkinson, 2006; Danby et al., 2011; Einarsdóttir, 2007; Einarsdóttir et al., 2009; Wall et al., 2013). Engaging children in an activity helps to break up the interview process (Punch, 2002a), creates a more relaxed atmosphere (Atkinson, 2006) and enhances child-researcher interactions (Danby et al., 2011). Furthermore, it encourages children to take necessary thinking time by reducing the pressure to give a verbal answer immediately (Einarsdóttir et al., 2009; Punch, 2002a; Wall, 2017). PVT interactions do this by engaging children in the process of colouring and adding to the template while discussing the thinking and learning in a pictured situation.

4.4. Conclusion and summary

This chapter has stressed the necessity of being reflexive and intentional when choosing a method to explore young children's metacognition to ensure that the method is fit for purpose and participants. It is important to use pedagogically appropriate methods with young children but there is no perfect way to explore a messy and internal phenomenon like metacognition. The chosen method has major implications for the kind of metacognition that is ultimately measured in the study – "how you test is what you get" (Desoete, 2008, p. 204).

The choice to use PVTs in this study has implications for the findings and the kind of metacognition this study is able to talk about. The data about young children's metacognition will be elicited behaviour and may not reflect spontaneous metacognitive behaviour during classroom tasks. However, for the study to successfully explore young children's metacognition, they must actually demonstrate it. Therefore, the selection of PVT interactions fits with the research aims because they are an activity designed to elicit metacognition. This is important for answering the second and third research questions, which are focused on an in-depth exploration of the metacognition and understandings of learning children express at the beginning of school. These questions do not focus on whether children can demonstrate metacognition, but rather focus on what kind of understandings they express in the context of the PVT interaction.

In this chapter, I highlighted that there is a gap in PVT research (see section 4.2.1). There has not yet been a study using PVTs that explores young children's metacognition in-depth without developmental comparisons. The first research question aims to better understand how the PVT interaction functions as a context for young children's metacognition, specifically. Following the suggestions of this review of methods literature, it will be important to examine how the characteristics of the interaction such as the questions asked impact on the metacognition children express in the interaction. Lastly, the fourth research question aims to better understand the impact of within-group differences in early skills, family circumstances and early education on the metacognition children demonstrate in PVT interactions.

Chapter 5. Methodology

The purpose of this chapter is to explain the research design in relation to the aims of the study. Cohen et al. (2018) emphasise that the selection of a research design should concentrate on “fitness for purpose” (p 173). Agreeing with a purpose-oriented approach, Hakim (2000) asserts that:

> No single type of study is inherently inferior or superior to others. Each does a particular job and should be selected according to the nature of the issues or questions to be addressed; the extent of existing knowledge and previous research; the resources and time available; and the availability of suitably experienced staff to implement the design (p 12).

This means that the research design should draw on key concepts from the literature review chapters (chapter 3 and 4) through the research questions identified in section 1.3. As highlighted in chapter 4, it is important that the identified research approach is appropriate to the complex nature of metacognition as well as to the age of the participants.

PVTs were chosen as a tool for exploring metacognition in this study because they are a pedagogically appropriate tool that promotes verbal metacognition (see section 4.2 for an in-depth consideration of the use of PVTs). The last chapter explored how PVTs have been used in other studies and outlined a gap for this study to fill. Namely, this study’s focus on 4/5-year olds allows for an in-depth exploration of young children’s metacognition and the development of a facilitative approach to eliciting metacognition in younger learners.

This chapter justifies the methodological decisions made throughout the study, drawing on concepts from its theoretical grounding in critical realism (see section 2.1) and its conceptualisation of the child (see section 2.2). First, I re-examine the research questions in relation to the literature. I then justify using a mixed methods approach and consider issues of sampling and recruitment. Next, I examine the role of the pilot study in making and justifying methodological decisions. Lastly, I address the data collection process and approach to ethical issues. The analysis approach is considered in the next chapter to facilitate easier connections between the frameworks used in analysis and the study’s findings.

The reader will notice that I have not included a specific section on research quality in this chapter. This is because I view research quality as being developed throughout the thesis and not constrained to a section within the methodology chapter. Heikkinen et al.'s (2007) principles for defining research quality are useful in this study. Although they were developed specifically for action research, their practical orientation is also useful for educational research more generally. Table 10 shows a breakdown of where and how they are addressed throughout this thesis.

Table 10: Heikkinen et al.'s (2007) 5 principles of research quality

Principle	Area(s) addressed in this study
Principle of historical continuity	Chapter 3 touched on how the thinking around young children's metacognition has changed over time and chapter 4 examined the recent move toward child-centred methods for exploring young children's metacognition. This helped to position the study with regards to historical thinking around young children's metacognition and how to best explore it.
Principle of reflexivity	Chapter 2 examined my positionality and explicitly stated that this is present throughout the thesis; therefore, this is addressed in all chapters. This chapter and chapter 6 reflexively examine my methodological decisions, but this is by no means constrained to this chapters and carries through to the findings and discussion chapters (chapters 7-10)
Principle of dialectics	This is about authenticity and representation. Authenticity was touched on in section 4.3.3 in relation to the PVT approach and section 5.6.1 of this chapter also touches on this. The discussion of children's voice in relation to authenticity is extended in section 9.5.
Principle of workability	This is about the implications of the research for practice, which are touched on throughout the findings chapters 7-9 and explicitly considered in chapter 10.
Principle of evocativeness	This has to do with the emotions and mental imagery evoked by the research. Chapters 7-9 use images, figures and quotes to create a narrative that describes the understandings children expressed in the study.

5.1. Restating the research questions

The purpose of restating the research questions at the beginning of the methodology is to provide a link between the literature that informed the research questions and the methodology I propose for exploring them in this chapter. The broad aim of this study is to explore children's metacognition at the beginning of school using PVTs. Under this broad aim, I have identified four research questions:

I. **What characteristics of facilitative PVT interactions impact on how children express their understandings of learning?**

The study is the first study using PVTs to concentrate specifically on young children's metacognition in a broader sense. The studies connected to the L2L project primarily looked at differences between older and younger children as did Gascoine's (2016) thesis. Hanke's (2014) study focused specifically on guided reading. Additionally, this study sets out to use a facilitative approach to the discussion like the early years teachers in the L2L project (Wall et al., 2007; Wall & Higgins, 2006). This means that there is an opportunity for the study to contribute knowledge about the characteristics of facilitative approaches that impact on the understandings of learning that young children express.

II. **How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?**

Chapter 3 highlighted the importance of children's felt experiences in constructing knowledge and beliefs about their cognitive processes. The cognitive process of interest in this study is learning, so this question stems from an interest in how children recognise learning experiences and differentiate learning from other processes. Since the children in this study are at the beginning of primary school, they will have experienced informal opportunities for learning at home and at nursery. It is possible that some of these experiences were explicitly framed as learning, but many will have been framed as play. They will have been in their primary 1 classroom for a short time, so they will have some experience of tasks that their teachers have explicitly framed as learning. They will probably also retain some of the expectations, beliefs and pre-conceptions about learning that they entered primary school with. Much of their knowledge about learning will have been built up implicitly through experiences that they recognise as learning or what they have been told in their interactions with peers and adults. Therefore, it is important to understand how they conceptualise learning more broadly and whether they differentiate it from other processes and activities.

III. What are the key characteristics of children's metacognition at the beginning of primary 1 in Scotland as demonstrated in PVT interactions?

This question aims to explore the kind of metacognitive knowledge and regulation that children demonstrate at the beginning of the school year. Key issues that were highlighted in chapter 3 may be relevant in answering this question. These could include issues like transfer, flawed and biased metacognitive knowledge and beliefs, domain generality/specificity, and the importance of feelings. Both inductive and deductive analyses will be carried out to gain a better understanding of the key characteristics of young children's metacognition. Moseley et al.'s (2005) framework has been used in previous PVT research (e.g. Gascoine, 2016; Wall et al., 2013). This framework will be used in this study to understand how different cognitive skills contribute to metacognition and understanding learning experiences. Other PVT studies (e.g. Gascoine, 2016; Wall et al., 2013) have used Veenman and Spaans' (2005) metacognitive knowledge and skilfulness categories to further explore metacognition. As part of the inductive analysis process, this study will select a framework that is best suited to understanding the data.

IV. Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their:

- **family background (parents/carers' education level, socio-economic status);**
- **early education (age at start of nursery, early education experiences and opportunities);**
- **early skills (self-regulation, executive functioning, verbal skills)?**

Other PVT studies have explored the connections between metacognition and gender, socio-economic status of the school catchment and length of school's participation in the L2L project (Wall, 2008; Wall et al., 2010, 2013). Age-related differences have also been explored (Gascoine, 2016). Due to its focus on a single age group, this study is well positioned to explore within-group differences. Section 3.2 highlighted the importance of social factors in metacognitive development. Parents/carers' education level and socio-economic status have been selected because they have been shown to impact on cognitive development in the early years (Bradshaw, 2011). Since experiences are important to developing metacognition, the study will also look at connections between metacognition and the duration of children's early education experiences and the kinds of early education opportunities children received. Chapter 3 (see section 3.3) also highlighted the importance of early skills like executive functioning and broader self-regulatory skills (i.e. emotional/motivational regulation) to metacognition. Lastly, chapter 4 highlighted the complex interplay between verbal skills and metacognition, particularly in methods that use verbal elicitation. Since PVT interactions involve verbal metacognition, it is expected that there will be a connection between demonstrated metacognition and children's verbal skills.

5.2. Employing a mixed methods approach

I employed a mixed method design to address the dual qualitative and quantitative aims of the study. Exploring young children's metacognition in a broader sense entails understanding metacognition as highly personal and subjectively constructed knowledge and skills and as a common mental function that has certain developmental patterns. By employing a qualitative instrument to elicit metacognition, the study endeavoured to better understand children's diverse and subjective constructions of metacognition. In addition to this qualitative understanding, the qualitative data was then quantitised (Sandelowski et al., 2009) to examine within-group differences in demonstrated metacognition.

As in many mixed methods studies, integration moved beyond a surface-level use of qualitative and quantitative instruments (Cohen, Manion, & Morrison, 2017; Frels & Onwuegbuzie, 2013; Johnson, Onwuegbuzie, & Turner, 2007; Robson & McCartan, 2016). Instead, I use the term "mixed methods" to refer to mixing methodology (Johnson et al., 2007). Methodology is a more encompassing term, incorporating "inquiry purposes and questions, broad inquiry strategies and designs, sampling approaches and logics, and warranted forms of inferences and writing" (Greene, 2012, p. 770).

The critical realist orientation of the study is useful in resolving the seemingly incompatible nature of an objective reality and subjective ways of knowing (Shannon-Baker, 2016). In essence, this means acknowledging the value of understanding metacognition from various perspectives (Maxwell & Mittapalli, 2010). These perspectives help to construct theories which in turn illuminate the real phenomenon of young children's metacognition. Indeed, Greene (2012) asserts that mixed methods a particularly useful approach for investigating complex human phenomena such as metacognition because it incorporates multiple ways of knowing.

The study represents a fully mixed methods design in that qualitative and quantitative approaches are mixed in multiple stages of the study (Greene, 2012). Fully mixed designs mix qualitative and quantitative approaches within or across four main parts of the research process: research aims, data type, analysis type and inference type (Leech & Onwuegbuzie, 2009). As discussed above, the research aimed to develop an in-depth understanding of the children's metacognition, which included developing a deep qualitative understanding (RQ 1/2/3) and a quantitative understanding of within-group differences (RQ 4). Therefore, both qualitative and quantitative data was collected through visually-mediated group interviews with children using PVTs and teacher and parent/carer questionnaires. Data collection can be classified as concurrent since the questionnaires and interviews were undertaken in the same general timespan (Leech & Onwuegbuzie, 2009).

Frels and Onwuegbuzie (2013) indicate that mixed methods can be used to address a wider variety of research questions than mono-method designs, which suits this study. The first three research questions reflect a qualitative purpose, namely to understand metacognition in young children and how it is constructed in the PVT interactions. The last question is the most traditionally quantitative as it explores connections between children's metacognition and their early skills, family characteristics and early education experiences. However, the dependent variable (metacognition) is derived from qualitative data from the PVTs. This makes it a mixed question, requiring the qualitative data to be transformed or "quantitised" to allow correlational analyses (Bazeley, 2018; Sandelowski et al., 2009). Although the first three research questions stem from a qualitative purpose, basic descriptive statistics like counts and percentages were useful in exploring patterns in the qualitative themes and subthemes (Frels & Onwuegbuzie, 2013).

Analysis was integrative and emphasised the qualitative data from PVT interactions. This was primarily because the metacognition data, which was the focus of the study, took the form of words instead of numbers. Before starting to analyse the data, I considered where data could be mixed and planned for this (see section 6.1). As I will consider further in section 6.5, qualitative analysis of the data informed how I decided to transform the qualitative data for use in quantitative analyses. Inferences drawn from the data describe multiple layers of understanding young children's metacognition. This includes both structural understandings of how metacognition may relate to children's family circumstances and early skills and more individualised, descriptive understandings.

5.3. Sampling and recruitment

This section outlines the sampling strategy and compares the selected sample to the wider population of Scottish schools and children at point of school entry. Comparing the selected sample with the population provides a context for the statistical results. Although statistical analyses can be undertaken regardless of representativeness, the strength of the inferences researchers are able to make about population-level structures is dependent on the degree to which the sample represents the population (Onwuegbuzie & Collins, 2007). In mixed methods studies where randomised sampling is not possible, making generalisations can be difficult. Collingridge (2013) states that mixed methods studies can make analytic generalisations, which rely on assertational logic. This means looking at the similarities and differences between the researched contexts and other potential contexts in which the findings might be applicable.

Participant recruitment required approval from multiple gatekeepers and took place in two distinct data collection periods in the first term of the 2018 and 2019 school years (see figure 10). Appendix A-1 contains the participant information sheets and consent forms for schools and appendix A-2 contains the participant information sheets and consent forms for parents. The informed consent approach used with children is described in section 5.6.2. Since this study aimed to capture cross-sectional data about children's metacognition at the beginning of primary school, I determined to finish data collection by the end of the first term. Children interviewed after the first term would have had substantially more experience of school learning than children interviewed in October and data collected from them could hardly be said to represent children's metacognition at the beginning of primary school.

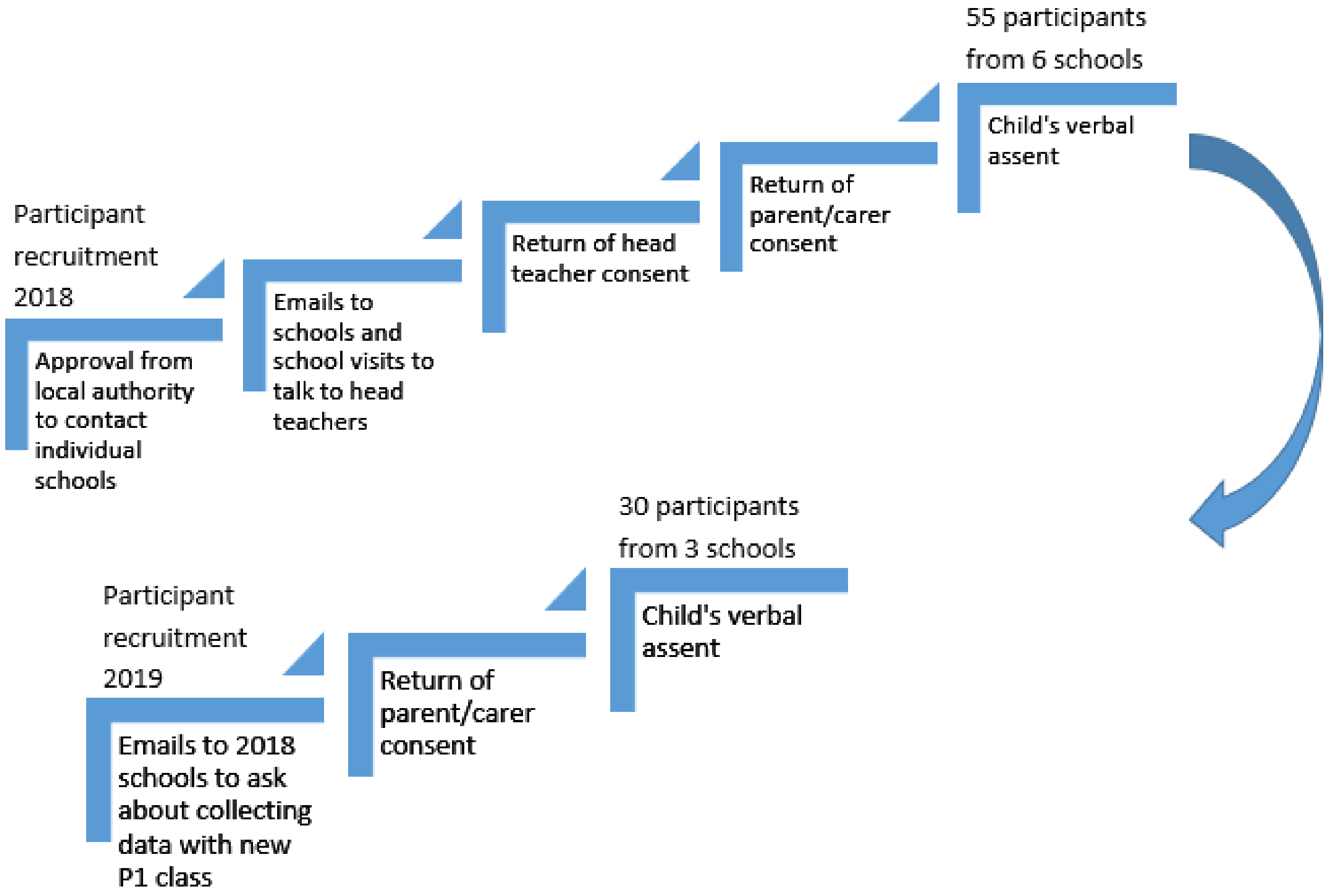


Figure 10: Participant recruitment process

I used convenience sampling to recruit a total of 85 participants from six primary schools in Central Scotland. Parent/carer consent was returned for 91 children – 85 assented and were included in the study, 3 dissented and did not take part (see section 5.6.2) and 3 were absent when I attended their school for data collection. After the initial period of data collection in 2018, I began analysis and presented initial findings to all participating schools in May 2019. To increase the sample size, I asked the head teachers whether they would participate in an additional period of data collection. Three head teachers agreed and two offered to talk about the study with parents and carers at an induction for new primary 1 children. These head teachers expressed a keen interest in the initial results of the study and in the PVTs as a tool. Importantly, this meant that information about the study and its' utility was passed onto parents and carers by a known and trusted professional. Consequently, the return rate for parent/carer consent forms was significantly higher in the second period of recruitment.

The sample size was relatively large for a qualitative study and relatively small for a quantitative study. This was necessary in order to balance qualitative sampling concerns about data depth with quantitative concerns about data breadth (Castro et al., 2010). Convenience sampling and other non-probabalistic designs are frequently used in developmental research due to the costly nature of probability sampling in terms of time, money and effort (Jager et al., 2017). A non-probabilistic sampling strategy was chosen due to pragmatic concerns about lack of access to a car (Cohen et al., 2018). Even if I could access all schools, local authorities cannot compel individual schools to participate in research studies. Therefore, the sample would still consist of schools that responded to the request and volunteered for the study, making the resulting sample non-probabilistic in nature.

I initially considered quota sampling "to represent significant characteristics (strata) of the wider population" (Cohen et al., 2018, p. 218). I intended to select from responding schools until each quota was filled (i.e. rural/urban, high/low levels of deprivation). However, low response rate from schools and low levels of consent form return meant that I worked with all willing schools and children. The advantage of this is that all the participating schools were invested in the study and the sample was made up of schools with head teachers who were interested in metacognition.

Although I ended up working with all willing schools and children, I chose strategically which councils to approach considering significant characteristics of the wider population and accessibility. I used the 2017 Scottish Government summary statistics to explore significant characteristics of Scottish primary schools. These included community-level information on urban/rural classification, Scottish index of multiple deprivation (SIMD) classification and proportion of pupils from ethnic minority backgrounds. SIMD is an index of multiple deprivations that aims to identify the most deprived areas in Scotland for the purpose of targeted interventions (Scottish Government, 2016a). It includes information on deprivation related to income, employment, education, health, access to services, crime and housing. SIMD ranks span from 1 to 10 – a low SIMD code indicates an area where many people experience multiple deprivations.

Unfortunately, approval was not gained in the only reasonably accessible council where I could access schools with a high proportion of children from ethnic minority backgrounds. Feedback indicated that this was not due to the project's quality or usefulness, but rather that this council is overburdened with research proposals from multiple research-intensive universities located within it. Therefore, the sample cannot be considered representative of children from ethnic minority backgrounds.

Approval was obtained in four local authorities. The local authorities contained urban schools with both high and low SIMD catchment areas as well as a high number of rural and small-town schools that were reasonably accessible. There were very few rural schools with catchment areas classified as deprived in terms of SIMD; however, this is generally representative of rural schools in Scotland as a whole. Out of 1,175 rural datazones, only 17 were classified as income deprived and 20 as employment deprived (Scottish Government, 2011).

It was important for the sample to contain both urban and rural schools as Scotland is comprised of a spectrum of urban and remote communities. The 2017 dataset classified schools using a 6-fold urban-rural measure divided by community type: large urban, other urban, accessible small town, remote small town, accessible rural and remote rural (Scottish Government, 2017). Appendix A-4 contains further information on the urban-rural classification and 6-fold classifications for the sample schools. Percentage calculations using Scottish government statistics indicate that in 2017, 91% of primary pupils attended schools in areas where urban centres were accessible. This means that most families with school-age children live in accessible areas. However, although only about 9% of pupils attended remote schools in 2017, these schools made up 33% of all schools in Scotland. This is likely because there are many remote primary schools, but they have a relatively low intake of students.

Table 11 below presents data about the sample and table 12 compares the sample to the population using simplified two-fold accessible and remote classes (Scottish Government, 2016b). This pooled the urban schools and accessible schools together (Schools 1,2,5,6) and the remote schools together (Schools 3,4). I pooled School 2 with the urban schools because accessible rural areas and small towns like the town where School 2 was located often serve as a residence for families who commute to urban areas for work. Families living in these areas may enjoy characteristics of both rural areas and urban areas.

There was also the option of using a two-fold rural and urban classification, which would have pooled School 3 with the urban schools, leaving School 4 as the only rural school. In this case, I chose not to pool School 3 with the urban schools because it was a remote school located on the same island as School 4. Therefore, it seemed natural to keep them in the same category since they shared more similarities than School 3 shared with the urban schools.

Table 11: Sample composition

	School 1	School 2*	School 3*	School 4	School 5*	School 6	Total
2-fold accessible/ remote classification	Accessible	Accessible	Remote	Remote	Accessible	Accessible	
Number of recruited participants	13	14	16	1	28	13	85
Gender split (Male – Female)	8 – 5	5 – 9	9 – 7	1 – 0	19 – 9	6 – 7	48 - 37

*Indicates schools that participated in both periods of data collection

Table 12: Comparison with population

	Accessible (Sample)	Accessible (Population)	Remote (Sample)	Remote (Population)
Percentage of schools	67%	79%	33%	21%
Percentage of recruited participants	80%	91.24%	20%	8.76%

*Population percentages and 6-fold urban-rural classification derived from 2017 statistics (Scottish Government, 2017)

The sample contained more boys than girls (56% boys), which is slightly higher than the population of Scotland as a whole (51%). Remote schools and participants were overrepresented in the sample when compared with the population. However, the proportion of pupils attending remote schools in the population is quite small (8.76%), so a representative sample would have contained only 7 participants. This small sample size would be less representative of the range of children growing up in remote areas.

There was a higher level of response from schools in low deprivation areas. SIMD information included a percentage of pupils in the school who came from the 20% most deprived datazones in Scotland (Scottish Government, 2017). Only 1 in 6 participating schools had a pupil population where over half the pupils came from the 20% most deprived data zones in Scotland. However, this is roughly proportionate to the overall Scottish population as 2017 statistics indicate 19% or roughly 1 in 5 schools in Scotland meet this criterion (Scottish Government, 2017). Although SIMD is an important community level variable, for this study it was more important to have data that accurately reflected individual family circumstances. This is because even if a school has a catchment area that includes many families that experience multiple deprivations, this does not mean that researchers can assume all children in the school experience multiple deprivations.

5.4. Pilot study of PVT use

A pilot study was carried out in September 2018 at one urban primary school (School 1). The school was a non-denominational council school with just over half of the pupils coming from families living in the 20% most deprived datazones in Scotland (Scottish Government, 2017). Thirteen children from two primary 1 classes in the school (5 girls, 8 boys) returned consent and twelve participated as one boy was absent during the piloting period. These children also participated in the main study in November/December, including the child who was absent during the pilot study. Before undertaking any research work in the school, I dedicated one day to observing and interacting with the children and teachers. This allowed me to answer questions from the teachers and build rapport with the children before asking them to participate in the study (Harcourt & Conroy, 2011). I then conducted informed consent workshops with each class and subsequent PVT interviews with six groups.

Pilot studies are “a crucial element of a good study design” and can fulfil a range of purposes depending on the research approach (van Teijlingen & Hundley, 2002, p. 1). The focus during the piloting phase was the PVT approach – particularly determining:

- How children responded to different templates;
- The most effective way to facilitate the discussion around the PVTs;
- How to best prompt children to fill in the speech and thought bubbles;
- Ideal group size;

- Whether I should use a voice recorder;
- How long children took to finish the activity.

It was essential that I practice using the templates and determine an effective approach to facilitate children's talk about learning to provide a context that afforded appropriate opportunities for children to demonstrate metacognition. In preparation for the pilot study, I used the instructions and potential prompt questions in Talking about Learning: Using templates to find out pupils' views to develop a list of suggested questions (Wall et al., 2007, p. 8) (see table 13 below*).*Table 13: List of suggested questions for pilot study

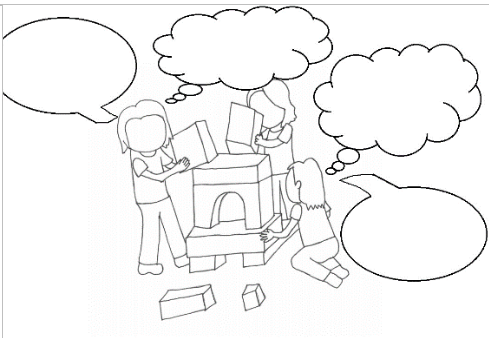
Possible questions and prompts for the speech bubble
1. What would you say was good about ______? 2. What would you say was not so good about ______? 3. What would you tell other schools/teachers/children about ______? 4. What do you think other children/teachers/ parents might learn though _______? 5. How do you feel about ______?
Possible questions and prompts for the thought bubble:
1. What did you learn when you _______? 2. What new skills/things did you learn when _____? 3. What helps you when you _______? 4. What did you learn about how you learn when you ______?

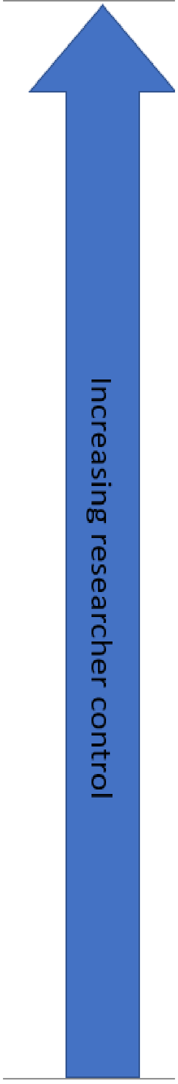
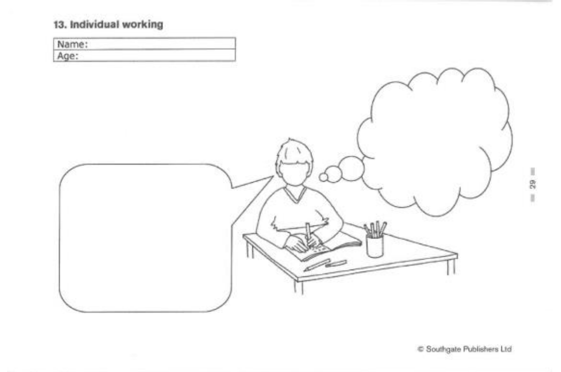
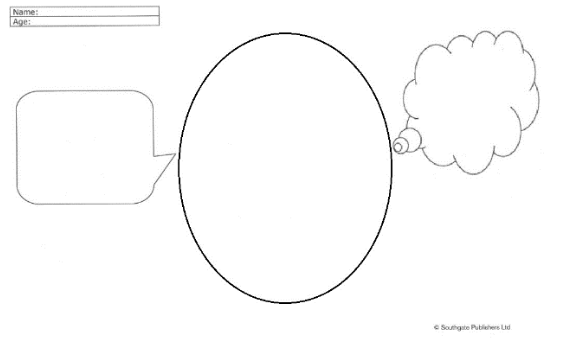
The questions I used varied between interactions and there was no fixed approach since the goal of the pilot study was to determine how to best facilitate the interactions. This meant adjusting the approach and reflecting on how children responded (see table 15 for reflective journal extracts).

I decided to trial groups of two and three, considering my previous interactions with children as a teacher and my reading about how to conduct interviews with children. I decided to use a group format rather than individual interviews as children tend to be more powerful and comfortable in a group than one-to-one with an unfamiliar adult (Einarsdóttir, 2007; Greig et al., 2007; Jug & Vilar, 2015; Thomson, 2008). Two to three children seemed the optimal group size as large focus groups of small children can be difficult to manage (A. Smith et al., 2005). Additionally, since I was scribing for the children, I needed to consider how many children I could practically support. Children could choose their own partners from the list of children who had permission to participate in the study. I was not familiar with the relationships between children in the classroom, so I asked children to choose their own partner to ensure that they were working with someone they felt comfortable with. This was especially important because I was a relatively unfamiliar adult, so the presence of another child that they liked working and talking with helped to create a more comfortable atmosphere for the interactions.

The pilot study fed into the main study by exploring how to maximise children's opportunities for expressing metacognition in the time available for the PVT interactions. This meant examining the opportunities provided by using PVTs with varying degrees of openness (see table 14) and deciding how to best record data about children's metacognition (see table 16). I piloted a range of templates including templates depicting paired work, individual work, learning with an interactive whiteboard, role-playing, and blank PVTs where children drew their own learning situation. The depicted situations included both specific situations with a more concrete context (see block play PVT in table 14) and semi-open situations where children had scope to imagine specific features of the context(see individual working PVT in table 14). The most open situation was a blank PVT (see table 14). I was interested in seeing how children responded to differing degrees of openness and the data that these different interactions would produce (see table 14 below for a summary). PVTs are a relatively closed method; however, their semi-open nature helps to lend structure to the interaction (Wall, 2017).

Table 14: Reflections of PVTs with different degrees of openness

		• Block play PVT • Closed PVT • Constrained talk due to clear focus on a single activity

		• Individual working PVT • Semi-open PVT • Opportunities for children to talk about a variety of learning situations • Semi-open situations were most effective
		• Blank PVT • Open PVT • Opportunity for children to choose to talk about any learning situation • Talk was primarily about what to draw and the process of drawing rather than reflecting on learning

Throughout the pilot I kept a reflective journal to inform and justify any changes to the data collection approach – table 15 below contains selected summaries from this journal.

Table 15: Selected reflections on PVT interactions

Participants	PVT	Reflections
1H1M, 1H2F (boy/girl pair)	Blank PVT	Much discussion related to what children were drawing and the drawing process rather than thinking and learning. The activity went over 20 minutes, but discussion around the speech and thought bubbles was

		disproportionately short. A predetermined learning situation would likely allow more time to discuss the speech and thought bubbles.
1H3M,1H4F, 1H5M (2 boys, 1 girl)	Interactive whiteboard, reading	Facilitating the discussion and scribing for 3 children proved difficult. This could be due to children choosing different templates; however, it was clear that children talk to me more than each other and the presence of another child did not add more social support.
1H6F, 1H7F (2 girls)	Building	It was clear from the interview that both girls were able to think productively about the situation. However, when I asked them what they would like to put in their thought and speech bubbles, 1H6F wanted to copy 1H7F's comment. I reminded her of some comments she had made in response to the questions and she decided on her own comment.
1H8M, 1H9M (2 boys)	Working individually	Use of voice recorder was beneficial as there was on-topic talk that was not reflected in children's chosen comments. Conversation was difficult to keep on track. The recorded conversation contains much discussion that was unrelated to the template but was enjoyable and important for the children's experience. I should consider writing down children's comments instead of recording.
1H10M, 1H11M (2 boys)	Building	Had trouble keeping the discussion on track. There was much talk unrelated to the research despite efforts to redirect talk toward the template. 1H11M didn't engage with talk about the template but did talk about unrelated things. Both children declined previously but changed their minds later possibly due to what was happening in the classroom.
1H12F, partner (2 girls)	Shop play	The pictured situation is too limiting, particularly since I drew the children in the picture actively engaged rather than neutral, which would have allowed participants to imagine what they might do in a play shop.

I did not undertake full coding and analysis of the pilot data at the time as this was not the intention of the pilot study. The approach used was too variable to elicit usable data for conducting a preliminary analysis – a majority of PVTs had comments missing in either the thought bubble, the speech bubble or both. Furthermore, as suggested by van Teijlingen & Hundley (2001), my skill at facilitating the PVT interactions improved throughout the pilot. This meant that the quality of data and the opportunities afforded to children to demonstrate metacognition varied greatly between PVT interactions. Instead, the purpose of the pilot study was to improve my facilitation and address practical issues like group size and supplemental data collection.

The children who participated in the pilot study also participated in the main study and the comments from the speech and thought bubbles of their pilot PVTs were included in the main data analysis. I decided to include these because ultimately, they constituted a minimal proportion of the data and since some interesting comments came out of the pilot, it seemed counterintuitive to needlessly discard data. Indeed, van Teijlingen & Hundley (2002) suggest that including pilot data in the main study is common practice in qualitative studies. However, this decision meant that the pilot study children had two distinct instances where they had opportunities to demonstrate metacognition where the children who participated only in the main study had one. This had to be considered during data analysis, particularly when transforming the qualitative data to ensure that the pilot study children's metacognition was not overestimated in the quantitative analyses (see section 6.5). It is also important to remember that this thesis does not take the view that children who did not demonstrate metacognition in the PVT interaction were incapable of it. Instead, I will consider potential reasons why children may not have demonstrated metacognition based on their comments, particularly in section 8.3 and throughout chapter 9.Another potential concern was that children who participated in the pilot study may have benefitted from becoming more familiar with me and with the PVT approach. It is commonly acknowledged that the relationship between the adult and child is important to the research interaction and the child's voice within (Mannion, 2007; Spyrou, 2011). However, the difference in time spent with the pilot school children and with the children from other schools was ultimately minimal. At all schools, I remained a relatively unfamiliar adult with all the ethical implications attached to this role (see section 5.6). At most, I had spent around 30 more minutes with the pilot children when they participated in the main study than the children who only participated in the main study. Additionally, the questioning approach changed, becoming more structured and intentionally facilitative in the main study. There was also a gap of around 2 months between children's participation in the pilot study and their subsequent participation in the main study. Therefore, although pilot children did benefit from an additional chance to engage in discussion around a PVT, there were relatively few similarities between the pilot questioning approach and the questioning approach in the main study (see section 5.5.4 for details on the main study PVT approach).

Table 16 below outlines and elaborates upon the decisions I made on several key practicalities following the pilot study.

Table 16: Key decisions based on pilot

Group structure	• Group size - A group size of 2 children best enabled me to support the interaction. Ideally children should choose their own partner to ensure that they are comfortable around each other.
	• Pacing and time - 20-30 minutes was about the limit of children's concentration, thus it is important to ensure pace is fast enough to allow adequate time to talk about the bubbles.
Templates	• Same template choice - It is important that the discussion centre around one learning situation. As social support is a major advantage in conducting group interviews with children, having an agreed upon situation to talk about helps children to build on ideas from their partner and develop their own thinking by hearing their partner's comments.
	• Openness of situation – Achieving a proper degree of openness that supported children's thinking while not overly restricting their ideas was crucial. The reading template, individual working template and paired working templates worked well. They were open enough to allow freedom for children to imagine different specific situations and discuss various strategies and techniques. During the observation day, I should confirm with the classroom teacher which situations will be familiar to children.
Supplemental data from groups	• Voice recording – There was too much chat that was unrelated to the research aims in the pilot groups for voice recording to be effective. Therefore, transcribing the voice recordings would be an inefficient use of time. • Structured response sheets (see appendix B-5) – During the pilot, children made some comments that demonstrated metacognition which they did not choose to write on their templates. By adding a structured response sheet, I sought to manage the volume of data collected while still recording as much data as possible. The benefit is that this afforded children more opportunities to demonstrate metacognition. Additionally, since I recorded the responses during the interview, the response sheets could be used to remind children of previous responses if they could not decide on a comment for their thought and speech bubbles. It was important to capture this extra data as although the children knew I wanted to find out what children thought about learning, they did not know the criteria I was using to categorise their statements. Therefore, they did not have the opportunity to choose comments with active knowledge of the analysis frame.
Thought and speech bubbles	• Lack of understanding – The children usually could not differentiate between the thought and speech bubbles (most often referring to both as thought bubbles). It is necessary to check children's understanding and explain the meaning of the

	bubbles. Additionally, it seemed inappropriate to tag text for being in the speech or thought bubbles during analysis as had been done in previous studies using PVTs (i.e. Wall, 2008) when most children did not differentiate between them.

5.5. Data collection

This section will outline the data collection process. Although the guidelines set out in the pilot were the ideal setup for the PVT interactions, flexibility is key to doing research in schools and I often had to make concessions and reorganise. This was particularly the case with group size, as several times a child who originally seemed uninterested in the research asked to join a pair of children I was taking to conduct the activity. I always encouraged these children to join if they expressed interest.

Data collection involved three main instruments:

- Parent/carer questionnaires
- Teacher questionnaires
- PVT interviews with children

The questionnaires yielded contextual information about children's early skills (teacher) as well as certain aspects of their early experiences and familial circumstances (parent/carer). This information formed the independent variables during analysis and was primarily gathered to explore connections with children's metacognition. Since the PVT interviews were designed to elicit metacognition, this data formed the variable of interest. Data was collected in two periods, from September to December 2018 and October to November 2019, making it a cross-sectional snapshot of children's thinking, skills and family circumstances in the first term of primary 1.

5.5.1. Parent/Carer questionnaires

The parent/carer questionnaires aimed to gather basic information about children's early experiences such as the age they started nursery and the types of childcare parents had used before children started school. Additionally, I collected information about parents' education and social class as other studies have indicated correlations between parent education and social class and children's vocabulary, problem-solving skills and attainment (Bradshaw, 2011). Appendix B-1 contains a full version of the parent/carer questionnaire. This gap in cognitive skills between children from advantaged and disadvantaged backgrounds has been thoroughly documented and contributes to the attainment gap that the Scottish Government has endeavoured to close. A discussion of the attainment gap is beyond the scope of this thesis, but Bradshaw's (2011) report provides a thorough exploration of the relationship between family circumstances and children's early skills in Scotland.

I chose to use the National Statistics Socio-economic Classification (NS-SEC) variable to measure social class. UK national censes typically contain questions that can be used to derive NS-SEC, so I was able to source questions from the 2011 Scottish Census which would have been thoroughly piloted to ensure the language was accessible to the general public. The NS-SEC is widely used in sociological studies and national publications to explore connections between social class and a variety of outcomes (i.e. Bradshaw, 2011; Connelly & Gayle, 2019). The variable is derived by asking questions about parents' jobs, which can then be classified into different types that roughly correspond with income (1=Higher managerial and professional occupations, 7=Routine occupations). It is also generally accepted that low income is only one part of deeper social inequalities which occupation-based measures like the NS-SEC were designed to better measure (Connelly & Gayle, 2019).

Questionnaires were piloted briefly to parents with a variety of educational backgrounds to ensure the questions were easily understandable. Additionally, since I knew all the parents, I was able to determine whether the answers provided a roughly accurate picture of the family's circumstances. Based on the first round of piloting, I decided to include the NS-SEC questions for both parents since most parents filling them in would be mothers. This additional data was essential in the case of stay-at-home mothers since their data alone did not reflect the actual social class of the family. I conducted a further pilot composed of people in relationships of varying lengths to confirm that one partner would be able to fill in the job-related questions for the other.

Parent/carer questionnaires were stapled to consent forms to discourage parents from returning consent without returning the questionnaire. It is possible that more parents would have returned consent if the questionnaire was not attached since it would have taken less time. However, it was important to have complete data for each child to look at connections between the children's background data and their metacognition. After the children were assigned a participant number, consent forms were separated from the questionnaire and stored separately. Questionnaires were labelled with the child's participant number to ensure this information was stored confidentially. Questionnaire data was obtained for all 85 participating children. I did not look at this data before conducting the PVT interviews so that previous reading on connections between parent education and social status and children's early skills would not bias my interactions with children.

5.5.2. Teacher questionnaires

The aim of the teacher questionnaires was to obtain contextual data about children's early skills. Appendix B-2 contains a full version of the teacher questionnaire. There has not yet been a study using PVTs that has explored connections between children's metacognition and other early skills like self-regulation, executive functioning and verbal ability. Therefore, this was an area where the current study could contribute new knowledge. Well-validated teacher/parent report tools exist for the assessment these skills, so I did not attempt to construct new instruments specifically for this study.

I chose Whitebread et al.'s (Whitebread et al., 2009) Checklist of Independent Learning Development (CHILD) 3-5 to record teacher ratings of children's self-regulatory behaviour. I selected this instrument because it is designed for teachers and includes questions about a variety of self-regulatory behaviours including emotional, pro-social, cognitive and motivational behaviour. The statements in the CHILD characterise positive self-regulatory behaviour and are taken from key literature on these phenomena (see teacher questionnaire in appendix B-2). Teachers evaluate the frequency that the child demonstrates these behaviours using always, usually, sometimes or never options (coded as 4-1). Figure 11 below shows example statements from the Emotion category in the CHILD instrument.

Checklist of Independent Learning Development (CHILD) 3–5

Name of child: ___________________ Teacher: ______________________

Date: _______________ School/setting: ___________________________

	Always	Usually	Sometimes	Never	Comment
Emotional					
Can speak about own and others behaviour and consequences					
Tackles new tasks confidently					
Can control attention and resist distraction					
Monitors progress and seeks help appropriately					
Persists in the face of difficulties					

Figure 11: Example of CHILD rating scale for Emotion category (Whitebread et al., 2009, p 81)

The CHILD questionnaire is relatively short and easy to fill in and research has shown that it is a reliable and valid tool for recording teacher ratings of children's self-regulatory behaviour (Whitebread et al., 2009, 2011). Since the data collection period in each school was relatively short, it was also vital that the instrument I used did not require additional training for teachers in identifying self-regulatory behaviour. Whitebread et al.'s (2009) study included both nursery teachers who had been trained in identifying self-regulatory behaviour and using the checklist as well as nursery nurses who had not been trained. This study found that the nursery nurses' assessments almost identically matched the trained teacher's assessments for the same children's self-regulatory capacities. A factor analysis of results from several research studies using the CHILD established that the instrument measured two distinct factors – one for self-regulation which encompassed emotional, cognitive and motivational regulation and another for social regulation (Whitebread et al., 2011). The two variables are determined by calculating the mean of teacher's answers in the associated categories. Higher scores indicate more advanced self-regulatory skills.

I chose to use the Childhood Executive Functioning Inventory (CHEXI) (Thorell & Nyberg, 2008) to record children's executive functioning (see teacher questionnaire in appendix B-2). A variety of teacher report tools for assessing children's executive functioning skills exist. However, many of these such as the Behaviour Rating Inventory of Executive Function, Preschool Version (BRIEF-P) (Isquith et al., 2005) require teachers to answer over 60 questions and can be costly to purchase. Conversely, the CHEXI only requires teachers to answer 24 questions and is freely available online. The wording on the statements characterise behaviour commonly demonstrated by children with executive functioning difficulties. This means that higher scores indicate more difficulty with tasks that may require executive functioning such as metacognition. The CHEXI yields two distinct factors – working memory/planning and inhibition/self-regulation of motivation (Thorell & Nyberg, 2008). This is meant to be an easy and accessible tool for teachers and parents to use without training.

This scale has been evaluated and found to have relatively strong correlations between teacher judgments and experimenter judgments during executive functioning tasks (Camerota et al., 2018). Although CHEXI has limited correlations with experimental measures of executive control, research has indicated that rating measures of executive functioning and experimental measures of executive functioning may tap different levels of cognition (Toplak et al., 2013). Toplak et al. (2013) suggest that experimental measurement shows the efficiency of executive functioning mechanisms in a highly structured context while rating measures of executive function use a more typical environment. This is because teachers and parents will call up instances of children's everyday behaviour when considering their answers to the questions. Therefore, this reflects children's actual goal-directed behaviour in a relatively unstructured environment. This study is more interested in executive functioning in everyday behaviour rather than performance in controlled experiments, so a rating measure of executive functioning was best suited.

Lastly, I included a global measure of children's verbal skills (table 17 below). According to Gray et al. (2018), teacher's global ratings of children's verbal skills correlate most strongly with children's expressive language, which is the aspect one would expect to have the most direct bearing on children's communication during the PVT interviews. I specified for teachers to concentrate on use of "appropriate words and expressions at appropriate times as well as the child's contribution to conversations" and their ability to use language effectively to convey their desired meanings (S. Gray et al., 2018, p. 450). Gray et al.'s (2018) study used a three-point rating scale with options for good, average and poor, but found that teacher's ratings were skewed possibly due to the colloquial use of the word "average" which tends to have a slightly negative connotation. Therefore, I changed the word "average" to "typical for this age". I also increased the points on the rating scale to make it more specific as these judgments tend to be more accurate (Artelt & Rausch, 2014).

Table 17: Teacher rating scale for children's verbal ability

Very far behind typical child this age			Typical for this age			Very far ahead of a typical child this age
1	2	3	4	5	6	7

This was a peer-referenced judgment since teachers were asked to assess participating children based off what they know about typical children of this age. The children they have taught before and what they know about child development would necessarily inform teachers' knowledge of what constitutes a typical child's verbal ability.

5.5.3. PVTs used for data collection

The PVTs used varied between schools with some overlap. This seemed to reflect the range of experiences schools offered to new primary 1 pupils. Although most schools offered some play experiences to children, play-based pedagogy was more embedded in some schools than others. The Play Strategy for Scotland was introduced in 2013 (Scottish Government, 2013) and schools are beginning to make the transition to a play-based curriculum in primary 1 (P. Duncan & Grogan, 2019). However, this has not yet been embedded in all Scottish primary schools. Schools with an embedded play-based pedagogy tended to stay away from desk-based scenarios. The templates were open-ended enough that the children imagined and discussed a range of situations, reflecting on the different types of learning that might be taking place in the picture. Table 18 below contains a summary of the number of children choosing different types of PVTs (see appendix B-3 for examples of each):

Table 18: PVT choice by school

Template	Description	Number of children					
		School 1	School 2*	School 3*	School 4	School 5*	School 6
Playground	3 children are standing in the playground, one adult is present	-	-	-	-	4	13
Paired working	2 children sit at a desk across from each other – 1 is holding a pencil	2	5	10	-	-	-
Working in a group	3 children sit at a table together – 1 is cutting, 1 is holding a paintbrush and 1 is holding a pencil	2	4	1	-	16	-
Circle time	5 children sit in a circle on the floor, one is raising their hand	2	3	3	1	2	-
Working with an interactive whiteboard (IWB)	3 children sit on the floor in front of an IWB, an adult is standing in front of the IWB	4	-	-	-	6	-
Individual reading	1 child sits on the floor holding an open book	3	-	2	-	-	-
Individual working	1 child sits at a desk, they have a pen in their hand and an open, blank book is on the desk	-	2	-	-	-	-

*Indicates schools that participated in both periods of data collection

5.5.4. PVT interactions

PVT interactions took place from October to December 2018 and October to November 2019 and I carried out complete data collection in each school before starting data collection in a new school. This process started with a rapport-building day where I joined in with normal classroom activities. In cases where there was more than one primary 1 class, I split my time evenly between the classes. I spent time interacting with all the children in the class and identifying potential participants (children who had parent/carer consent). This rapport-building day allowed the children to become comfortable with me and ask me questions (Harcourt & Conroy, 2011).

On the rapport-building day, I also asked the class teacher which learning situations children would be familiar with. This enabled me to ensure that the PVTs I asked children to choose from during the PVT interactions were familiar learning situations. I relied on the teacher's expertise in this area because I was not in the school for long enough to assess which learning experiences children would be most familiar with. It is important to acknowledge that using a teacher-selected context bounds the discussion within that context and silences some narratives. However, it was vital that the learning situations be familiar to children as they are more likely to demonstrate metacognition in familiar contexts (Rowe, 1989). The impact of the context will be examined in detail in chapter 9.

In most schools, I came back the next day(s) to conduct the informed consent workshops and PVT interviews except in cases where I had to work around holidays like Halloween and special learning themed days. Wherever possible I collected data from assenting children on the same day as the informed consent workshop to minimise forgetting. The space available for the interviews differed in each school. Some schools were able to offer a quiet room with a door so that passing groups of children did not interrupt us; however, most of the spaces were in slightly removed areas in corridors or cloakrooms. Although the children were sometimes distracted by interruptions in these areas, they were also relatively familiar places where children were often taken in small groups for activities or extra support. This meant that they were comfortable and secure in these areas and this was reflected in their interactions with me.

My role in the PVT interviews was supportive as the goal was to support children to demonstrate their metacognitive capabilities. I was flexible in the way I facilitated the activity, as some children needed more support than others. I was not a detached observer and my role was to provide children with ample opportunities to demonstrate metacognition. Section 4.2.2 discussed the general impact of using facilitative methods on the data, but the specific effect of the facilitative approach will be examined in chapter 9.

Since the informed consent sessions were comprehensive in covering the research aims and purposes and children were eager to start the activity, I began with a request that the children choose a template to colour and talk about. They could choose between two templates, which were selected from the templates that teachers indicated would be familiar to children. I asked children to negotiate the choice of PVT with their partner or partners (in the cases of groups of 3) so that we would not get mixed up talking about two different pictures. This reflected the choice made in the pilot study that children should discuss the same template (see table 16). Most children asked if they were going to be able to take their picture home and I reminded them that I was only going to take a photo of their picture and that they were free to take it home after showing their teacher. This promoted children's sense of ownership of the data (Angell et al., 2015). Next, I readdressed anonymity by having the children write their names on the back of the PVT, reminding them that their names were secret. This short interaction also served as an icebreaker.

The interview schedule that was developed to complement the PVTs (see table 19 below) was semi-structured, so the order of the questions within each section was not important. However, it was important to move from concrete questions to more abstract questions. This served to establish a context and specific situations that could be used to facilitate children's understanding and verbalisation of more abstract concepts like what the people might be thinking (Wall et al., 2007). This also allowed me to modify more open questions to use learning situations children had identified if they needed extra support. Less open and forced choice questions were always followed up with open questions to prompt children to explain their reasoning (Fargas-Malet et al., 2010).

Table 19: Interview Schedule

Part 1: Establishing what is happening

1. Tell me about the picture. 2. What are they doing?
Part 2: Establishing the learning
3. Are they learning? 4. How do you know? 5. What are they learning?
Part 3: Evaluating the situation – prompt questions for the speech bubble
6. What is good about _______? 7. What is not so good about ________? 8. How do you/they feel about ______? Why?
Part 4: Reflecting more abstractly – prompt questions for the thought bubble
9. What do you learn when you _________? 10. Who can help you? Why/when would you ask them? 11. What can you do if you're stuck? [added later in the first data collection period] 12. Is it easy or hard? Why do you think so?

The interview schedule changed slightly as I started to notice the importance of tapping children's metacognitive experiences in the question "Is it easy or hard? Why do you think so?". This was later in the first period of data collection after I had digitized many of the structured response sheets. I reframed the help-seeking question in part 4 to concentrate instead on the metacognitive experience of struggle. This was an attempt to open the question to include strategies other than help-seeking. Initial analysis between the two periods of data collection confirmed the interest in metacognitive experiences and I continued to use the new question in the second period of data collection. Improvement in the researcher's ability to facilitate the interviews is expected in qualitative studies as they build on knowledge from initial interviews and identify new areas of interest (van Teijlingen & Hundley, 2002). An important point is that both the old question about help-seeking and the new question about the experience of struggle afforded opportunities for children to demonstrate metacognition. I will return to this point in the data analysis section (see section 6.3).

The questioning approach was highly facilitative, and the goal was to prompt the children to think about the situation in different ways. This facilitative approach had both challenges and benefits as it served to direct children's thinking. Wall (2017) suggests that PVTs are a comparatively closed method compared to other visual methods which provide more space for the child's agenda. The addition of a structured questioning approach in this study meant this study's approach was more directive than other more open approaches to PVT discussion (Gascoine, 2016). On the one hand, the questions functioned as heuristic scaffolding, which can be helpful in prompting metacognition (Holton & Clarke, 2006). On the other hand, although the aim was not to lead children to a specific answer, the questions did lead children to think about aspects of the situation that they may not have brought up if the discussion was more child-directed. An example of this was questions 6/7, which led children to consider the positives and negatives of the pictured learning situation. A less directive way of phrasing this may have been "what do you think about [this situation]?" In this case, the questions reflected the phrasing in Wall et al.'s (2007) suggested questions. Asking the children to think first about positives and then about negatives was beneficial in that children were encouraged to look at the situation in two different ways, which supported evaluation. It is not possible to know what the children would have said if the approach was more open and child-directed and I do not claim that the study's data is representative of children's spontaneous metacognition. The approach was intended to be supportive and to maximise children's opportunities to demonstrate metacognition, meaning the data can only represent children's elicited metacognition in this specific context.

Most often, children talked more to me than they did to each other when they were answering the questions. Although it was early in the school year, many children had already formed substantial knowledge about being a pupil and appropriate ways to interact with adults in school. Burke (2008) suggests that the cultural influence of school can be strong, and children carry out research tasks in their roles as pupils rather than social individuals. Although I tried to differentiate myself from school staff (see section 5.6.1), I was still an adult in their school and was treated as such.

As I asked questions, I took note of children's answers on the structured response sheet. Many children took active interest in the structured response sheets. Sometimes children elaborated more to fill more space in the boxes when they realised that they each had boxes for their ideas. When I was writing, children talked to each other about unrelated topics and I joined these conversations where possible before turning talk back to the questions. Children's attention spans varied, so some of them indicated that they were finished before we reached the end of the interview schedule (most often between parts three and four). In these situations, I asked children if they would mind staying to fill in the speech and thought bubbles and got them to answer a question from part four when we were discussing what they wanted to put in the thought bubble.

I decided to leave the bubbles until after children had a chance to answer all the prompt questions and consider the situations in both concrete and abstract ways. This was because in the pilot some children had trouble thinking of what to put in the bubbles or wanted to put the same comment as their partner. However, these children were able to think of an answer if I prompted them with comments they made earlier in the interview. The advantage of this was that prompting them with their own comments avoided imposing my suggestions on them. However, leaving the bubbles for the end also meant that some of the children rushed through them.

5.6. Adopting an ethical approach

Drawing from a model of children as competent social actors, the ethical framework for the study was based on the concept of ethical symmetry (Christensen & Prout, 2002). Ethical symmetry highlights the similarities between ethical research with adults and children. This is not to imply that children have the same skills and abilities as adults, but rather that researchers should not view children as a homogenous group. Ethical symmetry focuses on the role of appropriate methods and "emphasising competence and agency" (Dockett et al., 2011, p. 71). Referring to this study's conception of the child and the role of the context in promoting competence and agency (see section 2.2), this ethical approach was suited to the study. Most primary 1 children cannot read the wordy participant information sheets that are commonly used with adults, necessitating a different approach that draws on their competences. This section discusses how I navigated ethical concerns around power relationships and informed consent and confidentiality.

5.6.1. Power relationships and my researcher role

Power relationships were a central ethical concern in this study due to the power disparity between young children and adult researchers. This was a particularly complex issue since ethical symmetry can be difficult to achieve in spaces where adults have entrenched power, such as primary schools (Dockett et al., 2012; Lynch, 2014). In spaces where adults have entrenched power, children may perceive participation as compulsory and the research as an extension of class work. This may bias children's responses toward what is acceptable in their classroom (Cappello, 2005). However, schools are also a familiar space where young children commonly encounter new adults in a variety of roles and children are generally more comfortable interacting with researchers in familiar contexts (Einarsdóttir, 2007; Greig et al., 2007; Harcourt & Conroy, 2011). Indeed, the children seemed confident to approach me and ask questions and did not seem reticent to come with me to hear about the study.

Although power influences cannot be entirely mitigated, I followed suggestions for minimising the power differential (Christensen, 2004; Mandell, 1988). I introduced myself to children using my first name to differentiate myself from school staff. Many children asked if I was a teacher and I explained that I was a researcher who was interested in finding out how children think when they are learning. Research also suggests that researchers refrain from teacher-like behaviours like directing or restricting children's actions (Christensen, 2004; Mandell, 1988). However, due to my role as facilitator during the PVT focus groups, some degree of direction was necessary. This was mainly to ensure that discussion did not deviate too far from the topic. Direction needed to be balanced with allowing space for children's agency and authentic voice to ensure that I was not overly directive. Similar to Gallagher's (2008) study, children's agency was not entirely unproblematic. Some children used their agency in dominating ways, most frequently this was associated with one child talking over another. Additionally, many children attempted to direct the discussion along the lines of their own interests that were not necessarily related to the study's aims.

I used my informed judgment when asserting adult power. This was necessary to ensure that no one person dominated the focus group (Johnson & Christensen, 2012) and keep the PVT activities to a reasonable length while addressing all the prompt questions. It was expected that not all the talk in the PVT interactions would relate to the study aims and the proportion of time spent talking about unrelated topics varied with participants' attention spans. Differences in attention span could be attributed to both inter-individual factors like interest in the topic and environmental factors like where and when the conversation took place.

5.6.2. Constructing an appropriate approach to informed consent

A further ethical issue was obtaining children's informed consent. Similarly to Lynch (2014), I encountered an obvious disconnect between the competence-based approach advocated for in theory and its transfer into real research situations. Researchers can position young children as competent and able to make informed decisions about whether they would like to take part in research (Christensen & Prout, 2002; Dockett & Perry, 2011; Harcourt & Conroy, 2011; Skånfors, 2009). However, primary schools, university ethics committees and organisational ethics codes (i.e. BERA, SERA) require parental consent to be obtained. In this study, I asked for both written parent/carer informed consent and children's verbal informed assent. I approached parental consent not as permission for children to take part in the study, but as permission to approach children to ask for their assent to take part.

Children's assent/dissent was framed in an ethically symmetrical way and was given the same weight as adult consent or refusal (Christensen & Prout, 2002; Dockett et al., 2012). There are arguments that assent may operate as a sort of ethical slippery slope where it is conceptualised as "at least not refusing" (Alderson & Morrow, 2011, p. 103). However, it is also an inclusive way to approach consent that does not exclude children who may be classed as incompetent if relying on Gillick competence notions of maturity, complete informed understanding and intelligence (Cocks, 2006). This is important since researchers have called into question the extent to which young children are able to form an accurate understanding of more obscure concepts considered to be required for informed consent (Noyes, 2008).

I decided to conduct informed assent workshops using visual methods and child-friendly language in an interactive narrative approach (Mayne et al., 2016) (see appendix A-3 for materials used in these sessions). Mayne et al.'s (2016) interactive narrative approach is a method for presenting information about research to young children. It combines visual, verbal, and written information to support children's understanding. The approach encourages interaction to gauge understanding in the same way a teacher might use formative assessment to gauge children's understanding before setting them to a task. I gauged children's understanding by asking questions – for example: so, I can't use my magnifying glass to look at children's thoughts and I can't use my binoculars either, what other tools could I use? *pointing at a picture of researcher tools*. I also elicited their ideas – for example: who should I ask if I want to know about what children are thinking?

The decision to use this method stemmed from a belief that children are active constructors of knowledge and that methods closely related to pedagogically appropriate classroom practice would best draw on children's competences. The use of multiple communication methods (visual, verbal and written information) recognises that children are not a homogenous group – their preferences differ and tools that facilitate understanding for some children will not necessarily do so for all children (Clark, 2010; Dockett et al., 2011). Similarly to Mayne et al. (2016), this study presented the research as a story, and prompted children's reflection on different aspects of the research to gauge their understanding.

I took an active and reflective interest in children's responses to my interpretation of Mayne et al's (2016) narrative approach to informed consent. Central to this was my goal to promote children's competence to provide full informed consent. I was specifically concentrating on whether children demonstrated an understanding of the research aims and purpose, what would happen to their data and the concept of anonymity to ensure that assent was informed (Skånfors, 2009). I determined that the language was appropriate by posing questions to check children's knowledge – most children raised their hands and were able to answer. The children seemed to have a rough understanding of what would happen to their data as one child asked, "Are you going to write about it [the PVT] in your book?" Although children seemed to have a basic understanding that their names would remain secret, it proved difficult to ascertain whether they understood the implications of anonymity, particularly the wider dissemination of the research. This echoes concerns from other researchers undertaking research with young children within the child rights discourse (i.e. Noyes, 2008).

The concrete process of writing their names on the back of the paper elicited the most evidence of children's understandings of anonymity. In the first group, 1H1M and 1H2F had a brief verbal exchange affirming the secrecy of their names. When I asked them to write their names on the back of the paper, 1H1M indicated that this was "because our names are secret" and said that he would write his name small as an extra precaution. 1H2F expressed concern that her name was visible since she used a dark marker that bled through the paper, to which I responded that I would cover it when I took a picture of it. 1H1M proceeded to check that his name was not visible through the paper. This exchange exemplified some basic understanding of the concept of anonymity. Since anonymity is a complex concept that can be difficult for children to understand, it made sense to re-visit this during the PVT interaction when I reminded them to write their names on the back of their sheet. At this point, I made sure to stress that since I was only taking a picture of the front of the PVT, no one reading my book would know who made the picture.

Most children verbally assented (n=85) and many displayed behaviour that indicated their eagerness to participate – for example, raising their hands and scooting closer in an effort to be chosen first (Dockett & Perry, 2011). However, there were three children who decided not to participate. Children who verbally dissented or seemed reticent following the informed consent session were not pressured to participate, but some changed their minds later. Dockett et al (2012) highlight that children participate or choose not to participate in research for an array of reasons, some based on the researcher or topic of research and some on other unrelated reasons.

Reflecting on this, I considered that children might have changed their minds due to what was happening in the classroom at the time or from talking to other children about the activity. For example, two children who initially dissented later asked if they could participate. Although I cannot know for sure their motivations, I concluded that they probably changed their minds based on what was happening in the classroom. When I explained the study to them, the children were engaged in free-flow activities while later they were engaged in a structured phonics task. It is likely that the children did not want to miss free-flow activities but were happy to miss the structured task. They participated in the research, but on their own terms.

In the case of the three children who dissented, their dissent was obvious (verbal and behavioural). One child started acting distressed when his teacher asked him to come with me to do the activity. Another told me he wanted to stop after starting the activity. The last child said "no, thank you" when I asked if he wanted to do the activity. There were other times when children chose to limit their participation and expressed more subtle actions that might indicate dissent (Dockett et al., 2012; Einarsdóttir, 2007). Attending to my ethical radar (Skånfors, 2009), I was careful to check with these children whether they wanted to stop and go back to the classroom. Some did leave early, but most decided to continue the activity.

5.7. Summary

In this chapter, I created a clear decision trail of the choices I made when designing and carrying out the study. I demonstrated how the research process was pedagogically appropriate and promoted children's competence to provide informed consent and communicate their early understandings of learning. Figure 12 presents a timeline of the research design, data collection and analysis processes, which serves to summarise what was covered in this chapter. It also connects with the next chapter on analysis by showing when initial analysis and final analysis took place in relation to the two periods of data collection.

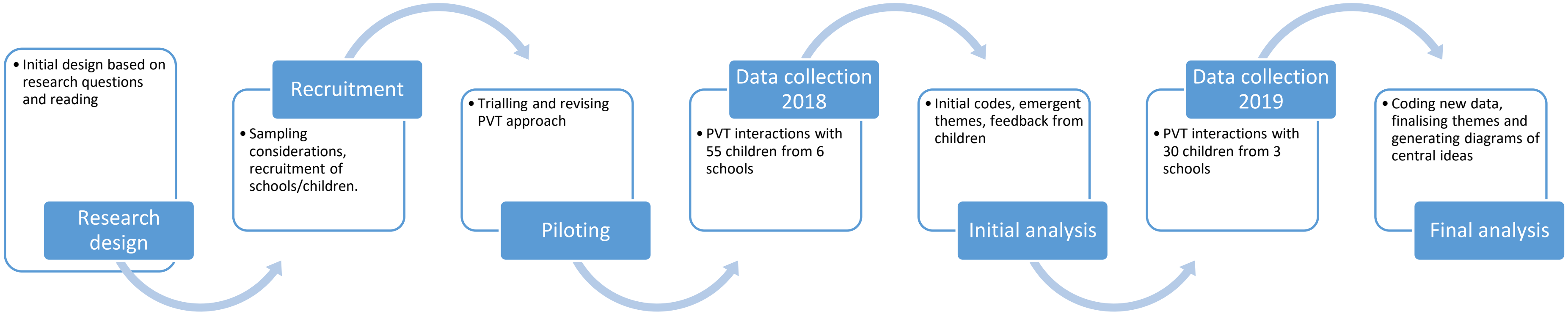


Figure 12: Overview of research processes in time order

Throughout this chapter I highlighted areas where the data collection process inevitably impacted on the findings of the study. This connects with chapter 4, which detailed connections between the method chosen for exploring metacognition and the kind of data about metacognition that the study generates. This theme will continue in the next chapter, which focuses on the analysis process. The connections between method and findings will be further elaborated on throughout the rest of the thesis and especially in chapter 9, which contains an in-depth discussion of the inseparable nature of metacognition and the context in which it is expressed.

Chapter 6. Data Analysis Approach

This chapter's purpose is to present the study's overall analysis approach. I examine and justify my decisions as I navigated the mixed methods analysis to ensure transparency in the analysis process, which is fundamental to establishing qualitative rigour (Noble & Smith, 2015). I have chosen to present this as its own chapter positioned directly before the findings chapters because my analysis process was ongoing as I wrote up the results of the study. As I wrote up the findings, new ways of looking at the data emerged, and I sometimes returned to assign new codes so that I could explore the data in different ways. I begin with an overview of my approach to integrating the qualitative and quantitative data collected in the study. Next, the quantitative and qualitative data preparation process is described. I then discuss the qualitative coding process and my approach to transforming some of the qualitative data for use in correlational analyses. This sets the scene for the subsequent discussion of the study's findings.

6.1. Integrative approach

Although the study can be described as a qualitative-heavy study, my approach to analysing the two types of data was integrative. One common issue in mixed methods studies is that they tend to analyse data separately and bring the findings together in the discussion, meaning that they often fail to fully realise the potential for mixing qualitative and quantitative data sources (Bazeley, 2012; Wall et al., 2013). Therefore, I considered and developed my plan for mixing the quantitative and qualitative data as I collected data and undertook the initial analysis after the first round of data collection. My plan was driven by the purpose for mixing, which was to enhance the study's understanding of young children's metacognition (Greene, 2007). This included understanding the structural factors that impacted on children's emergent metacognition as well as its subjective construction.

The study's integrative approach allowed deeper insight into patterns across qualitative data than strictly qualitative analysis. Transforming qualitative data for statistical analysis can enable exploration of associations between different themes and between participant characteristics and themes (Bazeley, 2018). In this study, associations between participant characteristics and themes were of interest in the statistical analysis (see section 8.3). For example, I hypothesised that participant characteristics like socio-economic status and verbal ability would be associated with demonstrated metacognition (theme). I was also able to use the quantitised data about children's metacognition to explore whether certain PVTs or questions elicited more metacognition than others (see section 9.2). This kind of exploration can be difficult when using qualitative analysis alone, particularly with a high volume of data, which was the case in this study.

Figure 13 details the data collected and the points of integration throughout the analysis process. It has been suggested that integration should be planned before analysis and that researchers should identify points in the analysis process where one analysis could inform the other (Castro et al., 2010; Greene, 2007). Therefore, I prepared a plan for integration before analysis and updated it as new directions emerged during the analysis process. The plan ensured that data were mixed throughout the process in an exploratory way and that there was flexibility for emerging understandings to be further explored. It was especially important to recontextualise the statistical analyses by returning to the qualitative data used to produce the quantitised variables so that information was not detached "from its original ecological "real-world" context" (Castro et al., 2010, p. 343).

I transformed the qualitative data after finalising the qualitative analysis. This enabled me to easily associate the quantitised data and results from the statistical analyses back to the original qualitative data, allowing recontextualisation (Bazeley, 2018). This is illustrated in section 8.3, where I provide illustrative quotes for children with high and low levels of early skills to examine qualitative differences in the ways they spoke about learning. The data transformation was informed by the qualitative analysis, which allowed me to construct quantitative variables for metacognition that aligned with the qualitative data. This transformation is detailed in section 6.5.

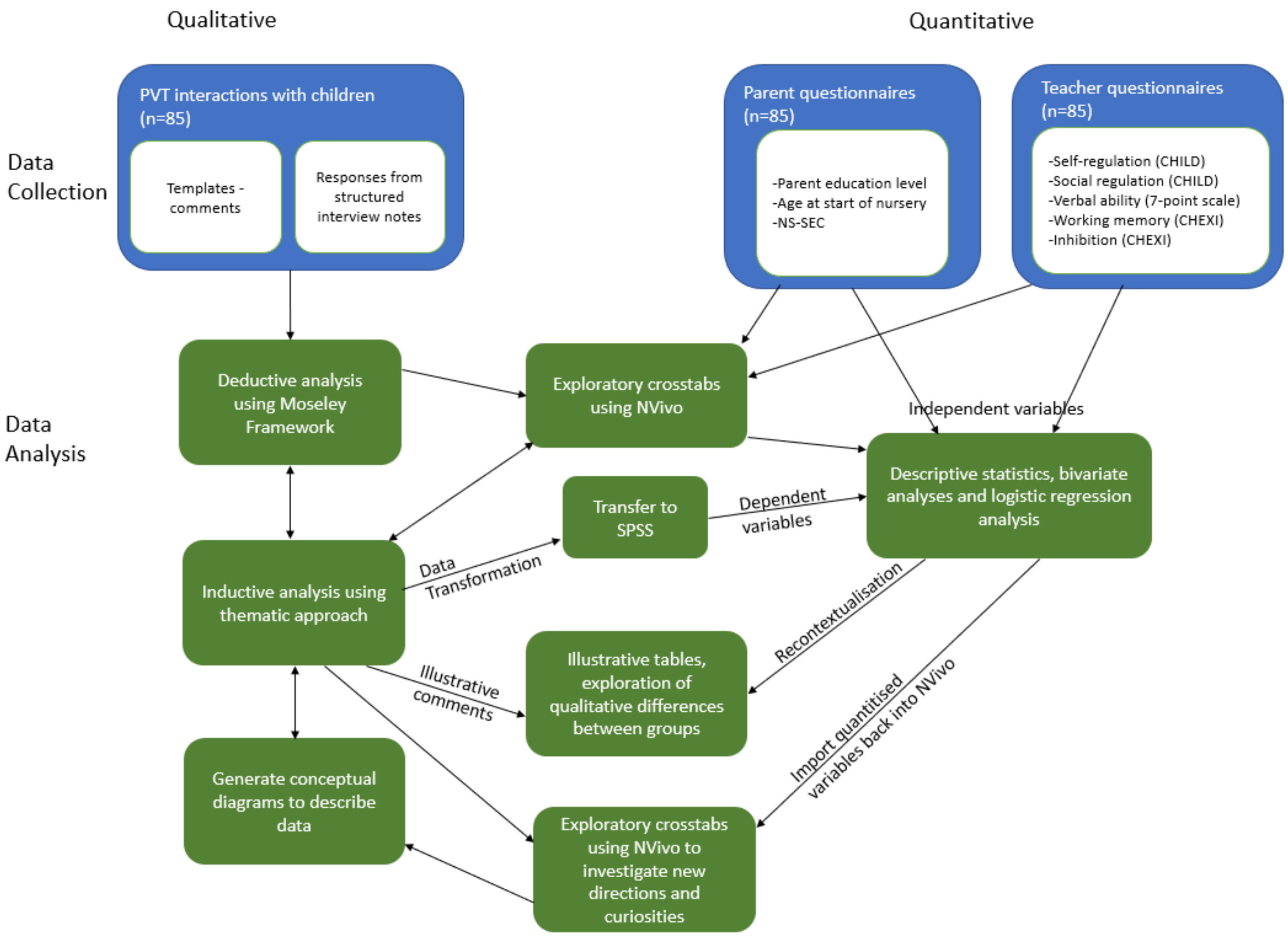


Figure 13: Approach to analysis and intended mixing points (based on Vogl, 2017)

6.2. Preparing data for analysis

Preparing the data for analysis also served as the first step in the analysis process since it allowed me to familiarise myself with both the qualitative and quantitative data. The structured response sheets and questionnaires were digitised, and I used NVivo's autocoding by speaker feature to create a case for each child using participant numbers from the structured response sheets (see appendix B-5). I then imported the questionnaire (see appendix B-1 and B-2) data as a classification sheet in NVivo. Children's participant numbers were used to connect the qualitative and quantitative data from the multi-level sample (Bazeley, 2018). Organising the data in this way enabled exploratory crosstabs to be easily conducted using NVivo. This allowed qualitative and quantitative data to be mixed throughout the analysis process. The classification sheets were updated when I imported the quantitised variables back into NVivo (see figure 13).

The completed PVTs were imported into NVivo and were then coded to the participating child's case. I transcribed text from the speech and thought bubbles separately; however, in some cases comments were obviously connected (see figure 14 below). Other researchers using PVTs have also noticed this and the connected comments have been analysed together (Gascoine, 2016). Therefore, in these cases I transcribed the text from the speech and thought bubbles together in a continuous statement – i.e. "I'm stuck…to tell an adult," rather than "I'm stuck" and "To tell an adult."

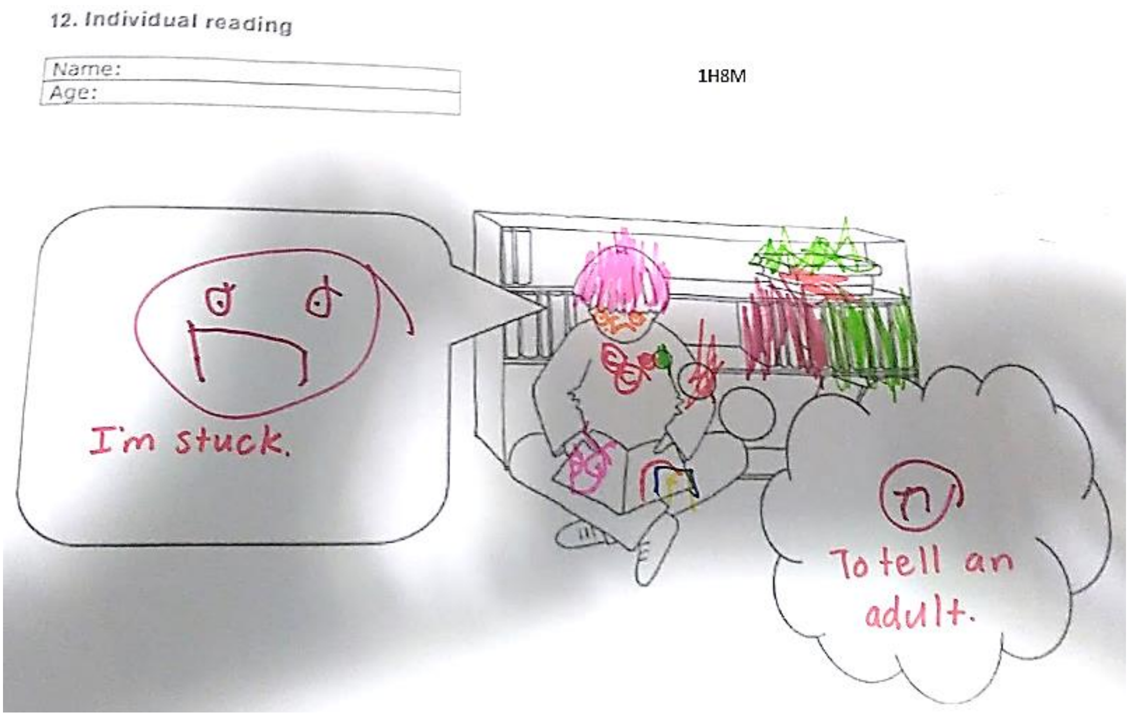


Figure 14: Example PVT with connected comments

I chose to analyse the data from the structured response sheets and comments from the PVTs in the same way because I considered them to be complementary data from the same visually-mediated encounter. The impact of the visual was apparent and had a hand in scaffolding the discussion. This is considered further in chapter 9. Comments from the PVTs and responses from the structured response sheets were coded in NVivo with the type of PVT the child completed. This enabled later exploration into whether certain PVTs elicited more metacognition than others (see section 9.2).

Digitising information from the questionnaires allowed me to assess the scope of missing data and potential misinterpretations of questions. Parent/carers were thorough and there was very little missing data. However, there was one question that seemed to be frequently misinterpreted (see figure 15 below).

4) If 100% is all the time before your child started school, how much time would you say your child has spent with the following? A guess is completely fine.

*For example:

A council nursery	30%
A private nursery	
A family member, friend, or neighbour	40%
With yourself or the child's other parent/carer	30%
Club activities	
Other:	

A council nursery	
A private nursery	
A family member, friend, or neighbour	
With yourself or the child's other parent/carer	
Club activities	
Other:	

Figure 15: Question resulting in frequent misinterpretation

Misinterpretations were fairly obvious because of the way parents allocated percentages. For example, some parents/carers only assigned values to one category – in one case, a parent assigned 90% to "council nursery." This question was meant to complement another question which asked about the age the child started nursery. Ideally, together the two questions would have given general information about the child's experience with education before entering primary school. However, because the question was frequently misinterpreted, it was excluded from analysis.

I calculated the NS-SEC variable for each parent using the Office for National Statistics' NS-SEC Coding Tool (Office for National Statistics, n.d.-a) and assigned household NS-SEC by considering which parent was likely to be the higher earner. The coding tool assigns analytic class by the respondent's job title and description. I reviewed the job's description on the coding tool against the description parents provided to ensure I was assigning the correct analytic class. Lastly, I assigned household NS-SEC to the parent who worked the most hours at their job. Although most two-parent households did not have jobs that differed greatly in analytic class, it was still necessary to assign a household NS-SEC code that accurately represented family circumstances. Household NS-SEC is typically assigned by using the householder's NS-SEC code (Office for National Statistics, n.d.-b). However, it was not clear which answers belonged to the householder as I had not asked the responding parent/carer to identify whether they were the householder. In cases of joint householders, NS-SEC is allocated based on the parent whose job brings in the most income (Office for National Statistics, n.d.-b). This prompted me to assign household NS-SEC based on the parent who worked the most hours as in most cases this parent will be the higher earner. Where parents' hours were similar (i.e. the same or only 1-5 hours difference), I assigned the higher NS-SEC code.

There was no missing data from the teacher questionnaires. I entered the individual scores for each statement in the CHILD (Whitebread et al., 2009) and CHEXI (Thorell & Nyberg, 2008) into the spreadsheet and calculated means for each factor. The CHILD yielded two variables – self-regulation and social regulation. The CHEXI yielded two variables associated with executive functioning – working memory and inhibition. Lastly, the verbal skills rating scale yielded a global score for expressive language, which was entered into the spreadsheet (S. Gray et al., 2018).

6.3. Coding process

After the data had been imported into NVivo, I started the process of coding the PVT data – both comments from the templates and from the structured response sheets. Bazeley (2007) states that although coding is sometimes framed as a reductionist process, it can also be viewed as a process of "linking data to ideas and from ideas back to supporting data" (p 66). Therefore, coding entails data condensation rather than reduction – it allows retrieval of relevant material, amalgamates data that are related to each other and distils the data into analysable form (Miles et al., 2014).

Establishing a coding process that demonstrates qualitative rigor is generally important, but doubly so in this study because I intended to transform some of the qualitative themes into quantitative variables for statistical analysis. As the validity of quantitised variables is intrinsically linked to the qualitative coding process, it was important that this process was meticulous and rigorous (Bazeley, 2018). Consequently, the aim of transforming the qualitative data needed to be considered throughout the coding process. This involved being transparent and reflexive in examining my decisions during data analysis and considering how my decisions might impact the quantitised variables. Additionally, I needed to ensure that codes were applied systematically across all the data so that codes were not disproportionately applied to the data. Unsystematic coding could have resulted in, for example, some children having more data associated with metacognition codes.

The coding process broadly followed a thematic approach. Braun and Clarke (2006) state that thematic analysis tends to be either theory-driven or inductive. I took a hybrid approach similar to Fereday and Muir-Cochrane (2006), using both inductive and deductive ways of exploring the data. Both deductive and inductive analysis frames have been applied to PVT data, although the volume of data usually prohibits inductive exploration of the entire data set (Wall et al., 2013). Since this study concentrated on one age group, the sample was manageable for inductive analysis and both analysis approaches were applied to the entire data set.

My approach to data collection was more hands-on and facilitative than other studies using PVTs, which have aimed to establish a more objective approach (i.e. Gascoine, 2016). The advantage was that I was able to delve into children's reasoning and enhance the richness of the data using prompts. However, as mentioned in section 5.5.4, this did have an impact on the data which could not be ignored during the analysis phase. The impact of the PVT approach is further considered in chapter 9. Like other studies using PVTs (i.e. Gascoine, 2016; Wall, 2008), a top-down analysis based on the Moseley et al. Framework for Thinking (2005) was used in a theory-driven approach to analysis. Additionally, an inductive analysis based on thematic analysis (Braun & Clarke, 2006) was carried out.

Individual coded units were rarely longer than a sentence, representing complete responses to prompt questions. Codes should "represent and capture a datum's primary content and essence" (Miles et al., 2014, p. 72). It follows that each coded unit should represent some unifying idea or meaning. Bazeley (2007) states that:

> "Capturing the detail of the text does not mean that you should segment it into tiny, meaningless chunks. Rather, the goal is to capture the finer nuances of meaning that lie within the text, coding enough in each instance to provide sufficient context, without clouding the integrity of the coded passage by inclusion of text with a different meaning" (p 69)

Since children were responding to prompt questions, in some instances their answers did not make sense without the question. In these cases, the questions were coded with children's responses (Bazeley, 2007).

6.3.1. Deductive approach based on Moseley et al.'s (2005) Framework for Thinking

Like other studies using PVTs (Gascoine, 2016; Wall, 2008; Wall et al., 2013), I conducted an initial deductive analysis using Moseley et al.'s (2005) Framework for thinking (see figure 7 in section 3.3.4 and table 20 below). The structure of Moseley et al's (2005) framework in terms of cognitive thinking skills and metacognition resonated with accounts of young children's metacognition outlined in the literature review.

Before I began the deductive coding process, I familiarised myself with how other studies had used the framework in their analyses (Gascoine, 2016; Wall, 2008; Wall et al., 2013). One of my primary considerations was how cognitive skills like building understanding and productive thinking might look different in younger children than older children. Previous studies included a range of ages, so there were some examples of comments in these categories from younger children. These were helpful in developing my understanding of what kind of comments fit into each category. Table 20 below shows the coding framework with descriptions and illustrative examples of comments coded to each category in this study.

Table 20: Deductive codes derived from Moseley et al. (2005) with examples

Code	Description	Examples
	Cognitive skills	
Information Gathering	"Recall of ideas and processes and recognition or basic comprehension of information they have been told or read" (Wall et al., 2013, p. 28)	• "A-B-C-D-E-F-G~ We've already learned these ones" • "I learn my PATHs and maths time. We learn to make pictures of our own."
Building Understanding	"Requires some organisation of ideas and recollections, some ideas of relationships or connections with some development of meaning about implications and/or patterns that could be applied/interpreted" (Wall et al., 2013, p. 28)	• "They're learning to do their words because they're just new" • (I feel) "happy because you get to play games and read stories"

Productive thinking	"Tended to show more complex thinking skills such as reasoning, problem solving and some movement of understanding beyond the concrete and toward the abstract. Ideas that were generalizable or creative" (Wall et al., 2013, p. 28)	• (They feel) "Happy cause they might be doing good listening and they know what to do" • "Doing letters, you know about letters, so you don't get mixed up with them"
Metacognition		
Strategic and Reflective thinking	"Represented awareness of the process of learning, including a reflective or strategic element to the statement or explicit thinking about learning" (Wall et al., 2013, p. 28)	• "I'm not really good at drawing this all by myself, I need help." • "Hard because my partner is on stage 5 words and I'm on stage 1."

NVivo was used to help with the coding process. I initially attempted to code children's structured response sheets and PVTs together in case windows; however, some comments did not make sense without the prompt question. This meant that I had to spend time going back to the structured response sheets to add context from the question so that I could code comments correctly. Therefore, I decided to code onto the structured response sheets, adding the question when it was needed for a comment to make sense (Bazeley, 2007). An added benefit to this approach was that I was able to see instances where children interacted with each other or expanded on each other's answers. In cases where one child expanded on another's answer, I added this as context to both children's answers.

Coding was a process of familiarising myself with the framework as I worked through the data set and I coded for cognitive skills and strategic and reflective thinking at the same time. Coding for all the skills at the same time helped me to understand what differentiated different cognitive skills from each other in the data. After finishing my first coding pass, I reflected on the process and discussed my questions with my supervisors. Among my primary concerns was that my prompting for "why" pushed the children toward building understanding and productive thinking by asking them to consider the reasons for their statements. This had implications for the study in that the thinking it recorded was elicited thinking rather than spontaneous thinking. These implications will be further considered in chapter 10 (see section 10.3).

Next, I revisited the definitions of each of the categories and explored these in conjunction with the comments that I had coded to each node in NVivo. This was a strength of using NVivo because it was not only easy to see which comments I had coded to each node, but the coding stripes pane allowed me to see whether I had coded the comment to any other nodes. As I explored each of the codes, I reallocated comments as needed if they did not fit the category definition or the single unifying theme around the code.

Since the boundaries between different categories were fluid, this meant that sometimes a single text unit fit into multiple categories (Gascoine, 2016; Wall, 2008; Wall et al., 2013). The Moseley et al. (2005) model does not suggest that children move through a strict progression from information gathering through building understanding to productive thinking before finally attaining the level of strategic and reflective thinking (Moseley et al., 2005). However, it does indicate that simple and deeper understandings (building understanding and productive thinking) build on initial recall of learned concepts (information gathering).

Building understanding and productive thinking require information gathering, but this did not mean that all comments coded as **building understanding** or **productive thinking** were also coded to **information gathering**. In other studies using PVTs not every participant had a comment coded as information gathering as the information gathering that led to building understanding/productive thinking was not always apparent in the comments on the PVT (Gascoine, 2016). However, the addition of structured response sheets in this study meant that there were more comments per child than previous studies which have tended to use only the comments in the speech/thought bubbles (Gascoine, 2016; Wall et al., 2013). Therefore, each child who participated in this study had at least one information gathering comment.

Given that I prompted children to explain their answers, I would have expected all children to display building understanding. Upon further inspection, the two children who did not demonstrate this skill were children who chose not to engage with the probing questions. They displayed limited engagement in the interview despite not wanting to return to the classroom. Table 21 provides an overview of the number of children who demonstrated each of the skills in Moseley et al. (2005) model.

Table 21: Overview of children's demonstrated thinking skills in Moseley et al. (2005) categories

	Information gathering	Building understanding	Productive thinking	Strategic and reflective thinking
Number of children	85	83	58	67
Percentage of children	100%	97.6%	68.2%	78.8%

Other studies using PVTs created further subcategories within Moseley et al.'s (2005) strategic and reflective thinking, including subcategories for metacognitive knowledge and skilfulness as proposed by Veenman and colleagues in various studies (Veenman et al., 2004, 2005; Veenman & Spaans, 2005). However, I wanted to decide which metacognitive framework fit best with the data during the inductive analysis. During the inductive analysis, codes that were more related to the C.Ind.Le framework (Whitebread et al., 2009) began to emerge, so I decided to use it to classify comments categorised as **strategic and reflective thinking** instead.

6.3.2. Inductive approach using thematic analysis

I drew on the principles of thematic analysis for the inductive analysis phase. It is a flexible form of analysis and its systemisation by Braun and Clarke (2006) lends transparency and rigour to qualitative analysis. Table 22 below outlines the phases of thematic analysis.

Table 22: Braun and Clarke's (2006) phases of thematic analysis

Phase	Description
1. Familiarising yourself with the data	Transcribing data, reading and re-reading the data, noting down initial ideas
2. Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme
4. Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis

From Braun & Clarke (2006, p 87)

After generating initial codes, the remaining steps functioned more as an integrated thinking exercise rather than separate steps in a sequential analysis procedure and I frequently returned to earlier steps in a cyclical process. At all stages, I was guided by the research questions and conceptual framework of the study as this protects against overload during the coding process (Miles et al., 2014). Traditionally, themes would start to emerge through a combination of collapsing similar codes together and clustering them into hierarchical trees (Bazeley, 2007; Braun & Clarke, 2006). This represents a serialist style of analysis where the researcher starts from lower-level categories and then develops higher-level categories from them (Madill et al., 2000). Madill et al (2000) also identify a holistic analysis style where the analyst starts from higher-level categories and then develops lower-level categories from them. I used a combination of these two approaches to analyse the data, which I will present here.

The first step was open and exploratory coding using printed copies of the structured response sheets. During this phase, I read through each of the structured response sheets and made notes in the margins with emergent codes. These initial codes were a combination of categories that were descriptive and specific to the data and higher-level categories that were guided by theoretical concepts related to metacognition. An example of a descriptive code specific to the data is **emotion – cognition connection** which was related to comments that indicated connections between the way a child was feeling and their mental processes. A code that was guided by theoretical concepts was **metacognitive feelings and judgments**.

These codes were transferred into NVivo for the second phase of analysis, which focused on increasing the systematicity of assigning codes. The exploratory phase resulted in variable application of emergent codes, meaning that I used certain codes more on some response sheets than others. Therefore, next a line-by-line analysis was undertaken to ensure that each response sheet was given the same consideration. NVivo was a useful tool in increasing the systematicity of the coding process. My process was to read a completed comment and consider it against each code in the list of nodes. I also analysed the text from the PVTs using this same process. This increased the number of comments coded to each node and ensured that I applied codes consistently across the data.

Next, I explored the initial metacognition-related codes and chose to adopt the Cambridgeshire Independent Learning in the Foundational Stage (C.Ind.Le) coding scheme to organise these codes (Whitebread et al., 2009). Table 23 below shows definitions for each category of the coding scheme with examples from the coded data. There were several reasons for choosing to use this coding scheme. The scheme was suited to this study's age group since in concentrates on self-regulation and metacognition in three to five-year-old children. Therefore, the examples given for each code were highly relevant to the data from this study. The categories in the C.Ind.Le framework aligned with the codes I had assigned in the exploratory phase of analysis. **Metacognitive knowledge** emerged as an initial code, which is not surprising given this study's interest in metacognition. Components of metacognitive regulation (particularly **planning**, **monitoring** and **evaluation**) also emerged as initial codes, albeit less strongly than metacognitive knowledge. Additionally, I noticed during the exploratory analysis that emotion comments were prevalent, which aligned with the C.Ind.Le framework's emotion monitoring and regulation categories.

Table 23: Whitebread et al.'s (2009) C.Ind.Le coding scheme with examples

Category	Definition	Example
Metacognitive knowledge		
Person	"A verbalization demonstrating the explicit expression of one's knowledge in relation to cognition or people as cognitive processors. It might include knowledge about cognition in relation to self, others or universals of people's cognition"	"I done a sad face cause he doesn't know how to read"
Task	"A verbalization demonstrating the explicit expression of one's own long-term memory knowledge in relation to elements of the task"	"They (your friends) stop you and you don't get your work done" [in paired learning]
Strategy	"A verbalization demonstrating the explicit expression of one's own knowledge in relation to strategies used or performing a cognitive task, where a strategy is a cognitive or behavioural activity that is employed so as to enhance performance or achieve a goal"	"He's putting his hand up because he wants to know how to do something"
Metacognitive regulation		
Planning	"Any verbalization or behaviour related to the selection of procedures necessary for performing the task, individually or with others"	"First you could colour, then paint, then cut"
Monitoring	"Any verbalization or behaviour related to the ongoing on-task assessment of the quality of task performance (of self or others) and the degree to which performance is progressing towards a desired goal"	"We've only got 'z' to go – tomorrow we'll learn 'z' and that'll be us"
Control	"Any verbalization or behaviour related to a change in the way a task had been conducted (by self or others), as a result of cognitive monitoring"	[in response to partner saying that the peach marker was coming out orange on the paper] Maybe if you do it gently it will go this colour [peach]
Evaluation	"Any verbalization or behaviour related to reviewing task performance and evaluating the quality of performance"	"Easy cause I can read better, but the book I have in my bag is hard"

Emotional and motivational regulation		
Monitoring	"Any verbalization or behaviour related to the assessment of current emotional and motivational experiences regarding the task"	"I don't like working with [child's name] because she doesn't share"
Control	"Any verbalization or behaviour related to the regulation of one's emotional and motivational experiences while on task"	"When I'm outside and I'm sad, I go to the friendship bench and someone comes and plays with me"

*Adapted from Whitebread et al. (2009) pg. 79-80

Incorporating the C.Ind.Le coding scheme meant starting from established definitions and examining data from the inductive codes I had assigned to form themes. During this process, I added new codes under metacognitive knowledge (**person**, **task** and **strategy** categories) and clustered the **planning**, **monitoring** and **evaluation** codes under metacognitive regulation. I also returned to the deductive Moseley framework to ensure that all comments coded as **strategic and reflective thinking** were classified according to the additional framework.

Applying these definitions and examples was useful because it lent reliability to the way I applied codes related to metacognition, particularly in relation to other studies of young children's metacognition, many of which use the C.Ind.Le coding scheme (Bryce, Whitebread, & Szűcs, 2015; Robson, 2016; Zhang & Whitebread, 2017). The codes related to metacognition arose from the data during exploratory coding; however, in seeking a more systematic and reliable way of defining and applying them, I sought out an appropriate conceptual framework. This shifting between inductive and deductive ways of thinking during analysis illustrates the close relationship between the two ways of thinking (Fereday & Muir-Cochrane, 2006).

The next steps were essentially an integrated, messy process that combined steps 3-5 as I returned to review the inductive codes. The boundaries between these phases were not static, but part of an integrated thinking process. I had a combination of lower-level categories and higher-level categories that emerged during initial coding. I collapsed codes together, created trees and defined categories as I reviewed data under each of my initial codes to construct emergent themes and sub-themes.

I used NVivo to bring up panes for each code and assessed for internal homogeneity and external heterogeneity (Braun & Clarke, 2006). Where there were overlaps, I collapsed codes together. For example, I had codes for **classroom behaviour** and **classroom rules and norms** that represented characteristics of learning children talked about. I noticed during initial coding that I frequently coded comments to both nodes and when I examined the comments in each category there was significant overlap. Therefore, they did not have external heterogeneity and I collapsed them into a single code **classroom norms and behaviour**. Additionally, I deleted several codes that overlapped substantially with others and did not add to the analysis. For example, I deleted the code **reasoning and attributions** because the two deductive codes **building understanding** and **productive thinking** covered reasoning and attributions comprehensively. Additionally, building understanding and productive thinking offered a more meaningful lens through which to view reasoning and attributions. These codes separated reasoning and attributions into different levels of understanding, which represented a move from concrete (building understanding) to more abstract ways of thinking (productive thinking).

Creating definitions prompted me to consider why I was interested in particular concepts and what sort of thing each code was (Bazeley, 2007). I found it useful to create memo links in NVivo where I defined what fit into each code. The process of writing memos involved reflection on how the codes related to the research questions. Table 24 breaks down an example – the theme **characteristics of learning**. As I considered the significance of each code under characteristics of learning, I found that my interest in them stemmed from an interest in how children conceptualise learning. I was interested in what young children know about learning, specifically what features they use to recognise and define it. This helped me to define and name this theme.

Table 24: Example of a hierarchical tree with overarching theme and codes

Theme	**Characteristics of learning**	
Definition	These are comments that relate to what kind of features children associate with learning. This relates to Flavell et al.'s (1995) research about thinking exploring the kinds of behavioural cues children associated with a person who was thinking.	
Codes	• **Space and Place**	• **Classroom norms and behaviour**
	• **Tasks**	• **Usefulness**
	• **Effort**	• **Materials**
	• **Values**	• **Frequency and volume**

After the second round of data collection, I coded new data to the existing categories using the definitions that I developed in the initial data analysis. No new codes were added, but the new data enhanced existing codes, providing deeper understandings and confirming initial findings. For example, new independent strategies were added to the code **internal reliance/independence**. This corresponded with the change in questioning from asking children about help-seeking strategies to asking them about getting stuck (detailed in section 5.5.4). I reviewed all the existing data in both inductive and deductive categories after coding the new data, uncoding data from codes where I disagreed with my previous assessment. This was not a frequent occurrence because I had developed a good understanding of the codes and themes through the process of creating definitions in the initial analysis.

Lastly, I organised the coding into higher-level themes by creating mind maps and diagrams (see appendix C-1 for examples). These helped to connect individual ideas expressed as codes and describe the children's emergent understandings of learning and how they were expressed in the PVT interactions. Three central ideas emerged. First, the children's understandings of learning contained both developed and explicit knowledge and still developing tacit beliefs about learning which reflected their experiences within personal, cultural and structural frameworks. Second, the children's early metacognitive theories were strongly affective, reflecting the felt quality of metacognitive experiences. Third, there was an inextricable link between the children's demonstrated metacognition and the context in which it was expressed. These ideas will be discussed in the subsequent three findings chapters.

6.4. Ensuring rigour in the qualitative analysis

Establishing validity and reliability in the qualitative analysis process was important in this study. This is widely referred to as rigour and the process of establishing trustworthiness and reliability differs from quantitative research (Cypress, 2017). Section 5.5.1, 5.5.2 and 6.2 have already examined some issues of validity and reliability in the quantitative tools. Every effort was made to use tools where reliability and validity have already been documented.

I have begun to establish qualitative rigour by being transparent about my decisions throughout the research process and reflecting on my approach (Noble & Smith, 2015). Qualitative researchers acknowledge that researchers' perspectives have an impact on the data, so a reflexive orientation is necessary when examining decisions throughout the research process (Heikkinen et al., 2007; Madill et al., 2000; Noble & Smith, 2015). Noble and Smith (2015) highlight that it is vital for qualitative researchers to maintain a "decision trail" and establish consistency so that other researchers would be able to arrive at similar findings (p 34). Chapter 2 established my perspective and position and my reflexive orientation has been apparent as I have written about my approach to data collection and analysis. Limitations in my research approach have been examined throughout these chapters and will be drawn together in chapter 10.

Section 2.2 has already established that I viewed the participating children as competent and reliable informants as long as their competences are supported by an appropriate context. PVTs were an appropriate context for expressing metacognition and supported the children in verbalising their understandings of learning. This will be further explored in chapter 9. To ensure that children's ideas were accurately represented in the findings, I went back to the six schools from the first round of data collection in May 2018 after conducting an initial analysis. These sessions gave children a chance to confirm, deny and qualify some of the emerging findings from the study. The sessions were not recorded, but I wrote up reflections that summarised the children's feedback directly after visiting the schools. These reflections were added to the data and will be discussed in the subsequent findings chapters.

Lastly, I sent 10% of the structured interview sheets (4/42, representing 8/85 children) to a fellow PhD student who was exploring critical thinking in the early years for a reflexive interrater reliability discussion. There were two goals for this exercise – to establish interrater reliability for the quantitised variables and to have an open discussion about how I had applied the C.Ind.Le framework (Whitebread et al., 2009) to the PVT data. Gascoine (2016) used the framework's person, task and strategy subcategories to further explore metacognitive knowledge, but did not use the metacognitive regulation codes or the emotional and motivational regulation codes. The interrater reliability discussions revolved around our coding differences and how to apply a framework designed for data from observations to PVT interactions. Three primary concerns emerged:

- There was significant overlap between different subcategories of metacognitive knowledge. For many of the statements there seemed to be implications of person knowledge when talking about strategies or task knowledge. This reflected the highly personalised nature of metacognitive knowledge as discussed in section 3.1.1. This is further explored in section 7.4.
- Application of metacognitive regulation codes – it was difficult to tell at times whether children were reflecting on learning they experienced before, imagining a new learning situation or referring to something they were doing, or their partner was doing in the moment. Whitebread et al (2009) consider metacognitive regulation codes to apply to online behaviour, but it was often difficult to tell what a child was focusing on when they made a comment. The PVT activity provided opportunities for thinking retrospectively, prospectively, imaginatively and about current behaviour related to the PVT interaction (e.g. colouring, writing, drawing). This will be further discussed in section 7.4.4.
- No emotional and motivational knowledge category to correspond with metacognitive knowledge categories. There was evidence in the data that children had substantial knowledge of how they emotionally responded to learning tasks. The code **emotional and motivational monitoring** was useful in picking up some of

this knowledge and the inductive code **emotion-cognition connection** helped to pick up other instances. The interplay between affect and cognition will be further examined in section 8.1.

6.5. Constructing the metacognitive variable – on the quantitising approach

This section outlines the process of transforming the qualitative data to create quantitative variables. It was necessary to consider the affordances and limitations of the qualitative data set when I decided how to construct a metacognition variable for each child. The PVT interactions yielded rich data about children's early knowledge and awareness of learning and thinking, which will be discussed in chapters 7 and 8. During quantitisation, this rich detail is inevitably lost no matter how data transformation is carried out (Vogl, 2017). Nevertheless, it is still necessary to take great care when deciding how to transform the qualitative themes and categories as each decision has implications (Bazeley, 2018; Sandelowski et al., 2009).

I decided to construct an integrated metacognition variable as this aligned with the way metacognition was expressed in the PVT interactions. Chapter 7 will emphasise how children's comments showed integration between different types of metacognitive knowledge as well as possible overlaps with metacognitive regulation. This theory-like structure suggested an integrated metacognitive variable that drew together all metacognitive knowledge categories and comments related to metacognitive regulation.

In this case, my choice to combine categories reflected the integrated conceptualisation of metacognition in this study. Separating, for example, metacognitive knowledge of person, task and strategy would have suggested that I viewed these categories as meaningful in terms of how children demonstrated metacognition in the study, which was not the case. Although I did separate these into their appropriate C.Ind.Le categories in NVivo and will explore them separately in chapter 7, the boundaries between these categories were flexible in the qualitative analysis. Depending on what was useful for advancing my understanding of the data, I moved fluidly between exploring children's comments under a general **metacognitive knowledge** theme and subcategories relating to **knowledge of task, person and strategy**. Quantitative analysis does not allow for flexible boundaries between variables, so an integrated variable best aligned with the study's conceptualisation of metacognition.

I used binary variables to quantify metacognition in the statistical analysis that will be presented in section 8.3 and counts to explore which PVTs elicited the most metacognition in section 9.2. Counts and binarization are the main methods for transforming qualitative data (Sandelowski et al., 2009). Binarisation involved assigning a 0/1 depending on whether the child had demonstrated metacognition in the PVT interview. Counts involved counting the number of unique statements each child made that were coded as metacognition. The process of quantitising data was:

1) Generate a list of metacognition statements by child using NVivo
2) Read through list and eliminate statements that are identical or nearly identical
3) Obtain a count per child for demonstrated metacognition
4) Convert the count into a binary variable by assigning a 0/1 depending on whether the child demonstrated metacognition

Identical statements usually meant that the child made a metacognitive comment during the interview process, but had a hard time thinking of something to write in their speech or thought bubble at the end. In these cases, I prompted children with what they said during the interview by reading their statements back to them. Children usually chose to write something identical or nearly identical on their PVT. During analysis, these were coded to the same node in NVivo, meaning that identical statements ended up in the child's list of metacognition statements. I judged statements to be nearly identical if they were communicating essentially the same item of knowledge. For example, one child said,

> *"I would need some help, I would ask Mrs [teacher name] to help me draw things I can't draw"*
>
> and
>
> *"I'm not really good at drawing this all by myself, I need help."*

While these statements are slightly different, they are demonstrating the same core concept – help seeking strategy + when help would be useful. Thus, they were counted as one instance of metacognition rather than two.

I decided that counts were not suitable for the statistical analysis because there was evidence that suggested that some children had more opportunities to demonstrate metacognition than others. First, section 5.4 established that the pilot study children had more opportunities to demonstrate metacognition than children who only participated in the main study since they participated in two separate PVT interactions. Also, the playground template often prompted statements that the children in the picture were not learning. These statements provided insight into how children conceptualised learning and differentiated it from playing, but also made it difficult for children to reflect on learning since they said it was not happening. This usually meant these children had fewer comments coded as metacognition (see section 9.2 for further consideration of the impact of the templates). Additionally, I had concerns that more verbose and/or confident children would talk more than less verbose and/or shy children and obtain a higher count for metacognition. This echoes general concerns that less verbose children's metacognition is frequently underestimated (Desautel, 2009; Pezzica et al., 2016). Bazeley (2018) suggests that if some participants have more opportunities to demonstrate a skill or talk about a theme, there is justification for using binarisation instead of counts.

Considering these concerns, binarisation was better suited for statistical analysis because it compared individual children with each other. Underestimating a child's metacognition in this context could result in a statistical analysis that poorly represented children's metacognition. Counts were still useful for exploring differences between templates because the counts were combined across children with a range of different verbal skills. This was less problematic because it was the templates that were being compared and not the children. The use of binary variables in the statistical analysis was meant to minimise underestimating or overestimating children's metacognition, but I do not claim that this decision eliminated misrepresentation. It was possible that the binarisation still misrepresented some children by allocating them a 0 when they were perfectly capable of metacognition. This will be considered further in the findings chapters, particularly section 8.3.2.

In terms of reliability for the quantitised variables, the binary variables were prioritised for interrater reliability since I intended to use them in statistical analyses. In the interrater discussions, we concentrated on discussing one girl's case because we initially disagreed as to whether she had demonstrated metacognition in the PVT interaction. We compared coding side by side and discussed our differences until we agreed that her responses focused on emotional, motivational and behavioural responses to learning. Although she demonstrated knowledge about the learning process, the object of this knowledge was not cognition, but the emotions and behaviours she connected to learning experiences.

6.6. Summary

This chapter has detailed the approach I took to analysing the data. Throughout this process, I have not endeavoured to remove my perspective from the research. The analysis process was guided by the aims of the study, which were in turn guided by my interests in young children's metacognition. Instead, I have examined the implications that my decisions during the analysis process had on the findings this thesis presents. Linking with the last chapter, I have continued to document a decision trail which has helped to establish qualitative rigour.

The next three chapters will present the study's findings. As Braun and Clarke (2006) highlight, the analysis process continues as the researcher writes up the findings. Correspondingly, the findings chapters draw on the analysis frameworks presented in this chapter and pick up the threads of discussions that I have begun in this chapter. The concerns from my interrater reliability conversations have hinted at some of the discussion that is to come, particularly in the next two chapters. My concerns about the implications of prompting will be picked up again in chapter 9, which considers how metacognition was constructed in the PVT interactions and in chapter 10, which covers the implications of this study.

It is useful to reflect on the connections between the methodology and data analysis approach chapters before moving into the findings chapters. Table 25 shows a summary of the sample, methods, data and analysis by research question.

Table 25: Summary of sample/methods/data/analysis by research question

Research question	Sample/method/data	Analysis

1) What characteristics of facilitative PVT interactions impact on how children express their understandings of learning?	• Sample: templates and structured response sheets from 85 children, pilot templates from 12 children.
	• PVT interactions
	  ○ Type of template completed
	  ○ Comments from structured response sheets and templates
	  ○ Child-child interactions, child-researcher interactions
	• Metacognitive counts
		• NVivo Crosstabs
		  ○ Number of metacognitive comments by template
		  ○ Qualitative exploration of comments by template
		  ○ Number of metacognitive knowledge comments by part of interview (see table 19 for breakdown of interview parts)
		• Qualitative exploration of interactions, relationships with relevant educational theory (i.e. scaffolding)

2) How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?	• Sample: templates/ structured response sheets (85 children), pilot templates (12 children); reflections by school on feedback activity (with 55 children from first period of data collection)
	• PVT interactions
	  ○ Comments from structured response sheets and templates
	• Feedback activity reflections
		• NVivo Crosstabs
		  ○ Exploration of relevant themes by school
		• Qualitative exploration of children's comments
		  ○ Answers to questions 3/4 – "Are they learning/how do you know"
		  ○ Inductive analysis – characteristics of learning theme
		  ○ Relationship with relevant theory (i.e. epistemological beliefs)
		• Qualitative reflection on differences between conceptions of learning from data collection to feedback activity

3) What are the key characteristics of children's metacognition at the beginning of	• Sample: templates/ structured response sheets (85 children), pilot templates (12 children); reflections by school on feedback activity (with 55 children from first period of data collection)	• NVivo Crosstabs
		  ○ Exploration of relevant themes by school
		• Qualitative exploration of children's comments
		  ○ Inductive analysis

primary 1 in Scotland as demonstrated in PVT interactions?	• PVT interactions ○ Comments from structured response sheets and templates ○ Templates • Feedback activity reflections	○ Deductive analysis (Moseley et al., Whitebread et al.) ○ Relationships with relevant theories (i.e. fringe consciousness, transfer theory, metacognitive theories) • Qualitative reflection on differences between themes from data collection to feedback activity ○ Role of teacher ○ Learning outside the classroom/ through play ○ Help-seeking
4) Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their: • family background (parents/carers' education level, socio-economic status); • early education (age at start of nursery, early education experiences and opportunities); • early skills (self-regulation, executive functioning, verbal skills)?	• Sample: templates/ structured response sheets (85 children), pilot templates (12 children), Parent/ teacher questionnaire data (85 children) • PVT interactions ○ Binary data reflecting whether children demonstrated metacognition in the PVT interaction ○ Comments from structured response sheets and templates • Parent questionnaire ○ NS-SEC ○ Parent/carers' education level ○ Age at start of nursery • Teacher questionnaire ○ Mean CHEXI score for working memory ○ Mean CHEXI score for inhibition ○ Mean CHILD score for self-regulation ○ Mean CHILD score for social regulation ○ Verbal skills rating	• Quantitative analyses using SPSS ○ Independent t-test ▪ Connections between binary metacognitive variable and CHEXI scores, CHILD scores and age at start of nursery ○ Chi-square ▪ Connections between binary metacognitive variable and NS-SEC, highest parent education and verbal skills rating ○ Logistic regression ▪ Connections between binary metacognitive variable and overall early skills score • Qualitative recontextualization using NVivo crosstabs ○ Qualitative exploration of comments by quantitative variable (verbal skills, NS-SEC category, early skills scores) • Qualitative exploration of cases of children who were outliers in the regression analysis

Chapter 7. A bottom-up analysis of children's understandings of learning

The remaining chapters of this thesis are dedicated to discussing the study's findings. They have been organised into three separate chapters which represent three perspectives on the data. This first chapter involves a bottom-up analysis approach, considering what kind of understandings of learning children expressed in the study. It is important to position this chapter first because the second findings chapter draws on the understandings from this chapter and integrates theory on the role of implicit processes and social and cognitive structures like culture, socio-economic status and executive functioning. Finally, the third chapter considers facilitative PVT interactions as a context for young children's metacognition, highlighting the key features that played a role in co-constructing the metacognition children expressed in the study.

This chapter addresses research questions two and three. Viewed holistically, these questions call for in-depth knowledge about children's emerging understandings of learning and ideas about how to manage the learning process. The central idea in this chapter is that children's early metacognition is both developed and developing. On the one hand, children had robust and well-developed conceptions of learning that they were able to use productively to make judgments about learning even when they were only partially aware of their underlying schemas. Meanwhile, they were also developing knowledge and skills related to academic learning and acknowledged their status as novices.

Throughout the rest of this thesis, children are referred to by their participant numbers. I made this decision because I felt that the sample size (n=85) was too large for the meaningful use of pseudonyms – if "Carol" is only mentioned once or twice in the thesis, the reader will probably not remember her name or comments. Additionally, the point of this thesis is not to follow specific children through the entire analysis. This is not to say that the individual children were not important, but rather that the point of the thesis is to explore characteristics of the children's metacognition holistically. However, it is important for the reader to have some information about the children when reading the thesis. Since classroom culture is relevant to children's developing metacognition, a school identifier was included. Specific participant numbers were assigned so that the reader knows that I have used statements from a range of children and not from the same child over and over. Figure 16 shows a breakdown of the different components of a child's participant number.

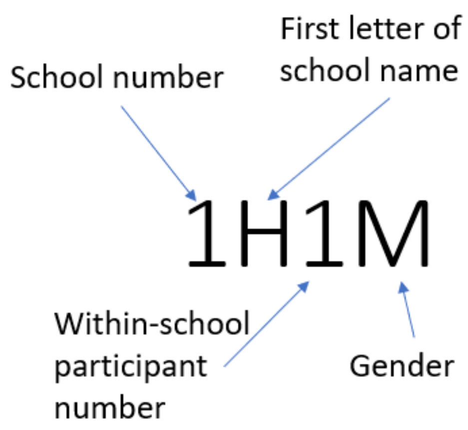


Figure 16: Participant number breakdown

7.1. Layers of understanding: a critical realist analysis

Drawing from my critical realist perspective, I acknowledged that different lenses were helpful in exploring the metacognition that children demonstrated in the study. These formed different layers of understanding. The model below (see figure 17) shows how I considered children's early understandings of learning as formed and functioning within personal, cultural and structural frameworks.

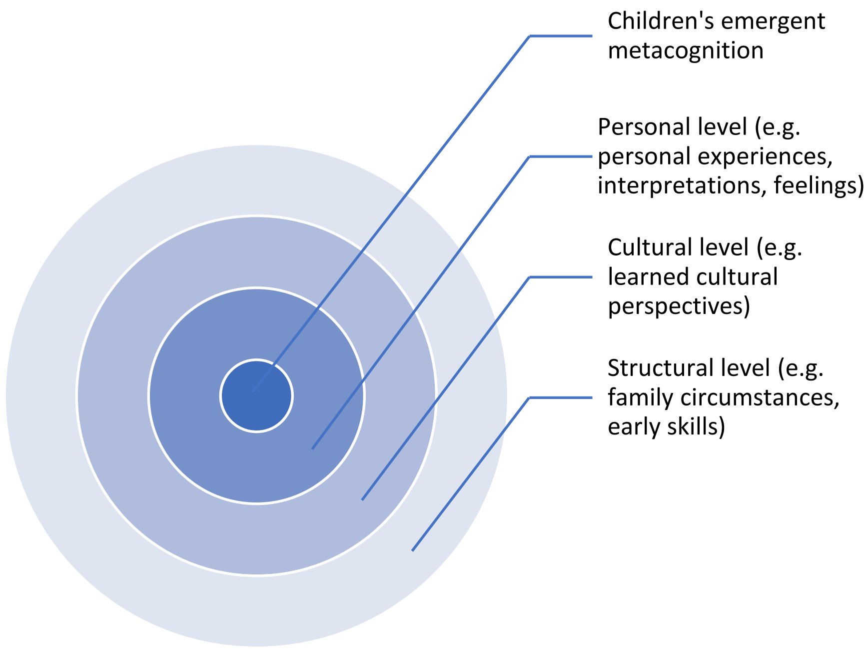


Figure 17: Framework for understanding children's early metacognition

Drawing from the multidisciplinary understandings reviewed in the literature review chapters (chapter 3 and 4), metacognition can be understood from both a personal level and a broader structural level. While it was clear that children's emergent metacognition was highly personal and subjectively constructed through their own experiences, it was also clear that structural influences like culture and early skills had an impact on how it was expressed in the PVT interactions (Dunphy, 2004; Efklides, 2014; Follmer & Sperling, 2016; Reber & Greifeneder, 2017). Children's experiences and understandings incorporated a cultural language of learning (Calarco, 2014; Wall & Hall, 2016). Additionally, certain structural factors interacted with children's metacognition, seemingly constraining or promoting its demonstration in the study. This chapter and the next draw on this model to examine children's metacognition at different levels of reality.

7.2. Developed and developing metacognition at the personal level

This chapter's bottom-up approach in useful in describing the salient features of the children's understandings of learning and particularly their metacognition. The underlying conception of children in this study was that they are simultaneously developed and developing (see section 2.2) and the children's responses demonstrated this. This chapter starts by discussing children's conceptualisations of what learning is and examining the features they associated with it. It then moves into a discussion of the structure of metacognition in children. I explore their knowledge of person, task and strategy as well as metacognitive regulation, highlighting how these functioned in an integrated way which resonated with Schraw and Moshman's work on metacognitive theories (Moshman, 2017; Schraw & Moshman, 1995).

7.3. Features of learning from the child's perspective

Children identified learning by referring to characteristics they connected with learning. Table 26 below provides a list of characteristics that children associated with learning with examples to illustrate each category.

Table 26: Characteristics associated with learning in the study

Characteristics	Example
Tasks	"He's learning to read" – 3R17F
Classroom norms and behaviour	"The little girl got in trouble because she didn't do what Mrs [teacher] said" – 3R11F
Space and place	(Are they learning? How do you know?) "Yeah, cause they're in school" – 1H1M
Materials	(Are they learning, how do you know?) "Yeah, because they've got their books" – 5R2F
Effort	"They have to work hard" – 2S15F
Values	"Easy because the teacher tells you what to do and then you do what the teacher says" – 5R12M
Time and volume	"Numbers and letters – taking too long, you have to learn about 2 letters – y, z." – 1H13M
Usefulness	"We learned how to cut out lines really carefully, so you don't cut yourself" – 5R13M

Children could recall what they had been learning in their classrooms and used this knowledge to identify what the children in the PVT might be learning. They spoke most frequently about literacy (118 comments), specifically learning letters and sounds, reading and writing. This was also the area of learning where children could most easily identify purpose such as learning letters so that they could read (3R18M) and spell words (1H7F). They also spoke frequently about arts and crafts (69 comments), mostly about drawing and colouring. This was perhaps unsurprising given that many pre-writing activities in early years education involve drawing and colouring pictures, using them to communicate meaning and improve fine motor control (Steffani & Selvester, 2009). Other learning tasks included numeracy (33 comments), health and wellbeing (15 comments), games and sports (41 comments) and homework (8 comments).

Children's ideas about learning were quite traditional, which was illustrated by how they talked about playing in comparison to learning. The PVT interaction was set up around talking about learning – the second question asked whether the children in the picture were learning (see interview schedule in section 5.5.4). There was no specific question about play, but playing was brought up frequently, especially when children talked about the playground template. Although I coded mentions of play to **learning tasks**, most children adamantly insisted that playing and learning were different. This lack of connection between playing and learning from children's perspectives was surprising given that play-based learning is becoming increasingly embedded in the Scottish curriculum (P. Duncan & Grogan, 2019) and was used to some degree in most participating schools. Table 27 below shows children's comments about play and learning, which hinted at their underlying conceptualisations of these concepts.

Table 27: Children's comments when talking about playing versus talking about learning

Talk about play	Talk about learning
"You don't learn anything out there, you just play (why not?) Because the people who look after you don't tell you to do anything, you just play" – 5R20M [Playground PVT]	"Ask their teacher to help them to make them get it right." – 1H4F [Paired working PVT]
"Easy because you get to just play and you can have your snack." – 6R8F [Playground PVT]	"(Is it easy or hard to learn something new? Why do you think so?) A bit hard, because you might get something a bit wrong." – 5R26M [Working with an IWB PVT]
"(It's good that) We get to play and don't have to do work. I kinda like doing work. I am on the top group for reading cause I can see my name on the top group." – 6R7F [Playground PVT]	"Teacher told him to do number hop, we just put our finger on one…two…three" – 2S1F [Individual working PVT]
"Easy cause you can do stuff on your own and you can do whatever you want" – 6R9F [Playground PVT]	"Easy cause they know the numbers properly" – 3R15F [Circle time PVT]

As evidenced in the quotes above, children conceptualised play as self-directed and independent. In play, they made up their own goals and did what they wanted. In contrast, children viewed learning as a teacher-directed and dependent process. In learning, teachers made the goals and defined the right and wrong ways of doing things. This was emphasised further in the types of behaviour that children associated with learning. These were classroom behaviours and norms set by the teacher such as sitting with *"legs in a basket"* (1H12F), raising your hand and punishments associated with bad behaviour. They were beginning to construct distinct definitions of learning and play and were able to apply these definitions to what they perceived to be happening in the PVTs. This finding aligns with Lunn Brownlee et al.'s (2017) study which found that children in primary school tend to hold mostly objectivist views of learning. In their study, this meant that when talking about learning the children focused most on the role of outside people like teachers and things like books and worksheets rather than their own role in learning.

Some children bridged the gap between playing and learning either on their own or with support but did not associate learning cognitive skills (i.e. problem solving, reading) with playing (see figure 18). For example, when I asked what the children in the PVT were learning, 2S1F responded *"playing is our learning,"* making a connection between play and learning on her own. She followed this with a statement about emotional regulation and social skills: *"when I'm outside and I'm sad, I go to the friendship bench and someone comes and plays with me."* This was further highlighted in the May/June 2019 feedback sessions. In these sessions, I asked children to agree or disagree with comments that illustrated emerging findings about their conceptions of learning (see appendix B-4 for more details on feedback sessions). After most children initially agreed that playing was not learning and that you could not learn without a teacher, they relaxed their positions with strategic questioning and through peer challenging. Strategic questioning involved using questions to prompt children to think about learning more broadly such as "can you learn anything at home/from your friends?" Peer challenging was characterised by a child disagreeing with the consensus, such as suggesting something that could be learned through play. Children spoke about learning physical skills such as jumping and cartwheels and social skills such as being kind through play. They also stated that they could learn how to play games from their friends. It seemed that when they heard the word learning from me, they first associated it with academic "work" and a push was necessary to expand their thinking and discuss learning more broadly. This will be further discussed in chapter 9 (see section 9.5).

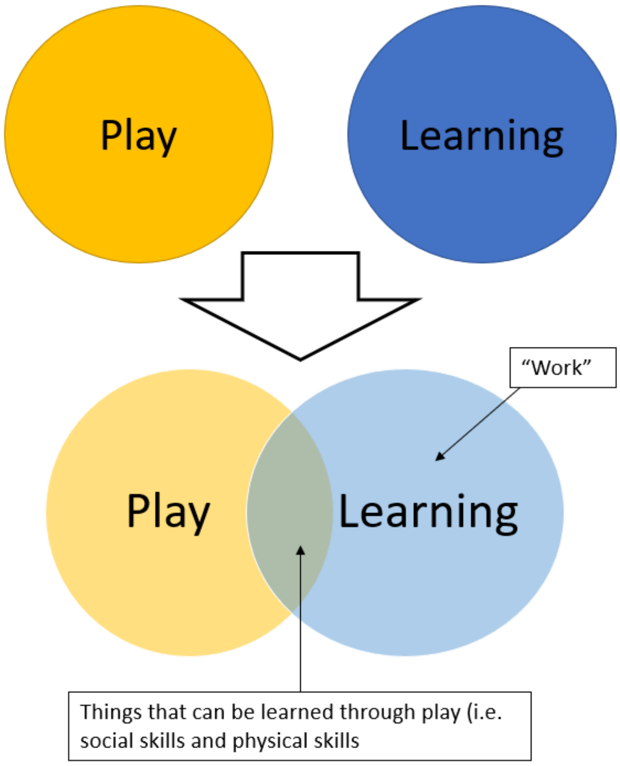


Figure 18: Bridging the gap between learning and play

The idea that learning is classroom work was also reflected in the materials and environmental features children associated with learning. Children connected learning with the classroom and with classroom materials.

> *(What can you learn in the playground?) "Nothing because we learn inside, that's just the way we learn" – 6R8F*

This idea was widely confirmed during the feedback sessions. Most children agreed, at least initially, and cited reasons relating to the outdoors lacking materials associated with learning such as desks, worksheets and blackboards. They reasoned that because classroom materials were not present, the outdoor environment was not a suitable place for learning. They also explained that because the teacher was not there, no one was learning. Interestingly, the children from School 6 disagreed that learning could only happen inside even though this comment was recorded there earlier in the school year. They still concentrated on learning physical and social skills but needed no prompting to make this connection. This diverged from the other five schools where children agreed with this comment before making concessions that some things could be learned outside and from parents and friends. It was likely that this had something to do with the culture at School 6. Section 8.2 discusses the role of school culture in more depth.

Looking beyond the results of this study, it is clear from other studies that children use and construct metacognitive knowledge through play (Marulis et al., 2016; S. Robson, 2010; Whitebread et al., 2009). What is less clear in the literature is whether children can transfer metacognitive knowledge from play experiences to school experiences that are explicitly framed as learning if they believe that there is a fundamental difference between play and learning. Metacognition literature acknowledges that transfer is difficult for learners regardless of age, particularly far transfer where contexts are not closely related (Barnett & Ceci, 2002; Chen & Klahr, 2008; McGregor, 2007). Barnett and Ceci (2002) define transfer between play and academic contexts as far transfer between different functional contexts. This means that cognitive skills and knowledge learned for one purpose (i.e. problem-solving during play tasks) might not transfer to another purpose (i.e. problem-solving in an academic task). Knowledge and skills that a child believes are unrelated to the task at hand are not likely to be retrieved from memory even if the child is perfectly capable of using them. This could cause utilisation deficiency in a new context (Clerc et al., 2014; Clerc & Miller, 2013). This will be returned to in section 10.4, which will discuss ideas about how transfer can be facilitated and scaffolded by the teacher.

Similar to Piaget (1969), children's judgments were not static and they sometimes expressed contradictory beliefs in close succession, especially in the feedback sessions. Children often said initially that you could not learn while playing or while you were outside, but later in the session they listed social and physical skills that could be learned outside and through play. Piaget (1969) viewed contradictory judgments around concepts like "alive" as evidence that children were not aware they had contradicted themselves and were unaware of their mental processes. However, these contradictory beliefs are not specific to children as there is evidence that even adults hold contradictory beliefs (Albahari, 2014). This could result in inconsistent judgments depending on the context in which they make the judgment (Tourangeau et al., 1989). Instead of viewing children's contradictory beliefs as evidence that they were unaware of their mental processes, I viewed this as potential evidence that the children's knowledge of learning was compartmentalised. I considered that it was possible that the PVT interactions prompted them to respond with comments related to classroom learning. This is further discussed in chapter 9 (see section 9.5).

It was clear that children could make reasoned judgments based on their knowledge about learning and their interpretations of what could be happening in the PVT. When making these judgments, they tended to rely on characteristics they related to learning, which allowed a look at their developing knowledge of learning. Tizard and Hughes (2002) argue that although children's thinking is different from adults due to their limited conceptual development and experience, they still actively reason from the information they have and are not illogical. This study's findings aligned with this idea as the children were far from unreasonable. Their comments indicated that they came to logical conclusions based on the knowledge they retrieved in the context of the PVT activity. This knowledge was, of course, related to their experience and conceptual development. Some of the children were better able to explicitly reflect on and discuss their justifications for judgments. However, all children could decide whether the children in the PVT were learning and most attempted to justify their answers. This indicates that they were aware of their learning and thinking processes to different degrees but understood them in different ways than adults or older children.

7.4. Emerging metacognition – an integrated model of young children's metacognition

Children's comments suggested that their metacognition functioned in a theory-like way (Moshman, 2017; Schraw & Moshman, 1995). As this and subsequent chapters of this thesis will make clear, affect was clearly important to children's metacognition. Therefore, when I use the term metacognitive theories, this is not meant to imply that these theories employed cold logic, simply that different aspects of knowledge came together in a theory or schema-like way. During the coding process, I noticed that many comments were not easily classifiable into a single category of Whitebread et al.'s (2009) C.Ind.Le framework (see section 6.3.2 for an outline of C.Ind.Le framework categories). Children's comments often reflected the integration of different types of metacognitive knowledge and sometimes regulation and I coded them to multiple categories (see table 28). For example, 1H6F made the comment:

"Easy because I know how to do every single word – I've been practising." – 1H6F

This comment was subsequently coded as **metacognitive knowledge of task** (commenting that word tasks are easy), **person** (belief that she can do every single word) and **strategy** (attributing her performance to the strategy of practising).

Table 28: Overview of comments coded to metacognitive categories

Category	Number of comments	Number coded to one or more other categories	Example of a crossover comment
Metacognitive knowledge			
Person	87	52	"People are getting better at reading, better at writing, better at working" – 5R20M [crossover with evaluation]
Task	67	34	"Sometimes it [reading] is hard and sometimes it's easy because sometimes I know how to read." – 1H9M [crossover with person knowledge and evaluation]
Strategy	62	26	"(Who can help you?) The teacher – they can say come on hurry up – they help them by saying come on hurry up its almost lunch time. They're very clever and they got trained." – 5R10F [crossover with knowledge of person]
Metacognitive regulation			
Planning	12	4	"(What are they learning?) Numbers, maybe they're drawing numbers and then they need to count it." – 1H2F [crossover with knowledge of task]
Monitoring	22	16	"I'm not really good at drawing this all by myself, I need help. (asking me for help with colouring)" – 1H13M [crossover with knowledge of person and strategy]
Control	3	0	N/A
Evaluation	24	16	"I can do the S proper now, I used to do it terrible." – 3R17F [crossover with knowledge of person]

The integration of different components of metacognition suggested that children were starting to build metacognitive theories to explain and control their cognitive processes. Additionally, the previous section highlighted that they used their underlying conceptions of learning to make judgments about what was learning and what was not. This suggests that children's metacognitive knowledge and beliefs were used in an integrated and contextualised way. Metacognitive theories have been argued to be "a relatively systematic structure of knowledge that can be used to explain and predict a broad range of cognitive and metacognitive phenomena" (Schraw & Moshman, 1995, p. 356). These could be tacit theories that children could use but were not explicitly aware of or informal or formal theories which require increasing awareness.

The quote in table 28 above "I'm not very good at drawing this all by myself, I need help (asking me for help with colouring)" might indicate that 1H13M used a metacognitive theory to explain his cognitive processing during the PVT task. In this case, he was taking a long time to finish his colouring. He drew on knowledge of person to communicate that he was not good at colouring by himself. This was connected to his strategy knowledge of asking for help because two people colouring would speed up the process (implying task knowledge). Perhaps he thought that you were either good or bad at art/maths/reading or perhaps his thinking was more nuanced, and you could be good or bad at something depending on the situation. He would have associated different characteristics with being good or bad at something and could use them to judge his own performance and the performance of others. He also associated a strategy with this – namely that if you were not good at something, you need help. In this case it was clear that he had some awareness of his own capabilities and what he should do if he encountered trouble. However, it was not clear whether he was explicitly aware of the criteria by which he judged his capability (i.e. going fast/slow). Other studies (Reber & Greifeneder, 2017) have indicated that judgments are based primarily off of feelings about processing fluency, which will be further discussed in section 7.4.2.

If metacognition functions as an integrated theory, it is worth asking whether separating different components is useful and what it is useful for. Many metacognitive models separate metacognition into different components (Efklides, 2008; Flavell, 1979; Veenman et al., 2005; Whitebread et al., 2009) and research has suggested that metacognitive knowledge and regulation form distinct components even in early childhood (Fritz et al., 2010). Separating knowledge and regulation is useful in conceptual models because there is often a gap between what a person knows and can do (metacognitive knowledge) and what they actually apply in a given situation (metacognitive regulation) (Clerc et al., 2014; Clerc & Miller, 2013). It is useful in Efklides' model (2008) to further separate metacognitive experiences because doing so recognises that learners' experiences and the contexts for these experiences impact on the skills they use and the knowledge they retrieve. Lastly, it can be useful to further separate these into components (i.e. metacognitive knowledge into knowledge of person, tasks and strategies) if the study aims to explore or highlight aspects of a person's metacognition (i.e. self-concept).

It is useful to break down metacognition into different components in this section to highlight and explore more deeply specific aspects of children's metacognition, but it is important to note that in context they did not function separately. Learners do not often tap a single aspect of metacognition and use it alone – i.e. retrieving knowledge of strategy would often bring up knowledge of task and person. Some of the comments only reflected one aspect of metacognition, but this does not mean that other knowledge was not retrieved, just that it was not verbalised explicitly. As discussed in section 6.4, one of the key take aways from the interrater reliability discussions was that other types of knowledge were often implied in a child's comment. The following sub-sections will examine different aspects of children's metacognition, highlighting some ways that different types of knowledge and regulation were integrated.

7.4.1. Knowledge of person – self-concept and theory of mind

Children demonstrated significant knowledge of people as learners, both in terms of their own self-concept and how they judged others as sources of knowledge. This was often demonstrated through comparing themselves with others or by judging the usefulness of someone as a source of help. Evaluating how useful someone might be as a source of help had significant crossover with children's knowledge of strategy and will be returned to in section 7.4.3. Through the PVT activity, children showed that they had built up and could apply their own theories of mind.

Children's self-concept was generally high, and they tended to think of themselves as good learners, although some children already thought of themselves as poor learners. This mirrored Cohrssen et al.'s (2016) study of pre-school children's self-concept which also found that a minority of children already thought they were significantly worse at academic tasks than their friends. The children tended to state this in a general way rather than saying they were good or bad at specific subjects or at specific tasks. For example:

> *"Hard, it's hard for me because I can't do it." – 3R8F*

> *"Easy, I'm good at working and all that stuff" – 2S10F*

This may confirm other findings that children's self-concept is still developing as a global construct at the beginning of school (Cohrssen et al., 2016). Conversely, it could be related to the general nature of the templates, which prompted children to think of themselves as learners in a general sense. An exception to this was the reading template, which prompted children to talk about themselves as readers:

> *"I like everything about reading (in response to his partner) I never get mixed up on with the words" – 1H5M*

This did not contradict the idea that self-concept is a global construct in the early years but did indicate that the children were aware of criteria by which they could judge a good or bad learner.

Children demonstrated awareness of their experiences as learners and were able to talk about things they knew how to do as well as things they did not know how to do well:

> *"(It's bad) Because I'm stuck with some words" – 1H8M*

> *"It's hard because we haven't learned the letters before, and we don't know them" – 3R13F*

> *"They're [the P7 buddies] teaching us and they look after us. I don't need that cause I can count to 100. (demonstrates)" – 2S10F*

It was clear that children were able to reflect on their emotional and cognitive experiences of tasks and what this meant for their skills. 1H8M recognised that he sometimes got stuck on words when he was reading and associated this with a bad feeling. In some cases, children spontaneously talked about their skills, but many of the self-concept comments children made were in response to feeling questions. Sometimes this was in relation to asking about whether something was easy/hard or just generally what was good/bad about a learning situation. This connection between metacognition and affect will be further explored in section 8.1. The judgments above seem to be reasonable and in one case 2S10F demonstrated the skill she judged herself capable of. However, this was not the case for all judgments, such as the following interaction between 5R19M and 5R20M:

(1) *5R20M – "I can count up to 1000"*

(2) *5R19M – "No P1s can do that"*

(3) *5R20M – "Well I'm a P1 and I can"*

(4) *5R19M – "Then do it"*

(5) *5R20M – "I'm not gonna count that cause I'll be nervous if I do"*

In this interaction 5R19M challenged 5R20M's claim that he could count to 1000 because his claim contradicted 5R19M's belief that P1s were incapable of counting that high. In most cases it was unclear whether children judged themselves more capable than they were, so it was not possible to evaluate the accuracy of children's judgments. However, other studies have indicated that young children often overestimate their own abilities (Roderer & Roebers, 2014).

Children talked about progression in skills and knowledge and often related this to age. They mostly did this through making comparisons to their younger selves, other children and adults. Children were aware of their progress in skills, particularly when they recalled what their skills had been like in the past:

> *"When I was 3, I used to be scribbly and now I'm neat [about his colouring]" – 3R18M*

Older children and adults were viewed as the most knowledgeable and skilled due to their age and the amount of time they had spent learning:

> *(Who can help you? Why?) "Another child if I'm dropping something. The teacher because she's the strongest in the classroom and she's the oldest so she probably knows more." – 4N1M*

"My brother doesn't need to learn anything because he already knows everything cause he's in P5." – 5R25M

"(People who can help) Mummy and daddy because they're biggest and I'm only little." – 2S3M

(What can you do if you get stuck) "You can just ask your friend – because I think they would know the answer and they could be smarter than you. When you get older your brain gets bigger." – 5R12M

"Hard because my friends are too fast for me because they're all 5. Wait a minute! My friend [name] is not 5, he is still 4." – 6R5M

It was clear that children viewed adults, especially teachers, as having the most knowledge. They viewed teachers as trustworthy sources of information or epistemic authorities (Guerrero et al., 2017; Mills, 2013). In the feedback sessions, this was further confirmed. In school 5, the children seemed tentative about learning from their friends and saw them as an unreliable source of knowledge. They said that their friends might not know and emphasised that the teacher was a more reliable source of knowledge, stating that teachers know more than children. They reasoned that their teacher must know more because she had been learning for longer than they had.

Children acknowledged differences between individual learners, so age was not the sole determinant of differences in knowledge and skills.

(Is it easy or hard? Why do you think so?) "Hard because my partner is on stage 5 words and I'm on stage 1." – 3R10M

(What would you say was not good about working as a team?) "Some people work a bit slow and some people work a bit fast" [partner expanded "yeah and then you get mixed up"]. – 5R11F

They individually picked out friends who they would ask about certain things and this was mostly based on knowing they knew a lot about that subject. For example, one boy said he would ask his friend questions about dinosaurs since he knows a lot about them as he has a "really big book" about dinosaurs. This illustrates the close relationship between a well-developed theory of mind and metacognitive knowledge about learners. Children indicated that they were aware of some of the criteria by which they could judge different people's reliability as sources of knowledge and help (metacognitive knowledge). They were able to make judgments about what topics they could ask certain people about through predicting what they might know based on previous interactions with them and/or with similar people (i.e. other adults or children of similar ages).

Children's wide use of comparisons when discussing their own skills and knowledge or other people's skills and knowledge resonates with Piaget's (1969) Judgment and Reasoning in the Child. He asserts that children's awareness of mental processes is developed and refined by contact with other minds. Additionally, he reasons that children become interested in justifying their own judgments and examining the reasons and criteria behind them through interaction with others. The PVT interactions were effective tools for prompting children to justify their judgments, potentially promoting increased awareness of the criteria by which they made judgments. Schraw and Moshman (1995) assert that increasing awareness is the main driver in moving from tacit metacognitive theories to informal and formal metacognitive theories. This has potential implications for teaching which will be further examined in section 10.4.

7.4.2. Knowledge of task – evaluating task characteristics to make judgments

Children used task knowledge to speak about various task-related characteristics and evaluate them productively to make judgments. Their judgments were often related to deciding whether something was easy/hard and whether situations were good or bad for learning. These judgments and explanations related strongly to their cognitive and affective experiences of different tasks. Some children also showed awareness of mental processes that were important to learning and talked about criteria related to specific tasks that they could use to evaluate their performance. The PVT interactions were effective in eliciting talk about specific tasks and about learning in general and children's task-related metacognitive knowledge reflected this.

All children could decide whether a task was hard or easy and most attempted to justify their reasoning, which allowed some insight into how they interpret their metacognitive feelings. Some children were more explicitly aware of the criteria they associated with the concepts of easy/hard and expressed this using task-related metacognitive knowledge.

Other children were less aware but nonetheless expressed their conceptions of easy/hard by using examples and subject knowledge. Still others used what I termed affective reasoning, which involved using their own subjective and affective experience to justify their ideas. Table 29 shows examples of children's justification styles. Affective reasoning and the importance of metacognitive experiences will be further elaborated on in section 8.1. However, it is important to note that children's task related metacognitive knowledge seemed to be built up on both cognitive and affective experiences of different tasks. The concepts hard/easy were associated with metacognitive, cognitive and affective aspects.

Table 29: Children's justification styles

Justification used	Task knowledge	Examples and subject knowledge	Affective reasoning
Example comment	"It's hard because we haven't learned the letters before, and we don't know them" – 3R13F	"Easy because I think you…when you make 8 it's easy because it's a "S" and then back up" – 2S13F	"Hard cause when I do work it's so boring" – 1H11M

Children seemed to associate hard/easy with having experience. They judged things they had not experienced before or had limited experience of as hard and things they already knew how to do as easy.

> *"Hard because I can't read books. Then it got easier and easier cause he saw the letters that he knew and he learned." – 3R17F*

> *"Easy, I know what new letter it is every day" – 3R12M*

The children who used examples and subject knowledge tended to adhere to this theme. The examples they gave and subject knowledge they related were things they had done before or already knew how to do.

> *(What are they doing?) "Maths – no, homework – homework is easier and maths is hard" – 1H3M*

> *"Counting to ten is easy cause you just go like 1, 2, 3, 4, 5, 6, 7, 8, 9, 10." – 5R25M*

In 1H3M's case, he compared homework with maths to illustrate ideas of easy and hard. Teachers generally give children homework using already learned concepts as the aim of homework is usually review and practice. In contrast, maths work done in school is more likely to involve learning new concepts and skills. Similarly, 5R25M communicated that something he had mastered (counting to ten) is easy. It was likely that personal experience of different tasks played a key role in building a conscious understanding of what characteristics made these tasks hard or easy. This echoed other metacognitive research which acknowledges that conceptions of difficulty are unique to the child (Bruce Thompson et al., 2012). Research has indicated that metacognitive feelings such as feeling of knowing and feeling of difficulty stem from underlying processing fluency or disfluency (Reber & Greifeneder, 2017). Processing fluency is understood to be a subjective sense of how well a task is being mentally processed. When a learner's mental processing is disfluent, they may experience metacognitive feelings such as feeling a sense of difficulty or that the material is not known or well-remembered. This is essentially an opportunity for metacognitive control, but unproductive attributions can result in acquisition of flawed metacognitive knowledge and theories (Desautel, 2009; Efklides, 2008; Veenman et al., 2005). An example of an unproductive attribution could be attributing fluency or disfluency to fixed characteristics like being good or bad at reading. This will be examined further in section 8.1.3.

Children were able to state characteristics that made a situation good or bad for learning. One commonality in these comments was their tendency to focus on external situational aspects that could have an impact on the internal process of learning.

> *(What's not so good about learning with your friends?) "They (your friends) stop you and you don't get your work done" – 1H2F*
>
> *(Do you think it's better working with your friends or on your own?) "On my own so it can be quiet" – 2S15F*
>
> *(Is it better to learn by yourself or with a partner? Why?) "Better to learn with a partner because they're learning stuff they don't know, but sometimes you need peace and quiet!" – 3R1F*
>
> *(Is it easy or hard? Why do you think so?) "Harder to learn outside than inside. You can get distracted when you're outside by people asking you to play all the time." – 5R21M*

This strong connection between external situational aspects and internal processes showed that some children were explicitly aware of environmental features that hinder and promote learning. These types of comments were particularly prevalent when children evaluated paired and group learning situations. Sometimes this was in response to the two questions asking what was good/not good about learning in the pictured situation (see 1H2F's comment above). If children were having trouble with these questions, I encouraged them to compare learning alone and learning with a partner. These comparisons were effective because children focused on aspects of the situation that might impact internal mental processes in their explanations. Sometimes this was just being aware that learning with friends could be useful when learning things that were hard and that you do not know yet. However, some comments indicated that they might be starting to view some mental processes as important to learning. Children's comments around a quiet atmosphere and avoiding distraction showed that they may have had an emerging awareness of the importance of concentration and attention in learning.

Other cognitive processes were addressed in the data more explicitly as being important to performing tasks and learning:

> *"I'm thinking about something and if you need help later, I will help you...I'm thinking about how to do it" – 2S10F*
>
> *"They're happy because maybe they might be doing good listening and they know what to do" – 1H2F*
>
> *"They're probably doing math and they're thinking about it." – 1H1M*
>
> *"They're remembering stuff" – 3R1F*
>
> *(Are they learning, how do you know?) "Yeah, they're concentrating while they're doing their letters." – 5R7M*

It was apparent from the comments above that children were able to make connections between a variety of mental processes and learning. It was perhaps less clear whether they were explicitly aware of why these processes were important for learning. The quotes above show some simple awareness of this, particularly 2S10F and 1H2F's quotes. 2S10F's quote illustrates that she understood that you cannot help someone before you've figured out how to do something, which hinges on the process of thinking. Similarly, 1H2F's comment shows that she was aware of the connection between *"doing good listening"* while the teacher was explaining something and knowing what to do during a task. It was likely that the concept of *"doing good listening"* was picked up from her teacher. The potential role of classroom culture and wider cultural ideas about learning will be further examined in section 8.2.

Lastly, some children explained the perceived appropriate ways of doing tasks, showing that they were aware of the importance of concepts like neatness. This showed that they were explicitly aware of some of the criteria they could use to judge whether or not a task had been completed well.

> *(What would you say was good about learning something new?) "Colouring because you do it anyway you want" – 5R1F*
>
> *"They (your partner) can colour in the lines for you and not scribble." – 3R6M*
>
> *"Easy, cause it's neat when you stay in the lines." – 1H7F*
>
> *"I wouldn't colour in the background because that would take a long time." – 6R7F*

It was possible that children had internalised success criteria that they had heard others talk about or that they had learned through personal experience. These could be used before, during and after colouring to plan, monitor and evaluate their own work and the work of others. 3R6M and 1H7F knew about the concept of neatness, namely that you should stay in the lines and not scribble when you colour a picture. 6R7F was aware of how long it takes to properly colour something. 5R1F acknowledged that colouring is an open activity where you can use whatever colours you want. It was likely that children had been colouring since they were very young and throughout nursery. Therefore, it was unsurprising that they were familiar with the process of colouring and quite knowledgeable about it. Although it was unclear whether children used success criteria to plan, monitor and evaluate their work, it was notable that they were explicitly aware of them. It was also unclear whether they made connections between neatness in colouring and neatness in academic tasks like writing. There were some comments that indicated children were aware of task-specific criteria in academic areas such as getting sums right in maths:

> *"I like doing maths cause it's so important to get your sums right" – 1H7F*

It makes sense that learners pick up and internalise task-specific criteria from their experiences in school and that this knowledge continues to develop as they gain more experience in school. From the comments children made in this study, it was clear that they had already gained some knowledge about how to appropriately complete tasks in their classroom. This highlights the importance of the school experience in building explicit metacognitive knowledge about tasks (Vygotsky, 1962). The importance of school experience and the culture surrounding this will be further examined in section 8.2.

7.4.3. Strategy knowledge – seeking help and working independently

Children's strategy knowledge mostly included dependent strategies that centred around help-seeking although some children related independent strategies. Help-seeking was spoken about very frequently in the interviews and 67 children (79% of sample) mentioned it at least once. This was primarily in response to the early question asking "What/who is helpful when learning something new" and the later "What can you do if you're stuck?". Seeking help was only coded as **metacognitive knowledge of strategy** if the child mentioned a strategic reason behind the help-seeking. Similarly, if the reason for help-seeking was emotional or motivational, it was coded to **emotional/motivational control** instead of **metacognitive knowledge of strategies**. Table 30 shows example comments illustrating children's independent and dependent strategies.

Table 30: Example independent/dependent strategies

Independent strategies	Dependent strategies
(What can you do if you get stuck?) "I have to try to think about what I've done and if I get it wrong, I have to try again." – 5R18M	(What helps you when you work with a partner?) They "(your partner) can teach you things" – 3R10M
"Practising helps me with my reading" – 1H3M	(Can you learn in the playground?) "Yeah, you can learn hopscotch (how did you learn?) My buddy helped me." – 6R7F
"I could get a chair so I can see better" – 4N1M	"The teacher can help you to spell words, they can write it on a whiteboard and you copy it" – 1H7F

Children were knowledgeable and adept users of help-seeking strategies. This aligned with

Dunlop et al.’s (2008) research, where nursery practitioners rated over 80% of children as being skilled at knowing when to ask for help at the point of transition between nursery and primary 1 in Scotland. This was understandable as children learn early on to ask for help from their caregivers (Coughlin et al., 2015). Therefore, by age 4/5 children were already experienced users of this strategy. Research has indicated that even 20 month old infants engage in strategic help-seeking (Goupil et al., 2016). Consequently, primary-aged children already have considerable experience using help-seeking in different situations (i.e. at home/nursery, in various tasks) and with a variety of helpers (i.e. parents/carers, peers of different ages, nursery practitioners, family members). The children in this study demonstrated well-developed and sophisticated metacognitive theories around help-seeking. They had considerable conditional knowledge related to help-seeking and reflected on situations where help was needed and who was likely to be a good helper. This conditional knowledge incorporated children’s metacognitive knowledge of person and task.

Children’s comments about help showed that they were able to discern when and why they needed help:

> *(Who can help you? Why?) “The teacher helps you. She helps me with things that are hard like writing words that are long.” – 5R7M*
>
> *“If he's stuck, he can get a teacher to help him” – 3R18M*
>
> *“If someone’s not good at building then we can help them” – 1H6F*
>
> *(What’s not good about learning with your friends?) “Sometimes I don’t need any help, I can do this myself.” – 2S11M*
>
> *(What’s good about learning with your buddy?) “They’re teaching us and they look after us. I don’t need that cause I can count to 100. (demonstrates)” – 2S10F*

Research into children’s help-seeking behaviours indicates that children seek help strategically in response to monitoring their own uncertainty and the difficulty of the task (Bruce Thompson et al., 2012; Coughlin et al., 2015). These feelings of uncertainty and difficulty stem from underlying processing fluency or disfluency (Reber & Greifeneder, 2017). From the quotes above, it was clear that the children centred uncertainty monitoring and difficulty in their reasons for asking for help. 3R18M expressed this as being stuck and 5R7M spoke about discerning the difficulty of tasks. 1H6F’s comment implied that people who struggle with building tasks need help. The central role of uncertainty and difficulty was further emphasised in children's comments about when they did not need help. 2S11M and 2S10F (partners during the PVT activity) spoke about not needing help from their older buddies (Primary 7 children aged 11-12) in tasks where they were certain of their abilities. In section 7.4.2, children explained that easy tasks were things that they already knew how to do, so it made sense that uncertainty and difficulty monitoring were both relevant factors in children's help-seeking.

Children's conditional knowledge of strategies united metacognitive knowledge of task and person. Personalised task knowledge incorporated children's self-concept and likely influenced whether they thought help was necessary in different situations.

> *(Who can help you? Why?) "Teacher helps me write cause I can't write and I might forget stuff" – 5R1F*

In this example, 5R1F acknowledged that she needed help during writing tasks because she was likely to forget and sometimes did not know how to write the words she wanted to. This showed insight into her perception of herself as a learner (person knowledge), but also in how she perceived her mental processing during writing tasks (task knowledge). It was difficult to pick out where knowledge of herself met knowledge of writing tasks as these did not function as separate components. This personalised task knowledge allowed her to discern specific reasons for help-seeking that were related to her perceived writing capabilities.

As mentioned in section 7.4.1, children could discern who was a good source of help and mainly relied on age, viewing older children and adults as more knowledgeable no matter the subject. It is likely that their judgments were based off their previous successful experiences asking and receiving help from adults. Studies indicate that children are able to critically evaluate the trustworthiness of adults based on information they have heard or previous interactions and observations of specific adults (Mills, 2013). Additionally, research suggests that children sometimes reject knowledge claims from a teacher if they conflict with their own beliefs gained through their previous experiences (Guerrero et al., 2017).

This study mostly elicited broad statements about groups of people (i.e. asking a teacher or asking your friends) and not evaluations about the trustworthiness of known individuals in specific situations. It is natural that the children judged adults as better sources of help based on general knowledge of them as a group. Research has indicated that even three year-old children show doubt in adults who clearly lack knowledge related to their current task (Mills, 2013). Adult trustworthiness can be manipulated in lab-based studies by introducing children to adults who have been instructed to demonstrate varying degrees of knowledge. However, in their early educational experiences, children have probably experienced teachers as being trustworthy sources of knowledge, particularly when compared with other children. Therefore, children naturally thought that other children were more likely to be ignorant than their teachers and other adults.

It is necessary to ask why help-seeking and dependent strategies were markedly prominent in the study, particularly in comparison to other studies of young children's self-regulation and metacognition (Marulis et al., 2016; S. Robson, 2010; Rowe, 1989; Whitebread et al., 2009). One potential explanation is that my questioning prompted them to relate help-seeking strategies instead of independent strategies. In section 5.5.4, I explained how I changed "What/Who helps when you're learning something new?" to "What can you do if you get stuck when you're learning?" because children were mostly relating help-seeking strategies. However, when I returned for the feedback sessions, I changed the wording and asked the children what they could do if they got stuck. Help-seeking was still the most prominent strategy despite the changed wording. The notable exception was one class at School 6, where children largely rejected dependent strategies in favour of independent strategies. One girl listed three independent strategies for helping yourself with addition and subtraction and one boy added that you should *"think about it in your head."* Another girl said that if you ask your friends for the answer you are not learning because you are just copying, and they could have the wrong answer. Because this was a class-related difference, it was likely that classroom culture played a significant role. There is a high likelihood that the teacher had been promoting independent strategies throughout the school year. The role of classroom culture will be further examined in section 8.2.

Another possible explanation for children's reliance on help-seeking is that it was a global strategy that was useful in a variety of different situations. Rowe (1989) highlighted that global strategies are "transsituational approaches to learning new things and solving problems" whereas specific strategies "allowed children to use information about a particular…problem to solve it" (p 85). Help-seeking was a global strategy that could be applied responsively in specific situations. The question about stuck strategies asked about learning in general and children tended to respond to this question with global strategies, mainly help-seeking. Help-seeking is a strategy that does not require adaptation to apply it in different situations. It was possible that the children defaulted to help-seeking as a heuristic response to feelings of uncertainty and difficulty (Coughlin et al., 2015) until their teacher introduced independent strategies in the context of academic work. Since this study took place at the beginning of the school year, the children were naturally less familiar with academic learning. They were still quite dependent, particularly in tasks they had little experience with such as reading and writing. Their self-assessments of their capabilities as readers and writers showed a degree of uncertainty:

> *(Who can help you? Why?) "Teacher helps me write cause I can't write and I might forget stuff" – 5R1F*

> *(It's bad) "I'm very grumpy cause I can't read yet" … "Use an adult to help you cause they can read." – 1H9M*

In these cases, the natural reaction would be to ask for help from a more knowledgeable other. Returning to metacognition as strategic and reflective thinking, most children were at the beginning stages of reflecting on and understanding relatively new skills such as reading and writing. In these beginning stages, it would be natural for children to rely on their felt sense of uncertainty and difficulty which prompted help-seeking.

Help-seeking may have been prominent in this study because children perceived learning as teacher-directed, academic work. The children saw teachers as central to the learning process which may have affected how they selected appropriate stuck strategies. Other naturalistic studies of young children's metacognition have used children's self-selected activities (e.g. Robson, 2010; Rowe, 1989; Whitebread et al., 2009). During these activities, children made their own goals and progressed toward them using stuck strategies that related to these goals. They would probably also have confidence that they had the necessary skills to achieve their goals. This is because self-regulated learning requires motivation and motivation is partially dependent on valuing the goal and feeling that it is achievable (Eccles & Wigfield, 2002). Self-selected goals can also be changed during the activity if the child starts thinking the original goal is unachievable. This is not usually the case with teacher-directed, academic work.

When the children talked about academic tasks, they were keenly aware of their progression and thought highly of themselves as learners, but also felt that they still had much to learn. This was particularly apparent when they compared themselves to older children and adults in section 7.4.1. If they knew their skills still needed work, feeling stuck may have promoted dependent strategies when they were working toward a teacher-directed goal. Their sense of uncertainty and difficulty during teacher-directed tasks may have prompted them to use strategies that progressed them toward their goal of getting the right answer. Since children viewed teachers as defining the right ways of doing academic tasks, it made sense that they would seek help to make sure they were “doing learning” right.

It is worth asking whether children’s conceptions of learning as teacher-led fed into a learned sense of helplessness when engaging in academic tasks. It is important to consider that strategy knowledge may look different depending on whether it is retrieved from memory in response to self-selected goals or teacher-directed goals. Self-selected (and peer-negotiated) goals probably would have provoked a higher sense of familiarity and control than teacher-led goals. The sense that school was different from nursery (and that play and learning are largely separate constructs) could have contributed to increased dependency at the beginning of school. The impact of school culture and wider cultural conceptions of learning will be discussed further in section 8.2. Potential teaching implications will be considered in section 10.4.

Although help-seeking was the most prominent strategy, children also demonstrated knowledge of more independent global and specific strategies (see table 31). Again, the stuck strategies question mostly elicited global strategies, although some children who chose the reading template also talked about specific strategies. This was perhaps due to the comparatively closed nature of the reading template which left less space for children to imagine a variety of specific situations. Chapter 9 will discuss the impact of the PVTs further.

Table 31: Examples of global and specific independent strategies

Global strategies	Specific strategies
• (What can you do if you get stuck?) "I have to try to think about what I've done and if I get it wrong, I have to try again." – 5R18M • (What can you do if you get stuck) "You rub it out and start again. Even when you get stuck, you do it by yourself and then you get a friend." – 2S15F • (What can you do if you get stuck?) "Just hit their brain and do it all again. Twist your brain and you learn again." – 5R25M • "We make water towers. 2 big stands with pipes. If they don't work, we do it differently" – 5R22F • "Practising helps me with my reading" – 1H3M • "I think making a really neat picture is really easy because I've been practising for ages." – 5R7M	• (What helps if you get stuck when you're reading?) "Half the words – chunky monkey taught us that" – 1H5M • (What can you do if you get stuck when you're reading?) "Just make it up because I do a lot of the time. I just say okay I'll just make it up." – 3R17F • "I usually like to use these (coloured pens) because you have to push hard on these (coloured pencils)" – 1H1M • "See on the side of the pen it looks like it's running out (colouring with side of pen tip), but if you turn it, it works (turning to other side of pen tip)" – 1H4F • "Do you know how I write was – I just sound it out and write it." – 5R21M

Two strategies are described in the global strategies column – trying again and practising. 5R18M, 5R25M and 5R22F expressed that it is necessary to think about the problem in a different way when you try again. Aside from 5R22F, children discussed trying again in a transsituational way, indicating that they were aware of the overall academic usefulness of this strategy. 1H3M and 5R7M talked about practicing in relation to their skill in tasks like drawing and reading. This suggested that some children were explicitly aware that practising was useful in furthering their skills in specific areas.

Comments about specific strategies were grounded in particular contexts. This was either reading for children using the reading PVT or spontaneous comments that had to do with the PVT activity. Both 1H5M and 3R17F described strategies that would progress them toward the goal of finishing the story. 1H5M talked about a chunking strategy that could be useful if he was stuck on long and difficult words and 3R17F indicated that if she got stuck, she could simply make up her own ending for the story. 1H1M, 1H4F and 5R21M's comments represent strategy knowledge that was not related to the pictured learning situation, but rather to the PVT interaction. This strategy knowledge was embedded in and responsive to what they were doing during the PVT task. I emphasised that they could complete their PVT however they wanted, so these comments resembled examples from metacognitive studies that used self-selected activities (S. Robson, 2010; Rowe, 1989; Whitebread et al., 2009).

7.4.4. Metacognitive regulation – planning, monitoring, control and evaluation of cognitive processes

Children's comments showed evidence of regulatory skills and the comments in this category highlighted the hazy distinction between online and offline processes. As previously discussed in section 4.1, the online/offline metacognition distinction is an area of active debate (Gascoine, 2016). Some of the comments I coded in the **planning**, **monitoring** and **evaluation** sub-categories toe the line between online and offline. It is likely that other coders with different beliefs about the online/offline distinction may disagree with my assessment. This is because some comments I coded as **regulation** were not related to what children were doing during the PVT task (i.e. colouring/writing/talking). Some comments were probably based on their reflections of past experiences (retrospective judgments) or imaginings about the pictured child's mental processes (prospective judgments). Sometimes it was difficult to tell whether they were concentrated on the task at hand, reflecting on something they had done or imagining some new task. I have acknowledged that metacognition is bounded within the context it is demonstrated in and not necessarily indicative of a child's overall metacognitive ability. This was discussed in chapter 4 and will be further emphasised in chapter 9. The same child may have demonstrated different metacognitive competencies depending on the task, place and their current emotional and physical state (among other contextual factors). Therefore, it was more interesting to explore what children's comments indicated in terms of metacognitive regulation rather than to be overly concerned about online/offline distinctions. I will return to the online/offline distinction in chapter 10 (see section 10.3).

There were fewer comments coded to **metacognitive regulation** than **metacognitive knowledge** (see table 28). This was similar to Robson's (2010) study using reflective dialogue and was likely related to reflective methods being better at eliciting off-line metacognitive knowledge. Children's comments showed very little evidence of metacognitive control, which was contrary to other studies using PVTs that found substantial evidence of metacognitive skilfulness (Wall, 2008; Wall et al., 2013). However, metacognitive skilfulness combines metacognitive control and metacognitive knowledge of strategy (Veenman et al., 2006). Therefore, if this study had combined the two, the results would have been more in line with previous studies using PVTs. Comments coded as **metacognitive control** all related to the PVT activity:

> *"What does a "y" look like? Flip it back over [partner had flipped her paper over to show her the "y" in her name so she could copy it but had flipped it back before she finished] You can do it for me." – 3R15F*
>
> *"They might be learning to write the letter 'r' for red – r-e-d (sounding out)" – 3R5M*
>
> *[in response to partner saying that the peach marker was coming out orange on the paper] "Maybe if you do it gently it might go this colour [peach]" – 5R17F*

These comments indicate that children used control not only to direct their own learning processes, but also to direct the processes of others. 3R15F wanted to write all our names on her PVT and asked her partner for help writing her name. After trying to copy 3R17F's name off the back of her paper without success, she asked her to write the "y" for her. Similarly, 5R17F suggested a way for 5R18M to achieve the colour he wanted for his picture. 3R5M used a sounding out strategy to help him spell "red." This albeit limited data about children's control processes lines up with my conclusions from the last section (section 7.4.3). Children could use independent strategies that were responsive to the immediate problem, particularly when pursuing self-directed goals (i.e. writing a partner's name, getting the correct colour).

Children's planning comments included a mix of statements that reflected their planning processes in the PVT activity and what they imagined the children in the PVTs to be doing (see table 32 below).

Table 32: Examples of comments coded as **planning**

Planning in the PVT activity	Imagined/predicted planning in pictured situation
"I'm gonna make a message in their brains." – 3R16M	"Working together and making stuff together. Thinking about what to draw and paint and do. Thinking really really hard." – 2S10F
"I'm gonna mix these light green and dark green together – oh, look it's black." – 5R6M	"(It's good) Doing the words first and then trying to guess what the words are" – 1H9M
"Some of mine are happy and some are sad – I'm gonna draw a line and the big ones are happy and the wee ones are sad" [there's a line in their playground and younger children can't cross into the older children's playground, but older children can cross into theirs] – 6R6F	(What are they learning?) "Numbers, maybe they're drawing numbers and then they need to count it." – 1H2F

The comments in the left column were the result of children narrating what they were about to do and related to what they were colouring or drawing in the moment. They were able to use planning to set up the kind of picture they wanted and to satisfy their curiosity about mixing colours. The comments in the right column hinted that children were aware that there is an order to academic tasks. For example, 1H9M and 1H2F's comments could have related to the sequence their teacher had previously laid out for tasks in their classroom. Later, they may have used their experiences with teacher-led planning to organise academic tasks themselves. 2S10F's comment indicated that she was aware that forethought was important. Admittedly, there were few comments in planning, so it was difficult to dig deeper into children's planning skills.

Looking back at section 7.4.2 and children's task skills, it was likely that feelings about tasks were important to children's planning.

> *(Is it easy or hard when you're learning something new?) "Easy because if you see something easy, it's easy to do." – 2S11M*

This was interesting because it suggested that 2S11M (and his partner who agreed with him) may have mentally framed tasks in response to feelings of ease/difficulty. This echoes evidence that learners rely heavily on a subjective sense of processing fluency when learning (Reber & Greifeneder, 2017). 2S11M's comment reflected his previous experiences of undertaking academic tasks where his mental processing was fluent, feeding into his feeling that the task was easy. Planning a task involves retrieving relevant knowledge from memory, so the way children felt when undertaking previous academic tasks probably contributed to their expectations for how they would process a new similar academic task. Children who usually have trouble with academic tasks would probably set different and lower expectations for themselves than 2S11M, impacting the way they plan for and approach a task.

Children's monitoring and evaluation comments were closely related and showed overlap. This overlap was both in coding and the key points that emerged from considering them. Therefore, I will present them together to avoid repetition. Like planning, their comments reflected monitoring and evaluation of what they were doing during the PVT activity as well as imagined processes in the pictured situation. Additionally, there were some comments that reflected children's ongoing monitoring and evaluation of their progress with learning letters. Table 33 contains examples of children's comments.

Table 33: Examples of children's monitoring/evaluation comments

Within the PVT activity	Imagined/predicted	Ongoing progress
	Monitoring	
(corrects partner's writing) "No, up the way!" – 3R17F	"I'm stuck...to tell an adult" – 1H8M	"We're finishing our curly caterpillar letters" – 3R12M
"I think I have 6 letters in my name – 1- (first letter from name), 2-(second letter from name) (etc. until he got to 6)" – 5R19M	"Hard because I can't read books. Then it got easier and easier cause he saw the letters that he knew and he learned." – 3R17F	(What new things are you learning?) "Letters – we've only got 'z' to go – tomorrow we'll learn 'z' and that'll be us." – 5R10F
(after making a mistake in colouring) "Will Ms (teacher) see this? You can add things to it if you want? (I tell her that you can, and she turns her colouring mistake into a patch of grass) – 6R6F	(in response to 5R11F's answer "some people work a bit slow and some people work a bit fast") "Yeah and then you get mixed up." – 5R12M	(What are they learning?) "We normally learn about letters nearly everyday. We've learned nearly all the letters. We learned some diagraphs. (like what?) We learned qu." – 5R18M
	Evaluation	
(draws face on person in PVT) "There now she can see and smile and talk!" – 6R1F	(He feels) "Happy because he just learned to read and he readed the whole book by himself" – 1H9M	(What are they learning?) "New letters, all of them! We learnt all of them even x" – 5R26M
"I got it – yay! [wrote a "y" by herself]" – 3R15F	-	"People are getting better at reading, better at writing, better at working" – 5R25M

There were only a few comments that indicated evaluation and monitoring during the PVT task. However, these showed that children monitored and evaluated their own cognitive processes and the mental processes of others. 6R1F and 3R15F's evaluation comments showed a sense of celebration when they did something the way they wanted. 1H9M's comment also echoed the positive feeling that children associated with reaching a goal. They noticed mistakes and took steps to rectify them. After noticing her mistake, 6R6F used questioning to clarify who would see her picture and what she could do before deciding how to fix it. 3R17F noticed a mistake in the way her partner was writing a letter and corrected her. I also noted that some children asked for a new PVT if they made a mistake with markers or asked for an eraser if they made a mistake with the coloured pencils. Like the comments in the **control** category, comments in the **monitoring** category indicated that children could responsively monitor their progress toward completing their picture the way they wanted.

Children's comments about imagined or predicted monitoring showed that they were aware of metacognitive feelings like getting stuck or mixed up. In bottom-up regulation, conceptual research indicates that metacognitive feelings like getting stuck or mixed up bring cognitive processing to explicit awareness, providing an opportunity to exert metacognitive control (Efklides, 2008). Additionally, most children recognised that the question "What can you do if you get stuck?" referred to the mental feeling of being stuck rather than physically being stuck somewhere. They usually responded to this question by talking about stuck strategies (dependent or independent). This indicated that they probably engaged in bottom-up regulation in response to metacognitive feelings in the classroom. 3R17F's comment about tasks becoming *"easier and easier"* indicated that children were likely aware of the fluency of their mental processing. 3R17F showed that she was able to make a reasoned attribution as to why the pictured child started to find the task easier and easier (they saw familiar letters). The ability to make metacognitive inferences like 3R17F's indicates that that an individual has naive theories about "the meaning of experienced ease or difficulty" (Reber & Greifeneder, 2017, p. 86). Again, these theories can be tacit, allowing the learner to make metacognitive judgments without explicit knowledge of the underlying theory.

Children's comments about their ongoing learning fit with the discussion from section 7.4.1 indicating that they were aware of their progression. In the examples in table 33, children demonstrated that they could track and evaluate their progress against familiar long-term goals like learning all the letters. They saw their skills and knowledge as emerging or developing but were adamant about what they already knew. As discussed previously in section 7.4.2, some of their judgments were accurate, while others were probably not if judged objectively. For example, 1H6F stated that she knew how to do every single word because she had been practicing (see page 160). While her judgment would not be accurate if she was asked to write a long and complicated word, her statement probably reflected her memories of knowing how to write the words her teacher asked her to write. She may have used these previous experiences of knowing to predict her performance if she was asked to write another word. Learners' estimates of their own abilities are generally understood to be flawed and overconfident, although this improves somewhat with age (Buehler et al., 1994; Schneider, 2008, 2010). This study also asked about learning in general rather than the ability to remember a certain skill or piece of knowledge, which would make it more difficult to make an accurate judgment. A child like 1H6F might make a more accurate judgment if they were asked if they recalled how to write a specific word. Her comment (and other children's comments) were reflective of their general experiences rather than a specific experience.

Children seemed to monitor their general learning skills and noticed their progress, sometimes through comparing their skills/knowledge with their younger selves and with others (see also section 7.4.1). This showed that children were aware that their skills were developing but had improved since starting primary school. 5R25M's comment in table 33 about people getting better at reading, writing and working is a good example. In section 7.3, one of the characteristics children associated with learning was time and volume. This showed that they were aware of the time it took to learn things as well as how much they had left to learn. The children's active comparison between themselves and older children and adults seemed to indicate that they thought of adulthood as a developmental destination. When one attained adulthood, they no longer have anything to learn because they know everything. They sometimes even viewed older children in the same way (i.e. previously in section 7.4.1, 5R25M's statement that his older brother in Primary 5 already knows everything). As discussed in section 7.4.3, this had implications for their strategic help-seeking.

It was not possible to tell from the data whether any children engaged in a full self-regulation cycle, moving through the phases of "forethought, performance and volitional control, and self-reflection" (Garner, 2009, p. 409). Instead, regulatory comments were sporadic. The sporadic nature of regulatory comments fits with Larkin's (2010) assertion that young children dip in and out of metacognition as well as Efklides' (2008) bottom-up experience-driven metacognition. It also fits with the nature of PVTs as a reflective exercise that may be better at eliciting more explicit and conscious metacognitive knowledge (Saraç & Karakelle, 2012).

Overall, children's regulation comments tended to be affective and relied on metacognitive feelings and experiences. Previous research has also indicated the importance of metacognitive experiences (Efklides, 2006, 2008; Koriat, 2000; Reber & Greifeneder, 2017). Reber and Greifeneder (2017) put processing fluency at the centre of learners' metacognitive feelings and judgments. This study's findings echoed this research in that children seemed to rely on their felt experiences of tasks, which were affective and cognitive responses to their processing fluency during previous academic tasks. This will be further discussed in section 8.1, which examines the importance of metacognitive feelings and experiences.

7.5. Summary

In this chapter I presented the developing and developed features of the children's metacognition. Sections 7.4.1-7.4.4 showed how metacognitive knowledge of person, task and strategy were intimately combined into personalised metacognitive theories which helped children to explain their experiences of learning. Their theories of learning were already robust in that they could use them to make judgments about learning. Most children were able to find ways of justifying their judgments, even when it was clear that they were still developing more explicit awareness of their criteria for making these judgments. Their justifications were linked to their affective and cognitive experiences of learning and self-concept. Although their metacognitive theories were highly personalised, they drew on common constructs like familiarity, uncertainty and difficulty.

The children's tendency to associate learning with academic work seemed to have implications for the ways they responded to feeling uncertainty or difficulty. There was a general reliance on help-seeking and dependent strategies that seemed focused on the goal of getting the answer right. Children seemed to feel a lack of control over learning goals and potentially over the learning process, particularly in comparison with self-selected or peer-negotiated goals. Teachers were centred in the learning process and viewed as epistemic authorities who decided on the right ways of doing learning. Since the goals of academic work were set by the teacher, children often defaulted to asking her for help as they saw their own academic abilities as still developing. However, when they felt a sense of familiarity or knowing, they asserted their independence.

Children seemed to be responding to a felt sense of their own mental processing fluency in the way that they described their metacognitive feelings. This finding contributes to Reber and Greifeneder's (2017) argument that the concept of processing fluency is critically important to education despite being largely neglected in educational literature. It seemed to be this underlying process that children were trying to describe and respond to through their metacognitive knowledge and regulation.

In the next chapter, I build on the findings of this chapter's bottom-up analysis by conducting a theory-driven analysis to explore the role of implicit processes and social and cognitive structures like culture, socio-economic status and executive functioning. The points this chapter has made about metacognition relying on felt experiences will be important in the next chapter as I expand on the links between affect, cognition and metacognition. Likewise, this chapter raised that classroom culture impacted on how children made sense of their learning experiences. This point will also be expanded on in the next chapter.

Chapter 8. Integrating theory to develop understanding of children’s metacognition

This chapter builds on the findings of the previous chapter by considering the data through the lens of theory, addressing questions two, three and four:

- RQ 2: How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?
- RQ 3: What are the key characteristics of children’s metacognition at the beginning of primary 1 in Scotland as demonstrated in PVT interactions?
- RQ 4: Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their:
    - family background (parents/carers’ education level, socio-economic status);
    - early education (age at start of nursery, early education experiences and opportunities);
    - early skills (self-regulation, executive functioning, verbal skills)?

For questions two and three, I build on the last chapter’s discussion by integrating theory to develop a better understanding of children’s metacognition and conceptions of learning. The previous chapter emphasised the felt quality of metacognition as well as the role of implicit knowledge in the form of tacit metacognitive theories. This chapter expands on the importance of affect and implicit knowledge in the construction and expression of metacognition in the early years by incorporating theory about schematic development (Nutbrown, 2011) and fringe consciousness (E. Norman et al., 2010). It also expands on the importance of culture. I use classroom culture and cultural conceptions of learning as a lens to explore differences and similarities between children’s conceptions of learning in different schools. Question four is addressed using quantitative analysis to explore connections between children’s metacognition and their early skills, family circumstances and early education. The key idea in this chapter is that the children’s emerging metacognition was both affective and cognitive and was formed and functioned within the context of personal, cultural and structural factors.

8.1. Making sense of metacognitive experiences

This section centres on children's metacognitive experiences and how they made sense of these experiences in the PVT interaction. Children's explanations of their metacognitive experiences involved cognitive and affective aspects, often combining them to represent their felt experiences. Drawing on Schraw and Moshman's (1995) classification of different types of metacognitive theories, some children's understandings were mostly tacit while others had developed a more explicit awareness that reflected elements of informal theories of learning. Therefore, the dataset contains different types of explanations which draw on explicit and implicit knowledge to explain how children experienced learning in different situations. By looking at the data as a whole and comparing different levels of awareness, I speculated on how this awareness might develop. I did this by relating the data to literature on metacognitive theories (Moshman, 2017; Schraw & Moshman, 1995), metacognitive feelings and experiences (Efklides, 2006; E. Norman et al., 2010) and schemas (Nutbrown, 2011). This helped to explore how children might have constructed increasingly complex explanations of their metacognitive experiences by building awareness and understanding of the learning process in different contexts.

8.1.1. The prominence of affective comments

Children's comments were often affective, showing that they were aware of their emotional experiences of tasks. Affective comments about specific tasks were coded as **emotional and motivational monitoring** (Whitebread et al., 2009) (see section 6.3.2 for an explanation of the C.Ind.Le framework). There were 100 emotional and motivational monitoring comments in total (in comparison, children made 166 metacognitive knowledge comments and 51 metacognitive regulation comments). The children used information they remembered about their experiences to build simple understandings of learning in different situations. The emotional nature of children's comments aligned with other studies that suggest affect and cognition are intertwined and both impact on metacognition (Blair, 2002; Efklides, 2006, 2008). The prevalence of affective comments about learning was probably also reflective of the children's ages. Wall's (2008) study found that children at Key Stage 1 (age 5-7) made more affective comments than children at Key Stage 2 (age 7-

11), indicating that early reflections on learning may be more heavily focused on emotional experiences.

Most children concentrated on positive experiences, but some children also reflected on negative experiences of tasks. Table 34 provides some examples:

Table 34: Examples of children's positive and negative comments about different tasks

Positive affect	Negative affect
“I like learning at the table because it's fun and I have lots of friends” – 5R10F	“I don’t like the bars because it’s too hard” – 6R3F
“I think that circle time is fun because you get to read stories” – 4N1M	“He’s sad because no one is listening to him.” – 5R22F

Children sometimes used affective comments to describe cognitive experiences like learning, reading and listening as reflected in 5R10F, 4N1M and 5R22F’s comments above. This illustrated the interactive nature of affect and cognition, which are seen as contributing to metacognition in Efklides’ (2008) model of metacognition (see figure 6 in chapter 3). Figure 19 depicts this relationship. Focal awareness refers to what the person is actively paying attention to at the moment.

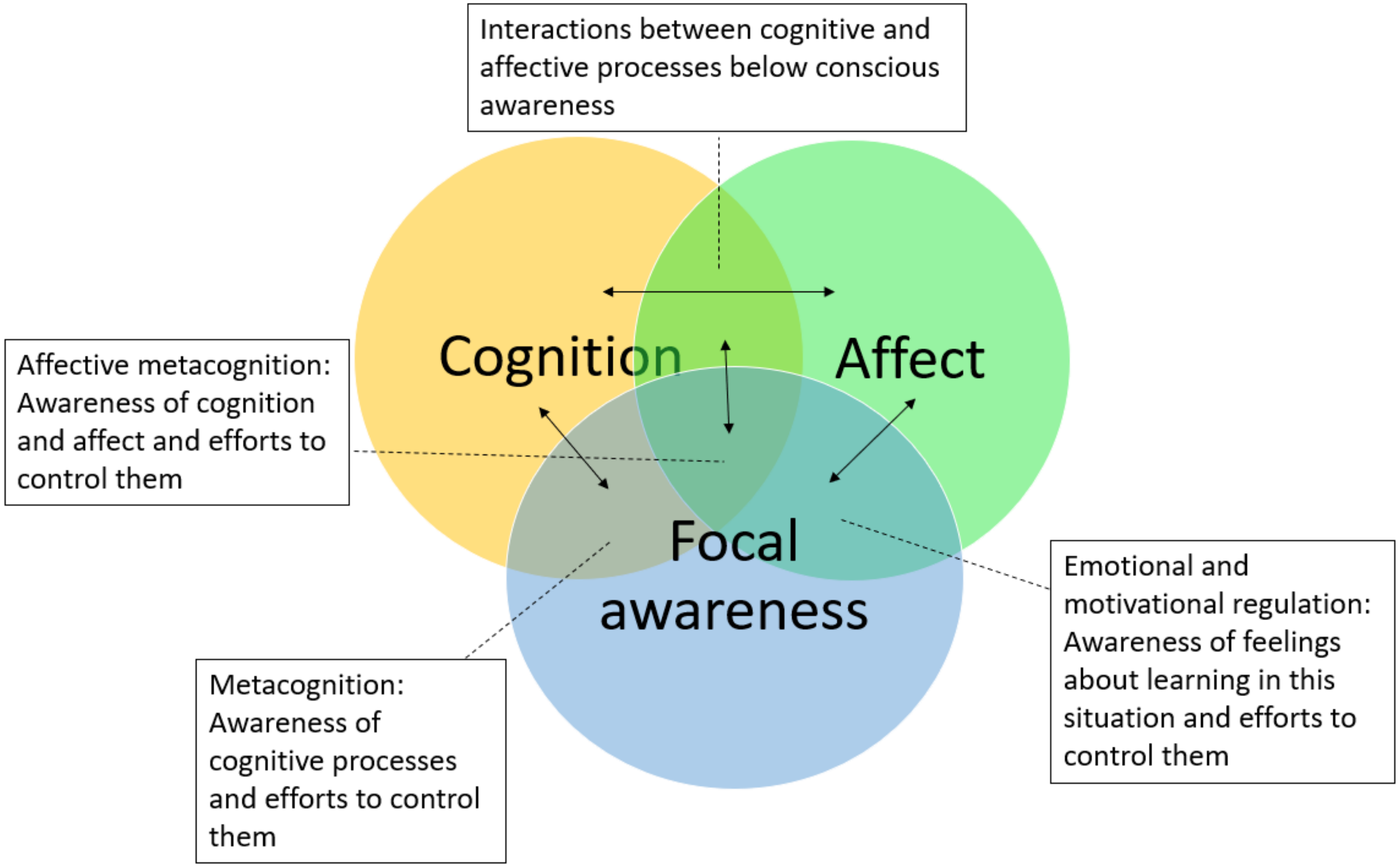


Figure 19: Conceptual diagram of metacognition with interactions between cognition and affect

A person can be focusing on different things depending on what is happening. Attention can be drawn to both internal and external factors. Awareness of internal mental processes could include affect, cognition or a combination. The piece of focal awareness that does not overlap with cognition or affect reflects that often people are not concentrating actively on their internal and mental processes, but on other things like what is happening in the world around them. Table 35 shows illustrative comments for metacognition, affective metacognition and emotional and motivational regulation.

Table 35: Example comments for metacognition, affective metacognition and emotional and motivational regulation

Metacognition	Affective metacognition	Emotional and motivational regulation
[What is good about working as a team?] "Cause you get it done quicker. Cause you get to learn more things and make more things" – 5R12M	"I'm very grumpy cause I can't read yet" – 1H9M	[How do they feel about working with their friends?] "Not happy, because they want it to be quiet and they're all talking" – 2S15F

As discussed in chapter 7, the children's metacognitive knowledge and regulation was reflective of their experiences of learning in their classroom. Research into metacognitive experiences has long acknowledged that both affect and cognition play a part in producing metacognitive experiences (Efklides, 2006; Flavell, 1979). Since metacognitive knowledge is built up through these experiences, it is reasonable to say that metacognitive knowledge itself is associated with affect. A good illustrative example was children's self-concept, which seemed to be a belief that was associated with positive/negative experiences as a learner.

> *"(I feel) Very bad because I think I can't do it" – 2S5F*
>
> *"I don't very much (like) doing my letters, I just don't. I don't know how to do it." – 3R18M*

> *"I kinda like doing work. I am on the top group for reading cause I can see my name on the top group." – 6R7F*

> *"Easy, I'm good at working and all that stuff." – 2S10F*

There seemed to be a positive or negative valence to metacognition as it was experienced, and metacognition was not always a good thing. 2S5F's reflection that she felt very bad when learning something new because she did not think she could do it can hardly be defined as a productive way of approaching learning. Likewise, 2S10F's reflection that she is good at working might not always be useful or accurate when thinking about her mental processing in certain tasks. This was an important point because metacognition is often portrayed as being a good thing, but flawed and inaccurate metacognition can negatively impact learning (Hacker & Dunlosky, 2003; Nisbett & Wilson, 1977). Section 8.1.3 will deal with the implications of flawed and unproductive metacognition on learning.

8.1.2. Building schemas for mental processing

Children demonstrated a range of different attributions for their learning experiences that reflected the schemas they had developed to explain the learning process. In early years literature, schemas often refer to children's attempts to explain why objects and materials act the way they do through experimenting with them in various ways (Nutbrown, 2011). These schemas develop through experience and begin with relatively simple and often affective explanations. Nutbrown's (2011) example from a four-year-old child shows a child ascribing affect to a water wheel to explain why it turns: "the wheel doesn't like to get wet, so it runs fast to get away from the water" (p 4). The children's metacognitive theories were like schemas because they were attempts by learners to explain why their cognitive processing acted the way it did in different situations.

The simplest explanations children gave for their metacognitive feelings and judgments were affective and based on their felt experiences of learning. This emphasises the central importance of affect in early metacognitive regulation before understanding of concepts is involved, such as in studies of infants (Arango-Muñoz, 2014; Goupil et al., 2016). Metacognition often involves interpreting metacognitive feelings and making attributions according to implicit and explicit theories (Arango-Muñoz, 2014; Nisbett & Wilson, 1977).

Before these attributions are possible, it is necessary for children to learn that feelings about learning are worth paying attention (Arango-Muñoz, 2014). Schematic development usually involves the learner paying active attention to certain phenomena and developing increasingly complex explanations for the behaviours of objects and materials (i.e. circular schema and development of ideas about rotation) (Nutbrown, 2011). These increasingly complex explanations are developed as the child repeats actions on objects and materials. The children's explanations indicated that they paid attention to their feelings about learning, reflecting the role of affect in the development of early ideas about learning. As children repeatedly encounter metacognitive feelings like ease and difficulty in different learning situations, they may start to build theories about them that help them to understand their experiences better. Later, these tacit theories about learning may develop into informal and formal theories as learners reflect more on the central tenants of their theories about learning (Schraw & Moshman, 1995). By reflecting on their experiences, learners become more aware of their theories and can start to explain the criteria by which they make judgments. Making sense of metacognitive experiences was not a solely individual activity and social interactions would certainly have had an impact on how children constructed their metacognitive theories. This will be further considered in section 8.2.

As highlighted in section 7.4; however, learners did not need to have an explicit awareness of their metacognitive theories to make judgments based off them. Concerning schemas, Piaget (1969) asserted that children did not need to know the criteria they were using when they answered questions about whether things were alive or not. They had a schema for "alive" that they were able to work from to make judgments, but the information about this schema was implicit rather than explicit. Similarly, children in this study did not need to have explicit awareness of their conceptions of learning or concepts related to mental processing like easy/hard to make metacognitive judgments. Instead, some children's judgments of easy/hard seemed to have a self-evident quality.

> *"Easy, it's just easy" – 3R18M*
>
> *"Hard, it just is." – 5R27M*

These statements seemed to indicate that while these children understood what easy and hard felt like, they took for granted the validity of these experience-based feelings and felt that it was not necessary to justify them. This self-evident quality resonated with Norman et al.’s (2010) description of experience-based metacognitive feelings stemming from fringe consciousness. Experience-based feelings have been described as the products of implicit monitoring of cognitive processing and have “the quality of pleasant or unpleasant,” indicating that they are affective (Efklides, 2006, p. 5). Norman et al. (2010) describe two parts of consciousness – a focal awareness and a fringe consciousness which "binds focally attended sensory information…to relevant contextual background information" (p 68). This background information is not currently consciously accessible, but relevant for current mental processing. Fringe consciousness “has the functions of summarising aspects of this knowledge in a way that may reveal properties of knowledge contents and facilitate their retrieval" (E. Norman et al., 2010, p. 64). Figure 20 incorporates the concept of the fringe into the working conceptual diagram:

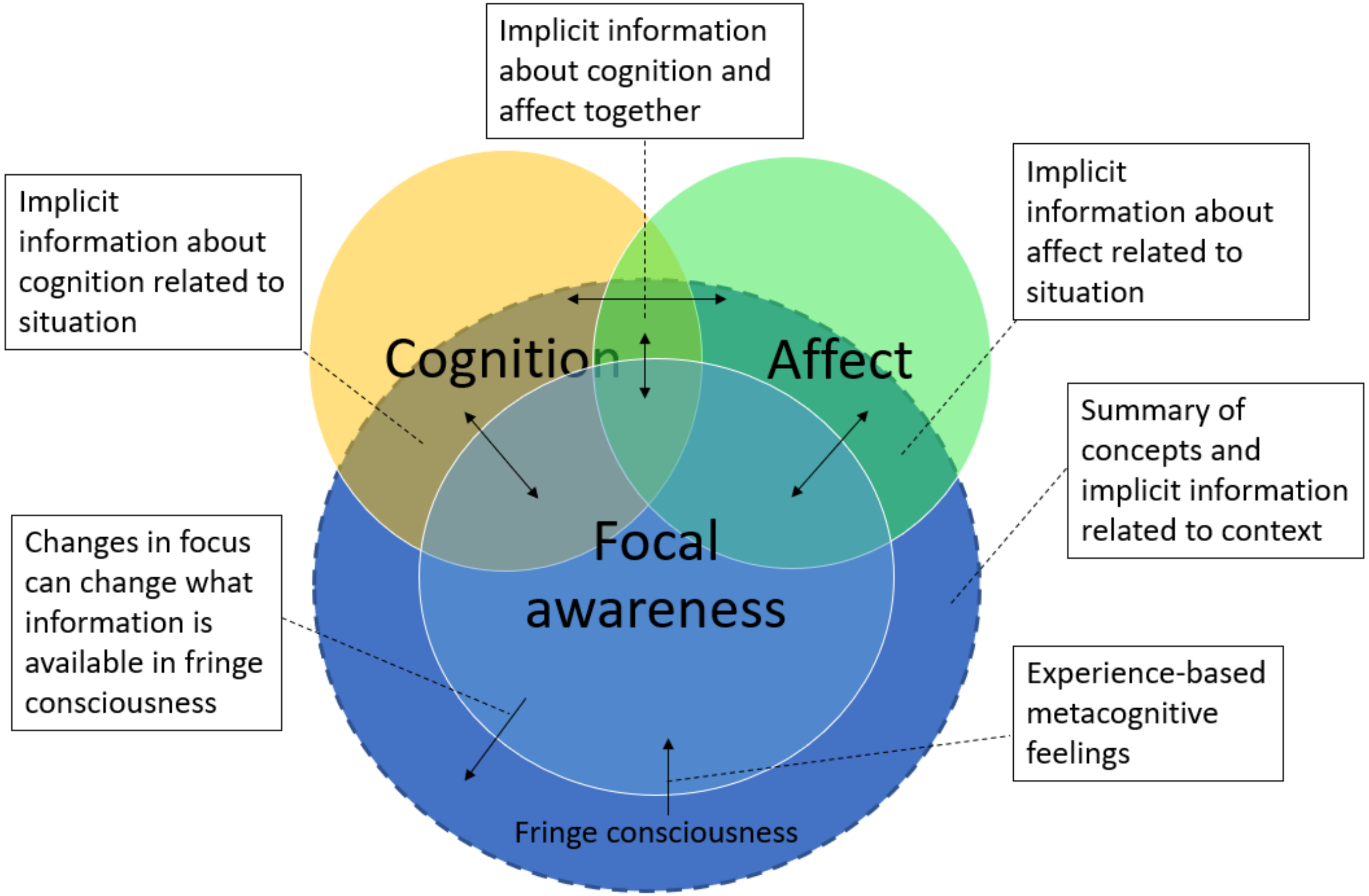


Figure 20: Conceptual diagram of metacognition with fringe consciousness added

In this diagram, focal awareness consists of whatever the learner is currently paying attention to, including online knowledge and current regulation. The fringe summarises potentially relevant implicit information that is closely related to the context in the mind of the learner. Experience-based metacognitive feelings could arise based on this implicit information – for example, a negative or positive feeling of knowing could lead to an easy/hard judgment (Arango-Muñoz, 2014; E. Norman et al., 2010). In section 7.4.2, it was evident that some children connected the concepts of easy/hard to whether they felt they knew or did not know. Judgments are said to be based on assigning meaning to positive/negative feelings that make their way into focal consciousness (Arango-Muñoz, 2014) and may arise before, during and/or after a task based on monitoring (Efklides, 2006, 2008). This is not considered to be a lengthy process of carefully considering the feeling on a conscious level and making a judgment, rather they are short experiences (E. Norman et al., 2010). I had an exchange with two children where they seemed to indicate that they assessed tasks with a cursory look and that surface features were enough for them to decide whether something was easy or hard:

(1) Researcher – "Is it easy or hard when you learn something new?"

(2) 2S11M – "Easy"

(3) Researcher – "Why do you think it's easy?"

(4) 2S11M – "Because if you see something easy, it's easy to do."

(5) Researcher – "How do you know it's easy?"

(6) 2S10F – "Just look at it"

(7) 2S11M – "Yeah, you just look at it"

In this study, I asked children to reflect on their easy/hard judgments as well as their experiences of being stuck and they were able to retrieve varying amounts of information about their schemas related to these concepts. Some children did not verbalise any information about their conceptions of easy/hard, instead relying on their self-evident felt quality. It is important to note that just because these children did not verbalise their conceptions of easy/hard does not mean that they were wholly unaware of them. Rather it could mean that they were vague affective feelings which were difficult to verbalise (E.

Norman et al., 2010). This further underlined that it is difficult to define clear distinctions between implicit/explicit or unconscious/conscious. It is perhaps more useful to think of information on a spectrum consisting of highly accessible to highly inaccessible information. Highly accessible information is only unconscious in that it is not currently represented in consciousness while highly inaccessible information cannot be brought into consciousness in its current form (E. Norman et al., 2010). Both accessible and inaccessible information are useful in making judgments. This way of viewing consciousness highlights the usefulness of fringe consciousness in this study. Namely, theory about fringe consciousness provided a framework through which to view the children's emerging awareness of their underpinning theories about mental processing.

Table 36 shows some example comments illustrating children's varying degrees of awareness/ accessibility of their personal schemas for mental performance, at least as available for verbal reflection in the PVT interaction.

Table 36: Example comments illustrating varying degrees of accessibility/awareness for conceptions of easy/hard

Highly accessible ◄			► Highly inaccessible
Usage of mental and/or generalisable concepts	Using examples and content knowledge	Affective reasoning	Self-evident
"Hard because I can't read books. Then it got easier and easier cause he saw the letters that he knew and he learned." – 3R17F	"This is easy cause if you draw a person you draw a circle and lines" – 1H2F	"Hard because I don't like colouring with a partner" – 3R11F	"It's hard because it just is." – 3R3M
"Hard because you can't remember what you're doing." – 2S12F	"Easy because you just have to draw numbers" – 1H13M	"Easy cause I like playing easy games" – 5R18M	"Hard, it just is." – 5R27M
"Easy because someone is helping" – 3R1F	"Easy because you get to just play and you can have your snack." – 6R8F	"Hard because no one likes it." – 5R1F	"Easy cause it's easy peasy" – 5R16M

Children noticed the affective quality of learning that they experienced as easy or hard. They associated positive affect with easy things and negative affect with hard things, but some did not reflect on their underlying conceptualisations of easy/hard. In these cases, I assigned the comments to the code **affective reasoning**. I defined affective reasoning as any explanation that relied solely on affect, such as liking/disliking something. Research on epistemic feelings or feelings related to cognition has speculated that there are both non-conceptual and conceptual epistemic feelings (Arango-Muñoz, 2014). The main difference is that non-conceptual epistemic feelings are based solely on a positive/negative feeling that affords a certain response while conceptual epistemic feelings involve some awareness of mental concepts and the ability to apply them. For example, a non-conceptual feeling of uncertainty could just be a vague feeling that something is wrong with your mental processing. The negative feeling naturally points toward searching for information in a similar way to the automatic physical response of pulling away from something causing you pain. The person never needs to be aware of the concept of "knowing" or have any metacognitive beliefs related to knowing. When epistemic feelings start to involve mental concepts, they become conceptual but still retain their affective quality. At this point, they incorporate the learner's metacognitive beliefs and conceptions of learning in ways that can have both positive and negative impacts on learning.

In table 36 above, children's attributions in the left two columns show the increasing explicit involvement of concepts in interpreting feelings of easy/hard. Children using examples and content knowledge recalled examples of tasks they found easy. In some cases, they demonstrated content knowledge that hinted at an emerging understanding that being familiar with the material meant the task was easy. 1H2F knew how to draw a person, so she described this task as easy. She easily retrieved relevant content knowledge about the task and her judgment was specifically about drawing a person. In comparison, the comments in the left-most column came from children who used more generalisable concepts in their attributions for easy/hard such as not being able to remember or having a helper. I considered that these comments may have represented children's increasing awareness of their underlying theories of their mental processing. These children had started to assign more sophisticated attributions for their feelings of easy/hard. This may have indicated that their beliefs and knowledge about mental processing were more accessible than children who relied on affect alone. There is a potential connection between the increasing accessibility of knowledge and beliefs and the move from tacit theories to more informal/formal theories (Schraw & Moshman, 1995). With tacit theories judgment is possible but explanation is difficult because most of the information is implicit and inaccessible to consciousness. As theories become increasingly formal, more information becomes accessible to consciousness, allowing judgment and reflection on the underlying theory.

I also considered the connection with Moseley et al.'s (2005) model, particularly the distinctions between information gathering, building understanding and productive thinking. In section 6.3.1, I reflected on the overlap between categories in the Moseley et al. (2005) model. In some sense affective reasoning involves making simple connections between concepts, so it would be considered building understanding. However, as can be seen in table 36, the children are basically stating that they like tasks that are easy and dislike tasks that are hard. Affective reasoning comments relied heavily on information gathering and the connections they made were simple. Conversely, comments using examples and content knowledge often hinted that children could have been trying to relate more complex and generalisable ideas about learning, but that these were difficult to verbalise. These blurred the line between building understanding and productive thinking. For example, 6R8F's comment that learning in the playground was easy because you can just play may have indicated that she had some understanding of the importance of control over goals. She was free to choose an easy task in the playground if she wanted, but she might have to pursue a more challenging teacher-initiated task in the classroom. On the other hand, this could have been my interpretation of her words making her comment more complex than she intended. Comments on the highly accessible end seemed to indicate more productive thinking. Specifically, these comments involved more mental concepts that may indicate that they were more generalisable and less context specific.

8.1.3. Using metacognitive schemas in context

Chapter 7's conclusions highlighted that processing fluency was likely the central mechanism that underpinned children's explanations. It would have been nonsensical to ask children about processing fluency, not only because the term would be unfamiliar but because research indicates that individuals only have indirect access to this mechanism (Nisbett & Wilson, 1977). Instead, learners have conscious access to the products of this process and can use them to explain their experiences of different learning situations (Efklides, 2006; Nisbett & Wilson, 1977). The children were aware of their metacognitive feelings and judgments that stemmed from processing fluency such as easy/hard and the experience of struggle. The fact that they were able to reflect on whether learning something in the pictured context on the PVT was easy or hard clearly indicated that they paid attention to these feelings and judgments when they were learning. This meant that their previous experiences attached to these feelings were available for reflection. Their previous experiences underpinned reasonable attempts to explain what they thought their mental performance or that of others would be like in the situations they thought might be happening in the PVT.

It is important to consider the importance of the context briefly here, although this will be further considered in chapter 9. Metacognition always takes place in a context and the information summarised in the learner's fringe consciousness is background knowledge that the learner perceives as related to that context (E. Norman et al., 2010). Therefore, the knowledge that children were able to access would be related in some way to the PVT interaction, including situations they imagined to be happening in their PVT. Based on children's tendency to separate play and learning, it made sense that most of the knowledge they expressed was presumably related to their experiences in academic situations. A different context could have provoked access to different information and underlying conceptualisations of mental processing. Figure 21 shows the addition of the context to the conceptual diagram of metacognition and will be discussed in more depth in chapter 9.

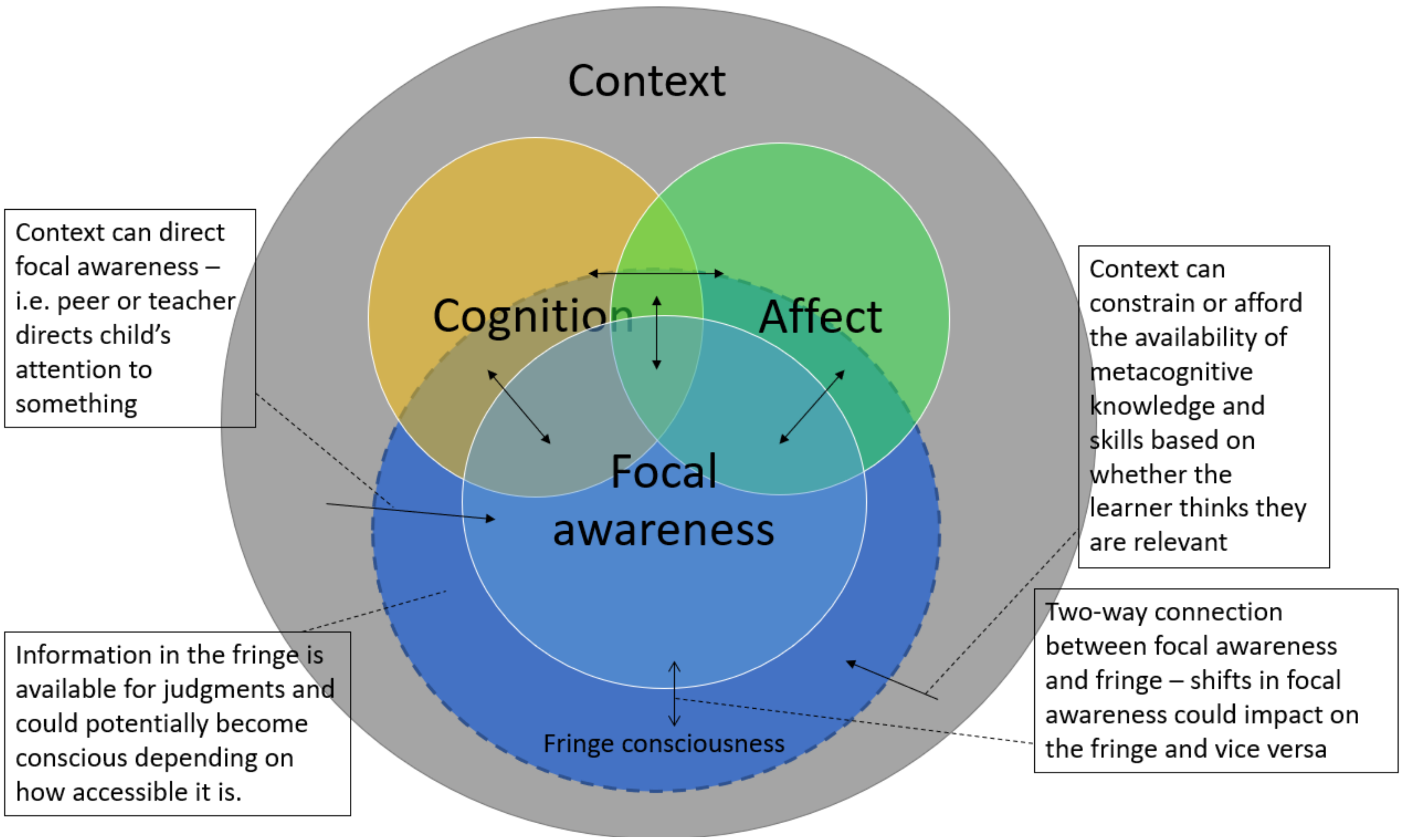


Figure 21: Conceptual diagram of metacognition with context added

Children related a variety of ideas about easy and hard and their attributions showed the potential impact of these feelings on learning. Figure 22 shows the main ideas children related about easy and hard.

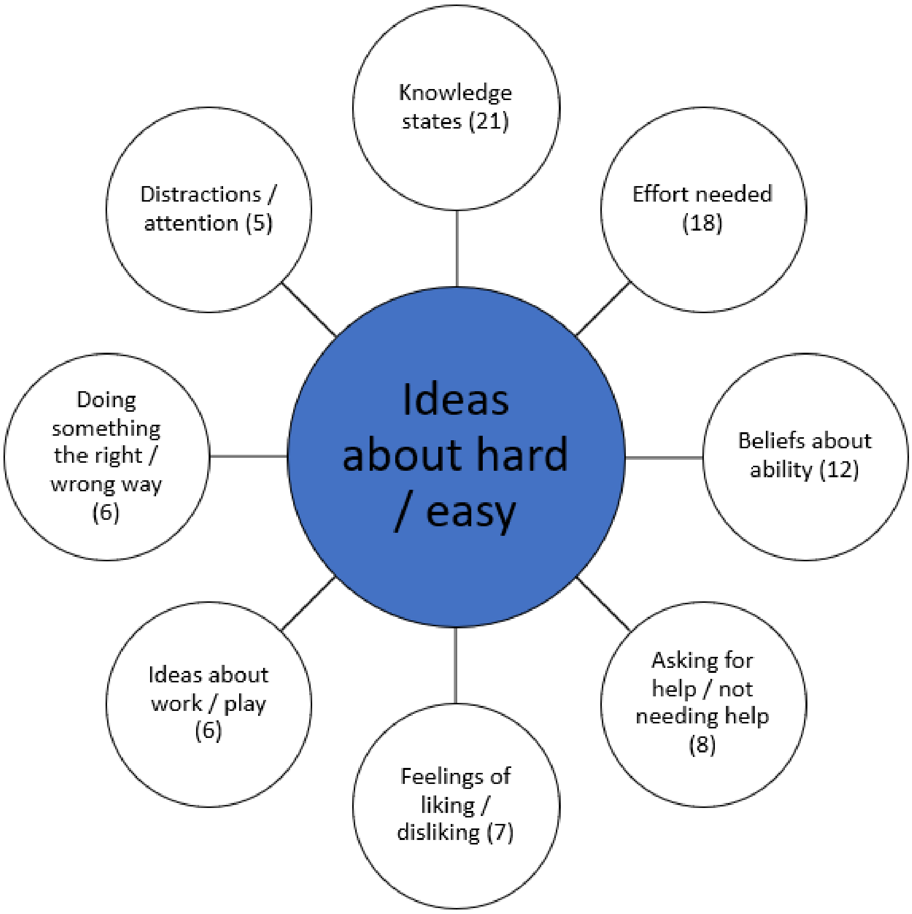


Figure 22: Children's ideas about easy and hard (number of comments)

The individual comments around these ideas were examined in chapter 7, so the comments themselves will not be re-examined. Looking at the broad ideas together; however, does give some indications about how children interpreted feelings about their processing fluency or disfluency. It is necessary to note that since these ideas are being explored together, this is not indicative of each of the children’s schemas around ideas of easy and hard. These were simply some of the criteria they seemed to use to make their judgments. Nevertheless, if we draw on the idea of fringe consciousness providing potential access to theories about processing fluency during a learning experience, ideas of how these attributions could impact learning start to become clear.

Metacognitive feelings of difficulty indicate disfluency in processing and are essentially opportunities to exert metacognitive control by using strategies (Efklides, 2006). Research indicates that feelings of disfluency and difficulty could actually be good for learning as they increase critical thinking and enhance long-term retention (Bjork, 2018; Efklides, 2006). However, these benefits can only be realised if the learner actually persists in the task and does not give up (Reber & Greifeneder, 2017). As figure 22 indicates above, feelings of difficulty could potentially dredge up ideas about self-concept, making mistakes and general negative feelings. This could be particularly bad for learning if the learner has fixed ideas about intelligence (Gunderson et al., 2018; Miele & Molden, 2010) and/or low learning power (Deakin Crick & Goldspink, 2014). Conversely, a feeling that something was easy might make the learner think they already know the information and that they will remember it later without any problems, producing illusions of competency (Bjork, 2018; Reber & Greifeneder, 2017).

It is clear then that the attributions children make for their feelings related to processing fluency have the potential to impact learning, particularly learners' dispositions. Efklides (2006) states that metacognitive experiences "feedback on one's self-concept and have an impact on causal attributions" which "influences personality characteristics and through them the long-term regulation of behaviour" (p 8). It is also clear that learners' interpretations of their fluent/disfluent processing are often not accurate or productive (Reber & Greifeneder, 2017). The children's attributions were sometimes productive and sometimes counterproductive. I define "productive" in this instance as "dispositions that are important for an individual to engage profitably with new learning opportunities" (Deakin Crick & Goldspink, 2014, pp. 20–21). These dispositions have been explored in the UK in both child and adult learners by Deakin Crick and colleagues and are used as a way to explore learners' learning power (Deakin Crick & Goldspink, 2014). Table 37 shows dispositions and provides a summary of data from the study relating to each dimension.

Table 37: Dimensions of the learning power scale

Name of skill	Conceptual definition	Summary of data from the study
Changing and learning	A sense of myself as someone who learns and changes over time	Progression was a theme in the study, in general children saw that their skills had changed and improved over time. However, some of them still made comments that seemed to indicate fixed views of intelligence (Gunderson et al., 2018). They used concepts like "smart" or being "good at" learning to justify feelings of ease. Some children approached learning something new with beliefs that they would be bad at it. Progression and fixed views of intelligence did not seem to be incompatible beliefs. Fixed theories of intelligence still allowed for progression in skills but seemed to rely on ideas that some people were simply better at learning than others.
Critical curiosity	An orientation to want to 'get beneath the surface'	A few children talked about the feeling of not knowing as exciting or an opportunity to learn something new, demonstrating curiosity. However, more children associated not knowing with negative affect. Children tended to focus on the product of learning rather than the process.
Meaning making	Making connections and seeing that learning 'matters to me'	Some children talked about the purpose behind different learning tasks. This was particularly prevalent in children's talk about literacy activities.
Creativity	Risk-taking, playfulness, imagination and intuition	Some comments demonstrated creative use of language to describe mental processes, but overall, there seemed to be limited opportunity for children to express risk-taking and imagination in the PVT interaction.
Learning relationships	Learning with and from others and also being able to manage without them	Social learning was a distinct theme in the data and help-seeking strategies were prominent. Children acknowledged that they could learn from both adults and peers although peers were seen as possibly unreliable sources of help. Most strategies for responding to struggle were dependent, but some children's comments seemed to indicate that they were strategic in analysing the situations where they needed help and where they did not.
Strategic awareness	Being aware of my thoughts and feelings and actions as a learner and able to use that awareness to manage learning processes	Children's comments showed that they were aware of the learning process to varying degrees and used their theories related to learning to generate attributions. It was unclear whether awareness of strategies translated into regulation as strategy use is notoriously dependent on the situation.

Resilience	The readiness and openness to persevere in the development of my own learning power in the face of challenge	Some children demonstrated resilience through their comments about trying again when faced with struggle. However, some other children seemed to have low power in this area which seemed to be related to negative perceptions of their own abilities. In general, mistakes were viewed as negative, which seemed to be related to children's emphasis on the product of learning and the importance of doing things in the correct way.

*Table and conceptual definitions from Deakin Crick & Goldspink (2014, p 21)

Learners learn how to interpret and differentiate their metacognitive feelings and “their beliefs and strategies so that they match the demands of the tasks and the situations” they are in (Efklides, 2006, p. 10). They often do this with help from others and construct metacognitive theories within a social context, usually school (Efklides, 2006; Schraw & Moshman, 1995). Literature concerning schemas also tends to emphasise the role of adults in helping provide children with opportunities to further explore their schemas as well as answering their questions about how things work accurately (Nutbrown, 2011; Tizard & Hughes, 2002). In terms of metacognitive theory development, through promoting active and contextualised reflection on children’s metacognitive theories, teachers may be able to push children toward more productive and accurate attributions for their mental performance. For example, children’s learning power could be increased by moving toward an incremental theory of intelligence rather than viewing intelligence as innate (Gunderson et al., 2018) and being more resilient when working through feelings of difficulty (Reber & Greifeneder, 2017). It is important to emphasise that dispositions are not a panacea and an overemphasis on attitudes can promote a deficit view of learners (Kohn, 2015). Instead they are a piece of the puzzle to enable more productive responses to feelings of difficulty. Unproductive dispositions should be addressed alongside teaching appropriate strategies to work through difficulty and creating a classroom culture that centres the process of learning and makes it explicit (Wall & Hall, 2016). This will be further examined in chapter 10, which covers implications (see section 10.4).

8.2. The impact of culture

This section explores the potential impact of culture on children’s developing schemas about learning. Chapter 7 outlined some of the similarities in children’s conceptions of learning and in their talk about learning and highlighted a few notable differences between schools. This section will explore these further, using connections to empirical and theoretical literature as ways of helping to explain differences and similarities between the ways children from different schools talked about learning. The focus of the study was exploring the children’s metacognition, so it was beyond the scope of the study to compare actual teaching approaches and practices in the schools. I was not in any of the classes for long enough to make judgments about the kind of teaching approaches that were used in each school. My talks with teachers were informal and I carried out no formal observations of practice. I state this as a preface and disclaimer that all the information in this section comes from what the children talked about and how they talked about it. That said, research has indicated connections between classroom culture and children's conceptions of learning (Higgins et al., 2007; Pyle & Alaca, 2018; Schraw & Moshman, 1995), so there was a basis for exploring the impact of culture.

The kind of culture that is explored here is cultural capital

> "inculcated through childhood experiences and the cultural practices and values of the classroom, which in turn are shaped by the structure and practices of the schooling system" (Deakin Crick & Goldspink, 2014, p. 29).

I do not view cultural reproduction of practices and values as passive transmission of beliefs from parents and teachers to children, but as an active process with both adults and children playing a role (Calarco, 2014; Deakin Crick & Goldspink, 2014). Like children, adults need not be explicitly aware of their own theories of learning for them to impact on children's perspectives of learning – all people can have tacit theories about learning or informal theories that have explicit and implicit aspects (Schraw & Moshman, 1995). Their beliefs and values will impact on the way that they speak to learners (Gunderson et al., 2018), model strategies for problem solving during learning (Calarco, 2014) and allocate time to different activities (Martlew et al., 2011).

8.2.1. School differences and similarities in children's talk about learning

As explored in section 7.3, children seemed to have rather traditional views of learning which were teacher-centred and outcome-oriented, but there were some differences in how they talked about these views. To explore school differences, I created a series of crosstabs in NVivo to explore characteristics of learning and metacognition by school and consulted my notes on the feedback sessions, which were already grouped by school. Table 38 sets out some of the key characteristics of children's talk about learning in different schools. School 4 is not included because only one child took part, so it was difficult to draw together key characteristics about learning in their school.

Table 38: Characteristics of children's talk about learning by school

	School				
Characteristic	School 1	School 2	School 3	School 5	School 6
Learning tasks	Mostly talked about literacy, numeracy and drawing	Talked about a wide range of tasks – literacy, arts and crafts, numeracy, health and wellbeing, learning social skills	Mostly talked about literacy, numeracy and drawing	Talked about a wide variety of tasks – literacy, numeracy, drawing, learning French and traditional Scottish words and topical work like firework safety	Mostly talked about games and sports due to all children choosing playground template
Classroom atmosphere	Learning behaviours framed in a positive way, included normal expectations of learners in a classroom – sitting with crossed legs, raising hands, putting lids on pens	Talked more about social skills than other schools, phrased them in both positive and negative ways – i.e. being kind, being rude, hitting, helping others, and sharing	Heavy focus on rules and behaviour management systems. Tended to frame these in a negative way such as losing golden time for talking or breaking the rules.	Usage of mental concepts like *"getting it quickly."* More comments about independent strategies in PVT activity, but fell back on asking for help in feedback session.	In the feedback session, the children placed a high emphasis on independent strategies and emphasised that it was important to try to get the answer yourself before asking for help.
Conceptions of learning (from feedback session)	Differentiated starkly between outside play and learning. Emphasised that the environment was not good for traditional learning activities like doing worksheets.	Agreed that you did not learn outside. Emphasised that the outdoor environment was not good for traditional learning activities like doing worksheets.	Agreed that you could not learn outside. Needed to be prompted twice before making slight concessions that you could learn to be kind or to be friends with additional questioning	Initial agreement that learning did not happen outside, but this was quickly challenged by other children listing things you could learn outside such as games and outdoor learning	Disagreed adamantly that you could not learn outside even though the prompting comment *"we learn inside, that's just the way we learn"* came from this school.

A major difference that emerged in conceptions of learning was that children from some schools seemed to have developed a less rigid view of learning as classroom work by the end of the year. These children were more open to accepting that learning could happen outside as well as inside. Children from school 6 seemed to have developed the least rigid views of learning by the time I returned for the feedback sessions. They disagreed immediately with a comment that was made by a learner at their school earlier that year that *"we learn inside, that's just the way we learn"* [6R8F]. Additionally, they placed a high emphasis on independent strategies and reasoned that it was important to try to get the answer themselves because if they just asked the teacher they were not learning. By the end of the year, they seemed to have the least teacher-centred view of learning. Overall, the comments children made seemed to reflect their classroom culture to some degree. This was definitely the case by the end of the school year when I returned for the feedback sessions, but as table 38 shows, some differences were evident even early in the school year.

Culture likely impacted on children's beliefs and knowledge about learning through their experiences and the way they made meaning from their environments. Bronfenbrenner (1979) suggests that children's development takes place within different microsystems (e.g. home, school) which are connected through mesosystems (e.g. relationship between home and school). Exosystems include institutions and organisations that the child does not directly interact with, but which have indirect influence on their lives through their microsystems and mesosystems (Hayes et al., 2017). These may be educational policies and initiatives, government agencies and the mass media. Exosystems embody attitudes and ideologies of the culture present in the macrosystem but may also influence them. Figure 23 incorporates the impact of culture on the study's model of metacognition.

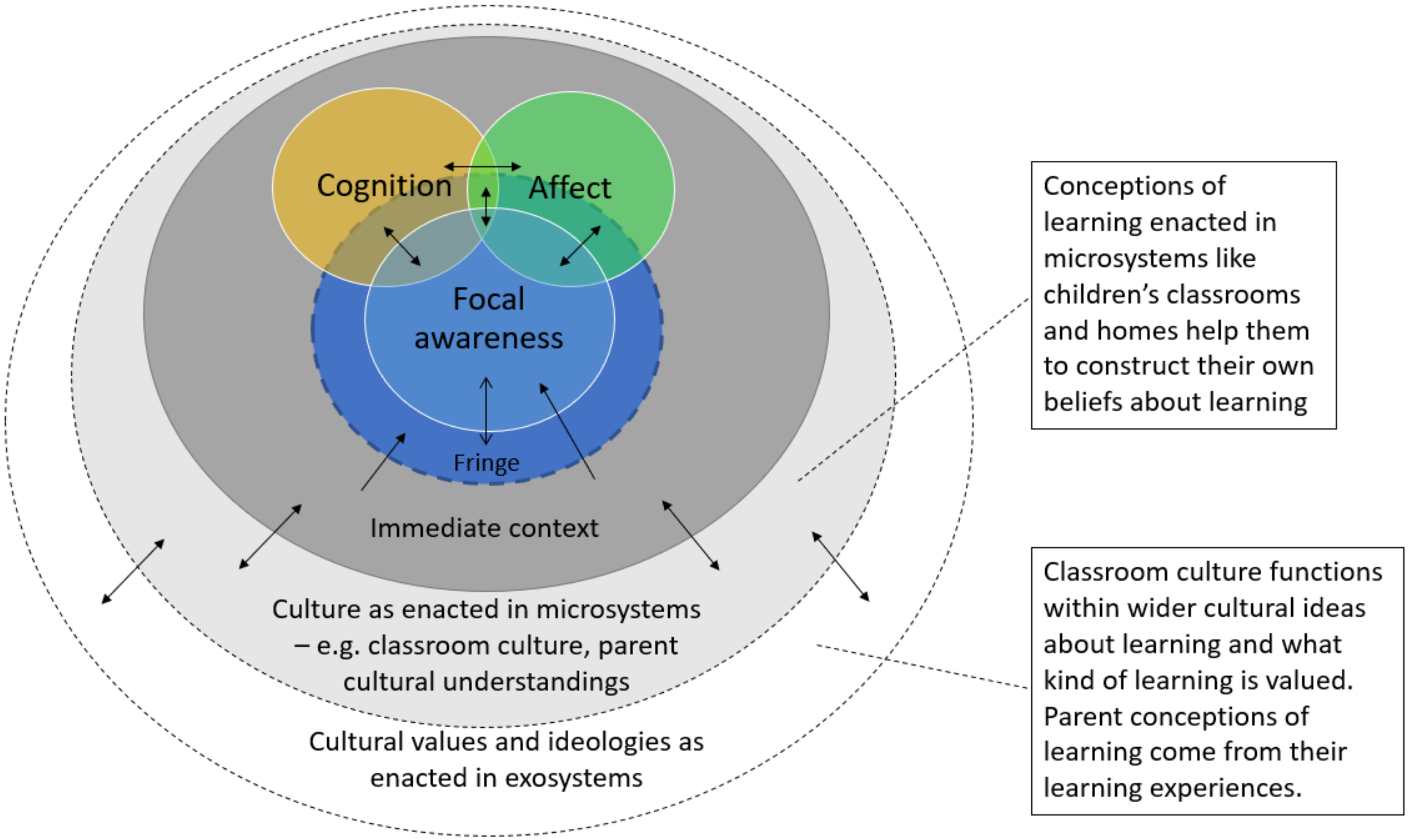


Figure 23: Conceptual diagram of metacognition with culture added

Although an in-depth consideration of the values espoused by the Scottish Curriculum for Excellence is beyond the scope of this study, it is worth mentioning that there is tension between the curriculum's presumably process-oriented framework and a societal fixation on measurable outcomes (Priestley & Minty, 2013). Advocates of a play-based primary 1 have even gone as far as to say that with the reintroduction of standardised testing in primary 1, "teachers are being asked to reconcile two competing ideologies: building a play-based curriculum or teaching to test" (Palmer, 2017, p. 28). The new Scottish National Standardised Assessments (SNSA) measure only literacy and numeracy at primary 1, which may provide some explanation for why the children talked so extensively about literacy and numeracy. It is possible that the emphasis on the measurement of literacy and numeracy skills translated into teachers prioritising these skills in the classroom, prompting children to associate them most strongly with learning. It also seemed as through the high societal value assigned to outcomes had been reproduced by children within their own beliefs about learning. This was evident in how children conceptualised learning, talked about mistakes and the right and wrong ways of going about learning (see section 7.3) As Hayes et al (2017) explain, societal beliefs and values may impact on the way children think about learning, but only if they are experienced by children within their more proximal microsystems and mesosystems. This may indicate that children perceived a focus on outcomes in their classrooms.

Classroom culture was a microsystem that had an impact on the children's conceptions of learning in this study. This was especially clear in that some children's conceptions of learning had become less rigid by the feedback sessions at the end of the school year. Schraw and Moshman (1995) state that "socially shared conceptions about the nature of cognition are transmitted to children via informal and formal education" (p 362). Like Calarco (2014), I did not consider this to be passive transmission, but rather a process where children constructed beliefs about learning around experiences in their classroom. The way that their teacher talked about learning and highlighted the process and/or product of learning probably impacted on the way children reflected on learning in the PVT interactions and feedback sessions. This has been observed and documented in different schools and stages in the Learning to Learn project (Higgins et al., 2007; Wall et al., 2010; Wall & Hall, 2016).

In the last chapter, I highlighted that the children thought of their teachers as important figures in the learning process. The feedback sessions seemed to confirm this, as some children explained that learning did not happen outside because their teacher was not there. Therefore, it was clear that teachers helped shape children's conceptions of learning and their metacognitive knowledge. This aligned with Hall and Wall's (2016) study which positions teachers as metacognitive role models who can help improve children's metacognitive awareness through "creative combinations of pedagogy, environment and learners' dispositions" (p 403). Pyle and Alaca's (2018) study suggests that the activities teachers actively engage with are important to children's construction of beliefs about learning and play. Their study highlighted that children were more likely to have a dynamic understanding of play and learning as connected constructs if they were in classrooms where the teacher was present in play and incorporated a wide variety of play types. This implies that the teacher's presence in an activity may earmark that activity as learning in children's minds.

In the feedback sessions at school 6, the children's changed beliefs about learning may have reflected a classroom culture where teachers emphasised independent strategies throughout the year. Additionally, their teachers may have talked about and been present in a variety of learning tasks and settings (Pyle & Alaca, 2018). In school 5, many of the children's comments incorporated mental concepts, so it was possible that their teachers modelled the use of mental vocabulary when they talked about learning. It is difficult to make conclusions about classroom culture without direct observations of practice, but there is a wealth of research examining what is ideal practice for developing metacognition (e.g. Schraw, 1998; Schraw et al., 2006; Wall & Hall, 2016). The study's implications for teaching and classroom culture will be further discussed in chapter 10.4.

Although parents' conceptions of learning and play were not examined in the study, children's experiences at home likely impacted on their conceptions of learning and metacognitive knowledge at the beginning of primary school. Calarco (2014) suggests that parents implicitly and explicitly coach their children in their own values and beliefs. In this study, children demonstrated traditional beliefs about learning, so it was possible that their parents/ carers also held traditional beliefs about learning. Studies have indicated that parents view play as important, but perceive it as different from learning (Kane, 2016). In Scotland, East Dunbartonshire's (2017) audit document suggested that parents' preference for a traditional approach was a significant barrier to implementing a play-based curriculum in primary 1. These concerns may indicate that Scottish parents still tend toward traditional beliefs about learning and need to be convinced of the merit of play-based learning.

Overall, considering the role of culture helped develop a better understanding of why children may have arrived at school with traditional beliefs about learning and why their beliefs may have changed throughout the year. In future studies, it would be useful to explore how children's metacognitive beliefs about learning are or are not connected to the actual teaching approaches used in their classrooms.

8.3. Considering the impact of early skills and structures on metacognition through bivariate and regression analysis

This section explores the relationship between the children's demonstrated metacognition and their early skills and family background. Specifically, it addresses research question four. I conducted bivariate analyses and logistic regression analysis to examine interactions between demonstrated metacognition and information from the parent/carer and teacher questionnaires. The independent variables included:

- Highest level of education achieved by either parent
- Household NS-SEC
- Age at start of nursery
- Mean CHEXI score for working memory
- Mean CHEXI score for inhibition
- Mean CHILD score for self-regulation
- Mean CHILD score for social regulation
- Verbal skills rating

These were chosen because they have been theoretically and empirically linked with metacognition and/or early cognitive skills in the literature. Section 5.1 established these connections, justifying their inclusion as independent variables in this study.

8.3.1. Hypotheses and results from bivariate analysis

Drawing on theoretical and empirical associations between the chosen independent variables and early cognitive/metacognitive skills, I made several hypotheses to test using statistical analyses. Table 39 below details these hypotheses.

Table 39: Hypotheses by independent variable

Independent variable	Variable name	Hypothesis
Highest level of education achieved by either parent	Highest Ed	Children whose parents achieved higher education would be more likely to demonstrate metacognition
Household NS-SEC	NS-SEC	Children from households in more professional/managerial NS-SEC categories (i.e. 1.1, 1.2, 2) would be more likely to demonstrate metacognition
Age at start of nursery	Age start nursery	Children who started nursery earlier would have more opportunities to develop cognitive/metacognitive skills and would be more likely to demonstrate metacognition
Mean CHEXI working memory score	Working memory	Children who did not have working memory difficulties (i.e. lower mean scores on the CHEXI) would be more likely to demonstrate metacognition
Mean CHEXI inhibition score	Inhibition	Children who did not have inhibition difficulties (i.e. lower mean scores on the CHEXI) would be more likely to demonstrate metacognition
Mean CHILD self-regulation score	Self-regulation	Children with higher mean scores in teacher-rated self-regulation would be more likely to demonstrate metacognition
Mean CHILD social regulation score	Social regulation	Children with higher mean scores in teacher-rated social regulation would be more likely to demonstrate metacognition
Verbal skills	Verbal skills	Children who were scored as having more advanced verbal skills would be more likely to demonstrate metacognition

There were two distinct groups for the purpose of analysis – children who demonstrated metacognition in the PVT interaction and children who did not (see table 40). Overall, the PVT interactions were very successful at eliciting metacognition with just over 75% of children demonstrating metacognition in the interview.

Table 40: Frequencies and percentages of children demonstrating metacognition

	Number of children	Percentage
No demonstrated metacognition	19	23.5%
Demonstrated metacognition	66	76.5%
Total	85	100%

Analysis involved first using bivariate analyses to explore whether there were any significant differences between the two groups in terms of the independent variables. This was done to examine associations between individual independent variables and whether metacognition was demonstrated. This meant carrying out t-tests and chi square tests depending on whether the independent variables were categorical or continuous. Age at start of nursery, CHEXI mean scores for inhibition and working memory and CHILD mean scores for self-regulation and social regulation were continuous variables. Household NS-SEC, highest parent education and verbal rating were categorical variables. Table 41 shows descriptive statistics for the continuous independent variables.

Table 41: Descriptive statistics for continuous independent variables

Variable	Mean	Standard deviation	Minimum	Maximum
Age start nursery	1.90	1.07	0.42	3.33
Self-regulation	3.07	0.67	1.35	4
Social regulation	2.99	0.63	1.60	4
Working memory	2.32	0.99	1	4.92
Inhibition	2.26	1.01	1	4.91

The continuous independent variables were assessed for normality using the Shapiro-Wilk test and their distributions proved to be non-normal. Although deviance from a normal distribution is often used as an argument against using parametric tests, there is an established argument that parametric tests are robust even when assumptions are violated (G. Norman, 2010). Additionally, the use of bootstrapping can be helpful in establishing that the statistical relationships recorded are genuine (Field, 2013; Zhang & Whitebread, 2017). Bootstrapping uses the sample data as a population, taking repeated samples from the dataset to estimate the sampling distribution (Field, 2013). This allows for parametric tests to be used more reliably on a non-parametric dataset. In the t-tests and regression analyses, I report bias corrected and accelerated (BCa) confidence intervals and *p* values based on 2000 bootstrap samples. If the confidence interval crosses zero, this means that the population value could be zero, suggesting no real effect (Field, 2013; Zhang & Whitebread, 2017).

It should be noted that bootstrapping can only take repeated samples from the original dataset to estimate the sampling distribution, so there can still be problems if the dataset does not represent the population well (Wright et al., 2011). In this case, the concern is that the group sizes were skewed toward children who demonstrated metacognition (n=66 demonstrating metacognition, n=19 not demonstrating metacognition). There is a possibility that the smaller group of children who did not demonstrate metacognition was not completely representative of the wider population in terms of age at start of nursery, self and social regulation skills and executive functioning skills. Representativeness is always a concern when making inferences from the results of statistical tests. The methods chapter (see section 5.3) looked at how the study's sample represented significant population characteristics. However, there was no way to compare the sample to the wider Scottish primary one population in terms of age at start of nursery, regulatory skills and executive functioning. According to critical realism, the researcher should consider whether their inferences make sense in context (Shannon-Baker, 2016). When interpreting the results of the statistical tests below, I consider whether the results make sense in light of other research on the connections between metacognition and the independent variables.

Table 42 below shows the results of the t-tests carried out to compare means between the two groups for age at start of nursery, CHEXI scores and CHILD scores.

Table 42: Mean differences in age at start of nursery, CHEXI scores and CHILD scores between children who did/did not demonstrate metacognition

Independent variable	Metacognition	Mean	Std deviation	Std error mean	*P* value	95% BCa confidence interval	
						Lower	*Upper*
Age start nursery	Not demonstrated	1.89	0.50	0.22	0.97	-0.50	0.50
	Demonstrated	1.90	0.48	0.14			
Self-regulation	Not demonstrated	2.47	0.74	0.17	<0.001*	-1.10	-0.45
	Demonstrated	3.24	0.54	0.07			
Social regulation	Not demonstrated	2.56	0.65	0.15	<0.01*	-0.85	-0.25
	Demonstrated	3.11	0.56	0.07			
Working memory	Not demonstrated	3.26	1.02	0.23	<0.001*	0.69	1.68
	Demonstrated	2.05	0.81	0.10			
Inhibition	Not demonstrated	3.10	1.03	0.24	<0.001*	0.52	1.63
	Demonstrated	2.01	0.86	0.11			

*Statistically significant

The mean age for starting nursery was nearly the same for the two groups (1.90 for children demonstrating metacognition and 1.89 for children who did not). Unsurprisingly, this difference was not statistically significant ($t(32.72) = -0.046$, $p = .97$). This meant there was no evidence for the hypothesis that children who started nursery earlier were more likely to demonstrate metacognition. Since all children had nursery experience from three years of age at the latest, it was possible that additional time in nursery did not significantly impact on children's demonstration of metacognition. However, considering that a large proportion of children in the sample came from advantaged socio-economic backgrounds (see table 43), this may not hold for children from disadvantaged backgrounds who are more likely to benefit from additional early interventions focused on developing self-regulatory skills (R. J. Duncan et al., 2018).

Children who demonstrated metacognition received higher mean self-regulation scores on the CHILD questionnaire than children who did not (3.24 versus 2.47 respectively). This difference was statistically significant ($t(83) = -5.01$, $p < 0.001$) and represented a large effect (Hedges' $g = 1.30$). This meant that teachers generally assigned higher self-regulation scores to children who demonstrated metacognition in the PVT interaction. This made sense because metacognition is considered to be an essential component of self-regulation, if not fully part of the same construct (Dinsmore et al., 2008). It seemed that when teachers considered children's self-regulatory skills using the CHILD questionnaire, they were considering in a broader sense the same metacognitive construct that was picked up by the PVT interactions with children.

Similarly, children who demonstrated metacognition received higher mean social regulation scores on the CHILD (3.11 versus 2.56). This difference was also statistically significant ($t(83) = -3.65$, $p < 0.01$) and represented a large effect (Hedges' $g = 0.95$). As demonstrated in section 3.2, social encounters are considered to have an impact on the formation of metacognition and the PVT interaction was a social encounter. Therefore, it made sense that children who were considered to be better at regulating themselves in social situations demonstrated metacognition more often than those who had difficulty in these situations.

Children who demonstrated metacognition had lower mean scores on the CHEXI working memory and inhibition scales than children who did not demonstrate metacognition. This meant that children who demonstrated metacognition were rated as having less difficulty in working memory and inhibition. For working memory, the mean score for children demonstrating metacognition was 2.05 versus 3.26 for children not demonstrating metacognition. The difference was statistically significant ($t(83) = 5.41$, $p < 0.001$) and represented a large effect (Hedges' $g = 1.41$). For inhibition, the group of children demonstrating metacognition had a mean score of 2.01 versus 3.10 for the group who did not. This difference was also statistically significant ($t(83) = 4.64$, $p < 0.001$) and represented a large effect (Hedges' $g = 1.21$). Working memory and inhibition are considered to especially have an impact on metacognitive regulation, particularly monitoring and control (Bryce et al., 2015; Follmer & Sperling, 2016; Garner, 2009). Working memory and inhibition are both potentially important to verbal expression of metacognition. This is because inhibition involves children's abilities to control attention and cognition, which may have helped children to focus on the most important information in a question or in their memory. Furthermore, working memory involves holding information in mind, such as the questions asked during the PVT interview and the responses their partner gave, and actively working with this information to verbalise an appropriate response.

Table 43 shows the results of the chi square tests used to explore whether there were significant differences in NS-SEC, highest parent education and verbal skills scores between the two groups. Some categories were combined to minimise the cells with expected counts less than 5. Fisher's exact test was used to determine significance due to relatively small proportions of certain characteristics in the sample (i.e. parents with lower educational qualifications, children rated as having low verbal skills). NS-SEC scores were divided into professional and managerial (1.1, 1.2, 2), intermediate (3, 4) and routine and manual (5, 6, 7) occupations as in other studies of associations between household NS-SEC and achievement (Connelly & Gayle, 2019). Verbal categories were collapsed evenly across the scale – the two lowest scores (2, 3), two middle scores (4, 5) and two highest scores (6, 7) were collapsed to form low, middle and high categories.

Table 43: Differences in NS-SEC, parent education and verbal skills for groups that did/did not demonstrate metacognition

Characteristic		Proportion of children, n (%)		Fisher's exact test
		No demonstrated metacognition (n=19)	Demonstrated metacognition (n=66)	
NS-SEC				0.070
1.1 1.2 2	Professional and managerial occupations	10 (16.7%)	50 (83.3%)	
3	Intermediate occupations	2 (25%)	6 (75%)	

4				
5 6 7	Routine and manual occupations	7 (41.2%)	10 (58.8%)	
Highest parent education				0.424
	Secondary	5 (38.5%)	8 (61.5%)	
	College	3 (18.8%)	13 (81.3%)	
	University	5 (16.1%)	26 (83.9%)	
	Postgrad	6 (24%)	19 (76%)	
Verbal skills				0.016*
2 3	Low	7 (53.8%)	6 (46.2%)	
4 5	Middle	8 (19%)	34 (81%)	
6 7	High	4 (13.3%)	26 (86.7%)	

*Statistically significant

In the chi square test, there was a significant association between the child's verbal skills rating and whether they demonstrated metacognition $\chi^2(2) = 9.10$, $p = 0.016$. This seemed to represent the fact that, based on the odds ratio, the odds of a child with high verbal skills demonstrating metacognition was 7.58 times higher than if they were rated as having low verbal skills. The children with low verbal skills were the least likely to demonstrate metacognition. Children with middling verbal skills were still 4.96 times more likely to demonstrate metacognition than children with low verbal skills. It did not seem to matter much whether children had middle-level verbal skills or high-level verbal skills as children with high verbal skills were only 1.78 times more likely to demonstrate metacognition than their middle-level peers. From this analysis, it seemed that verbal skills that were "typical for this age" (a rating of 4 on the verbal scale) were sufficient for children to verbally express metacognition. There were some qualitative differences between children with high and low verbal scores in how they described their metacognition. Namely, children with higher level verbal skills seemed to use more sophisticated language and mental concepts than children with lower level verbal skills. Table 44 below displays metacognitive comments from children in the high and low verbal scores groups.

Table 44: Comparison between children with high and low level verbal skills

Participant number	Verbal score	Comment
5R21M	6	"Harder to learn outside than inside. You can get distracted when you're outside by people asking you to play all the time."
3R17F	3	"Hard because I can't read books. Then it got easier and easier cause he saw the letters that he knew, and he learned."

In this comparison, both children were successful at explaining their reasoning behind what makes something hard or easy. Both used mental concepts like knowing and learning, which were referred to throughout the PVT interaction in the prompt questions. However, 5R21M also talked about the mental state of being distracted making it difficult to learn, acknowledging that both internal and external factors can make it difficult to learn.

Highest parent education and household NS-SEC did not seem to be associated with whether children demonstrated metacognition as neither were significantly associated with metacognition in the chi square test. However, it is important to note that a high proportion of children in the sample (n=60) came from households in the most advantaged NS-SEC categories representing professional and managerial jobs (codes 1.1, 1.2 and 2). Parents and carers also tended to be highly educated, with 56 parents/carers reporting the highest education degree in the household as either a university or postgraduate degree. A sample with more even representation across the NS-SEC categories and education qualifications may allow a better exploration of differences between these groups in terms of demonstrating metacognition.

Although not statistically significant, according to the odds ratio, children from the most advantaged NS-SEC categories were 3.5 times more likely to demonstrate metacognition in the PVT interactions than children from the least advantaged NS-SEC categories. Some research indicates that children from advantaged socio-economic backgrounds enter school with more advanced vocabulary than their disadvantaged peers (Bradshaw, 2011). Therefore, it is possible that this relationship represented differences in children's verbal skills. A contingency table was generated to look at differences in verbal skills between children in the most and least advantaged NS-SEC categories (see table 45).

Table 45: Contingency table for verbal skills by NS-SEC category

	Verbal category		
NS-SEC category	Low	Middle	High
Professional and managerial occupations	7 (11.7%)	27 (45%)	26 (43.3%)
Intermediate occupations	0 (0%)	7 (87.5%)	1 (12.5%)
Routine and manual occupations	6 (35.3%)	8 (47.1%)	3 (17.6%)

Although there were too many cells with low expected values for the chi-square test to be valid, there was some contrast between the most and least advantaged groups in terms of verbal skills. Children from advantaged households were most likely to be rated as having typical or advanced verbal skills for their age with only 11.7% of the group being rated as having low verbal skills. On the other hand, children from disadvantaged households were most likely to be rated as having typical or low verbal skills for their age with 35.3% of the group being rated as having low verbal skills. From the verbal chi-square test, it was clear that children with low verbal skills were less likely to demonstrate metacognition.

I also checked for qualitative differences between NS-SEC groups as research indicates it may be the type of strategies used that differ between social classes rather than whether children demonstrated metacognition or not. Calarco (2014) suggests that strategies differ between middle and working-class children in response to parents' modelling and teaching their own cultural ways of resolving challenges at school. She found that working-class children were encouraged not to bother the teacher and work things out themselves while middle class children were encouraged to do whatever they needed to solve problems at school. There was some potential evidence of this as the two children in the NS-SEC 7 category did not mention asking for help in response to struggle:

> *"I'm thinking in my head" – 3R15F*
>
> *"They just scribble" – 3R16M*

However, children in NS-SEC 5 and 6 mentioned help-seeking alongside some independent strategies, although 3R17F (NS-SEC 6) did mention that the teacher might be busy at one point in the interview. In Calarco's (2014) study, working-class parents reasoned that teachers were very busy, so they thought children should just try their best on their own and trusted that the teacher would notice if they were struggling. The children in this study were still in primary 1 and fairly dependent on the teacher for help with emerging skills like reading and writing. Therefore their status as beginning learners probably outweighed any concerns about bothering the teacher.

8.3.2. Exploring correlations between independent variables and regression analysis

Next, I explored correlations between the independent variables that were significantly associated with metacognition. These correlations were useful because they could be used to examine whether teachers tended to rate children's early skills as consistently high across the board. As demonstrated in the literature review chapters (chapter 3 and 4), there is evidence of considerable overlap between early skills like self-regulation, verbal skills and executive functioning skills (Bryce et al., 2015; Clerc & Miller, 2013; Larkin, 2010; Roebers & Feurer, 2016). Additionally, if the independent variables are highly correlated with each other, it is likely that there will be issues with multicollinearity in the regression model (Field, 2009; Muijs, 2004). Although verbal skills was an ordinal variable, it was included in the correlational analysis with the continuous variables as studies have shown that Pearson correlations are very robust even when ordinal variables are used (G. Norman, 2010). I also ran a Spearman correlation to check for any differences in correlation coefficients between the two tables, but there were no substantial value differences or differences in significance between the parametric and non-parametric tests. Like G. Norman's (2010) findings, Pearson and Spearman correlations were nearly identical. Table 46 below shows the Pearson correlations among all the teacher-rated measures of early skills. The Spearman correlation table is included in appendix C-2 for reference.

Table 46: Pearson correlations among measures of early skills

	1	2	3	4	5

1. Self-regulation	-				
2. Social regulation	.710**	-			
3. Verbal skills	.802**	.552**	-		
4. Inhibition	-.558**	-.582**	-.335**	-	
5. Working memory	-.773**	-.639**	-.627**	.738**	-

** Correlation is significant at the 0.01 level (2-tailed)

It was clear from the table above that all the teacher-rated measures of children's early skills were significantly related to each other. This lent further support to theoretical and empirical claims that there is significant crossover between executive functioning, self-regulation and verbal skills (Bryce et al., 2015; Clerc & Miller, 2013; Larkin, 2010; Roebers & Feurer, 2016). Unfortunately, the high correlations between the independent variables indicated that there would likely be issues of multicollinearity in the regression model. I ran collinearity diagnostics to see if the independent variables in table 46 might be better combined into one variable measuring early skills. Muijs (2004) explains that if the tolerance value for any variable is too close to zero when running collinearity diagnostics, this suggests that "almost all the variance in the variable is explained by the other variables" (p 181). He suggests >0.6 as a benchmark for appropriate tolerance values, with anything below this value being a cause for concern. Table 47 below shows that all the tolerance values were too close to zero, indicating that the variables were possibly measuring the same broad underlying construct.

Table 47: Collinearity diagnostics for early skills measures

Variable	Tolerance value
Self-regulation	.201
Social regulation	.433
Verbal skills	.322
Inhibition	.385

Working memory	.245

Following the results for the correlation analysis and collinearity diagnostics, I decided to combine the early skills variables to construct an overall teacher-rated early skills score for each child. Since there was also additional evidence in the literature about crossover between these skills (Bryce et al., 2015; Clerc & Miller, 2013; Larkin, 2010; Roebers & Feurer, 2016), I did not view this as a unreasonable decision. Since the CHEXI inhibition and working memory scores measure increasing difficulty rather than increasing skill, the scale was reversed to align with the CHILD scores and verbal scores. The children's mean CHEXI and CHILD scores were added to their overall verbal score to yield a composite early skills score (see table 48 for descriptive statistics). The Shapiro Wilk test was used to test for normality and the distribution was non-normal. This variable was added as a predictor variable to the logistic regression model with the outcome variable being whether children demonstrated metacognition.

Table 48: Descriptive statistics for early skills composite score

Variable	Mean	Standard deviation	Minimum	Maximum
Early skills score	18.50	3.90	8.81	25

Binary logistic regression was used to determine whether children were more or less likely to demonstrate metacognition based on their composite early skills score. Table 49 presents the results of the logistic regression. The odds ratio denotes the degree to which the predictor variable increases or decreases the likelihood of demonstrating metacognition. An odds ratio of one would mean that there was no difference in the odds of demonstrating metacognition based on early skills score. In this case, the odds ratio was above one, meaning that the odds of a child demonstrating metacognition increased for each unit increase in early skills score.

Table 49: Logistic regression model for demonstrated metacognition
95% BCa confidence intervals for B in parentheses. Confidence intervals, standard errors and *p* value based on 2000 bootstrap samples.

				95% CI for Odds Ratio		
	B	SE B	*P* value	Lower	Odds Ratio	Upper
Included						
Intercept	-4.71 (-8.40, -2.50)	1.85				
Early skills score	0.34 (0.16, 0.72)	0.11	<0.01*	1.18	1.41	1.68

Note: R^2= .23 (Hosmer & Lemeshow), .22 (Cox & Snell), .33 (Nagelkerke). Model $\chi^2(1) = 19.28$, p<.001.
*Statistically significant

The model was statistically significant ($\chi^2(1) = 19.28$, p<.01.). As table 49 shows, children with higher early skills scores were more likely to demonstrate metacognition than children with lower scores. The odds ratio of 1.41 indicated that for each one-point increase in teacher-rated early skills score, we could expect to see a 41% increase in the odds that the child demonstrated metacognition in the PVT interaction. Taken with the results from the previous bivariate analysis, it was clear that early skills were important to demonstrating metacognition in the PVT interaction. Table 50 recontextualises these results, comparing statements of the children with the lowest early skills scores to the children with the highest early skills scores.

Table 50: Comparison of children with low and high early skills scores

Participant number	Early skills (max 25, min 8.81)	Demonstrated metacognition?	Illustrative comment
1H12F	8.81	No	“Easy for me cause my pencil is really good at drawing”
3R3M	8.83	No	“It’s hard because it just is.”
5R18M	25	Yes	“I have to try to think about what I’ve done and if I get it wrong, I have to try again.”
5R22F	25	Yes	“If you make a mistake on something you won’t do it like that again. We make water towers. 2 big stands with pipes. If they don’t work, we do it differently – that’s learning”

It was apparent that the children with very low early skills scores like 1H12F and 3R3M used much more simple reasoning in their statements. 3R3M relied on the felt quality of something being hard and seemed to think of this as self-evident while 1H12F suggested that her pencil was good at drawing, which made it easy for her. They seemed to struggle more with talking about their thinking, which may have been due to low verbal skills. On the other hand, children with very high early skills scores like 5R18M and 5R22F seemed to have an easier time talking about their thinking and used rather sophisticated mental concepts. 5R18M highlighted the importance of stopping to think about what you have done when you get something wrong before trying again. 5R22F also emphasised the importance of learning from your mistakes and doing something differently if it does not work the first time.

Examining the residuals from the regression analysis allowed me to identify three children who had high early skills scores but did not demonstrate metacognition as outliers warranting further examination. Field (2009) indicates that any cases with standardised residual values close to or above 3 warrant inspection. The three cases with the highest standardised residuals (above 2.5) were children with high early skills scores who did not demonstrate metacognition in the PVT interaction. In these cases, the regression model predicted that they would have demonstrated metacognition based on their high early skills scores. As stated previously, demonstration of metacognition is highly dependent on both internal factors like motivation and external factors such as the context. Therefore, the fact that I categorised these children as not demonstrating metacognition in the PVT interaction does not mean that they were incapable of metacognition. Table 51 shows possible explanations for why these children did not demonstrate metacognition based on their comments.

Table 51: Outliers – children with high early skills who did not demonstrate metacognition

Participant number	Early skills (max 25, min 8.81)	Illustrative comment(s)	Possible explanation

2S2F	23.69	"If you play nicely people will want to play with you, but if you don't people won't want to play with you" "I don't like people not playing with me, then someone comes and helps me"	Choice of content to reflect on
2S6M	19.82	"That's gonna be me and that's gonna be you. They're hitting" [Off topic, joking about peeing in pants]	Off topic
2S7F	19.45	"[what can you do if you're stuck?] Ask my friends to help me. [How do they help you?] By helping you"	Coding decisions

As can be seen in table 51 above, 2S2F's comments were reflective and strategic, but the object of her reflection was mainly social playing situations and her comments reflected emotional and motivational monitoring and regulation rather than metacognition. In the case of 2S7F, her comment reflected help seeking in response to struggle. However, I had decided early on that only help-seeking that indicated a cognitive reason for seeking help would be coded as **metacognitive knowledge of strategy**. 2S6M was off topic for most of the PVT interaction and chose not to reflect on learning during the interaction.

Since the residuals did not highlight cases of children with relatively low early skills who demonstrated metacognition even though the regression model predicted they would not, I examined these myself by looking for mismatches between predicted group and actual group. Table 52 shows some notable cases of children who were rated as having low early skills demonstrating metacognition.

Table 52: Outliers – children with low early skills who did demonstrate metacognition

Participant number	Early skills (max 25, min 8.81)	Illustrative comment(s)
3R6M	9.03	"They (your partner) can colour in the lines for you and not scribble. You know they can help you"
3R17F	12.64	"Hard because I can't read books. Then it got easier and easier cause he saw the letters that he knew, and he learned." "[What can you do if you get stuck?] Just make it up because I do a lot of the time. I just say okay I'll just make it up."
5R6M	12.60	"My hard work is doing two things at the same time."

The cases of children who were outliers in the regression model illustrate the need for further discussion of the impact of the method. It was clear from table 51 and table 52 that children responded differently to the PVT interaction. It was designed to elicit metacognition but did not do so in some highly skilled children and did in some children with low skills. Echoing the conclusions of chapter 4, it was apparent that the PVT interaction impacted on the data that was produced. This which will be considered in the next chapter.

8.4. Summary

This chapter has built up a conceptual model of metacognition in this study by making connections to theory, considering the role of implicit processes and culture in interpreting metacognitive experiences and driving conceptual development. This has developed the study's understandings of children's metacognition and conceptions about learning in response to research questions two and three. It is clear that the way children ascribe meaning to their metacognitive experiences is important for learning. This has implications for teaching and for constructing a classroom culture that promotes metacognition. Wall and Hall (2016) state that

> "a classroom that emphasises metacognition…allows time to focus on the learning process, the sharing of thinking about thinking, and creates spaces in which the learners can act on their reflections (time for reflective and strategic thinking)" (p 408).

Implications will be further explored in chapter 10.

The statistical analysis in this chapter has drawn attention to the importance of early skills such as verbal skills, self and social regulation and executive functioning to demonstrating metacognition. It was clear from the recontextualization of the statistical results that there were qualitative differences in the way children with high and low early skills scores demonstrated metacognition and explained their metacognitive experiences. There are implications for teachers and researchers from this analysis, which will be further examined in chapter 10.

This chapter has also drawn attention to the role of PVTs in creating a context for expressing metacognition. The conceptual diagram built up throughout this chapter has highlighted that the context and culture in which metacognition is expressed are important because metacognition is a situated phenomenon. Additionally, the children who were outliers in the regression analysis emphasise the need to explore the role the method played in co-constructing the metacognition that children expressed in the study. These threads will be picked up in the next chapter, which answers the first research question by exploring the PVT interactions as a context for reflecting on learning.

Chapter 9. Constructing metacognition together using PVT interactions

This chapter addresses the first research question, which considers the impact of the PVT interactions as a context for metacognition in primary 1. Therefore, I have presented this findings chapter last so that it serves to synthesise the understandings presented in the last two chapters. PVTs were created to facilitate talk about learning, but previous studies have tended to employ a relatively hands-off approach to the discussion (Gascoine et al., 2017; Wall et al., 2013). Since this study focused specifically on young children at the beginning of their educational journey, I employed a more hands-on and facilitative approach to the discussion. This approach had implications for the data that was produced in the study.

The central theme of this chapter is that the understandings of learning that children demonstrated in this study were inextricably linked to the context they were expressed in. My use of the word context is broad and includes features of the environment, internal states of the participating children, child-child and child-researcher interactions. These immediate features interacted with the classroom and wider school culture. In this chapter, I look at how the contexts created with the children contributed to the understandings of learning that were recorded as data in this study. This chapter adds to the literature base detailing how the general use of PVTs can promote metacognition (Wall, 2008; Wall et al., 2013; Wall & Higgins, 2006) by considering how additional supports can be employed to facilitate metacognitive reflection in the early years. The study's approach helped to construct a context together with children in which they were supported to make their understandings of learning explicit.

The PVT interactions represented pedagogically-appropriate tools (Wall, 2019). This meant that the approach fit with the Primary 1 curriculum in Scotland and the tasks were familiar and age appropriate. Much pre-literacy work with children in Primary 1 includes drawing and colouring activities where children talk to adults about their drawings and receive support to start writing about their thoughts and feelings (Bath, 2012; Steffani & Selvester, 2009). This had benefits in that the children seemed to know what to do and most were not hesitant to speak during the activity. However, there were also limitations in using an activity that was aligned with normal classroom practice which will be examined in this chapter.

9.1. Overview of the contexts for PVT interactions

Although the PVT interactions were relatively structured in terms of the overall approach (see section 5.5.4 for a description of the approach), each context was different because they were constructed together with different participating children. Some features of the PVT interactions, such as the questioning approach, were stable between different interactions. Additionally, most PVTs were used in more than one interaction (see section 5.5.3 for a breakdown of PVT choice by school). However, it is important to note that even these stable features were interpreted by the children and sometimes given different meanings. Figure 24 below shows two pair work templates which reflect very different contexts.

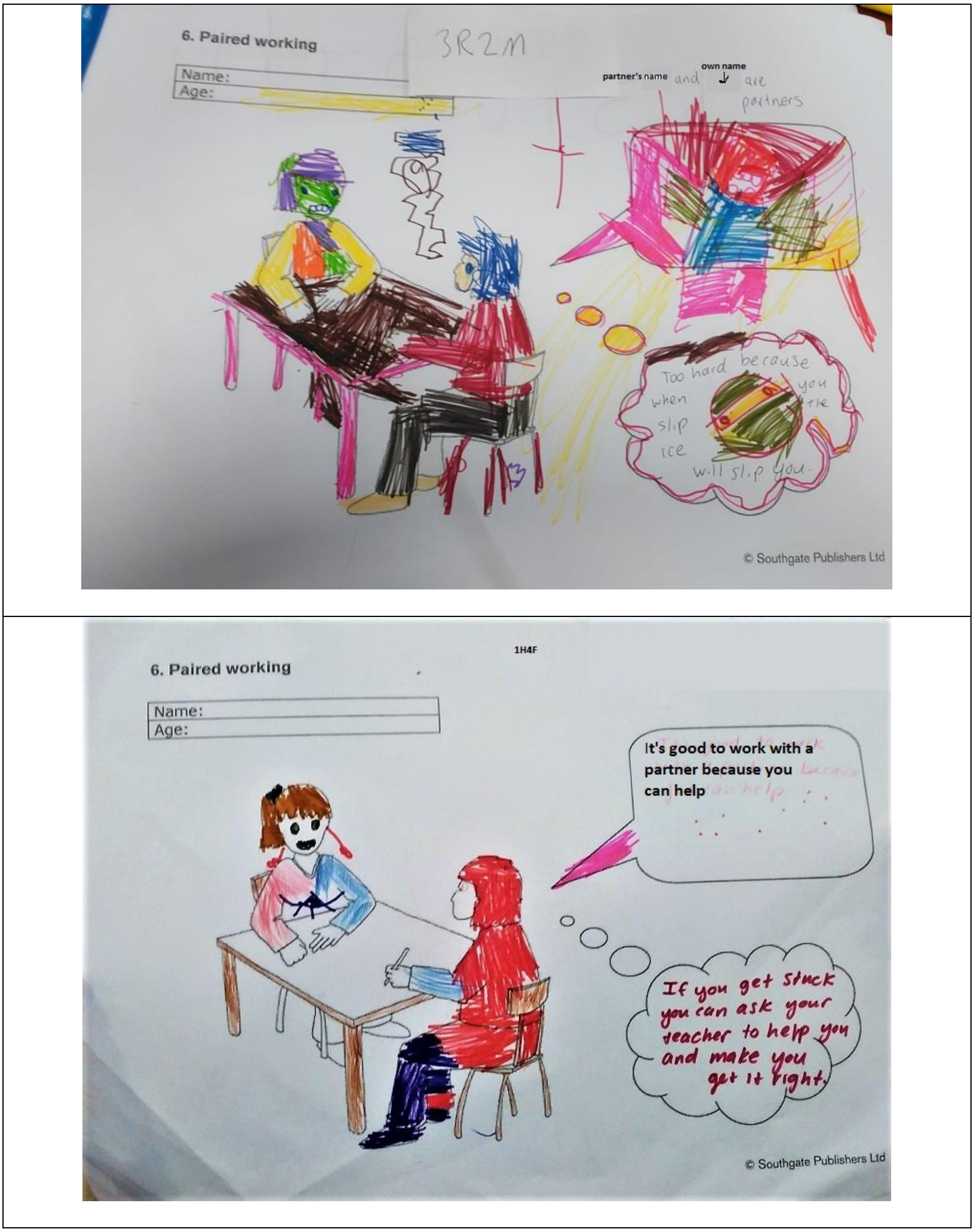


Figure 24: Two paired learning templates depicting different contexts for discussion

At the top, 3R2M chose to turn one of the children in his PVT into a zombie and drew a Teenage Mutant Ninja Turtle in the thought bubble. 3R2M dominated this interaction and the context was heavily influenced by his interest in talking about zombies, presumably because this took place the day after Halloween. He resisted all my attempts to bring the discussion back to the topic of learning and most of the PVT interaction was focused on topics other than learning. Neither 3R2M nor his partner 3R3M made any comments that were classifiable as metacognition in this study. This was not necessarily because they were not metacognitive, but they did not express metacognition in this interaction because they were not focused on reflecting on learning or any other cognitive process. Conversely, 1H4F's PVT reflects a productive discussion where she and her partner 1H3M developed talk around the benefits of working together. Although this is an extreme example, it shows how contexts could differ depending on when they took place and the interests of the learners engaging in the conversation.

Figure 25 below shows the conceptual diagram of metacognition with the addition of immediate contextual features and the shaping influence of classroom and school culture. The dotted line around classroom and school culture represents that even though they are not depicted in this diagram, school culture can be shaped by other systems like exosystems and macrosystems as detailed in the last chapter (see section 8.2) (Bronfenbrenner, 1979; Hayes et al., 2017). As highlighted in the previous chapter (see section 8.1.2), children may have a wealth of knowledge and beliefs that relate to learning but will only access what they perceive as relevant to the context.

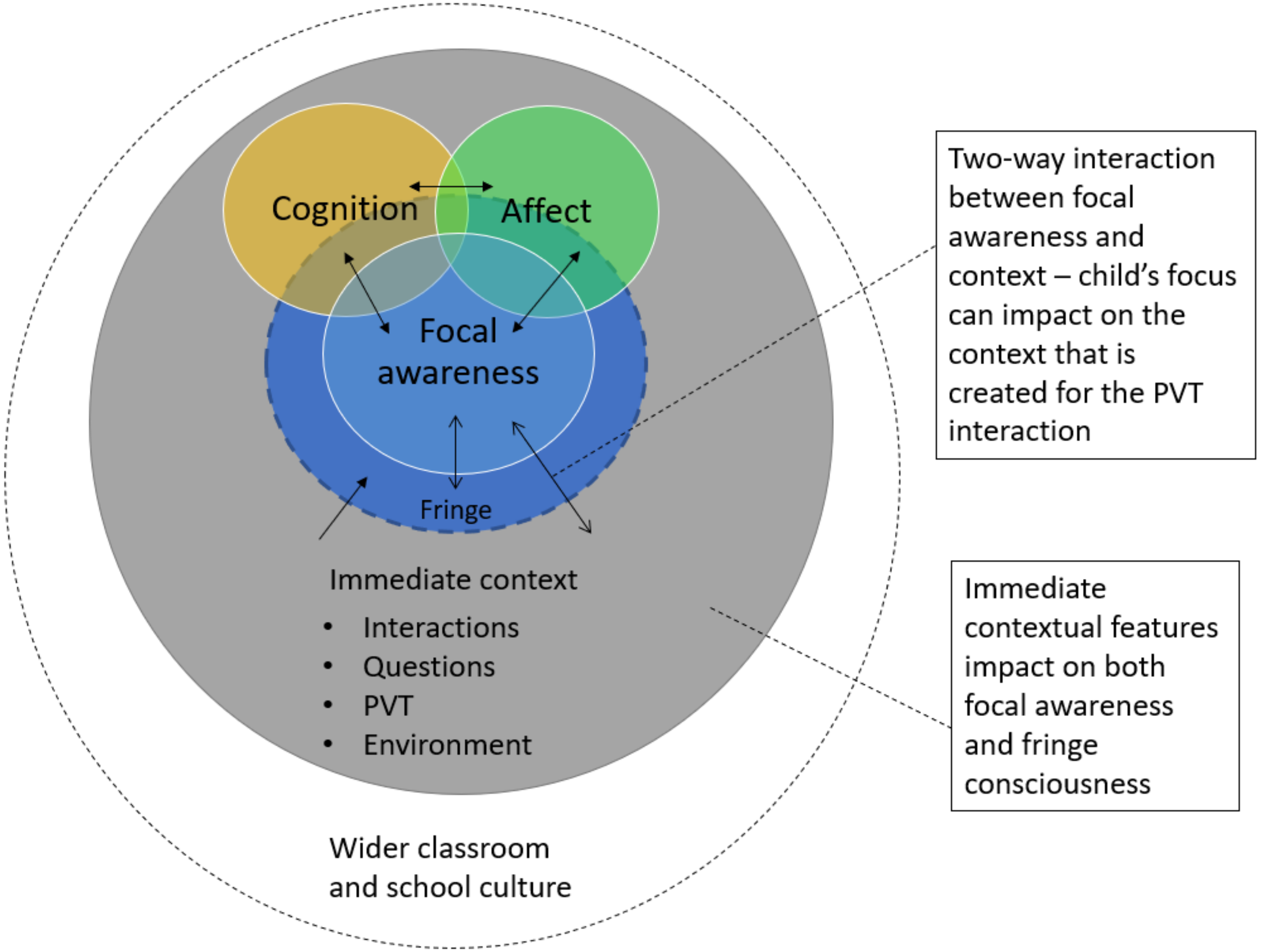
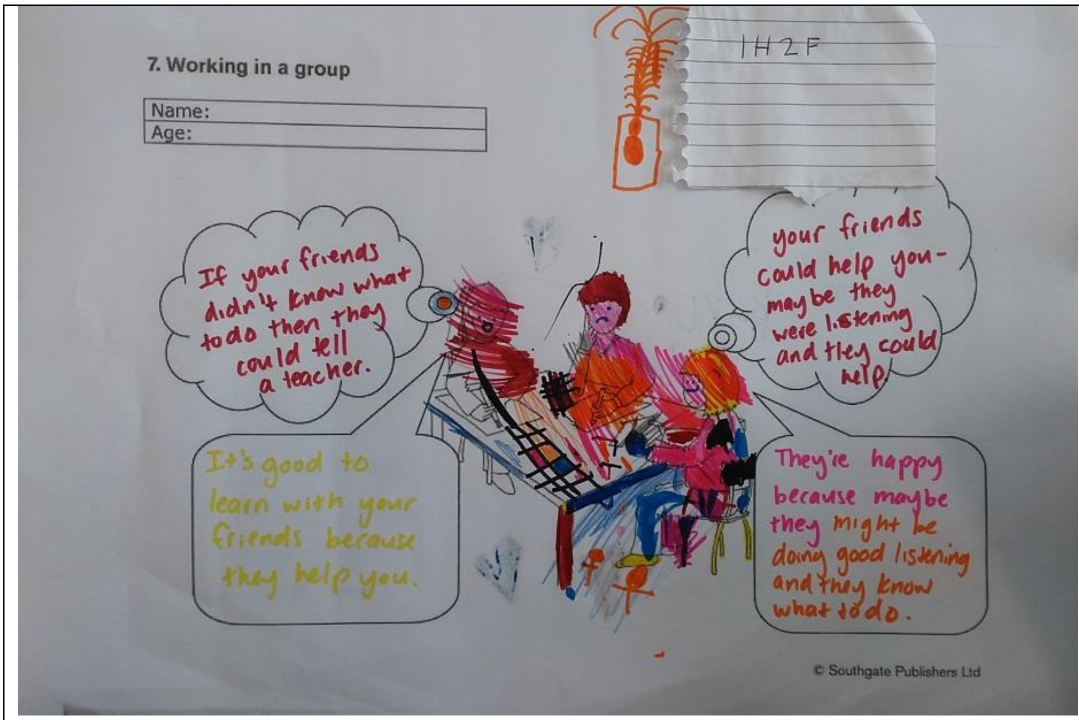


Figure 25: Conceptual diagram of metacognition as a situated phenomenon

The PVT interactions took place at Efklides' (2008) social level of metacognition and within the zone of proximal development (ZPD) (Vygotsky, 1978). It is possible to see here how fringe consciousness aligns with Vygotsky's (1978) concept of the ZPD. The ZPD is the "distance between the actual developmental level…and the level of potential development…under adult guidance or in collaboration with more capable peers" (p 86). Fringe consciousness contains a summary of knowledge and skills that are relevant to the context, but not present in focal awareness (E. Norman et al., 2010). Essentially, in the PVT interactions it represented a zone of potential containing a summary of knowledge that was both highly accessible and highly inaccessible. Interactions with peers and adults helped children to verbalise their metacognition and to make implicit understandings explicit through scaffolding and modelling. Experience-based metacognitive feelings could cause the learner to fully or partially retrieve implicit knowledge and bring it into focal awareness to be verbalised in the PVT interaction.

It is important to note that this study does not claim to objectively measure children's metacognitive abilities and takes the position that it is highly unlikely that any study can do so (see also chapter 4). Metacognition is a situated phenomenon, so it is only possible to claim that this is the metacognition that children were able to verbally demonstrate in a specific PVT interaction (Lundin & Jakobson, 2014; Wallerstedt et al., 2011). For illustration, figure 26 below shows one of the pilot children's different attributions for easy in two different PVT interactions. 1H2F completed the PVT at the bottom during the pilot study and the PVT at the top during the main study.



(1) Researcher – "Is it easy or hard to learn with your friends?"

(2) 1H2F – "Easy…I don't know"

(3) 1H2F – "This is easy cause if you draw a person you draw a circle and lines"

Figure 26: 1H2F's different attributions for easy in two different PVT interactions

1H2F demonstrated content knowledge about drawing to explain why she thought drawing was easy in the pilot study (line 4, bottom image) while in the main study, she could not verbally express why she thought learning in a group was easy (line 2, top image). In this example, the role of the context is clear as it relates to the accessibility of knowledge in fringe consciousness. When talking about drawing 1H2F accessed content knowledge to explain why it was easy but did not access this same knowledge in the group working situation. As Lundin and Jakobson (2014) highlight, different situations afford different opportunities for meaning making. She had constructed a different context for the group work situation and her knowledge about how to draw a person probably did not seem relevant.

The subsequent sections are dedicated to further exploration of aspects of the PVT interactions that had a hand in co-constructing the context and consequently the data that was produced for the study. Among these were the templates, the questions I used and my role as a facilitator, interactions with peers and using school as a place for reflecting on learning.

9.2. The role of templates in establishing a context for reflection

All templates were successful at facilitating metacognition, but the comments children made were greatly influenced by how they interpreted what was going on in their chosen template. As in figure 24 above, it was possible for children to modify their template to fit with what they wanted to talk about. However, more often children's talk was impacted by what situations they could reasonably imagine happening in the PVT they chose. This was part of constructing the context that the PVT interaction took place in. Children were encouraged to convey their ideas of what was happening in their PVT at the beginning of the interaction by looking at the picture and considering the first prompt question (see table 54 for interview schedule). As the interaction went on, sometimes the context shifted and provided affordances for thinking about the pictured situation in different ways. This was mostly done through questioning and interactions with peers, which are further examined in section 9.3 and section 9.4. This section considers the impact of the templates.

First, I observed during qualitative analysis that some templates seemed to elicit more metacognition than others. In order to explore this more systematically, I used the metacognitive count that I assigned to each child (described in section 6.5) and totalled the number of metacognitive comments for each template. Children who demonstrated metacognition made between 1 and 6 unique metacognitive comments in the PVT interactions. Table 53 shows the total number of unique metacognitive comments by template and the average number of metacognitive statements made by children using that template. Further information about the metacognitive counts by PVT type is available in appendix C-3.

Table 53: Metacognitive statements by template

Template	Total unique comments coded as metacognition	Number of children demonstrating metacognition using this PVT	Average number of metacognitive comments made by children using this PVT
Group work	44	19	2.3
Playground	32	15	2.1
Pair work	25	10	2.5
Circle time	23	9	2.6
IWB	21	7	3*
Reading	20	5	4*
Individual work	1	1	1

*=more metacognitive statements than average

In all, 66 children made a total of 166 unique metacognitive comments in the PVT interactions. This means that overall children who demonstrated metacognition made an average of 2.5 metacognitive statements in the PVT interaction. Therefore, children who used the IWB and reading templates made more metacognitive statements than average.

The reading template (see figure 27) was particularly notable because all the children who chose it demonstrated metacognition in the PVT interaction. Additionally, they all made three or more comments which were subsequently coded as metacognition.

Figure 27: Example of a reading PVT completed by 3R18M

This may have been because the children were fairly new to reading and as a novel task, metacognition was more useful (Veenman & Spaans, 2005). It is also likely that reading was an activity that generated a lot of metacognitive experiences for children to reflect on. Flavell (1979) states that:

> "metacognitive experiences are especially likely to occur in situations that stimulate a lot of careful, highly conscious thinking…such situations provide many opportunities for thoughts and feelings about your own thinking to arise and, in many cases, call for the kind of quality control that metacognitive experiences can supply" (p 908)

Children who chose the reading template showed that reading was an activity associated with struggle and where they were used to dealing with feelings of knowing and not knowing. This emphasised reading as an activity that tended to generate metacognitive experiences:

> *"I done a sad face because he doesn't know how to read" – 1H8M*

"Easy – cause I can read better, but the book I have in my bag is hard." – 1H5M

"Sometimes it's hard and sometimes it's easy because sometimes I know how to read." – 1H9M

Larkin (2010) suggests that at the beginning of school monitoring processes used during reading are highly conscious and that "a good deal of conscious effort is initially employed in linking sounds together and understanding the connection between written symbols and sound" (p 6). As beginning readers, the children seemed highly conscious of their mental processing and the feelings that arose during reading:

(He feels) "Happy because he just learned to read and he readed the whole book by himself" – 1H9M

"He's sad because he never got to read. 'Cause the teacher promised she would read the story to him but she's working with someone else." – 3R17F

As a core area of the primary 1 curriculum, reading was perceived as learning by all children using the reading template. Additionally, it was brought up as a learning activity by children using other templates as well. This is likely due to the prominence of literacy in the classroom and the fact that teachers tend to explicitly teach reading strategies like sounding out difficult words as part of structured programmes commonly used in schools (Education Scotland National Improvement Hub, 2019). This probably drew children's attention to the process of reading.

The playground template (see figure 28) was fairly successful at eliciting metacognition despite children often saying that the people in the picture were not learning.

(1) *Researcher – "Are they learning? How do you know?"*

(2) *5R22F – "Kind of, they don't look like they're learning. They're just standing about and playing"*

Figure 28: Example of playground PVT completed by 5R22F

5R22F's statement illustrates how children tended to make meaning of the picture and what the people in it were doing. Indeed, children using this template strongly believed that most of the situations they talked about were not learning. During the PVT interactions and most of the feedback sessions, an additional push was necessary for children to think about this template in a different way and acknowledge the opportunities for learning that outdoor areas in their school afforded (see also section 9.5). Of course, people can express metacognitive knowledge by reflecting on cognitive processes other than learning and the children in this study sometimes did so:

> *"We don't know [if we like it] yet – we never know until we go on it" (about the climbing frame that they were not allowed to go on) – 6R2M*

The research questions focused on learning and having a focal cognitive process kept the interviews from becoming unfocused, making them easier to facilitate but this did reflect my own researcher interest and likely constrained the discussion.

Children who chose the playground template mostly talked about learning social and physical skills (see section 7.3). Without additional prompting, the children almost always associated this picture with playing in the outdoor area during their mid-morning and afternoon breaks. The adult in the picture was almost always assumed to be a playground monitor. It is likely that these activities offered fewer opportunities to engage in highly conscious thinking. This is not because they were play activities as research indicates that play affords plenty of scope for highly conscious thinking such as problem solving (Bryce et al., 2015; Marulis et al., 2016; S. Robson, 2010). However, breaktime play in most Scottish schools takes place in a relatively small, crowded area with few resources (McKendrick, 2005). This does not necessarily offer an environment that is ideal for focusing on learning something or engaging in the highly conscious mental activity that is likely to prompt metacognitive experiences:

> *"Harder to learn outside than inside. You can get distracted when you're outside by people asking you to play all the time." – 5R21M*

This template did, however, offer opportunities to talk about social skills and how to engage in social problem-solving, which were important in the playground. In my experience teaching and researching in Scottish schools, it is common for children to tell their teachers about social problems that occurred in the playground. Teachers often assist children in reflecting on social problems and what steps they might take in order to solve these problems.

Some of the PVTs were more open to interpretation than others in terms of what could be happening in the picture. For example, the reading template was probably the most closed template used in the project. Although there was scope for the child to be reading for fun or for schoolwork, it would be difficult to imagine that they were doing anything but reading. Conversely, PVTs that depicted children working at desks (see figure 29 for an example) were relatively open to interpretation. Children imagined the learners in these pictures to be drawing, colouring or doing work for a variety of different curricular areas.

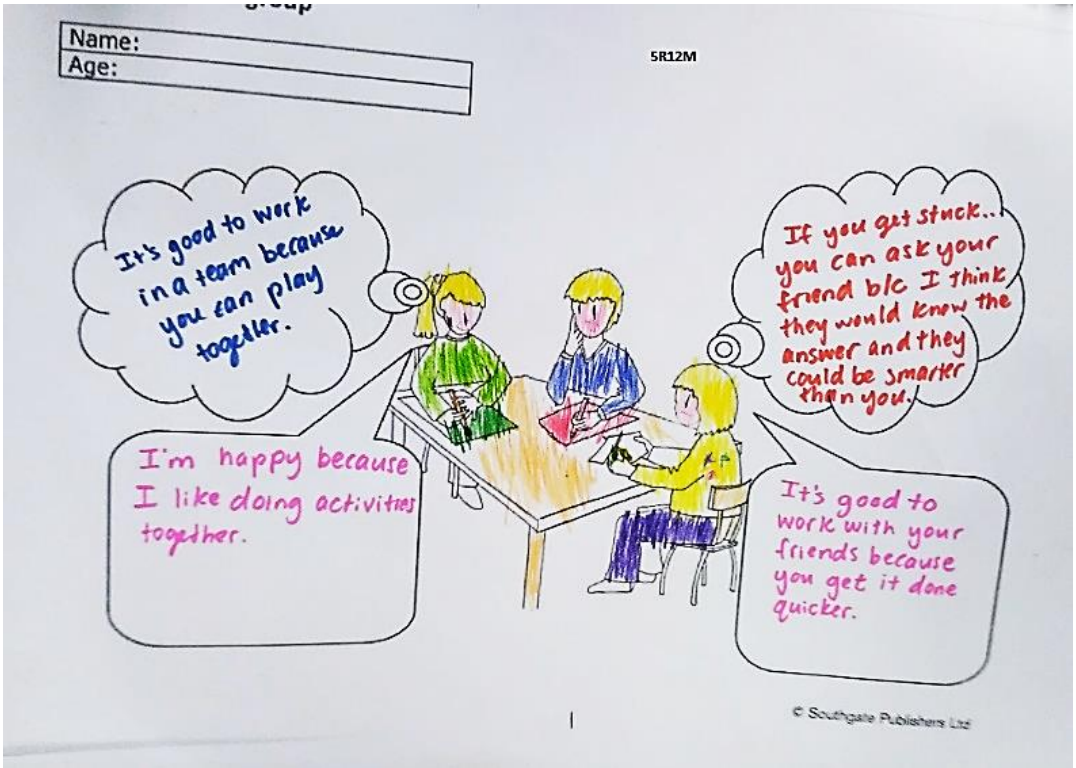


Figure 29: Example of a group work PVT completed by 5R12M

All PVTs were semi-open and entailed a higher degree of researcher control over the context when compared with other visual methods like draw and write or draw and tell using open prompts (e.g. Cobb, 2017; Lunn Brownlee et al., 2017). This semi-open format alongside the structured questioning approach served to focus the discussion, but also meant that talk was often constrained to learning situations that might reasonably be happening in the picture. This was not necessarily negative since as the visual served as an initial springboard to start discussion as well as an anchor to ensure that discussion did not stray too far from the research topic. Wall (2017) states that sometimes openness can feel overwhelming to children, which was apparent in the pilot study when I trialed using a blank PVT where children drew their own learning situation (see 1H2F's pilot PVT in figure 26). Children took a long time to get started and decide on a situation to draw, often asking me for suggestions. Conversely, the children using PVTs that already had a cartoon situation drawn on were able to think of many learning situations that might be happening straight away. This kept the discussion focused on the learning happening in the picture rather than figuring out what to draw.

It was possible that the traditional set-up of many of the situations pictured in the PVTs prompted the children to talk more about traditional academic learning situations and to conceptualise learning in a more traditional way. As shown in figure 29 above, the pictured situation includes traditional learning materials (paper that might be a worksheet, pencils) and features learners seated at desks. Other situations like the IWB template featured a prominent teacher with learners displaying traditional learning behaviours (see figure 30). The use of templates depicting traditional learning situations may have prompted them to focus most on correspondingly traditional instruction methods.

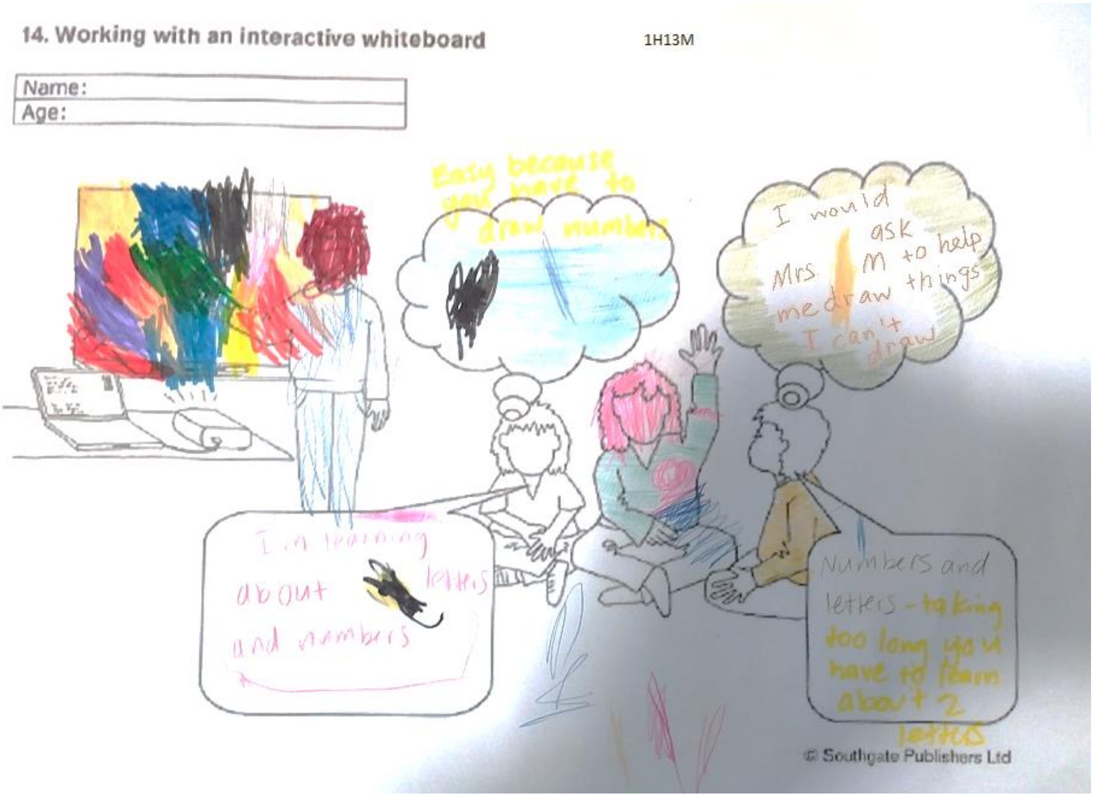


Figure 30: Example of an IWB PVT completed by 1H13M

Overall, the templates offered both affordances and limitations in facilitating children's talk about learning. They were an anchor for discussion and facilitated talk about a range of different learning situations. However, it was also necessary to be aware of their potential to constrain the type of talk that took place during the PVT interactions and that some PVTs were better at facilitating reflection on learning than others. This gives a context to the qualitative findings from chapter 7, which found that children's talk about learning reflected traditional understandings of learning. It also provides some explanation for the children who had high early skills scores but did not demonstrate metacognition, particularly those who chose the playground template which tended to elicit more talk about social skills and dealing with social problems. Nonetheless, the templates were instrumental in constructing a context for the discussion, which is discussed in the next section.

9.3. The role of questions and a supportive adult in scaffolding reflection

The questions I used in the PVT interactions were important because they served as metacognitive prompts which helped to scaffold reflection (Hacker & Dunlosky, 2003). Since this section focuses primarily on my role as a supportive questioner, it is worth reiterating the questions used in the PVT interactions (see table 54 below).

Table 54: Questioning approach used in PVT interactions

Part 1: Establishing what is happening
13. Tell me about the picture. 14. What are they doing?
Part 2: Establishing the learning
15. Are they learning? 16. How do you know? 17. What are they learning?
Part 3: Evaluating the situation – prompt questions for the speech bubble
18. What is good about _______? 19. What is not so good about ________? 20. How do you/they feel about ______? Why?
Part 4: Reflecting more abstractly – prompt questions for the thought bubble
21. What do you learn when you _________? 22. Who/what can help you? Why/when would you ask them? 23. What can you do if you're stuck? [added later in the first data collection period] 24. Is it easy or hard? Why do you think so?

Essentially, the questioning approach aimed to enable children to move from concrete ways of thinking about a learning situation to more complex and abstract ways of thinking about it (Wall, 2017; Wall et al., 2007). Additionally, the questions suggested metacognitive vocabulary for the children to use to talk about their experiences of learning. The PVT interaction took place within the child's ZPD, using supportive questioning to help children express more complex understandings of learning than they probably would have done without support. It is impossible for this study to establish what the children would have said without support since all children received support. However, the children with low early skills scores who demonstrated metacognition in the PVT interactions despite the regression model predicting they would not (see section 8.3.2) may have benefitted from this scaffolding approach.

My questions alongside the templates helped scaffold the children's thinking and prompted them to verbalise their metacognitive knowledge and experiences. Specifically, the questioning approach served as heuristic scaffolding, encouraging the children to think about the learning situation in different ways (Holton & Clarke, 2006). The questions served to shift the child's focal awareness, which also would have impacted on the knowledge available to the child through their fringe consciousness (see figure 31 below).

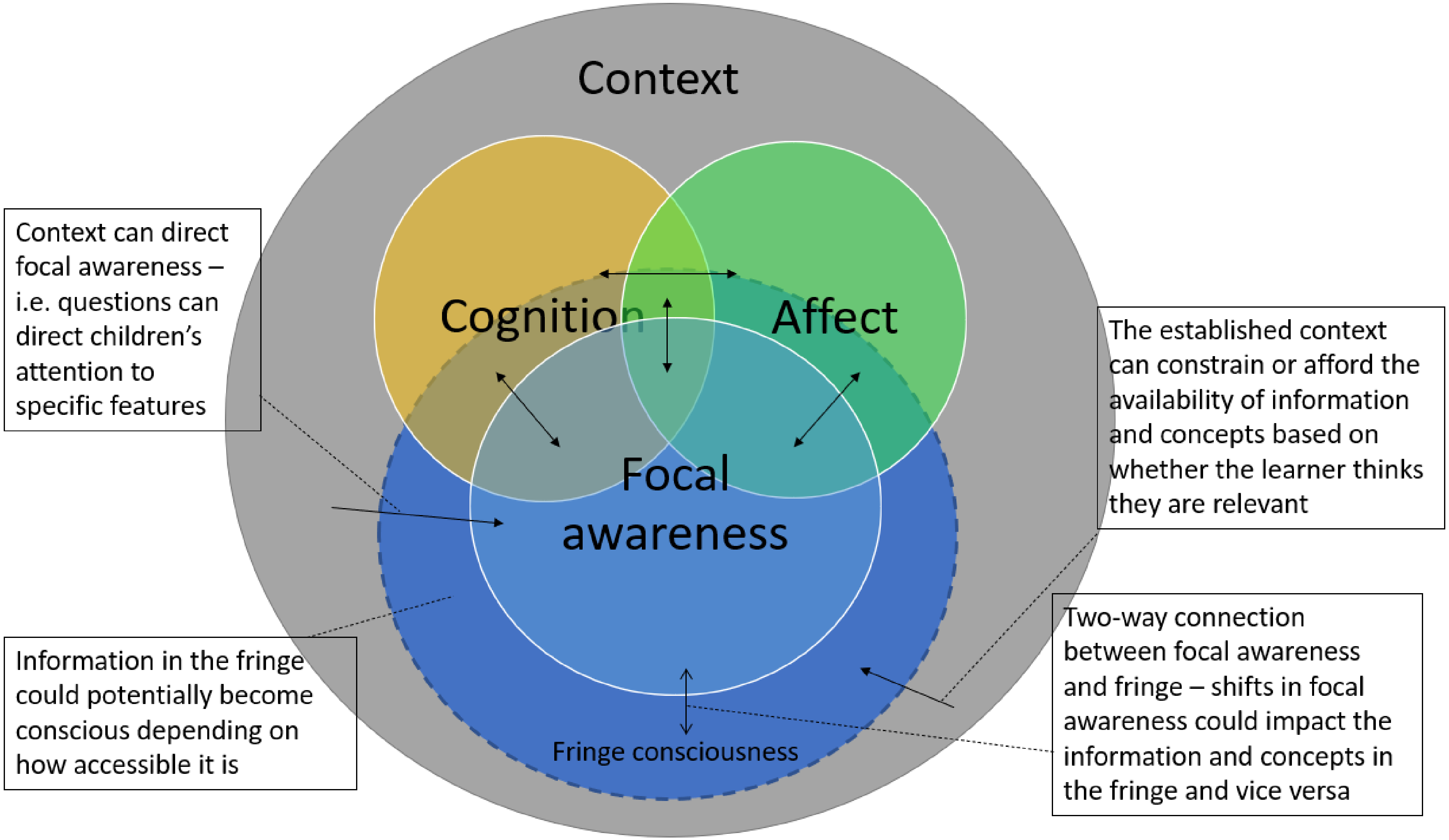


Figure 31: Interactions between the context and focal awareness and fringe consciousness

The first two parts of the questioning approach helped to establish the context by considering what the children in the picture might be doing, whether they were learning and what kinds of learning might be taking place. The children could then use the contexts they identified to come up with more specific reasons for their answers to more complex questions. Identifying potential learning situations in the beginning of the interview may have helped to establish the relevance of information and concepts related to those learning situations (see figure 31 above). The child might later retrieve this relevant information from memory and use it to explain why they thought something was easy or hard or what they could do when they were struggling. Figure 32 shows an example.

(1) Researcher – "What are they learning?"

(2) 5R7M – "We learn about letters, numbers. Today we're learning 'y'"

(3) Researcher – "Who can help you?"

(4) 5R7M – "The teacher helps you. She helps me with things that are hard like writing words that are long."

Figure 32: Excerpt from 5R7M's PVT interaction showing the impact of scaffolding

5R7M identified early in the interview that the children in the picture might be learning letters or numbers (line 2). Later in the interview when I asked about help-seeking, he was able to return to the situations he identified earlier to think of reasons he might need to ask for help (line 4). His answer demonstrates content knowledge about how long words are harder to spell, using this as a reason why he might need to seek help.

The contexts identified by the children in parts 1 and 2 of the PVT interaction clearly had an impact on their reasoning when they responded to more abstract and general questions. Some of the children had a harder time answering abstract questions, so I could use the contexts they had identified to increase scaffolding for abstract questions. Suggesting a more specific context for reflection seemed to help increase the accessibility of content knowledge related to the learning situations children had suggested earlier in the interview.

(1) Researcher: What is good about learning something new on your screen [IWB]?

(2) 1H7F: [no response]

(3) Researcher: What is good about learning your letters (context child had identified earlier)?

(4) 1H7F: That you can spell something. Me and [partner name] like learning our sounds.

(5) Researcher: What is not so good about learning your letters?

(6) 1H7F: "One of them was a bit big for me – the two 'c's' kicking k and curly c"

I recognised the benefit of suggesting contexts to increase scaffolding for more abstract questions during the final analysis stage. In stage 1 and 2 of data collection, I generally only used this approach if a child did not give a response as 1H7F did above. However, it could have been useful as an additional prompt for children who used affective reasoning and self-evident qualities to explain why something was easy or hard. Directing their attention to a specific learning area may have allowed them to access content knowledge to explain why something was easy or hard. Additionally, this approach may have been effective in supporting children rated as having high difficulty with tasks involving working memory. According to the CHEXI questionnaire, children with poor working memory often have difficulty remembering what they are doing in the middle of a task or completing tasks with multiple steps (Thorell & Nyberg, 2008). This might make it difficult for them to use the contexts they identified earlier to construct their answers for later questions, and they may have benefitted from being reminded. This approach could be used in further research using PVTs with young children or by practitioners who want to explore children's metacognitive experiences using PVT interactions.

Suggesting contexts for reflection also helped children using the playground template reflect on their experiences of outdoor learning opportunities. In the first round of data collection, the discussion around the playground template was the most difficult to facilitate because the children did not think it was a picture of learning. However, when I returned for the feedback sessions children from school 5 and school 6 talked about outdoor learning in their schools. Therefore, during the second round of data collection, I talked to the class teacher at school 5 about outdoor learning opportunities and included a prompt for children to reflect on these. My goal was to direct children's attention to activities that the class teacher viewed as learning because they were more likely to be set up as learning experiences and thus provide more affordances for reflection on learning. My interaction with 5R20M was a good example:

(1) *Researcher: Are they learning?*

(2) *5R20M: "You don't learn anything out there, you just play"*

(3) *Researcher: "Why not?"*

(4) *5R20M: "Because the people who look after you don't tell you to do anything, you just play."*

(5) *Researcher: "What about when [teacher who leads outdoor learning] takes you outside? Does she teach you anything?"*

(6) *5R20M: "No, we just learn ourselves, you can make your own water slide, it's really interesting. Sometimes we do a marble run."*

During the feedback sessions, it became apparent that children differentiated between teaching and learning. Some children said they did not learn outside but when asked if anyone had ever taught them anything outside, they said that other children had taught them physical skills or that they had taught themselves these skills. Although this study cannot say why children differentiated between the two processes, the change in wording likely shifted their focus slightly. Using a different word also avoided directly contradicting children's statements that they were not learning outside and left it up to them whether they wanted to use "teach" or "learn" in their responses. In the example above, 5R20M acknowledged that he learned how to make water slides and marble runs by himself when he was engaged in outdoor learning (line 6). This was in keeping with his initial explanation that no one told him to do anything outside (line 4). He further emphasised his role in leading his own learning outside by saying that no one helped him when he learned outside:

"I just learn it myself, because now I'm 5." – 5R20M

Using questions targeted specifically at metacognitive experiences seemed to help children verbalise their metacognitive knowledge. Focusing on metacognitive experiences directed children's attention to their mental experiences of learning. This provided insight into the different theories that children used to explain their mental processing. The children's responses often included metacognitive knowledge. Table 55 shows a breakdown of the number of comments coded as **metacognitive knowledge** in different parts of the interview.

Table 55: Breakdown of comments coded as metacognitive knowledge in different parts of the interview

	Number of comments coded as metacognitive knowledge	Percentage of total comments coded as metacognitive knowledge
Part 1: Establishing what is happening	7	6%
Part 2: Establishing the learning	15	12%
Part 3: Evaluating the situation	29	23%
Part 4: Reflecting more abstractly	74	59%

This indicates that children were most likely to demonstrate metacognitive knowledge in part 4 of the interview, which focused primarily on metacognitive experiences. Metacognitive knowledge and experiences are intimately connected in conceptual models, with metacognitive experiences serving as a catalyst for acquiring and modifying metacognitive knowledge (Flavell, 1979; Larkin, 2010). Additionally, metacognitive knowledge and beliefs may have an impact on metacognitive experiences (Arango-Muñoz, 2014; Flavell, 1979). Therefore, focusing on metacognitive experiences may have helped elicit metacognitive knowledge that was associated with those experiences.

My role in the PVT interactions was that of a supportive adult. Although this study has taken the position that all data about metacognition is situated within the context it was expressed in (see chapter 4), the understandings children expressed in this study were heavily impacted by adult scaffolding. It is not clear whether the children would have explained their reasoning behind their answers to questions without additional prompts to do so. As outlined previously in chapter 4, the study focuses on elicited behaviour, not on naturally occurring behaviour. Most methods of data collection that require interaction with participants aim to elicit a certain type of information, so this was not an issue that was unique to this study. Using a supportive way to elicit children's understandings meant that the study focused not on what children objectively know, but what knowledge they demonstrated under these particular circumstances (Wallerstedt et al., 2011).

9.4. Children's interactions as social metacognition

The metacognition children demonstrated during the PVT interactions was constructed within a social context through interactions with me as the researcher and the child's partner(s). In Vygotsky's (1978) explanation of the ZPD, both peers and adults can act as more knowledgeable others in an interaction. The previous section demonstrated that my interactions with the children scaffolded their thinking through the questions I asked. Therefore, this section will address how the children's interactions with each other helped to construct the understandings of learning that emerged in the data.

Although children's interactions with each other did not always relate to the questions I asked, when they did the paired format offered a social space to build on each other's ideas, prompting deeper reflection (Burke, 2008; Einarsdóttir, 2007). Some children engaged in sustained shared thinking (Siraj-Blatchford, 2009) during the PVT interaction. Sustained shared thinking has been defined as occurring:

> "when two or more individuals 'work together' in an intellectual way to solve a problem, clarify a concept, evaluate an activity, extend a narrative etc. Both parties must contribute to the thinking and it must develop and extend the understanding." (Sylva et al., 2004, p. 36)

Children did this by elaborating on each other's ideas, effectively extending the narrative:

(1) *Researcher – "Tell me what is happening in this picture?"*

(2) *1H2F – "He's sad"*

(3) *1H1M – "Because he didn't know the answer?"*

These kinds of exchanges prompted children to think beyond vague explanations such as suggesting a general dislike for the situation. In this case, 1H1M helped 1H2F build on her initial idea that the child in her picture was sad by suggesting a cognitive attribution for his emotional state – the boy knows that he does not know the answer (metacognitive knowledge) and is sad. 1H1M changed their shared focus to include both cognitive and affective factors by suggesting a connection between them. This shared focus was maintained throughout the rest of the interview with both 1H1M and 1H2F contributing to developing and extending their shared understanding of learning in a group:

(1) *Researcher – "What is not so good about learning with your friends?"*

(2) *1H1M – "Nothing"*

(3) *1H2F – "Nothing"*

(4) *1H1M – [after thinking about it for a while] "they [your friends] might annoy you"*

(5) *1H2F – [agreeing with 1H1M] "they [your friends] stop you and you don't get your work done"*

In 1H1M and 1H2F's interaction, they seemed to be exchanging the role of more knowledgeable other by becoming the elaborator at different points in the interaction. They used each other's affective explanations to explore cognitive causes and the potential impact of affect on learning.

Peers sometimes functioned as more knowledgeable others by modelling specific ways of thinking about situations. Modelling can help to generate and internalise new metacognitive insights in peer interactions (de Backer et al., 2012). Instead of elaborating on each other's responses like 1H1M and 1H2F did in their interaction, 1H9M used 1H8M's responses as a model to support his own reasoning (see figure 33 below).

(1) Researcher – "How are they feeling? Why?"

(2) 1H8M – "He's sad because he doesn't know how to read"

(3) 1H9M – "He's happy because he just learned to read and he readed the whole book by himself"

Figure 33: Interaction between 1H8M and 1H9M showing modelling

Their PVTs share a similar focus on emotions. 1H8M represented this with pictures of sad faces in the speech and thought bubbles (top PVT) and 1H9M drew a happy face in his speech bubble (bottom PVT). During this PVT interaction, 1H9M waited for 1H8M to answer before responding. This way, he was able to listen to 1H8M's comments and use them as a model to scaffold his own verbal responses to the situation. Drawing on Vygotsky's ZPD (1978), 1H8M's provided 1H9M with a model for a specific way of explaining emotions in learning situations by considering their potential cognitive causes. This was like 1H1M and

1H2F's interaction, but instead of developing the narrative around "sad," 1H9M considered a different emotion (happy) and its potential cognitive causes. This represented a shared focal awareness on emotional responses to learning to read. Referring back to figure 31 in the last section, peers were also able to suggest changes to focal awareness, providing access to new language and knowledge through the fringe. In their PVT comments, the emotions "sad" and "happy" were attached to the experiences of struggle (1H8M) and a feeling of ease when you know how to read a book (1H9M).

Since the children constructed the context together, it sometimes helped if children with low early skills scores were paired with children with high early skills scores. It has been generally established that pairing learners with lower level skills with learners with more advanced skills is particularly beneficial to the lower level learner (de Backer et al., 2012; Justice et al., 2011). For example, 3R6M had an early skills score of 9.03 while his partner 3R5M's score was 17.66. Additionally, 3R6M's verbal skills were rated as behind for his age (rating of 2) while 3R5M's verbal skills were rated as advanced for his age (rating of 6). Together, they developed a discussion around the topic of talking while learning, considering that it could be good and bad for learning.

(1) Researcher – "Are they learning? How do you know?"

(2) 3R6M – "Yeah, they can talk if they want to learn"

(3) 3R5M – "Yes, sometimes they talk when they're learning"

(4) Researcher – "What is good about learning with a partner?"

(5) 3R6M – "Learning"

(6) 3R5M – "You can talk while you're learning."

(7) Researcher – "What is bad about learning with a partner?"

(8) 3R6M – "Nothing…if someone talks then they get outside, and the teacher talks to them"

(9) 3R5M – "You'll be too busy talking and get into trouble"

In this interaction, 3R5M sometimes interpreted and restated 3R6M's points such as when he explains explicitly that children who talk during learning might get into trouble because they are focused more on talking than work. Both children demonstrated metacognition and 3R6M was the only child with a verbal rating of 2 (the lowest verbal rating assigned by teachers) who demonstrated metacognition in the study.

Children could also successfully challenge their peers' constrained focus on learning as academic work by shifting their focal awareness. In the feedback sessions, peer challenging helped bridge the gap between play and learning. This sometimes meant that children who had just expressed the belief that you cannot learn while playing subsequently listed social and physical skills that could be learned while playing. In school 5, a few children disagreed with the consensus that playing is not learning by suggesting that you could learn things like games during play time. Peer challenging like this broadened children's focus to include other forms of learning besides "work." It was likely that the school setting encouraged children to focus specifically on academic work (see also section 9.5). However, as soon as a peer challenged this, they were able to shift their focus to different kinds of learning. This subtly changed the context of the feedback session and offered an opportunity for children to reflect on a different kind of learning.

Although Piaget (1969) argued that children's inconsistent beliefs reflected a lack of awareness of their underlying schemas related to these beliefs, research suggests that adults also express inconsistent beliefs depending on the context (Tourangeau et al., 1989). Tourangeau's (1989) study explored the connections between beliefs expressed by participants and previous questions on a survey. He suggests that when participants are asked about their beliefs in a survey, they respond based on a quick sampling of their beliefs rather than an in-depth search of their memory. He asserts that "because the composition of this sample will differ from one occasion to the next, the responses are likely to differ as well" (p 403). In the example of the feedback sessions, children initially responded based on their highly accessible beliefs about learning. Since they were in their school, the most accessible beliefs probably would have related to academic work, particularly since that was often what they were doing before I talked to them. When some of their peers suggested that learning games or social skills was possible outside, this expanded the context children were considering beyond academic work. This resulted in some children expressing seemingly contradictory beliefs due to a change in focal awareness making new information accessible through fringe consciousness.

9.5. The impact of pedagogic voice when using schools as a place for reflection

The purpose of this section is to explore how conducting the PVT interactions in schools impacted on the understandings of learning children voiced during the interviews. I have previously pointed out some of the limitations in using school as a place for reflecting on learning, specifically relating to children's traditional conceptions of learning. It was clear that the setting as well as the power relationships traditionally present in a school setting impacted on the data (Spyrou, 2011). Power relationships were also explored in the methodology (see section 5.6), so the way that I constructed my researcher role will not be readdressed here. What was important was that the children saw me as an adult in their school and clearly predicted the kind of learning they thought I wanted to hear about. This usually meant academic work.

Spyrou (2011) asserts that children's voices are shaped by "the cultural and social norms that regulate social relations" in the setting research takes place in (p 156). I have already acknowledged that the understandings of learning that children demonstrated in the PVT interactions were situated in the context, so it is important to consider how children's voices were shaped by the school setting. Rather than stating that these were not children's authentic voices, I take Spyrou's (2011) position that children's voices are multi-layered and complex. It is assumed that if the PVT interaction had taken place in a different setting, the understandings children expressed probably would have been different. The understandings and beliefs that children expressed were representative of a sample of their most accessible beliefs, which probably seemed most relevant to the situation (Tourangeau et al., 1989). Setting is assumed to function as another factor that situates the data recorded throughout the study like the other factors discussed in this chapter.

The school context alongside the templates depicting school-based learning situations seemed to limit children talking about learning more broadly. Since PVT interactions are pedagogical tools (Wall, 2017, 2019), this means that they were reminiscent of classroom activities. In classroom activities, children take on the role of a student and in their roles as students, they speak with a pedagogic voice (Arnot & Reay, 2007; P Thomson, 2008). Pedagogic voice can be defined as "the language of learning created by school pedagogies" (Arnot & Reay, 2007). Thomson (2008) explores pedagogic voice in the context of research interactions, suggesting that research discussions taking place in school can be biased based on what children think a teacher or other school staff would want to hear. Considerations of what their teacher might want to hear would certainly be informed by the kind of knowledge prioritized in their classroom culture (see section 8.2).

The feedback sessions made it clear that pedagogic voice was present in the data, serving as a space to explore emerging findings from the initial analysis. In these sessions, I was able to probe children's reasoning behind why they agreed or disagreed with statements that represented emerging findings from the first round of data collection. I was especially interested in the role of pedagogic voice in the comment *"we learn inside, that's just the way we learn,"* so I asked the children who agreed with this statement why they thought so. When they explained their reasoning, they talked about things like not having desks outside or that it would be difficult to work if worksheets get stepped on or blown away. It became obvious that when I asked about learning outside, the children were responding using the context of traditional classroom activities and thought that it was nonsensical to try to do these outside. Before peer challenging or prompting from myself to expand their focal awareness, many did not seem to consider that they could learn different things in the playground that might not be related to classroom learning. In other words, many children needed a push to consider learning in a broader sense than traditional classroom work. It is possible that they thought I would not be interested in these types of learning because I was an adult in their school who they predicted would only be interested in classroom learning (P Thomson, 2008).

Some children seemed reluctant to express negative perspectives on learning and most showed a strong preference for pro-social behaviours. Since pedagogic voice is shaped by school pedagogies (Arnot & Reay, 2007), it is likely that even early in the school year children had already begun to understand what it meant to be a good learner in their classroom. This may have included avoiding talking negatively about learning, particularly to an adult who they saw as knowing more about learning than they did. To illustrate, below are some quotes that I thought represented avoidance of negatives in response to my question "what is not so good about [situation]"?

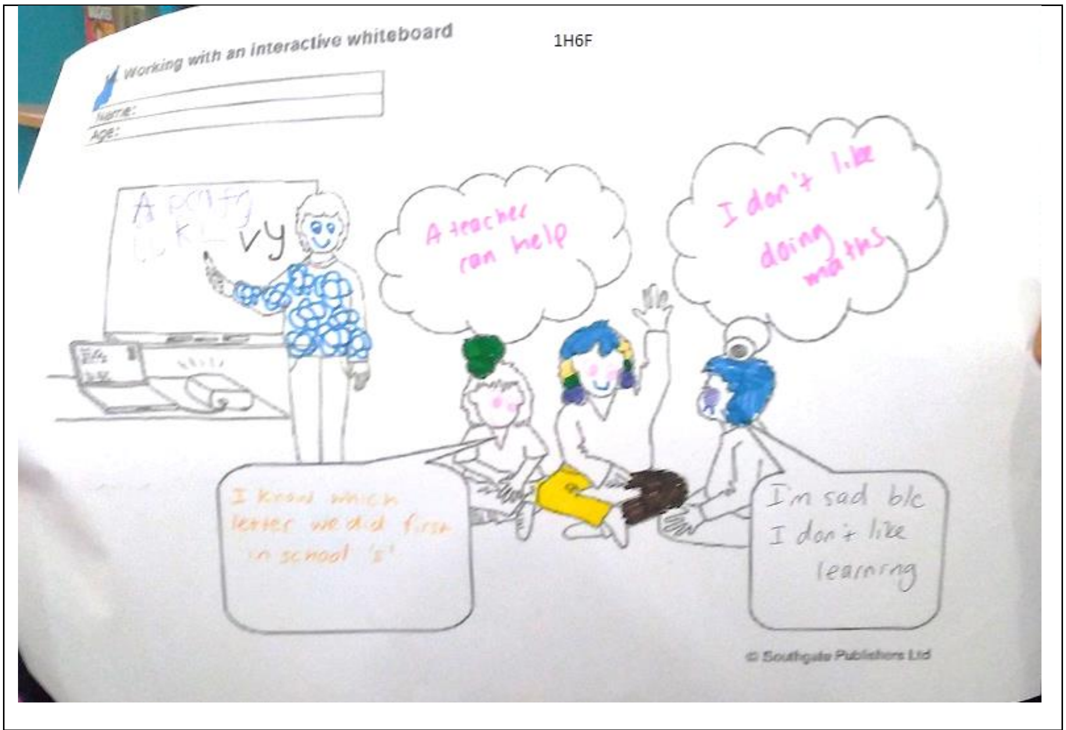
> *"No, we like everything" – 1H6F*
>
> *"Nothing, I like it." – 4N1M*

"No, nothing bad" – 5R6M & 5R7M (partners)

"Don't tell that you don't need help" – 2S10F

2S10F's comment was particularly interesting because both she and her partner discussed how sometimes they did not need help when they were working on something with their primary 7 buddies. However, 2S10F's comment illustrates that she viewed telling her buddy that she did not need help as unacceptable in her classroom, possibly because this would defy pro-social norms in paired and group learning situations. Children from other schools also highlighted that in paired and group learning situations, it was important to engage in pro-social behaviours such as being kind and sharing and avoid anti-social behaviours such as being rude and refusing to help.

A benefit to the templates was that because they depicted more than one learner, even children who were reluctant to express negative perspectives on learning could project these onto an imagined learner in the situation (see figure 34).



(1) Researcher – "What is not so good about learning your letters?"

(2) 1H6F – "No, we like everything"

(3) Researcher – "How do they feel? Why?"

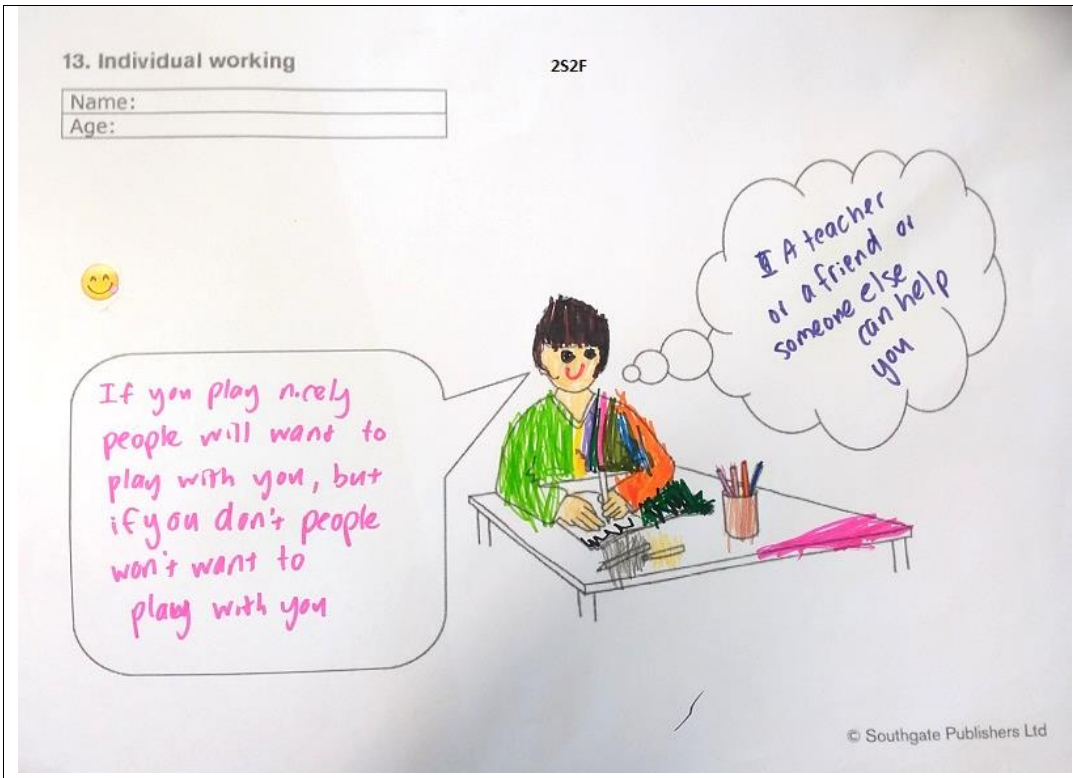
(4) 1H7F – "He's sad because he doesn't like learning and they two do."

(5) 1H6F – "The same as [partner name] – two happy and one sad"

Figure 34: Example PVT from 1H6F illustrating projecting negative perspectives onto imagined learner

This approach could be harnessed more explicitly by researchers or teachers using PVTs by adjusting questions about negative perspectives on learning. These could be directed at imagined learners by asking "what do they think is not so good about [this situation]?" Implications for teachers and researchers will be further considered in the next chapter.

It was clear that the PVT interactions elicited a specific kind of metacognition, so while the tendency for children to presume academic work as a context was a limitation, it was also useful in focusing children on situations they believed were learning. As the playground templates illustrated, it was more difficult for children to reflect on learning if they did not view the pictured situation as learning. This was further highlighted in the cases of children like 2S2F (see also section 8.3.2) who had high early skills scores but did not have any comments categorised as metacognition because they chose to focus on their knowledge about social skills. In 2S2F's case, she chose a traditional learning situation (individual working PVT) but the shared focus between her and her partner shifted to how being with someone else was better than being alone in part 3 of the PVT interaction (see figure 35). Additionally, these children were some of the children mentioned in section 5.5.4 who said they were finished between parts 3 and 4 of the interview. This meant that I was only able to ask one question from this part 4 and they merely listed people who could help them without giving strategic reasons.



(1) *Researcher: "What is good about learning something new?"*

(2) *2S1F: "Playing is our learning"*

(3) *2S2F: "Learning to read, I don't read but sometimes I do."*

(4) *Researcher: "What is not so good about learning something new?"*

(5) *2S2F: "I don't like people not playing with me, then someone comes and helps me"*

(6) *2S1F: "When I'm outside and I'm sad, I go to the friendship bench and someone comes and plays with me"*

Figure 35: 2S2F's template with comments from Part 3 of PVT interaction

Some of 2S2F's comments were coded as **emotional and motivational monitoring and regulation**, so while they represented broader strategic and reflective thinking, the object of this strategic and reflective thinking was not cognitive. This study does not claim that children like 2S2F were not metacognitive, just that the context that they created for reflection was focused on a different skill set. Although the questioning approach was focused on learning, sometimes children chose to concentrate on more emotional aspects of learning situations.

9.6. Summary

Throughout this chapter, I have taken the position that metacognition is a situated phenomenon and that the understandings and skills children demonstrated were inextricably linked to the context in which they were expressed. In other words, "how you test is what you get" (Desoete, 2008, p. 403). This chapter serves to contextualise the data from the previous two chapters and to underline that the metacognition expressed in this study can only represent a small portion of children's metacognitive knowledge and skills. There were many aspects of the PVT interaction that played a role in constructing the data in this study, not just the child's abilities. The fact that a child did not demonstrate metacognition in this study should not be taken to imply a lack of metacognitive ability. This has implications for other studies which are examined in detail in the next chapter.

The metacognition children expressed in this study was elicited metacognition. This chapter detailed the aspects of the PVT interaction that played a role in co-constructing the metacognition demonstrated by the children. The interaction took place in the ZPD and both myself and the children's peers functioned as more knowledgeable others to support verbalising metacognition. Vygotsky (1978) stated that it is important to ascertain both the child's actual developmental level (what they can do on their own) and what they can do with assistance. Therefore, it is important to understand what children's capacity for verbal reflection is with assistance because they might be able to do this on their own tomorrow. Metacognitive concepts in the ZPD are in tacit form – they are ideas in the process of maturation – therefore, social metacognition is important to help children clarify their conceptions, correct misconceptions and develop more explicit theories of learning (Efklides, 2014; Heyes et al., 2020; Vygotsky, 1978). This is particularly important for practitioners and will be examined in more detail in the next chapter.

The next chapter will position the results of this study in the field and outline its implications for researchers and early years professionals. Although some limitations have been outlined in this chapter and in previous chapters, the next chapter will explore these in more depth. This chapter's key idea that metacognition is inextricably linked to the context it is expressed in will be important in the next chapter. This idea has implications for researchers and teachers in terms of recording and discussing evidence of metacognition and in supporting children's metacognitive development.

Chapter 10. Discussion and implications

The last three chapters have presented and discussed the main findings from this study. Therefore, the main purpose of this chapter is to draw together these key findings and discuss the implications they have for both practice and research. First, it is useful to explicitly outline how the study has answered the research questions detailed in section 5.1. Table 56 presents the key findings from the last three chapters in relation to the study's four research questions.

Table 56: Key findings in relation to research questions

Research question	Key findings
1) What characteristics of facilitative PVT interactions impact on how children express their understandings of learning?	• The understandings children expressed during the PVT interaction were inextricably linked to the contexts they were expressed in. • Features of the PVT interaction such as questions, the template and peers could prompt children to re-direct their focal awareness during the interaction, promoting reflective discussion and metacognition. • PVT interactions took place within the ZPD and comments showed the positive influence of scaffolding and modelling. • The school setting and pedagogical tools generally suggested reflection on academic contexts
2) How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?	• Children expressed mostly objectivist beliefs about learning and differentiated between play and learning. • Children's conceptualisations of learning reflected their experiences within their classroom culture and potentially connected to societal values that emphasise the product of learning, specifically measurable outcomes.
3) What are the key characteristics of children's metacognition at the beginning of primary 1 in Scotland as demonstrated in PVT interactions?	• Children demonstrated both developed and explicit metacognitive knowledge and still developing tacit beliefs about learning. • Overlaps between knowledge of person, task and strategy and regulation illustrated the way metacognition works as an integrated theory. • Children's comments showcased the complex interplay between explicit and implicit mental processes. • The children's metacognition was highly affective, and their comments reflected the felt quality of metacognition.

	• Children relied heavily on dependent strategies, which resonated with their objectivist beliefs about learning and awareness of their status as beginning learners.
4) Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their: • family background; • early education; • early skills?	• There was no observed relationship between children's age at start of nursery and their demonstrated metacognition. • A non-significant relationship between socioeconomic status and demonstrated metacognition was observed and would be worth further investigation. • Children's teacher-rated early skills were significantly related to their likelihood of demonstrating metacognition in the PVT interaction. • Qualitative differences between children with high and low early skills scores were observed

I have started to discuss how this study's findings fit with other research around young children's metacognition in the last three findings chapters. The first part of this chapter draws these points together, positioning the study in the field by making connections with other empirical and conceptual research. It also draws attention to the study's contribution to knowledge. The second section outlines the limitations of the study and their impact on the knowledge claims the study can make. The third part, divided into two sections, is dedicated to the study's implications for research and practice. These sections also highlight some directions for future research.

10.1. How does this study fit with other research?

In this study I assumed that metacognitive competence is situational (Lee, 1998; Wallerstedt et al., 2011) and did not set out to determine whether the children were metacognitively competent. Instead, I sought to facilitate children's metacognitive competency to develop understanding of what their early metacognition is like. Nevertheless, the study does add to the expanding body of multidisciplinary evidence that they are capable of metacognition and can express it in contexts that are appropriate for their age and skill set (Bryce et al., 2015; Cobb, 2017; Destan et al., 2014; H. Lewis, 2019; Marulis et al., 2016; S. Robson, 2010; Wall, 2008; Whitebread et al., 2009). The study's main contributions stem from its exploratory orientation, which will become clear in this section.

This study aligns well with recent work that provides qualitative insight into metacognition in the early years (H. Lewis, 2019; Marulis et al., 2016; S. Robson, 2016a). Metacognition research has traditionally been interested in development (Dinsmore et al., 2008), meaning that young children are often viewed in terms of what they cannot yet do. This includes both comparisons with older children as well as pre/post-test intervention studies. A developmental perspective is important to understanding young children's metacognition, but there is a real need for more qualitative exploration of the phenomenon. This study contributes knowledge in this area and differs slightly from other interview and reflective dialogue approaches. Video-assisted reflective dialogues like those used in Lewis (2019) and Robson (2016) and the metacognitive interviews used in Marulis et al (2016) focus on a specific task. In contrast, I invited children to draw on experiences in a variety of tasks they could imagine taking place in the picture. My approach had limitations in that some children struggled to access subject knowledge to help them to justify their judgments and explain their metacognitive experiences. However, it also provided the opportunity for children to reflect more abstractly on their general conceptions of learning if they were able and willing to verbalise them within the PVT interaction. This allowed the study to investigate subtle differences between tacit and explicit understandings of learning.

Regarding domain-specificity, the PVT interactions provided opportunities to express both domain general and domain specific metacognition. For domain general strategies like help-seeking, children had developed domain-specific conditional knowledge about when it was appropriate to use these strategies and why. Since studies show that even infants are capable of strategic help-seeking (Goupil et al., 2016), it was safe to say that the domain general knowledge had preceded the domain specific knowledge in line with Sperling et al (2002). However, I also found that the children differentiated starkly between play and academic contexts at least at the beginning of the year, so it was unlikely that all metacognitive knowledge transferred as easily as knowledge about help-seeking (Barnett & Ceci, 2002). Other researchers (e.g. Brown, 1987; Clerc et al., 2014; Clerc & Miller, 2013) have found that utilisation deficiency is common in early childhood and I have presented evidence that context influenced the availability of metacognitive knowledge. Therefore, this study aligns more with the view that metacognitive knowledge can become more general as learners explore the usefulness of strategies in different contexts (Brown, 1987; Geurten et al., 2018; Veenman & Spaans, 2005).

In terms of metacognitive knowledge, I have underlined the importance of individual experiences in how learners construct knowledge about learning and about themselves as learners throughout this thesis (Bjork, 2018; Dunphy, 2004; Nutbrown, 2011; Reber & Greifeneder, 2017). The children's metacognitive knowledge was not cold and cognitive, but heavily associated with felt experiences based on processing fluency (Arango-Muñoz, 2014; Efklides, 2006; Reber & Greifeneder, 2017). Individual experiences do not take place in a vacuum and socio-cultural factors were important in helping to interpret metacognitive experiences and acquire metacognitive knowledge (Heyes et al., 2020; Jansen et al., 2014; Slee & Shute, 2003). This is important to remember because an overemphasis on individual learners' dispositions disregards the role of classroom culture and wider cultural ideology in creating the experiences in which children construct their dispositions and beliefs (Bronfenbrenner, 1979; Kohn, 2015; Wall & Hall, 2016).

Research around young children's metacognitive feelings and judgments is normally experimental (e.g. Destan et al., 2014; Vo et al., 2014), so this study's contribution is its investigation of the criteria children said they used to make these judgments. Destan et al.'s (2014) and Vo et al.'s (2014) studies focused on the accuracy of children's judgments with the criteria being something to control for based on how the task was set-up. Conversely, this study elicited rich data about the criteria children used to make judgments and the implicit/explicit nature of these criteria, but in most cases I could not evaluate the accuracy of children's judgments. This study aligns with research that indicates learners base their judgments on feelings that arise from underlying processing fluency (Arango-Muñoz, 2014; Bjork, 2018; Reber & Greifeneder, 2017). I presented evidence that children paid attention to feelings about their processing fluency during learning experiences and could interpret them based on tacit or more explicit theories about learning (Arango-Muñoz, 2014; Nisbett & Wilson, 1977). They could use their past experiences of success and failure to make prospective judgments about whether learning something new would be easy or hard (Finn & Tauber, 2015). Reber and Greifeneder (2017) state that processing fluency remains relatively unaddressed in educational literature despite having obvious implications for education. This research affirms the importance of processing fluency to how children construct beliefs about learning and about themselves as learners.

The results from the statistical analysis aligned with other studies indicating that children's early skills are important for metacognition (Bryce et al., 2015; Haberkorn et al., 2014;

Misailidi, 2010; Pezzica et al., 2016; Roebers et al., 2012; Saraç & Karakelle, 2012). Both executive functioning and verbal skills were important to expressing metacognition in the study. In terms of the division between metacognition and self-regulated learning, this study's results align with the view that they are intertwined if not fully part of the same underlying construct (Dinsmore et al., 2008). However, conceptual division can be helpful, particularly when self-regulated learning research is often more concerned with top-down self-regulatory processes rather than the bottom-up, feelings-based processes that aligned more with this research (Efklides, 2008; Follmer & Sperling, 2016; Larkin, 2010; Schneider, 2010). My integrative approach to quantitative analysis allowed qualitative investigation into children whose demonstration of metacognition differed from what was predicted by the regression model. Additionally, I was able to explore qualitative differences between groups. This contributes valuable knowledge about how quantitative group differences were reflected in the ways that children talked about and understood their learning.

In line with other reflective methods of exploring young children's metacognition (e.g. Robson, 2010), this study elicited more metacognitive knowledge than regulation. Researchers adhering to strict online/offline distinctions would probably assert that this is due to the fact that the study elicited primarily offline metacognition (Bryce & Whitebread, 2012). However, this is also due in part to the framework I chose to code metacognitive comments. Other PVT studies (Wall, 2008; Wall et al., 2013) have found more evidence of metacognitive regulation using Veenman and Spaans (2005) metacognitive skilfulness to code metacognitive comments. This framework combines knowledge of strategy with regulation, meaning that this study would have also found substantial evidence of skilfulness if I had used Veenman and Spaans (2005) framework instead of the C.Ind.Le framework (Whitebread et al., 2009).

Although a potentially contentious point, this study highlights that online/offline distinctions are not as straightforward as they are sometimes portrayed (Gascoine, 2016). It is likely that some researchers would disagree with the way I assigned online codes representing metacognitive regulation to what many would consider offline reflective data. Traditionally online assessment of metacognition has the following characteristics:

- Assessed while the learner is engaged in a specific task

- Assesses “domain specific metacognition with a focus on the learning process” (Saraç & Karakelle, 2012, p. 302).

Offline assessment of metacognition has the following characteristics:

- Assessed prospective or retrospective to a specific task
- Aimed at “assessing metacognition either in general (i.e. without any explicit reference to a specific task) or specific to a task” (Saraç & Karakelle, 2012, p. 302)

The PVT interactions represented a specific task that was focused on learning processes and elicited both domain-specific and domain-general metacognition. Although it is true that they were primarily a reflective task in that they allowed children to draw together past experiences of a learning setup, chapter 7’s discussion of metacognitive regulation (see section 7.4.4) suggested that the PVT interaction also provided opportunities for imagining new learning situations and metacognition related to the PVT interaction itself. This meant that the PVT interactions often blurred the line between online and offline and it was sometimes difficult to discern whether children were focused on reflection, imagination or elements of the PVT task. Additionally, some topics children brought up indicated monitoring and evaluation of their emerging skills or progress toward longer-term goals like learning the alphabet or learning to read. I would argue that these longer-term goals are specific tasks that take place over an extended period, meaning that the children were engaged in them on an ongoing basis. The fact that there is substantial crossover between online/offline characteristics in the PVT interactions shows that this is a contentious area and raises questions about whether the online/offline distinction is meaningful. This is further discussed in implications for researchers (section 10.3).

Because of its context-dependent view of metacognition, this study strongly aligns with Desoete (2008) and Gascoine et al.’s (2017) assertions that the way metacognition is explored and how it is defined has a strong impact on the study’s results. The above assertions about coding and analysis add that the *way* data about metacognition is analysed also impacts on the results of the study. Throughout this thesis, I have framed metacognition as a messy and internal phenomenon that can be difficult to know about. The outliers in the statistical analysis demonstrated that even if children were strategic and reflective about non-cognitive topics, they could still end up with no comments coded as metacognition in the analysis even though they were probably capable of metacognitive reflection. Metacognition has to be inferred from learners' behaviour and verbal accounts and cannot be observed directly (Veenman, 2007). This is exacerbated by the interplay between implicit and explicit processes as even highly inaccessible knowledge and beliefs about mental processes have the potential to impact on learning. As Williams and Grant Atkins (2009) suggest "the true extent of metacognition is difficult to determine as children may possess knowledge and use strategies that they are unable to express" (p 30). Veenman (2007) notes that intentionality is important, but this study highlights that intentionality may not be easy to establish, particularly when tacit understandings come into play.

10.2. Summary of limitations

I have discussed some limitations of this study throughout the methodology and analysis, but it is important to draw these together before outlining the study's implications for researchers and teachers. There were limitations in the study's design and how I carried out the research and analysed the data. These have been considered throughout the methodology and analysis chapters (see chapter 5 and 6). This section provides a reflection on the limitations in relation to the knowledge claims that can be made.

The research was limited by the fact that it was carried out by one researcher and informed by my own perspective. In all empirical metacognition research, the researcher sets up the context for metacognition, which is informed by the way that they perceive metacognition and the participants demonstrating metacognition. Although I discussed my decisions with my supervisors and my use of the C.Ind.Le framework (Whitebread et al., 2009) with an independent coder, the research approach and analysis were ultimately informed by my own understanding of metacognition and young children (see chapter 2). I have not endeavoured to remove my presence from the research in this thesis, instead establishing a decision trail which explains and justifies the decisions I made (Noble & Smith, 2015). There were places where I would argue that my critical realist perspective strengthened the research, particularly in my in-depth analysis of the context of the PVT interactions. By emphasising how the different features of the context played a role in co-constructing the metacognition children expressed, I acknowledged the complex nature of metacognition and readily highlighted the impact of the research approach.

This study, like all PhD studies, was limited by the time and resources available. This is also a common concern in mixed methods studies, which have to balance qualitative and quantitative concerns about depth and breadth (Castro et al., 2010; Halcomb, 2019). Throughout the research process, I had to make decisions about depth and breadth that came with their own limitations. While I was able to gather considerable data by conducting two rounds of data collection and feedback sessions, the study is limited by the fact that I interviewed most children only once. The only children interviewed twice were the ones who participated in both the pilot study and the main study. This means that most children only had one chance to demonstrate metacognition. Considering that metacognitive performance can be significantly impacted by contextual features, this is a considerable limitation. Due to time and resource constraints, it was necessary to choose between gathering more data from the same participants or gathering more data from a larger group. Taking the latter approach meant that I was able to obtain a larger sample size and draw together data from a wider range of participating children and schools. The resulting data set is a cross-sectional snapshot of children's metacognition. Throughout my presentation of the findings, I have highlighted that not demonstrating metacognition in the interaction does not mean a child was not metacognitive. I operated on the assumption that children and adults alike can become metacognitive depending on the situation. The study's contribution is not in establishing whether children were metacognitively competent, but in its in-depth exploration of what their early metacognition is like and what factors might impact its expression. This is an important contribution, especially in areas where quantitative, experimental research is the norm such as studies of children's metacognitive judgments.

It cannot be claimed that the sample of schools and children was representative of all Scottish schools and children. Section 8.2 drew attention to the importance of classroom culture and its potential role in facilitating changes in children's perceptions from the beginning of the school year to the end. Each school's culture is different, and this would likely impact on how children in other schools express metacognition. Although other schools in Scotland are situated in the same wider culture, Scottish socio-cultural ideology would probably be enacted differently in various local cultural contexts. However, the connections between affect and metacognition and the importance of implicit processes and tacit knowledge are well-supported in the literature (Efklides, 2006; E. Norman et al., 2010; Reber & Greifeneder, 2017; Schraw & Moshman, 1995). Therefore, it is likely that other studies investigating young children's metacognition would also find that these are important, although they might be expressed in different ways.

Sample representativeness also likely impacted on the results of the statistical analysis. Since the PVT interactions were highly successful at eliciting metacognition, the group of children who did not demonstrate metacognition (n=19) was small in comparison with the group of children who did (n=66). Although this should be viewed as an advantage of the method, when group numbers are heavily skewed it has an impact on statistical analysis. This study's use of bootstrapped confidence intervals helps in confirming that the statistical relationships recorded were genuine (Field, 2013; Zhang & Whitebread, 2017). When the skewed group sizes were combined with low representation of children from disadvantaged socioeconomic groups and with low verbal skills, it likely meant that some of the statistical tests were underpowered. This was especially visible in the results of the chi square tests, most notably the marginally nonsignificant result for differences between children from different NS-SEC classes. Potential connections between socioeconomic status and expression of metacognition would be worth further investigation in a sample with more even representation. Nonetheless, the importance of early skills to the expression of metacognition is a connection that is supported by other studies, which lends increased credibility to the results of this study (Bryce et al., 2015; Haberkorn et al., 2014; Misailidi, 2010; Pezzica et al., 2016; Roebers et al., 2012; Saraç & Karakelle, 2012).

The data collection process also introduced some limitations, which were highlighted in previous chapters, particularly chapter 4 and chapter 5. Since these have already been addressed, the specific issues will not be returned to in detail. However, it is useful to draw together the limitations of the data collection method by addressing the overarching issue of using a comparatively closed method. Chapter 9 demonstrated that using an approach that tended to constrain the talk to academic learning situations usually prompted reflection that was relevant to the research questions and often elicited metacognitive statements. However, this did mean that the research likely missed some avenues for productive discussion, which children may have brought up if the study used more open and participatory methods.

The focused approach meant that I was able to draw on a relatively large number of children's perspectives of academic learning situations. A more open approach may have yielded more data about how children think about their cognitive processing in other contexts. The study's critical realist approach is useful here because it acknowledges that different approaches add different kinds of knowledge to the collective understanding of real phenomena. Open approaches have their own limitations, with some researchers suggesting that it can be difficult to obtain information that is relevant to the research agenda if the approach is too open (Blaisdell et al., 2019). I do not suggest that this study has presented a complete understanding of the participating children's metacognition. This is not only due to this study's specific limitations, but because I would argue that a complete understanding is not possible due to the complex, internal nature of the phenomenon. Nonetheless, this study does add its own meaningful contribution to the collective knowledge of young children's metacognition. It has important implications for both researchers and teachers which will be outlined in the next two sections.

10.3. Implications for researchers

Chapter 4 highlighted that it is important to consider how the context shapes the kind of metacognition that children express in a study and how the tool determines what is recorded as data. Figure 36 details some questions researchers should consider when they collect and analyse data and ultimately contribute knowledge to our collective understanding of metacognition in young children. The numbered comments in the diagram are to help the reader refer back to the diagram in the discussion below.

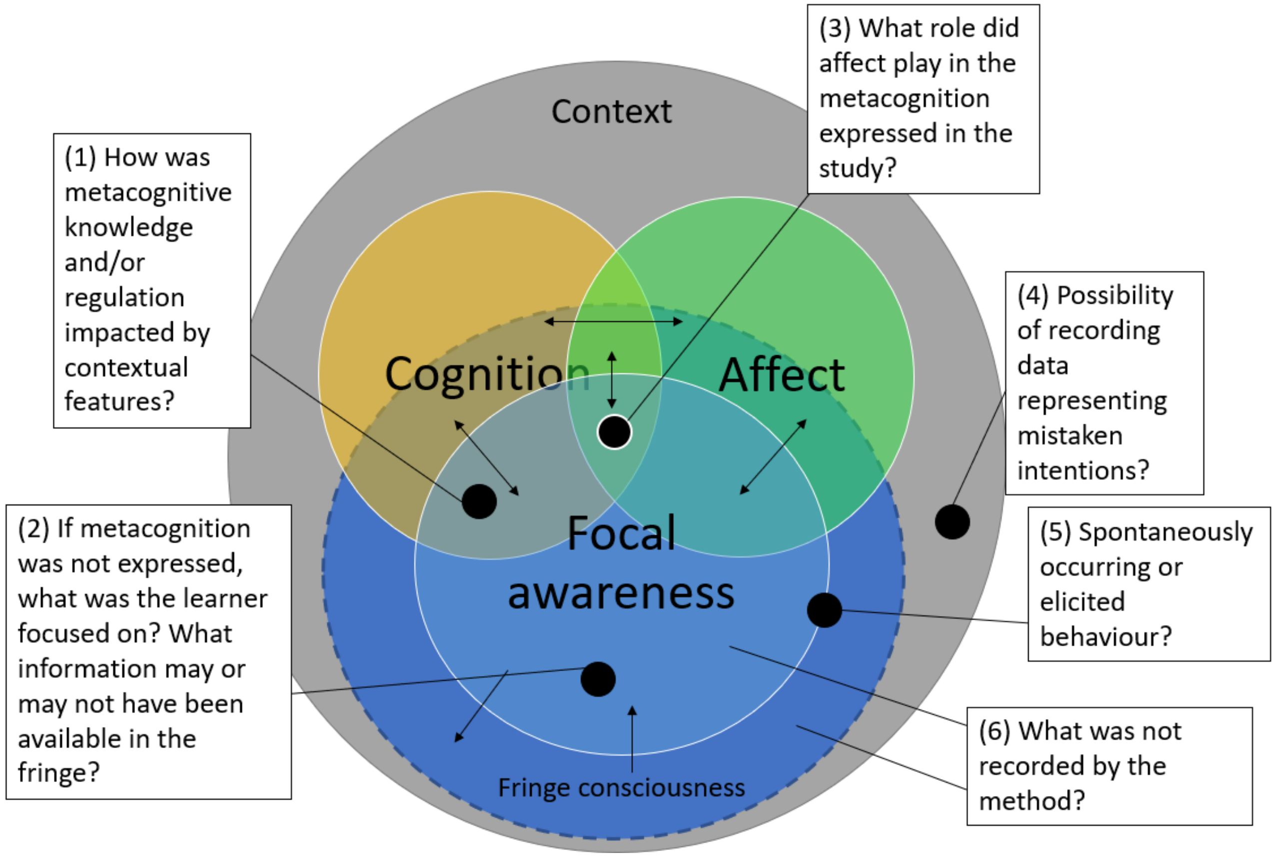


Figure 36: Questions for researchers when considering metacognitive contributions

Throughout this thesis, I have argued that metacognition is a complex and internal phenomenon that is difficult to know about. No approach to recording data about metacognition is perfect and none will provide a complete picture of the thinking the learner was engaged in at the time (6). This means that it is problematic to state that learners are not metacognitive. The methods that we use as researchers only capture a small portion of learners' thinking and our methods generally play a part in directing focal awareness (5). Metacognition might be present but not recorded by the data collection tool. It can draw on implicit knowledge that is difficult to express and might not be obvious from a learner's behaviours or explanations (Williams & Grant Atkins, 2009). Additionally, methods that prompt metacognition in some learners may not do so in other learners because they are focused on something other than cognition (2). In the early years, teachers and schools put in a lot of effort to ensure that young learners understand how to work well with others and how to recognise and regulate their emotions. It follows that it is important to acknowledge in research that there are other ways to be strategic and reflective besides metacognition. Choosing to focus on factors other than cognition does not mean that a child is not capable of metacognition.

Researchers should consider the potential of their methods to misrepresent learners' intentions. Veenman (2007) indicates that intention is important, so it is necessary to think about whether data recorded as metacognition was actually intended that way by the learner or only interpreted as metacognition by the researcher (4). As stated in section 10.1, intentionality can be hard to establish, particularly when implicit processes come into play. Nevertheless, misrepresentation is an issue that should be considered. In this study, it was possible that I read too much or too little in children's utterances and interpreted them as more complex or simple than they were intended to be. This issue is not only relevant for reflective and interview-based methods like the ones used in this study but has implications for other popular methods for exploring young children's metacognition such as observation. Evidence for emerging findings should be actively questioned and it is important to consider the impact of researcher perspectives on the research approach. Using multiple coders for interrater reliability can help ensure that analysis approaches are not overly influenced by one perspective.

The feedback sessions with the learners used in this study or reflective discussions about recordings used in observations (S. Robson, 2016c) may help to confirm, deny or qualify emerging findings and could limit misrepresentation. These approaches have limitations because they might not pick up on implicit knowledge that learners may not be fully aware of (Schraw & Moshman, 1995). Additionally, learners might express seemingly contradictory beliefs in different contexts (Tourangeau et al., 1989). Nevertheless, learners' explicit knowledge from feedback sessions and reflective dialogues could provide complementary data that adds insight to the study's analysis. This was particularly helpful in this study because the feedback sessions helped identify the impact of pedagogic voice and gather some data about how children's beliefs had changed during the school year.

It is important to keep in mind that metacognition is impacted by contextual features and how learners feel about the context, particularly if the study is exploring the kinds of metacognition participants express (1,2). As this study demonstrated, different contexts can provide different affordances for metacognition and for expressing various understandings of learning. It was unclear how much of children's objectivist views of learning were a product of the focus on academic learning and pedagogic voice. Lunn Brownlee et al.'s (2017) study exploring children's epistemological beliefs also found that children had objectivist views of learning, but their study was also conducted in a classroom setting. It is clear that context influences the availability of beliefs (Tourangeau et al., 1989) and this study demonstrated that pedagogic voice played a role in children's traditional beliefs about learning.

It is an open question how much of children's objectivist beliefs about learning are reflective of their expectations and experiences of learning in academic contexts specifically. In this study, some children emphasised their own role in learning, particularly in outdoor contexts where they did not feel that they were being told what to do. Future studies using PVTs could explore children's beliefs about learning in multiple contexts by using different templates with the same children. Especially in Scotland, it is important that these include new templates designed to reflect play-based learning contexts commonly used in schools that have implemented this change in curriculum (P. Duncan & Grogan, 2019).

In reference to the online/offline debate, I would argue that there are more useful ways of looking at different types of data than online/offline measurement. This study suggested that the context significantly impacted the kind of metacognition children expressed. Therefore, I suggest that it would be more meaningful to look at differences in the degree of elicitation between methods and whether the focus is primarily on general or specific metacognition. The online/offline distinction hinges on being able to tell what a learner is focused on. If they are focused on the task at hand, then the metacognition is online, but if they are focused on reflection then the metacognition is offline. This sounds simple, but it can be difficult to tell, for instance, when a learner momentarily stops a task to reflect on what they have done. In the data from this study, sometimes it was difficult to tell if children were reflecting on their experiences of other learning situations, imagining a hypothetical learning situation or talking about something they were doing in the PVT interaction. Conversely, differences in elicitation come from the approach designed by the researcher and do not rely on being able to tell what the learner is focused on. This means that researchers should consider the extent to which the method they used influenced what learners said or did (5).

Most studies aim to record a certain kind of behaviour or perspectives on a certain topic, but the extent to which behaviour is elicited differs depending on the study's approach. If elicited behaviour and spontaneous behaviour are positioned as ends of a spectrum, the metacognition I have discussed in this study would be toward the highly elicited end (Pauwels, 2011). Some metacognitive studies will record more spontaneous behaviour than others. Ostensibly online methods like observation and think aloud protocols record more spontaneous behaviour than this study. However, asking children to think aloud directs their attention to their thoughts, making the behaviour recorded in studies using think aloud protocols less spontaneous than observation (Gascoine et al., 2017). Considering where a study falls on the spontaneous/elicited spectrum is particularly important if researchers are trying to make assertions about children's metacognitive abilities since it matters whether the demonstrated behaviour is spontaneous or elicited when discussing the results. This resonates with Vygotsky's (1978) discussion of the difference between what learners can do on their own and what they can do with assistance.

There is a meaningful difference between spontaneous and elicited metacognition, namely whether the child performed the behaviour on their own or whether the behaviour took place in the ZPD, with assistance from other people or from prompts. The amount of assistance can vary and plays a role in how elicited the behaviour is. Researchers have argued that online methods are more representative of children's actual use of metacognition than offline methods (Bryce & Whitebread, 2012). However, this statement is problematic because it implies that metacognition in one situation is representative of metacognition in other situations. It might be argued that online methods like observation and think-aloud protocols tend to be interested in relatively spontaneous behaviour that is task-specific. This spontaneous behaviour might be more predictive of other spontaneous behaviour than elicited behaviour. However, even if we accept this, not all online methods explore spontaneous behaviour. Experimental metacognition studies would be classified as online because data collection takes place while the learner carries out the task, but many involve substantial elicitation, such as when children are prompted to make a confidence judgment (i.e. Destan et al., 2014; van Loon et al., 2017; Vo et al., 2014). Additionally, some measures that many would consider offline involve much more elicitation than others. Questionnaires that list strategies and ask learners whether they use them (Sperling et al., 2002) involve substantially more elicitation than PVT activities with minimal prompting (Gascoine, 2016). The interest in presumably offline studies also varies widely with some studies being interested in domain-general metacognition, task or domain-specific metacognition or both. These issues make the online/offline distinction confusing and less meaningful than looking at differences in the degree of elicitation and whether the study is interested in general metacognition, specific metacognition or both.

It is important that researchers provide information about the context metacognition was expressed in. This is necessary when discussing issues like transfer because research has shown that transfer is more difficult when contexts differ substantially (Barnett & Ceci, 2002; Chen & Klahr, 2008). Information about the context is important for studies involving both spontaneous and elicited metacognition. Although the important contextual features will likely differ from this study, more spontaneous metacognition is also tied to the context it was expressed in. Perhaps the recorded lack of correlation between online and offline measures of metacognition (Desoete, 2008; Saraç & Karakelle, 2012) is actually attributable to differences in the degree of elicitation/spontaneity and whether the research tool is targeted at general/specific metacognition. It is possible that a better understanding of children's metacognition could be gained by offering them opportunities to express metacognition in different ways (Clark, 2010; Desoete, 2008; Saraç & Karakelle, 2012). This could include using spontaneous and elicited methods as complementary tools as in Robson's (2016c) use of observation and reflective dialogues.

For researchers using elicitation to investigate young children's metacognition, this study can offer some recommendations. It recommends the use of pedagogically appropriate methods that draw on children's competences (Wall, 2019). This study joins other studies that have effectively used visual methods to support young children to talk meaningfully about learning (Cobb, 2017; H. Lewis, 2019; Lunn Brownlee et al., 2017; S. Robson, 2010). Visual methods are more familiar and understandable to children than traditional methods and draw on ways that they already use to communicate their thoughts and feelings. The visual helps to mediate power differences and provides a tether that helps ground the discussion, keeping children from deviating too far from topics that are relevant to the research aims (Wall & Higgins, 2006). For researchers using PVTs and other visually-mediated discussions, it is important that the visuals reflect learning situations that the children have experienced. In this study, I spoke with teachers to determine which situations children would be familiar with. In Scotland, it would be helpful to develop PVTs that reflect play-based learning situations since the curriculum is shifting toward this in the early years. Other creative methods that draw on children's play activities can and should be developed to offer more varied opportunities for children to meaningfully talk about their learning and thinking (i.e. Marulis et al., 2016).

The fact that this study's supportive questioning approach was successful in eliciting metacognition in over 75% of cases builds a strong case for the use of facilitative techniques. This study suggests that using questions that focus on metacognitive experiences like struggle can facilitate discussion of both general and specific metacognitive knowledge. This approach could be expanded in future research to incorporate more prompts and probes to further investigate how children interpret their underlying feelings related to processing fluency (Reber & Greifeneder, 2017). Researchers can support children with working memory difficulties or who struggle to answer abstract questions by suggesting more specific contexts for reflection. This may help children to access subject-specific knowledge to help explain their reasoning. Visual approaches like draw and tell and visually-mediated interviews can incorporate general questions about the picture at the beginning to establish the context with children and take note of children's suggested contexts. These suggested contexts can be used to support children in thinking more abstractly if needed. Future studies could also expand on the evidence from this study that comparisons were useful in reflection. These helped children focus on both internal and external features that facilitated and inhibited learning in different situations such as learning inside/outside and learning alone/with friends. Additionally, comparing themselves with others and with their younger selves helped children communicate how their skills had progressed and how they might progress in future.

In a wider sense, this study has implications for how research is discussed and linked with practice. Although it has a distinctly educational focus, this study is interdisciplinary in that it draws on concepts from educational and psychological research. Throughout this study, critical realism has been a useful framework for understanding the value and connections between different ways of knowing about metacognition. Other researchers have suggested that concepts from psychological research like processing fluency are important to education, but receive little attention even in inherently interdisciplinary fields like educational psychology (Reber & Greifeneder, 2017). This study provides evidence that processing fluency informed children's explanations of their learning experiences, meaning that it is important to education. Both teachers and children could benefit from a better understanding of this concept, but it needs to be discussed in a way that is accessible and meaningful to teachers and educationalists.

There are various ways that researchers could work toward making metacognition research more accessible to teachers and practitioners. This could mean using relevant practice-based examples or making connections to educational concepts and theories that are meaningful to teachers. It could also mean partnering with teachers who are interested in metacognition to support them in gaining an understanding of concepts like processing fluency (Wall, 2018). This would help them to reflect on how these concepts apply to teaching and learning in their classrooms and develop their own practitioner enquiries. In Scotland, it would be useful if researchers worked closely with teachers to develop new PVTs that reflect Scottish classroom practice and explore connections between classroom culture and children's conceptions of learning. This study has attempted to discuss concepts like fringe consciousness and metacognitive theories in ways that are useful and familiar to educationalists by showing their parallels with the ZPD and schemas. Although psychological studies tend to be interested in specific aspects of metacognition such as judgment calibration, it is worth thinking about how they overlap with educational concepts and apply to practice. If metacognitive research is meant to ultimately improve learning and teaching, incorporating familiar and useful educational concepts may help teachers to develop a better understanding of psychological processes in relation to practice.

There is space and need for more mixed methods research about metacognition. It is possible that using qualitative data to recontextualise quantitative results could help make quantitative metacognition research more accessible and meaningful to teachers and educators. Additionally, the use of integrated mixed methods analyses would be helpful in advancing our collective knowledge about metacognition. Qualitative examples help to illustrate what quantitative differences look like and can help in understanding mismatches in predicted/actual group in regression models more meaningfully. Particularly in the case of children with low early skills who did demonstrate metacognition, there is much to be gained in further exploring what it was about the situation that supported them in demonstrating metacognition.

10.4. Implications for practice

Figure 37 outlines some questions for practitioners to consider about how metacognition is supported in their classrooms. The numbers in the diagram are for the reader to refer back to the diagram in the discussion below.

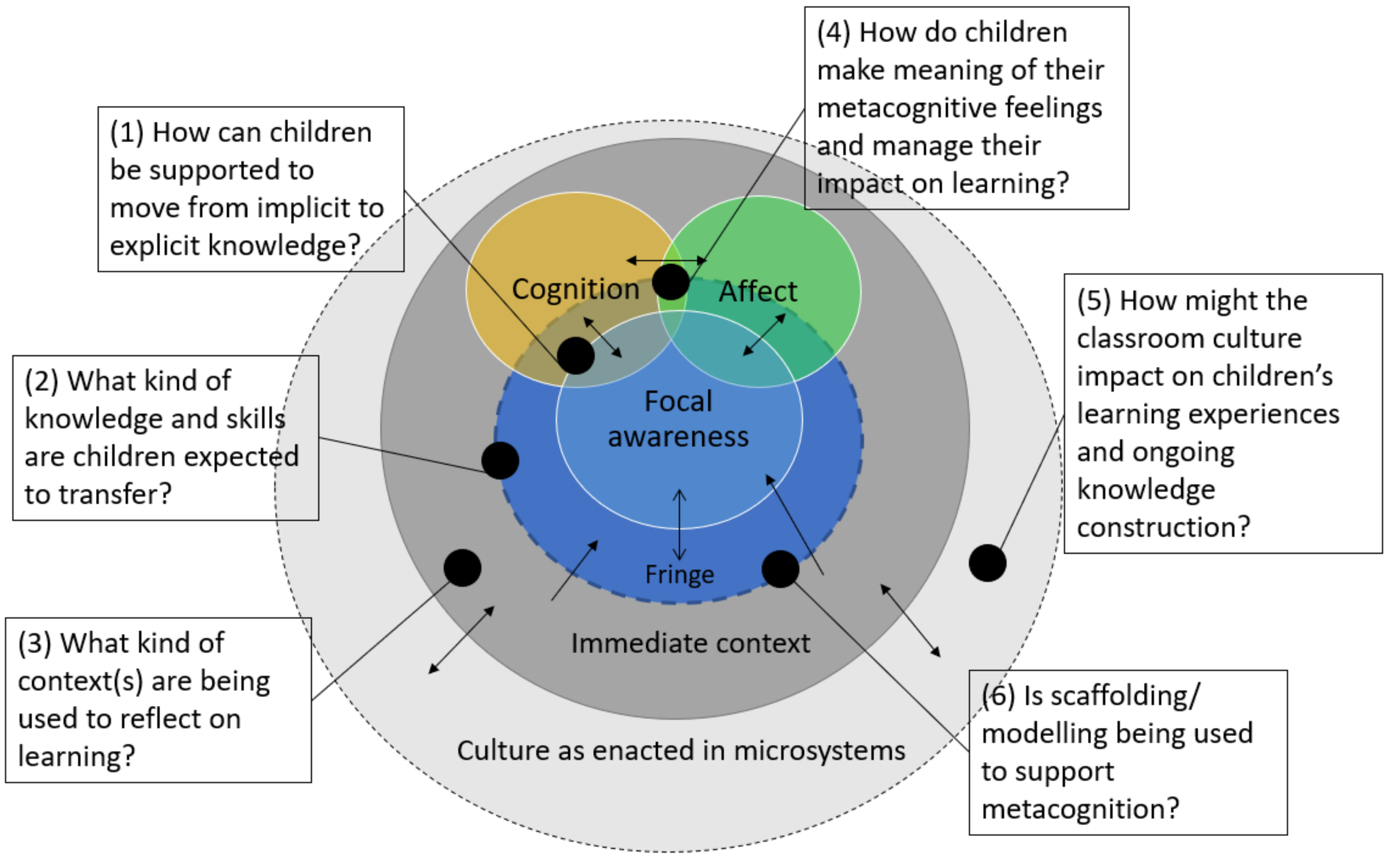


Figure 37: Questions for teachers when considering how their practice supports metacognition

This study joins other studies that have highlighted the importance of creating a classroom culture that prioritises talk about learning as a process rather than an outcome (5) (Wall & Hall, 2016). Wall and Hall's (2016) paper shows that shifting from a focus on work to a focus on learning takes active engagement from teachers. This is because it represents a cultural shift which can be challenging, especially in an educational system that tends to focus on outcomes. There is evidence that collaborations between teachers and researchers can be successful in changing school and classroom culture to focus on the learning process (Higgins et al., 2007; Wall et al., 2010; Wall & Hall, 2016). It would be useful if future research projects aiming to develop metacognitive practice in schools were guided by teacher enquiry with support from researchers. Wall (2018) suggests that researchers and teachers should work closely with each other.

It is not helpful that the primary takeaways from popular research on mindsets have tended to prioritise changing children's mindsets without considering the culture that has shaped how their mindsets were created (Kohn, 2015). In practice, growth mindset interventions are often decontextualized one-off lessons encouraging children to adopt a general growth mindset. This is likely because it is simpler to tell learners that they need to change their mindset than to transform classroom culture and ultimately the curriculum to be about the process of learning rather than the product. Schraw and Moshman (1995) emphasise that even strategy instruction can only go so far, and that knowledge constructed by individual learners is more meaningful. The kind of learning that children experience in their classrooms influences the knowledge they construct about learning.

The fact that most children in the study demonstrated metacognition means that even at the start of primary school, children with varying skill levels can meaningfully discuss their learning if supported to do so (6). This means that teachers should build in regular opportunities to talk about learning from the early years on. For classroom teachers it is worth knowing about the metacognitive knowledge and beliefs the learners in their class hold because knowledge and beliefs impact on learning in meaningful ways. This study has shown that children can express their explicit beliefs about learning and that some of their explanations might hint at implicit beliefs about learning. Tacit theories are enough to make judgments about learning, but when these theories are unproductive or flawed, they can be harmful even if children are not explicitly aware of them (Arango-Muñoz, 2014; Schraw &

Moshman, 1995). Schraw and Moshman (1995) indicate that the benefit of making implicit knowledge from tacit theories explicit is that explicit theories can be evaluated and judgments can be made about how correct they are (1). Regular opportunities to discuss learning in the classroom afford both children and teachers a chance to evaluate their theories of learning (3). Efklides (2008) states that:

> "language and reflection allow people to analyze and compare their subjective mental states and knowledge with those of other people and to form explicit theories about knowledge and cognition. This leads to the building of a socially shared and socially negotiated model of cognition, as well as of one's self and others as cognitive beings" (p 279)

When interacting with others and exchanging ideas, the theories that children hold might change as they accommodate the new understandings generated by social metacognition. This could be particularly effective in helping learners to change some of their flawed or unproductive metacognitive theories. Additionally, discussions about learning can help to develop a shared language of learning in the classroom (Wall & Hall, 2016). This could be particularly helpful for children with low verbal skills who might initially struggle to discuss their ideas about learning.

The regression model showed that teacher ratings of children's early skills were a good predictor for whether children would demonstrate metacognition. However, some children with relatively low-level early skills such as difficulties with working memory and low verbal skills did demonstrate metacognition even though the regression model predicted they would not. This indicates that researchers and practitioners should not assume that children with low early skills are unable to talk about learning. Instead researchers and practitioners should work together to design practical and pedagogically appropriate ways to support children with low early skills to talk about learning since with practice, their skill is likely to improve. This study has offered some suggestions for supporting children with low early skills to talk about their learning. They could be paired with children with higher skills who can help them to elaborate on their ideas and suggest vocabulary to help them verbalise their implicit knowledge. Additionally, when using questioning to prompt talk about learning, teachers and practitioners can add more structure to abstract questions by reminding children of the contexts and ideas brought up earlier in the discussion. This could be particularly helpful for children with working memory difficulties who might struggle to hold earlier information in mind so that they can work with it later.

PVTs are an ideal tool for facilitating regular discussion about learning in the classroom because they are low-cost and flexible. As visual tools, they provide a useful anchor for conversation and help to direct learners' attention to salient aspects of the pictured situation. They do not require any expensive equipment and are pedagogically appropriate (Wall, 2019). Unlike video-prompted reflective dialogues, they can be used in both planned and responsive ways to facilitate general and specific talk about learning. Teachers could decide during a lesson to use a digital version of a PVT in a reflective plenary session after a particularly tricky or engaging learning episode. They could also plan for discussion about a learning set-up they are interested in. PVTs can be used in a whole class set-up or in small groups. A major problem with using PVTs with small groups in the early years is that children are less independent, and most will not be able to write down their ideas without help. Additionally, teachers are not always able to dedicate large amounts of time to working with small groups. One idea might be to train older children in the school to facilitate PVT discussions and scribe for younger children. Schools often already use a buddy system to connect older and younger learners which could be utilised for this purpose. This would also benefit older learners because their facilitative role may help them to reflect on their own beliefs about learning and how their beliefs impact the way they learn. Of course, it would be necessary to ensure that older learners do not pass on misconceptions about learning or lead children to talk about learning in a way that aligns with their own beliefs. This is particularly important since this study indicated that young children perceive older children as being trustworthy sources of knowledge.

Research suggests that young children learn how to make meaning of and discriminate between metacognitive feelings from their parents,teachers and peers (Finn & Tauber, 2015; Heyes et al., 2020). This means the ways that adults frame metacognitive feelings are important (4). In this study, the children broadly defined easy as being positive and hard as being negative. Some even seemed to infer that if a learner finds something easy, they are good at learning but if they find it hard, they are not. In my discussions with children, they enjoyed using sayings like "easy peasy, lemon squeezy" and my limited observations in the classroom showed that teachers were using these too. It is worth asking why easy is overwhelming framed as positive for learning in the classroom when research insists that difficulty can be desirable and learners should actually be suspicious of feelings of ease (Bjork, 2018; Finn & Tauber, 2015). Feelings of ease might lead to overconfidence and poor decisions on how to allocate study time if the learner assumes that they already know and do not need to study anymore (Finn & Tauber, 2015). In the early years of primary school, children may not make many decisions about how they learn, but the attributions they make for metacognitive feelings form the basis for later self-regulated learning. This means that it is important for children to learn more accurate information about memory in a developmentally appropriate way. It follows that it is important for teachers to have an accurate understanding of memory and learning processes. Memory and learning can sometimes seem like counterintuitive processes, meaning that it may be difficult to come to an accurate understanding through experience. For example, research suggests that it may actually be better to wait until a learner has almost forgotten something before reviewing it rather than incorporating a lot of practice at the beginning (Dunlosky & Rawson, 2015). Reber and Greifeneder (2017) suggest that informing teachers about the underlying mechanism – processing fluency – may help them "flexibly apply this knowledge across situations" (p 94).

Feelings of difficulty are opportunities for metacognitive control, so it is important that teachers help children develop ways of understanding and dealing with metacognitive feelings of difficulty in an academic context. If children cannot think of any strategies for independently dealing with difficulty, they are more likely to give up or just ask for help without trying to resolve the difficulty on their own. This does not necessarily mean that they do not know any stuck strategies or that they have never learned to be independent. Instead, they may not realise the strategies they know are useful or know how to apply them in a new context. Research indicates that context and focal attention impacts the availability of knowledge and beliefs in a given situation (E. Norman et al., 2010; Tourangeau et al., 1989). The study shows evidence that the children may have arrived at primary school with the expectation that it is different from the play-based learning they experienced at nursery. These early expectations could have been formed in their discussions with their parents and carers and may be confirmed or challenged in their experiences in the first year of school. Independence will likely need to be taught and fostered in an academic context.

Since teachers are increasingly moving toward a play-based curriculum, it is important that they do not assume that children will automatically transfer strategies they learn in play to academic situations (2). In classrooms that incorporate a mix of play and more traditional academic work, child-initiated play often happens in the same space as teacher-led academic learning, but they are still substantially different contexts (Barnett & Ceci, 2002). This study suggests that children may think of different types of goals differently because they have more control over the goal in play but feel that they lack control over the goal in teacher-led tasks. This may lead to increased dependency when children start engaging in teacher-led academic tasks. This does not mean that transfer from play to academic learning is impossible or that play-based learning should be abandoned. A classroom culture that uses solely teacher-directed academic tasks is one where the teacher has most of the control and children may feel that they have little control. There is evidence that some Scottish schools still lean toward a control culture in the early years, which may promote dependence and a sense of learned helplessness (McNair, 2016). Instead, this study would recommend that teachers encourage children to bridge the gap between play and learning and adopt holistic views of learning. This study has discussed the benefit of using questions and prompts to direct children's focal attention, which can impact the knowledge that is summarised in the fringe (E. Norman et al., 2010). This aligns with Veenman, Kok and Blote's (2005) study that showed children used more strategies when metacognitive cues were incorporated. Teachers could experiment with the use of cues, reminding children of strategies they may have learned through play and helping them to apply them in more teacher-led academic tasks.

It is also important to consider how play is incorporated, talked about and reflected on in the classroom. Pyle and Alaca (2018) indicate that in their study:

> when varied types of play were integrated in the classroom, providing opportunities for child-directed free play, alongside opportunities for more teacher guided play contexts, the children communicated a more holistic definition of play that integrated both pleasurable, open-ended opportunities…and opportunities to learn necessary academic skills in a playful context. (p 1071)

In this study and in Pyle and Alaca's (2018) study, some children seemed to see the teacher's role as a director, and they differentiated starkly between play and learning. This seemed to be because the children saw the teacher's presence as signifying that certain activities were opportunities for learning. This means that teachers who are looking to incorporate play-based learning in their classroom should ensure that they are not just continuing to adopt a solely directing role. This can happen when some children are involved in free play while the teacher pulls out small groups for teacher-directed activities.

Fisher (2013) states that ideal early years practice involves a mix of adult-directed, adult-initiated and child-initiated activities. She stresses that while the adult's role is different depending on the type of activity, teachers can play an important role in extending children's play and it is important that child-initiated play is not abandoned. If the teacher does not participate in play, the children will continue to see her only in her directing role and may struggle to see the opportunities for learning that child-led play offers.

Research has indicated that other regulation and co-regulation are important to the development of self-regulation (Mercer & Howe, 2012), so it is possible that teacher-facilitated reflection could encourage children's independent reflection. Talking about play-based goals and reflecting on the learning that took place could also help children to bridge the gap between play and learning. In this study, when children were encouraged to think about outdoor learning, they acknowledged their own role in learning, seeming to take a more constructivist view of learning. Therefore, it would be helpful to design PVTs that are based on play situations where there are a lot of opportunities for metacognitive experiences. According to Flavell (1979), these would be situations that stimulate careful and highly conscious thinking. Future studies could involve teachers and researchers working closely together to identify the play activities that are likely to stimulate this kind of thinking. They could then design and pilot new play-based PVTs with children.

10.5. Concluding thoughts

This study has made a small yet impactful contribution to knowledge about young children's metacognition, namely its rich description of young children's metacognition. Although it has limitations, it provided a cross-sectional, in-depth exploration of children's metacognition at the beginning of primary school using a relatively large sample of learners from six different schools. It focused on one age group without making age-related developmental comparisons. This meant the study was able to dig deeper into differences and similarities between children from different schools, socioeconomic classes and with different levels of early skills. Qualitative exploration of metacognition is still relatively rare in the field and particularly in research of some metacognitive phenomena like metacognitive judgments and feelings. More qualitative research and integrated mixed methods designs which allow further exploration into quantitative differences are needed and will help to advance our collective understanding of metacognition in the early years. If metacognitive research is to improve teaching and learning, teachers and practitioners need to understand what different metacognitive phenomena and differences in skills look like in practice. To achieve this, close links between researchers and practitioners are necessary. Table 57 summarises the implications of this study for researchers and practitioners, building on the key findings presented in table 56.

Table 57: Summary of implications for researchers and teachers in relation to the study's key findings

Research question	Key findings	Implications for researchers	Implications for teachers
1) What characteristics of facilitative PVT interactions impact on how children express their understandings of learning?	• Metacognition is inextricably linked to the context it is expressed in • PVT interactions took place within the ZPD – different features could shift focal awareness promoting reflective discussion and metacognition. • The school setting and pedagogical tools generally suggested reflection on academic contexts	• Reflect on how the researcher-created context impacts on the metacognition expressed • Development of new pedagogically appropriate contexts for recording evidence of young children's metacognition • Potential of elicitation to work in the ZPD – expansion of questioning targeted at metacognitive experiences, comparisons	• Creating regular opportunities for facilitated reflection on learning, including reflection on play-based learning • Use of visuals like PVTs to prompt reflection • Using metacognitive prompts based on metacognitive experiences such as struggle and easy/hard may help children to reflect on learning
2) How do children at the beginning of primary 1 in Scotland conceptualise learning in PVT interactions?	• Children expressed mostly objectivist beliefs about learning and differentiated between play and learning. • Children's conceptualisations of learning reflected their experiences within their classroom culture.	• Develop new PVTs reflecting play-based learning situations • Use of different types of situations to reflect on conceptions of play and learning • Investigating connection between culture and formation of metacognitive knowledge	• Facilitate transfer between play and academic learning • Creating a process-oriented classroom culture • Reflecting on teacher's role in learning as director/ facilitator, potential to earmark activities as learning

Research question	Key findings	Implications for researchers	Implications for teachers
3) What are the key characteristics of children's metacognition at the beginning of primary 1 in Scotland as demonstrated in PVT interactions?	• Evidence of explicit metacognitive knowledge and beliefs and still developing tacit understandings. • Theory-like structure of metacognition. • Complex interplay between explicit and implicit mental processes. • Metacognition was highly affective, comments reflected the felt quality of metacognition. • Heavy reliance on dependent strategies, possible connection with objectivist beliefs about learning.	• Working with teachers to understand how to operationalise knowledge about metacognition for classroom application, particularly for important concepts like processing fluency • Developing new ways of recording implicit knowledge and understanding how it contributes to metacognition • Thinking about how we analyse data about metacognition – what is the place of intentionality when implicit understandings come into play?	• Helping children to clarify metacognitive concepts and move from tacit to explicit understandings • Thinking about how concepts related to processing fluency like ease/difficulty are enacted in the classroom, correcting misconceptions in developmentally-appropriate way • Fostering independence in the early years, moving children toward more holistic views of learning
4) Are there associations between the metacognition primary 1 children demonstrate at the beginning of the school year and their: • family background; • early education; • early skills?	• Potential relationship between socioeconomic status and demonstrated metacognition. • Teacher-rated early skills were significantly related to likelihood of demonstrating metacognition. • Qualitative differences between children with high and low early skills scores were observed	• Potential of integrated analyses to help explain quantitative connections and understand group differences • Further investigation of possible socioeconomic differences in metacognition • Exploring how to support children with low early skills to demonstrate metacognition	• Supporting children with low early skills to reflect on learning • Regular opportunities to discuss learning could help children with low verbal skills to form more explicit understandings of learning

The study's critical realist orientation has been instrumental throughout the study, positioning metacognition as a messy, internal phenomenon that is difficult to know about. A collective understanding is built up over time with the contributions of different approaches to knowing about the same real phenomenon. This study provides three overarching contributions to knowledge of children's metacognition in the early years:

- Metacognition has both developed and developing aspects in the early years. Children's metacognitive beliefs and knowledge were tied to their personal experiences and interactions within their surrounding environments. Children's early skills could afford or constrain their ability to talk about their early conceptions of learning. Structures like socioeconomic status may play a part, but this requires further research.
- Metacognition is affective in the early years and strongly influenced by felt experiences, making use of implicit and explicit knowledge. Children used affective and cognitive attributions to make sense of their learning experiences. This resulted in a sort of affective metacognition that was enacted to assign meaning to feelings arising from processing fluency.
- Metacognition is intrinsically linked to the context it was expressed in. Contexts can facilitate or constrain children's metacognitive competence. Approaches that draw on pedagogy such as supportive PVT interactions can be effective in facilitating metacognitive competence in the early years.

Although young children's metacognition, and indeed metacognition in general, will likely always be a messy phenomenon, it is a phenomenon that is worth further study. I have highlighted in this chapter some of the ways that the main findings of this research might be taken forward, but I acknowledge that these are informed by my own perspective and background. There are likely many other productive directions that researchers and practitioners coming from other perspectives might take these key findings that I have not highlighted in this chapter. Young children's metacognition is an inherently interdisciplinary area where educational, sociological and psychological perspectives have great potential to come together to build a better understanding. Reber and Greifeneder (2017) highlighted that important metacognitive concepts from one discipline are often neglected or under addressed in other disciplines. This concern is on top of the commonly acknowledged research-practice divide. In order to build better metacognitive practice and a better collective understanding of young children's metacognition, it is important that researchers and practitioners from different perspectives and disciplines come together instead of adhering to artificial disciplinary or perspectival boundaries.

Appendix A: Recruitment and consent materials

Appendix A-1 – Copy of participant information for schools and consent form

Gatekeeper Information Sheet

Title of the study:
Thinking about learning and learning about thinking – exploring how children think about learning at point of school entry in Scotland

Who I am and what this study is about:
My name is Jennifer Zike and I am a doctoral student in the School of Education at University of Strathclyde. This study aims to explore children's developing thinking. I am interested in exploring children's thinking about learning at the beginning of primary school, particularly how they think about learning, reflect on their learning and develop strategic approaches to learning in different situations.

What I need your assistance with:
I hope to invite children in primary 1 to participate in the study and need your assistance with distributing information. All children in primary 1 in your school would be invited to participate and both the children's and parent/carer's consent will be asked for before any data is collected.

What taking part in the research will involve:
Parents/carers who consent to the research will be asked to fill in a short questionnaire, which should take no more than 10-15 minutes. The teacher will be asked to share general assessment data – for example, information about where children are with their verbal skills (i.e. advanced, average, needs support), academic skills (i.e. early literacy and numeracy skills) and social skills. To ensure children's informed assent, I will read an interactive story about the research and invite them to ask any questions. Children choosing to participate in the research and whose parents/carers have returned consent will be asked to participate in a discussion about the thinking taking place in a learning situation. During the discussion, they can colour and personalise the template and decide what people in the situation are thinking and saying – I will assist them by scribing in thought/speech bubbles (see attached example).

I will take a photo of the template (no children will be in the picture). Afterward, the templates will be shared with the children's teacher before being taken home by the children. There are a variety of templates to choose from and the templates used will be negotiated with the teacher to ensure that learning situations are relevant to the children and of interest to the teacher. The timing of all research activities will be negotiated with the classroom teacher. The interactive story will take no longer than 20 minutes and each discussion group will last no longer than 20 minutes.

Are there any risks?
There are no identified risks as the topic being discussed is not sensitive; however, if children disclose information identified as a child safety hazard, the child will be informed that the researcher must share the information to keep them safe and it will be passed on to the child's named person.

Who will have access to data from the research?
Voice recordings from discussions will only be available to the researcher. Transcribed portions included in any published or presented material will be anonymised using pseudonyms and any information that might identify the child or the school will be removed/changed to protect privacy. A list with children's names and their pseudonyms will be available to the researcher only and destroyed once all research stages are complete, leaving only anonymous information.

When returned, the child's pseudonym will be written on the top of the parent/carer questionnaire and the teacher's assessment will be catalogued under the same pseudonym. This ensures that all data for each child is stored under the same pseudonym while ensuring that children's names and identifying information is kept private.

The finished worksheets will be shared with the child's teacher to add to their formative assessments. After this, I will ask the teacher to send the worksheets home with the children. The photos of the worksheets will be stored digitally on the researcher's secure office computer and will only be available to the researcher and supervisors.

What will happen to the results of the study?
The anonymised information will be used in the researcher's PhD thesis and in journal articles and conference presentations. All information that may potentially identify the child, their parents/carers or the school will be removed or changed.

After the results have been analysed, a summary report will be made available to the schools, parents, and teachers who participated in the study if requested. A children's report will be developed either with or for the children depending on teacher preference and time available.

Thank you for reading this information, please feel free to ask any questions

Researcher contact details:

Jennifer Zike
School of Education
University of Strathclyde
Email: jennifer.zike@strath.ac.uk

Chief Investigator details:

Dr Kate Wall
School of Education
Faculty of Humanities & Social Sciences
University of Strathclyde
Lord Hope Building
141 St James Road
Glasgow, G4 0LT
Telephone: 0141 444 8067
Email: kate.wall@strath.ac.uk

This investigation was granted ethical approval by the University of Strathclyde Ethics Committee.

If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Dr Eugenie Samier – Chair of the School of Education Ethics Committee
University of Strathclyde
School of Education
Lord Hope Building
141 St James Road
Glasgow, G4 0LT
Email: eugenie.samier@strath.ac.uk

Consent to facilitate research

- I……………………………………… voluntarily agree to help facilitate this research study.
- I understand that even if I agree to help now, I can withdraw at any time without any consequences of any kind.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that I will assist by allowing the researcher access to _________________________ school to undertake the research activities described in the information sheet including:
    - Worksheet-based pupil views template activity
    - Conversation with child's teacher about the child's skills (i.e. verbal, social)
- I understand that all data collected in this study is confidential and anonymous.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

(PRINT NAME)	
Signature of Gatekeeper:	Date:

I believe the participant is giving informed consent to participate in this study:

(PRINT NAME)	
Signature of Researcher:	Date:

Appendix A-2 – Copy of information sheet and consent form provided to parents/carers (images removed)

SCHOOL OF EDUCATION

This research was granted ethical approval by the School of Education Ethics Committee.

If you have any questions/concerns about the research and wish to contact an independent person, please contact:

Eugenie Samier, Chair of the School of Education Ethics Committee
University of Strathclyde
School of Education
Lord Hope Building
141 St James Road
Glasgow, G4 0LT

Email: eugenie.samier@strath.ac.uk

University of Strathclyde Humanities & Social Sciences

Parent/Carer information

Thinking about learning and learning about thinking - exploring how children think about learning at point of school entry in Scotland

Information about participation

Who am I and what am I doing?

My name is Jennifer Zike and I am a PhD student in the School of Education at University of Strathclyde.

The goal of this research is to investigate children's developing thinking at the beginning of primary school. In particular, I am interested in children's perceptions of learning and thinking processes.

Does my child have to take part?

No, your child does not have to take part. Your child's class teacher has agreed to participate in the study, so I have sent home consent forms with all the children in their class. However, participation is completely voluntary and not part of school work. You and your child are free to withdraw personal information from the study until data is analysed. At this point, all data will be anonymous.

What will my child do if he or she takes part?

Children will participate in a small group discussion about the thinking and learning taking place in a pupil views template (PVT) (example below):

(PVT example)

Children will colour and personalise the PVT and decide what will go in the thought/speech bubbles – I will help them write.

I will take a picture of each child's PVT and share them with the class teacher. Finally, children will take their picture home. Timing of research activities will be negotiated with your child's teacher and each discussion will last no longer than 20 minutes.

What other information will be collected?

I will ask you to complete a questionnaire (included here) and the child's teacher to provide academic information about your child. This information will be used to explore the relationship between children's thinking skills and their academic skills.

What will happen to the information?

PVTs will be available to your child's teacher, so that he or she can gain additional insight into your child's thinking. The information will not be used in formal assessments. Pictures of the PVTs and information from parent/carer questionnaires and from your child's teacher will only be available to me and my academic supervisors and will be stored securely under your child's pseudonym.

I will use the information in my PhD thesis and a summary school report will be available. I will also publish in academic journals and present at conferences. None of these will contain information that could be used to identify your child or their school.

Who should you contact if you need more information?

If you have any questions or concerns, feel free to contact my supervisors or me:

Researcher contact:	Supervisor contacts:
Jennifer Zike School of Education University of Strathclyde Email: jennifer.zike @strath.ac.uk	Dr Kate Wall School of Education University of Strathclyde Email: kate.wall@ strath.ac.uk Dr Lorna Arnott School of Education University of Strathclyde Email: lorna.arnott@ strath.ac.uk

Consent Form for Parents/Carers

Name of department:	University of Strathclyde School of Education

Title of the study:	Thinking about learning and learning about thinking - exploring how children think about learning at point of school entry in Scotland

- I confirm that I have read and understood the information pamphlet for the above project and the researcher has answered any questions to my satisfaction.
- I understand that my child's participation is voluntary and that my child and I are free to withdraw consent from the project at any time, without having to give a reason and without any consequences. If I exercise my right to withdraw and I don't want my child's data to be used, any data which have been collected from him/her will be destroyed up until the point of analysis, at which point only anonymous data will remain.
- I understand that I can withdraw from the study any personal data about my child (i.e. data which identify me/my child personally) at any time up until the data is subject to analysis.
- I understand that anonymised data (i.e. data which do not identify my child personally) cannot be withdrawn once they have been included in the study.
- I understand that academic information about my child will be shared as part of the project. This information will be used to explore the relationship between children's thinking skills and their academic skills.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies my child will be made publicly available.
- I consent to my child being a participant in the project

Child's Name: ______________________________

Print Name: ______________________________

Signature of Parent/Carer: ______________________ **Date:** ____________

Appendix A-3 – Materials from consent workshop with children (this was bound into a big book)

*Picture of person with magnifying glass
*Picture of person with binoculars
*Picture of a person asking another person a question

Hi! My name is Jenny.

I am from America.

I am a researcher

Picture of researcher smiling

Picture of children working together at a table

Picture of children playing with toys

I want to find out about children's thinking.

How do you think I can find out?

He's
thinking
about....

She's
saying...

Picture of children at a table
filling out PVTs

Picture of a PVT

I want to ask you about your thinking so I can find out how children think when they are learning something new.

Picture of person typing at a computer

Other people want to know about children's thinking too, so I am going to write about it.

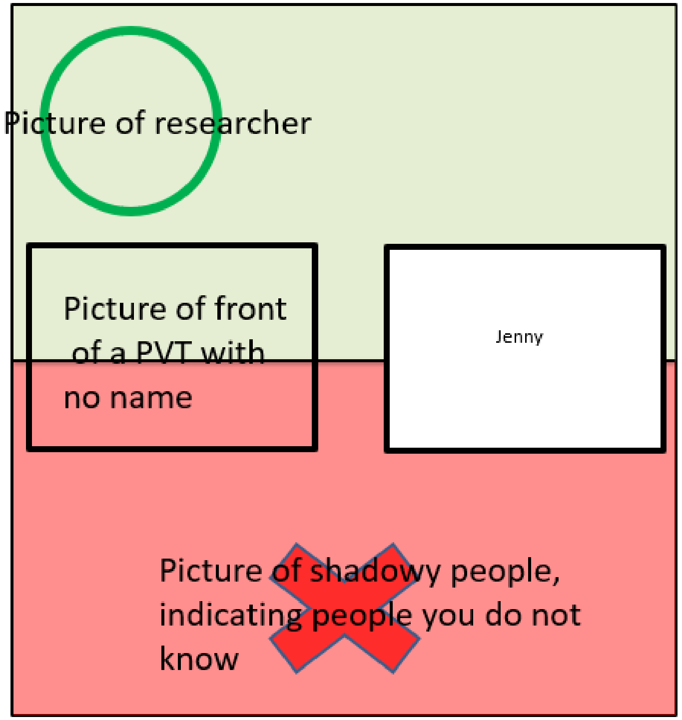
Picture of people reading on computers, in books and on sheets of paper

Lots of people might read about it on computers or in books…

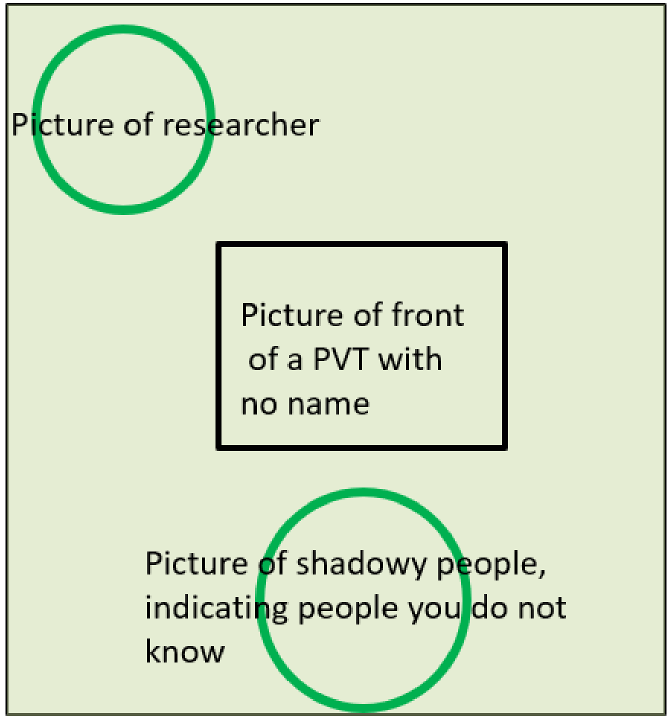
Picture of person presenting to an audience

I will also tell people about it!

But… you don't know these other people, so we should make sure to make your names and what school you go to a secret!

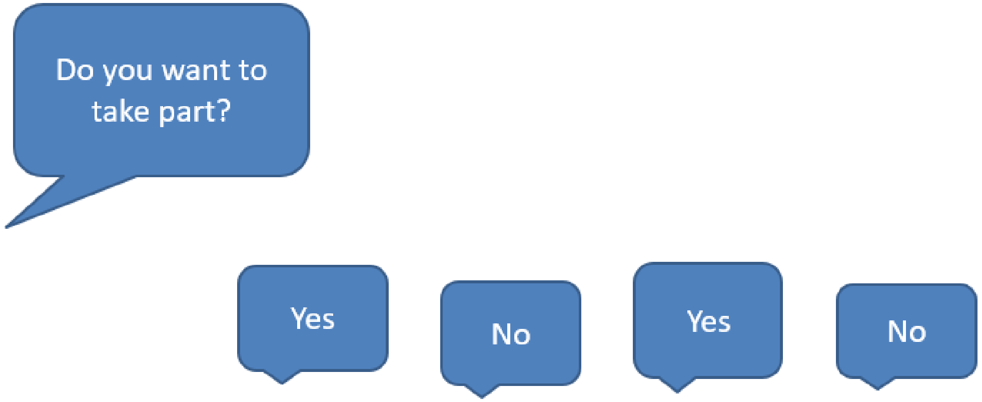


Only your teacher and I can see your work with your name…



Other people can see your work, but not your name!

I want to ask you if you would like to come talk to me and colour and draw with some of your friends, but you don't have to say yes. When a researcher asks someone to talk to them about something, sometimes they don't want to, so it is okay if they say no!



Picture of researcher

Four pictures of children smiling

Appendix A-4 – Urban-rural class information and 6-fold classifications for sample schools

Table 58: 6-fold urban rural classification

Class	Class name	Description
1	Large urban areas	Settlements of 125,000 people and over
2	Other urban areas	Settlements of 10,000 to 124,999 people
3	Accessible small towns	Settlements of 3,000 to 9,999 people and within a 30-minute drive time of a settlement of 10,000 or more
4	Remote small towns	Settlements of 3,000 to 9,999 people and with a drive time of over 30 minutes to a settlement of 10,000 or more
5	Accessible rural areas	Areas with a population of less than 3,000 people and within a 30-minute drive time of a settlement of 10,000 or more
6	Remote rural areas	Areas with a population of less than 3,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more

From (Scottish Government, 2016b, p. 5)

Table 59: Sample composition

	School 1	School 2	School 3	School 4	School 5	School 6	Total
6-fold urban-rural measure	Large Urban	Accessible small town	Remote small town	Remote rural area	Other urban	Large urban	
Number of recruited participants	13	14	16	1	28	13	85
Gender split (Male – Female)	8 – 5	5 – 9	9 – 7	1 – 0	19 – 9	6 – 7	48 - 37

Appendix B: Data collection materials

Appendix B-1 – Copy of parent/carer questionnaire

<table>
<tr><td colspan="2">Questionnaire – Please return with consent form</td></tr>
<tr><td>1) What gender is your child?</td><td></td></tr>
<tr><td>2) What age is your child?</td><td></td></tr>
<tr><td>3) What is the highest level of education completed by yourself and any other parent/carer in your child's life?</td><td>Yourself:
<table>
<tr><td>Less than secondary</td><td></td></tr>
<tr><td>Secondary</td><td></td></tr>
<tr><td>College</td><td></td></tr>
<tr><td>University degree</td><td></td></tr>
<tr><td>Postgraduate</td><td></td></tr>
</table>
Other parent/carer:
<table>
<tr><td>Less than secondary</td><td></td></tr>
<tr><td>Secondary</td><td></td></tr>
<tr><td>College</td><td></td></tr>
<tr><td>University degree</td><td></td></tr>
<tr><td>Postgraduate</td><td></td></tr>
</table></td></tr>
<tr><td>4) If 100% is all the time before your child started school, how much time would you say your child has spent with the following? A guess is completely fine.

*For example:
<table>
<tr><td>A council nursery</td><td>30%</td></tr>
<tr><td>A private nursery</td><td></td></tr>
<tr><td>A family member, friend, or neighbour</td><td>40%</td></tr>
<tr><td>With yourself or the child's other parent/carer</td><td>30%</td></tr>
<tr><td>Club activities</td><td></td></tr>
<tr><td>Other:</td><td></td></tr>
</table></td><td>
<table>
<tr><td>A council nursery</td><td></td></tr>
<tr><td>A private nursery</td><td></td></tr>
<tr><td>A family member, friend, or neighbour</td><td></td></tr>
<tr><td>With yourself or the child's other parent/carer</td><td></td></tr>
<tr><td>Club activities</td><td></td></tr>
<tr><td>Other:</td><td></td></tr>
</table></td></tr>
<tr><td>5) If your child attended nursery, what age did they start attending?</td><td></td></tr>
</table>

<table>
<tr><td>6) What do you think your child would prefer to do if they could choose?</td><td><table><tr><td>Play on their own</td><td></td></tr><tr><td>Play with other children</td><td></td></tr><tr><td>Play with an adult</td><td></td></tr></table></td></tr>
<tr><td>7) What would you say is your child's favourite activity?</td><td></td></tr>
</table>

Please flip to the next page

Are you currently working?

Yes		
No		→ What year did you last work? ____________
Never worked		

If you are not working now but have worked before, please consider answering the following questions for your last job – it would be very helpful!

*Answer the questions for your main job or, if you are not working, your last main job (your main job is the job where you usually work the most hours)	
(1) In your main job, are (were) you:	An employee? ☐ Self-employed or freelance without employees? ☐ Self-employed with employees? ☐
(2) What is (was) your full and specific job title? *For example: Primary school teacher, car mechanic, district nurse, structural engineer	
(3) Briefly describe what you do (did) in your main job. *For example: teaching primary children, in charge of stores, maintain cleaning standards	
(4) Do (did) you supervise any employees? *Supervision involves overseeing the work of other employees on a day-to-day basis	Yes ☐ No ☐
(5) How many hours (to the nearest full hour) a week do (did) you usually work in your main job? *Include paid and unpaid overtime	____________ Number of hours worked in a typical week

(6) At your workplace, what is (was) the main activity of your employer or business? *For example: Armed forces, primary education, repairing cars, contract catering, computer servicing, doctor’s surgery *If you are (were) a civil servant, please write government	

Does your child have another parent or carer who is currently working (i.e. your partner living in the same household or the child's other parent)?

Yes	
No	

If you are able to fill out the following questions about your child's other parent/carer, it would be very helpful!

<table>
<tr><td colspan="2">*Answer the questions for their main job or, if not working, their last main job (their main job is the job where they usually work the most hours)</td></tr>
<tr><td>(1) In their main job, are (were) they:</td><td><table><tr><td>An employee?</td><td></td></tr><tr><td>Self-employed or freelance without employees?</td><td></td></tr><tr><td>Self-employed with employees?</td><td></td></tr></table></td></tr>
<tr><td>(2) What is (was) their full and specific job title?

*For example: Primary school teacher, car mechanic, district nurse, structural engineer</td><td></td></tr>
<tr><td>(3) Briefly describe what they do (did) in their main job.

*For example: teaching primary children, in charge of stores, maintain cleaning standards</td><td></td></tr>
<tr><td>(4) Do (did) they supervise any employees?

*Supervision involves overseeing the work of other employees on a day-to-day basis</td><td><table><tr><td>Yes</td><td></td></tr><tr><td>No</td><td></td></tr></table></td></tr>
<tr><td>(5) How many hours (to the nearest full hour) a week do (did) they usually work in their main job?

*Include paid and unpaid overtime</td><td>_____________ Number of hours worked in a typical week</td></tr>
</table>

(6) At their workplace, what is (was) the main activity of their employer or business? *For example: Armed forces, primary education, repairing cars, contract catering, computer servicing, doctor’s surgery *If you are (were) a civil servant, please write government	

Appendix B-2 – Copy of questionnaire provided for teachers to fill in

1) **Whitebread's SR scale**

Choose what best represents the child's behaviour on the following scale. Behaviour can be general rather than specifically relating to academic activities.

Always	Usually	Sometimes	Never
A	U	S	N

Emotional

Behaviour	Example	Child	Child	Child	Child
1) Can speak about own and others behaviour and consequences	U				
2) Tackles new tasks confidently	N				
3) Can control attention and resist distraction	S				
4) Monitors progress and seeks help appropriately	A				
5) Persists in the face of difficulties	N				

Pro-social (regarding child's social interactions)

Behaviour	Child	Child	Child	Child
6) Negotiates when and how to carry out tasks				
7) Can resolve social problems with peers				
8) Shares and takes turns independently				
9) Engages in independent cooperative activities with peers				
10) Is aware of feelings of others and helps and comforts				

Cognitive

Behaviour	Child	Child	Child	Child
11) Is aware of own strengths and weaknesses				
12) Can speak about how they have done something or what they have learnt				
13) Can speak about future planned activities				
14) Can make reasoned choices and decisions				
15) Asks questions and suggests answers				
16) Uses previously taught strategies				
17) Adapts previously heard language for own purposes				

Always	Usually	Sometimes	Never
A	U	S	N

Motivational

Behaviour	Child	Child	Child	Child
18) Finds own resources without adult help				
19) Develops own ways of carrying out tasks				
20) Initiates activities				
21) Plans own tasks, targets and goals				
22) Enjoys solving problems				

2) Verbal skills

Please use the following 7-point scale to comment on the child's verbal skills, concentrating on their ability to use appropriate words and expressions at appropriate times and their ability to contribute to conversations.

Very far behind a typical child this age			Typical for this age			Very far ahead of a typical child this age
1	2	3	4	5	6	7

	Example	Child	Child	Child	Child
Overall verbal skills	5				

3) Childhood executive functioning inventory (CHEXI) for parents and teachers

Please read each statement and indicate how true it is for the child using the following scale.

Definitely not true	Not true	Partially true	True	Definitely true
1	2	3	4	5

Statement	Example	Child	Child	Child	Child
1) Has difficulty remembering lengthy instructions	4				
2) Seldom seems to be able to motivate him/herself to do something that he/she doesn't want to do	1				
3) Has difficulty remembering what he/she is doing, in the middle of an activity	4				
4) Has difficulty following through on less appealing tasks unless he/she is promised some type of reward for doing so	2				
5) Has a tendency to do things without first thinking about what could happen	3				
6) When asked to do several things, he/she only remembers the first or last	5				
7) Has difficulty coming up with a different way of solving a problem with he/she gets stuck	4				
8) When something needs to be done, he/she is often distracted by something more appealing	2				
9) Easily forgets what he/she is asked to fetch	3				
10) Gets overly excited when something special is going to happen (e.g., going on a field trip, going to a party)	2				

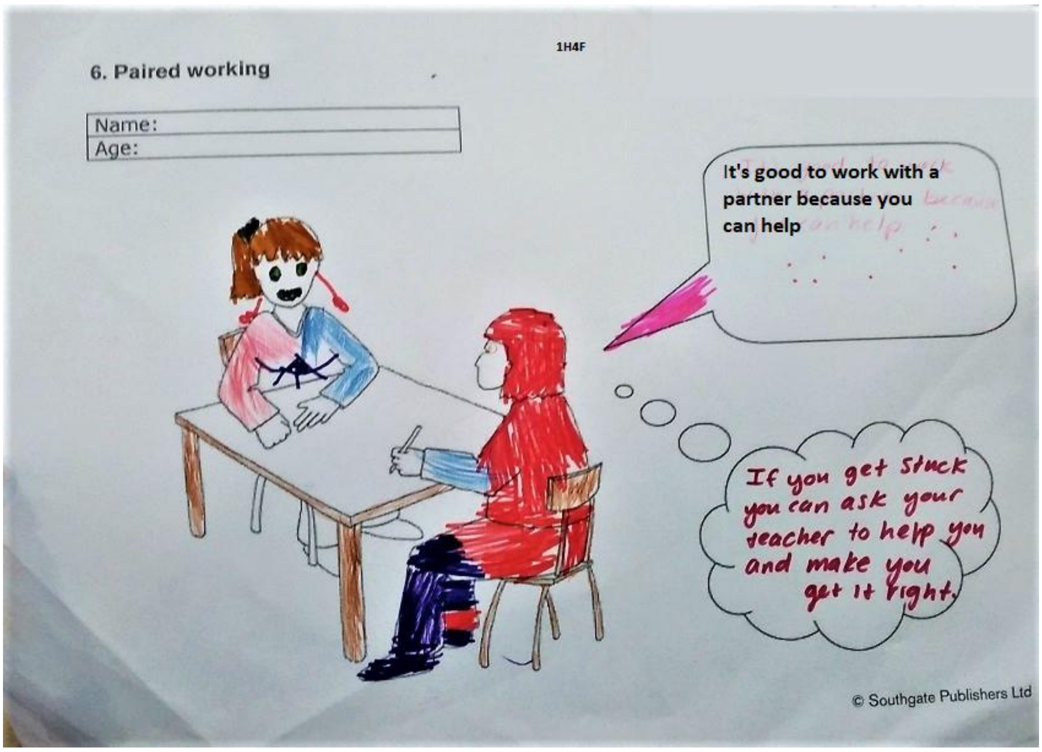
11) Has clear difficulties doing things he/she finds boring	2				
12) Has difficulty planning for an activity (e.g. remembering to bring everything necessary for a field trip or things needed for school)	3				
13) Has difficulty holding back his/her activity despite being told to do so	1				
14) Has difficulty carrying out activities that require several steps (e.g., for younger children, getting completely dressed without reminders; for older children, doing all homework independently)	4				
15) In order to be able to concentrate, he/she must find the task appealing	2				
16) Has difficulty refraining from smiling or laughing in situations where it is inappropriate	1				
17) Has difficulty telling a story about something that has happened so that others may easily understand	3				
18) Has difficulty stopping an activity immediately upon being told to do so. For example, he/she needs to jump a couple of extra times or play on the computer a little bit longer after being asked to stop	2				
Statement	Example	Child	Child	Child	Child
19) Has difficulty understanding verbal instructions unless he/she is also shown *how* to do something	5				
20) Has difficulty with tasks or activities that involve several steps	3				
21) Has difficulty thinking ahead or learning from experience	4				
22) Acts in a wilder way compared to other children in a group (e.g., at a birthday party or during a group activity)	1				
23) Has difficulty doing things that require mental effort, such as counting backwards	4				

24) Has difficulty keeping things in mind while he/she is doing something else	3				

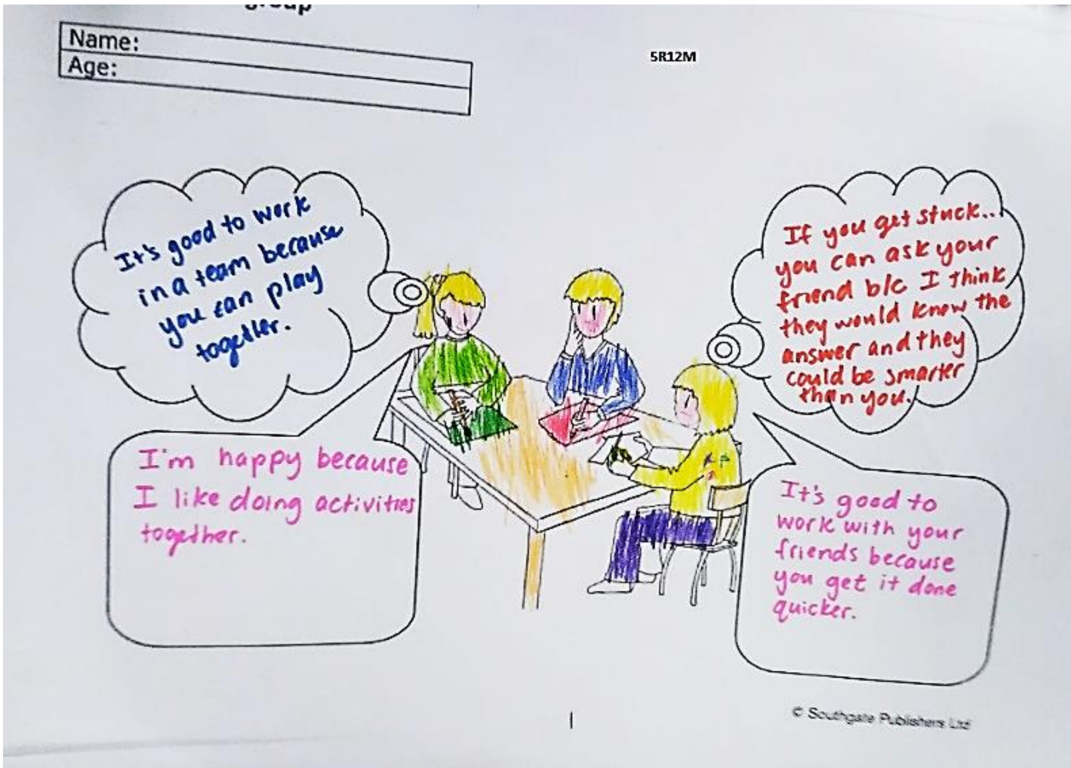
Appendix B-3 – PVT examples

PVT examples – Playground

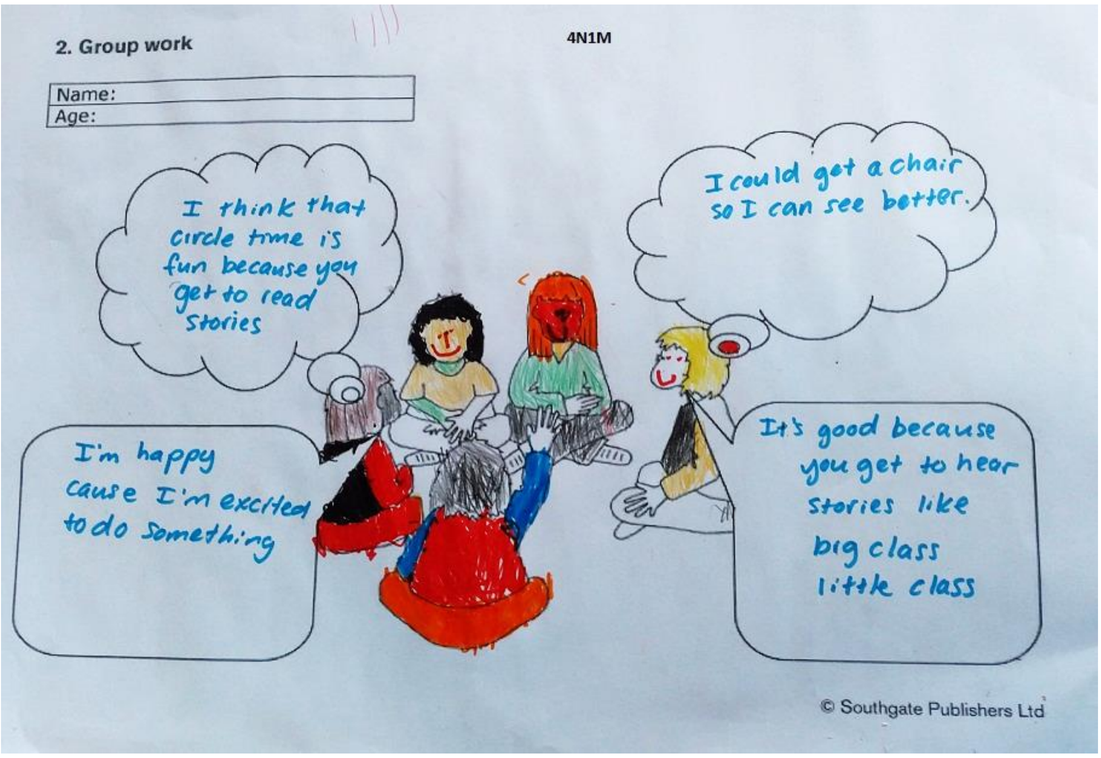
PVT examples – Paired working



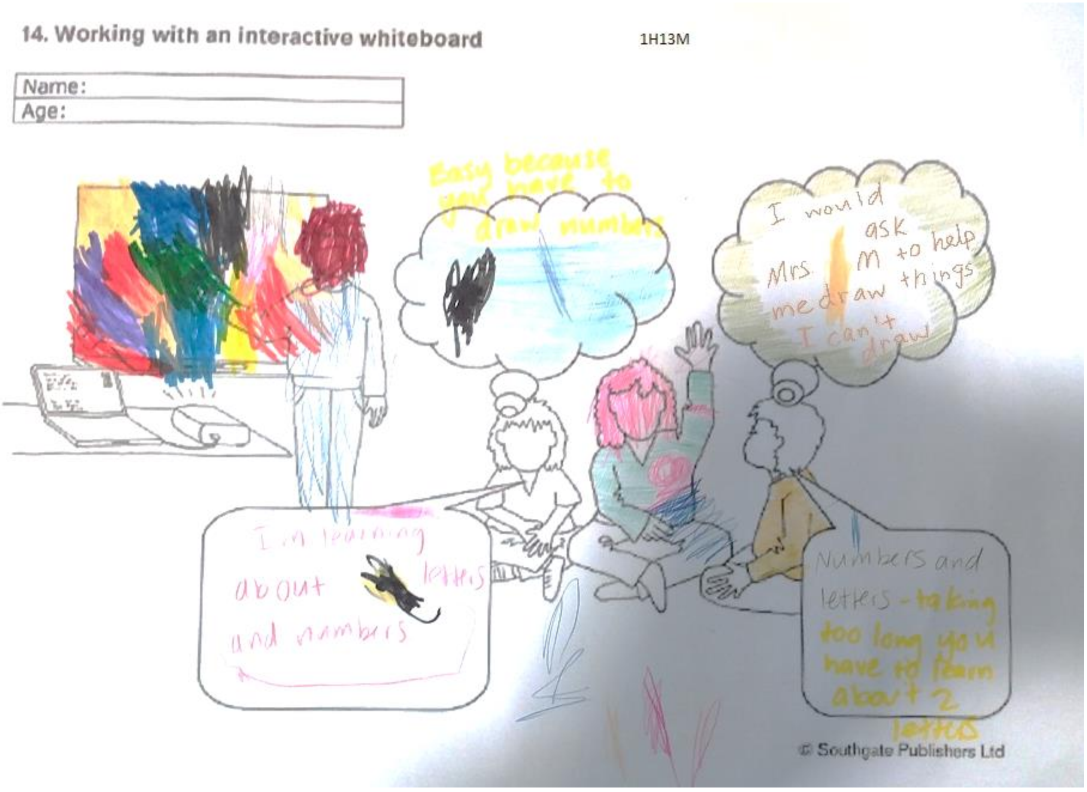
PVT examples – Working in a group



PVT examples – Circle time

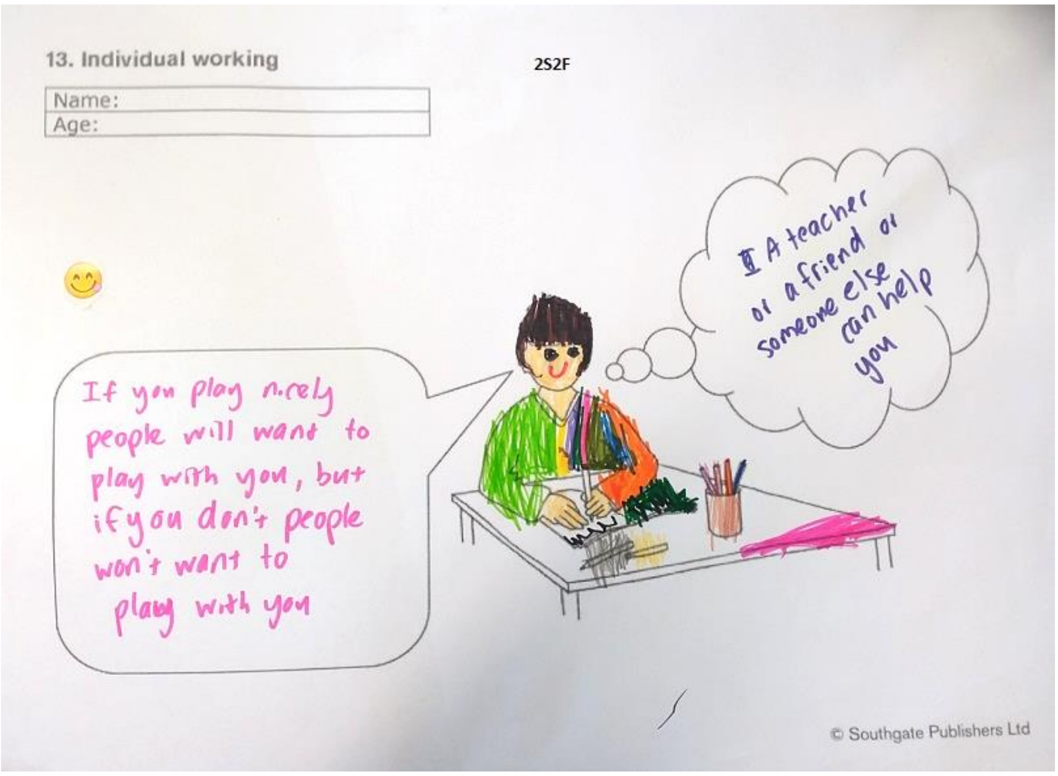


PVT examples – Working with an interactive whiteboard



PVT examples – Individual reading

PVT examples – Individual working



Appendix B-4 – Feedback activity with children

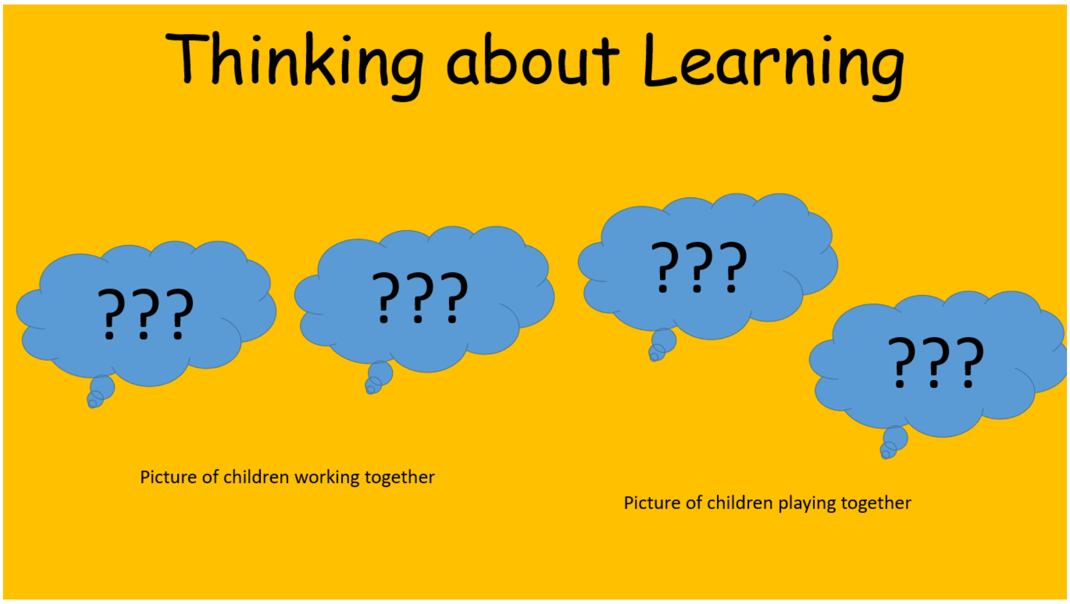
Feedback activity plan

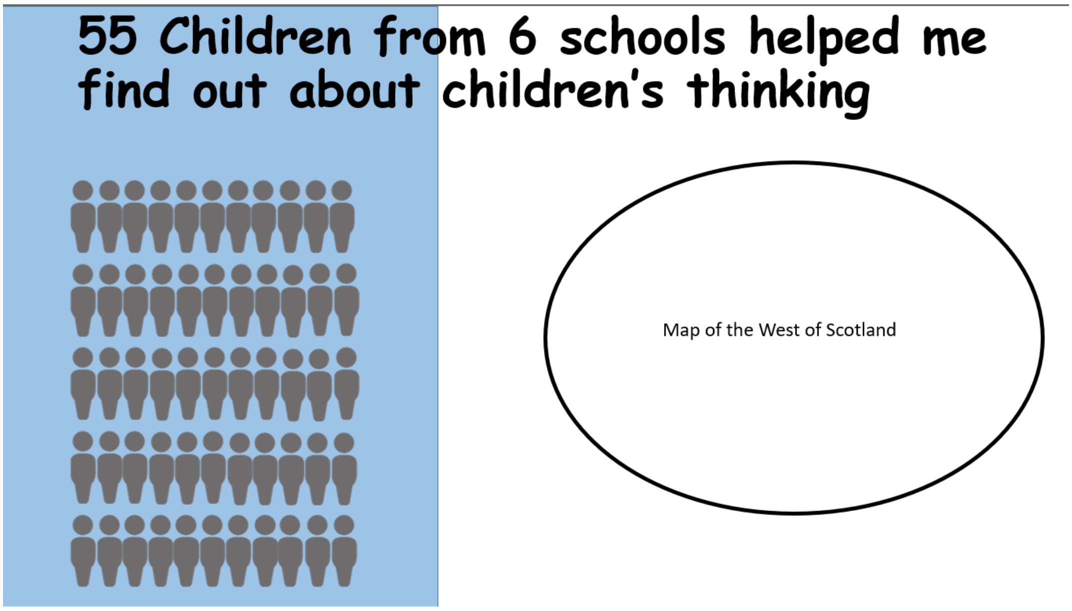
Organisation of Learners/Learning	Resources
Small group of research participants (depending on teacher preference)	• Mystery box of plastic Easter eggs with statements from children's interviews that relate to each of the questions in the PPT • PPT

PROCEDURE - Interactions and Communications (with detailed timings)

	Timings
Introduction Ask the children to gather round in a circle. Start the workshop by saying hello to the children and introducing myself. Introduce the project briefly in the title slide/first slide Show the animation of all the PVTs completed and ask the children if they'd like to know what I found out (show mystery box to promote interest)	**2 minutes**
Development • Ask the children the first question and ask them to think really hard for 10 seconds. • Tell them to stand on the side with their answer (emphasise that they shouldn't run). • Ask a few children their answers and have them pick an Easter egg. • Read statements. • Repeat for rest of questions	**10 minutes**
Conclusion/Plenary Thank the children for listening and participating	**1 minute**

Feedback activity PPT (with images removed)





Animation of all the PVTs completed in the first round of data collection

How do you know someone is learning?

I don't know

I know

Picture of child scratching head/
Picture of child with lightbulb over head

What can you do if you get stuck while you're learning or have a bit of trouble?

I don't know

I know

Picture of child scratching head/
Picture of child with lightbulb over head

Who would you want to ask for help? Why do you want to ask them?

Picture of children together with arms around each other

Picture of a teacher with chalkboard

My friends

My teacher

Is it hard or easy when you learn something new? Why?

Picture of child trying to solve difficult problem
With question marks over head

Picture of child trying to solve easy problem
With light bulb over head

Hard!

Easy!

Appendix B-5 – Structured interview notes template

Structured interview notes

Participant numbers:

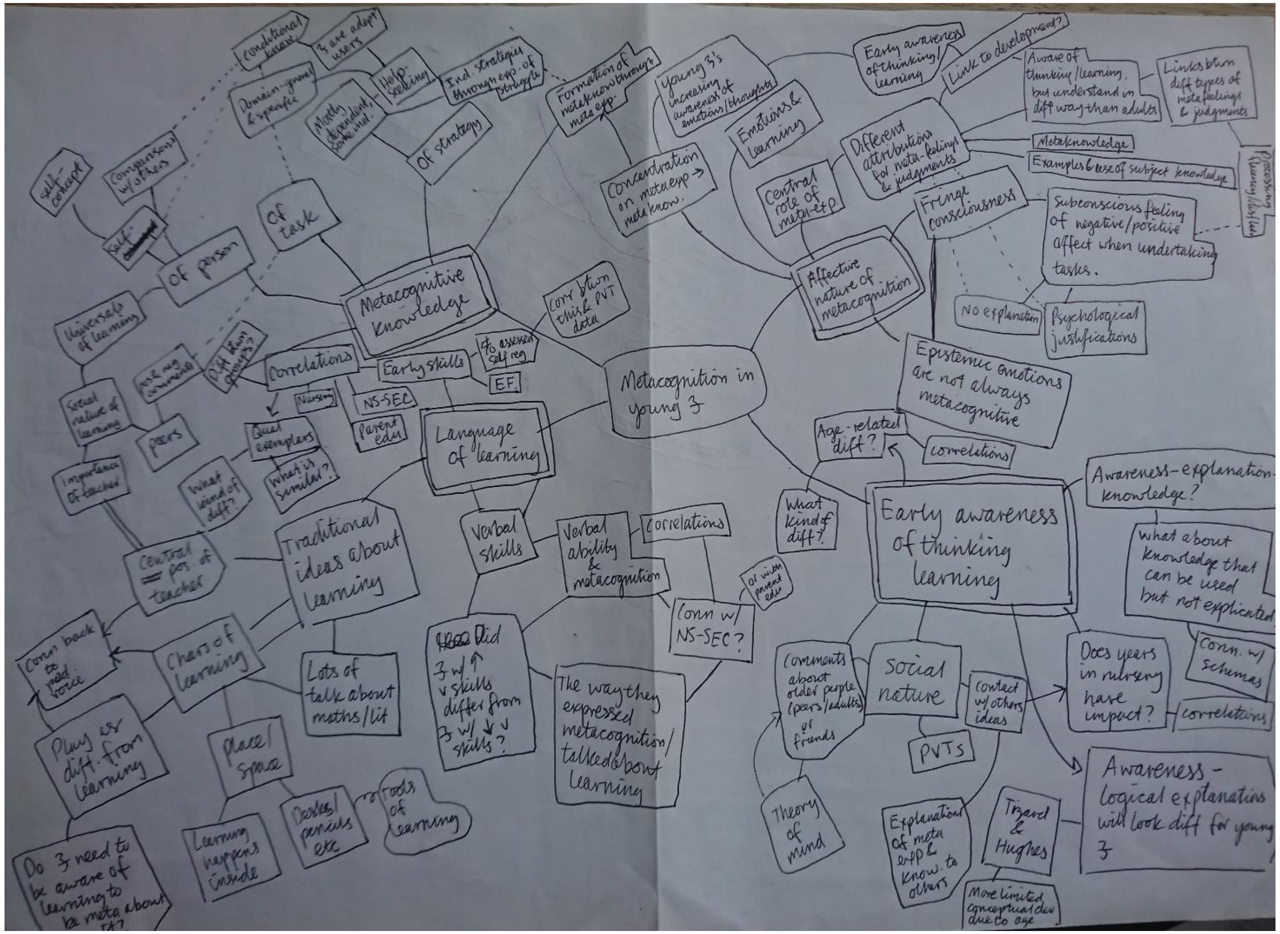
Template used:

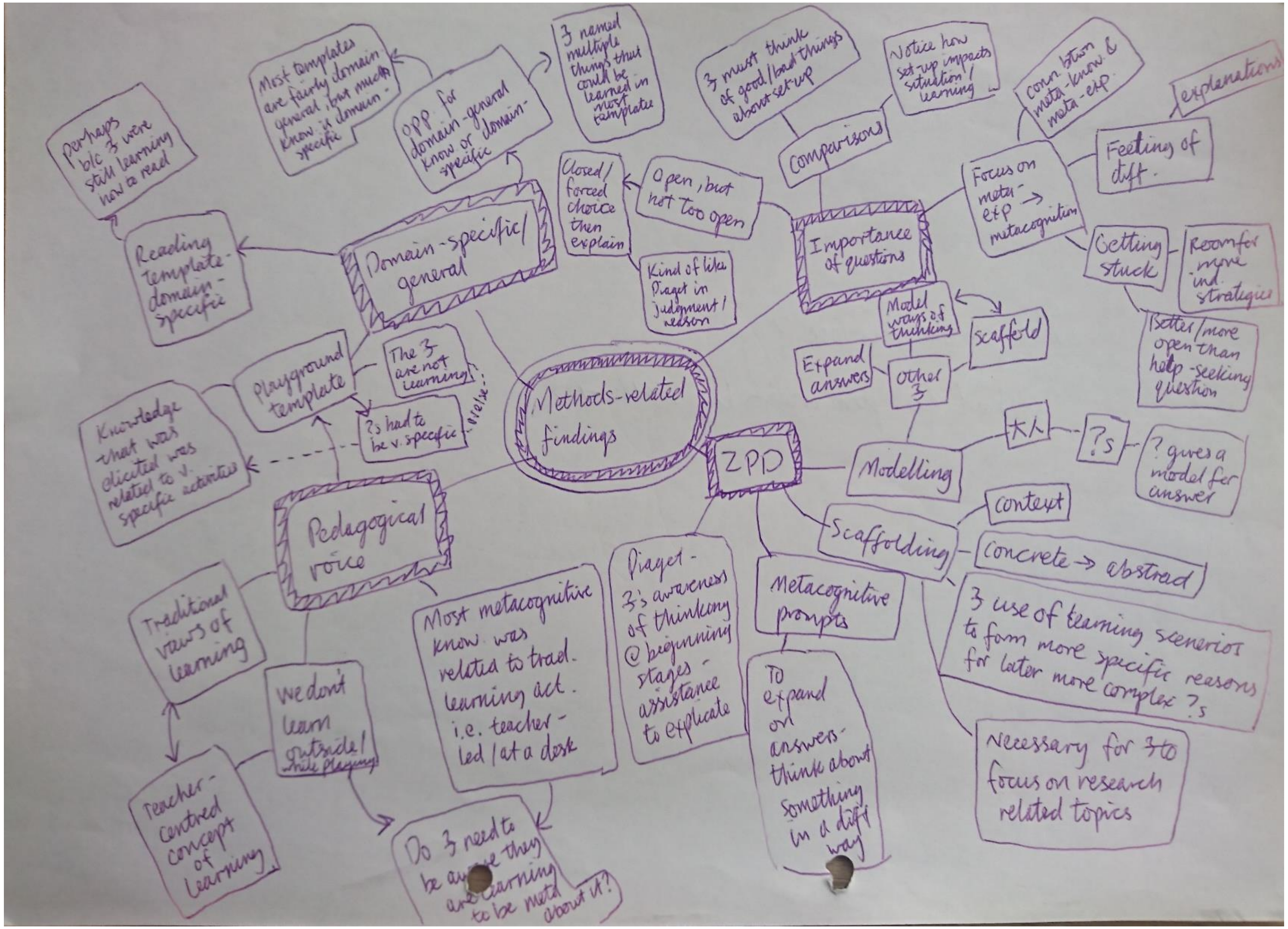
Tell me about what's happening in this picture What are they doing?
Are they learning? How do you know? What are they learning?

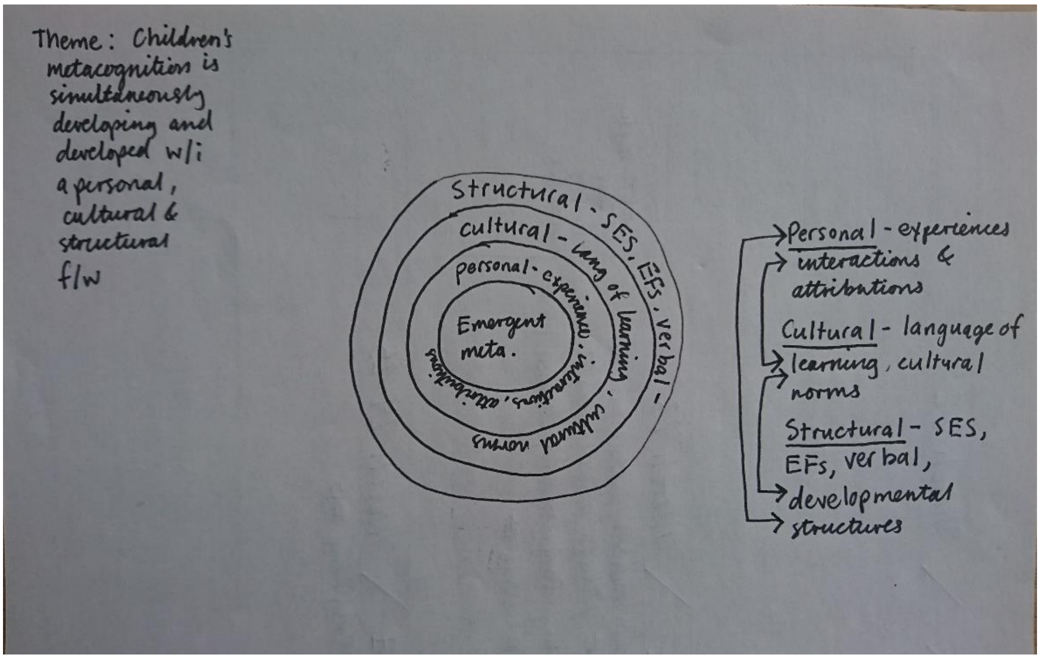
1) What would you say was good about ______? 2) What would you say was not so good about ______? 3) How do you feel about ______?
1) What did you learn when you _______? 2) What helps you when you _______? 3) Is it easy or hard? Why do you think so?

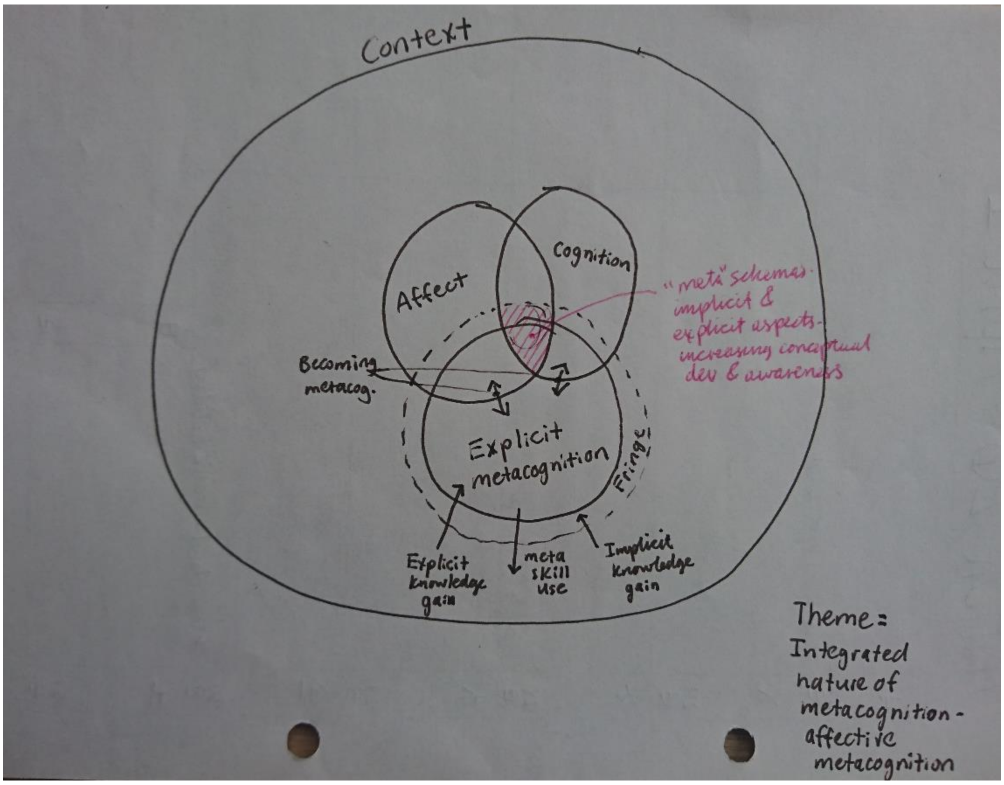
Appendix C – Supplemental information from analyses

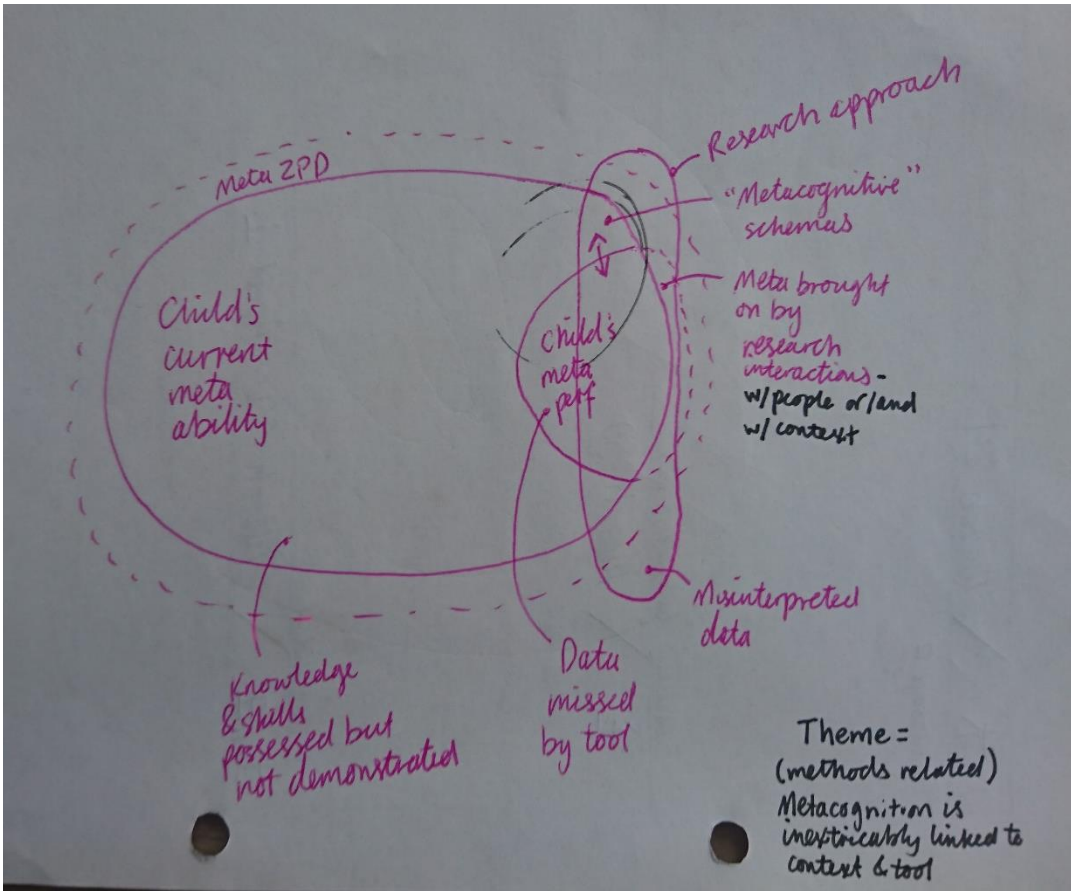
Appendix C-1 – Mindmaps and diagrams from qualitative analysis




Methods-related findings
Domain-specific/general
Reading template - domain-specific
Perhaps b/c 3 were still learning how to read
Most templates are fairly domain general, but much know. is domain-specific
Opp. for domain-general know or domain-specific
3 named multiple things that could be learned in most templates
Closed/forced choice then explain
Open, but not too open
Kind of like Piaget in judgement/reason
Importance of questions
Comparisons
3 must think of good/bad things about set-up
Notice how set-up impacts situation/learning
Focus on meta-exp → metacognition
Conn. btwn meta-know & meta-exp
Feeling of diff.
explanations
Getting stuck
Room for more ind. strategies
Better/more open than help-seeking question
Model ways of thinking
Scaffold
Expand answers
Other 3
Playground template
The 3 are not learning
?s had to be v. specific
Knowledge that was elicited was related to v. specific activities
ZPD
Modelling
大人
?s
? gives a model for answer
Scaffolding
context
Concrete → abstract
3 use of learning scenarios to form more specific reasons for later more complex ?s
Necessary for 3 to focus on research related topics
Pedagogical voice
Traditional views of learning
We don't learn outside/while playing
Teacher-centred concept of learning
Most metacognitive know. was related to trad. learning act. i.e. teacher-led/at a desk
Do 3 need to be aware they are learning to be meta about it?
Piaget - 3's awareness of thinking @ beginning stages - assistance to explicate
Metacognitive prompts
To expand on answers - think about something in a diff way


Theme: Children's metacognition is simultaneously developing and developed w/i a personal, cultural & structural f/w
Structural - SES, EFs, verbal -
cultural - lang of learning, cultural norms
personal - experiences, interactions, attributions
Emergent meta.
Personal - experiences interactions & attributions
Cultural - language of learning, cultural norms
Structural - SES, EFs, verbal, developmental structures


Context
Affect
Cognition
"meta" schemes: implicit & explicit aspects. increasing conceptual dev & awareness
Becoming metacog.
Explicit metacognition
Fringe
Explicit knowledge gain
meta skill use
Implicit knowledge gain
Theme: Integrated nature of metacognition - affective metacognition


Research approach
Meta ZPD
"Metacognitive" schemas
Meta brought on by research interactions - w/people or/and w/ context
Child's current meta ability
Child's meta perf
Misinterpreted data
Knowledge & skills possessed but not demonstrated
Data missed by tool
Theme = (methods related) Metacognition is inextricably linked to context & tool

<u>Appendix C-2 – Spearman correlation table for interactions between independent variables</u>

Table 60: Spearman correlation among measures of early skills

	1	2	3	4	5
1. Self-regulation	-				
2. Social regulation	.701**	-			
3. Verbal skills	.803**	.539**	-		
4. Inhibition	-.536**	-.587**	-.322**	-	
5. Working memory	-.700**	-.629**	-.593**	.727**	-

**. Correlation is significant at the 0.01 level (2-tailed)

Appendix C-3 – Additional information about metacognitive counts for PVTs

Note: The process I used to assign metacognitive counts was detailed in section 6.5.

NVivo was used to construct table 61 below. I used the explore option to construct a crosstab between the code “template used” and the classification “metacognitive count.” This table shows how many children obtained metacognitive counts of 0-6 using different templates. Table 53 in chapter 9 used these counts to obtain a total number of unique metacognitive utterances for each template. For example, the group work template elicited a total of 44 metacognitive comments – (0x4)+(1x5)+(2x8)+(3x2)+(4x3)+(5x1)=44

Table 61: Comparison of different templates by the number of unique metacognitive comments made

Template	Number of children obtaining different counts for metacognition by template						
	0	1	2	3	4	5	6
Group work	4	5	8	2	3	1	-
Playground	2	5	5	4	-	1	-
Pair work	7	2	4	2	1	1	-
Circle time	2	2	2	3	2	-	-
IWB	3	3	-	1	1	1	1
Reading	-	-	-	2	1	2	-
Individual work	1	1	-	-	-	-	-

Table 62 below shows the number of children who demonstrated metacognition using each template as well as the number of children who did not demonstrate metacognition. The average number of unique metacognitive comments made using each template was calculated by dividing the total unique metacognitive comments (see table 61) by the number of children who demonstrated metacognition.

Table 62: Number of children demonstrating/not demonstrating metacognition by template

Template	Number of children demonstrating metacognition	Number of children not demonstrating metacognition	Total of children who chose this template
Group work	19	4	23
Playground	15	2	17
Pair work	10	7	17
Circle time	9	2	11
IWB	7	3	10
Reading	5	0	5
Individual work	1	1	2

Reference List

Akturk, A. O., & Sahin, I. (2011). Literature Review on Metacognition and its Measurement. *Procedia - Social and Behavioral Sciences*, *15*, 3731–3736. https://doi.org/10.1016/J.SBSPRO.2011.04.364

Albahari, M. (2014). Alief or belief? A contextual approach to belief ascription. *Philosophical Studies*, *167*(3), 701–720. https://doi.org/10.1007/s11098-013-0122-x

Alderson, P. (2016). The philosophy of critical realism and childhood studies. *Global Studies of Childhood*, *6*(2), 199–210. https://doi.org/10.1177/2043610616647640

Alderson, P., & Morrow, V. (2011). *The Ethics of Research with Children and Young People* (2nd ed.). Sage. https://www.dawsonera.com/readonline/9781446209387

Angelides, P., & Michaelidou, A. (2009). The deafening silence: discussing children's drawings for understanding and addressing marginalization. *Journal of Early Childhood Research*, *7*(1), 27–45. https://doi.org/10.1177/1476718X08098352

Angell, C., Alexander, J., & Hunt, J. A. (2015). 'Draw, write and tell': A literature review and methodological development on the 'draw and write' research method. *Journal of Early Childhood Research*, *13*(1), 17–28. https://doi.org/10.1177/1476718X14538592

Arango-Muñoz, S. (2014). The nature of epistemic feelings. *Philosophical Psychology*, *27*(2), 193–211. https://doi.org/10.1080/09515089.2012.732002

Arnot, M., & Reay, D. (2007). A Sociology of Pedagogic Voice: Power, inequality and pupil consultation. *Discourse: Studies in the Cultural Politics of Education*, *28*(3), 311–325. https://doi.org/10.1080/01596300701458814

Aronsson, K., & Hundeide, K. (2002). Relational rationality and children's interview responses. *Human Development*, *45*(3), 174–186. https://search.proquest.com/docview/224018678/fulltextPDF/C7280E792D7C4DF2PQ/1?accountid=14116

Artelt, C., & Rausch, T. (2014). Accuracy of Teacher Judgments: When and for What Reasons? In S. Krolak-Schwerdt, S. Glock, & M. Bohmer (Eds.), *Teachers' Professional Development* (pp. 27–43). SensePublishers. https://doi.org/10.1007/978-94-6209-536-6_3

Atkinson, L. (2006). From play to knowledge: from visual to verbal? *Anthropology Matters*, *8*(2), 1–17. https://www.anthropologymatters.com/index.php/anth_matters/article/view/66

Auspurg, K., & Jäckle, A. (2017). First Equals Most Important? Order Effects in Vignette-Based Measurement. *Sociological Methods & Research*, *46*(3), 490–539. https://doi.org/10.1177/0049124115591016

Barnett, S. M., & Ceci, S. J. (2002). When and Where Do We Apply What We Learn? A Taxonomy for Far Transfer. *Psychological Bulletin*, *128*(4), 612–637.

https://doi.org/10.1037/0033-2909.128.4.612

Basilio, M., & Rodríguez, C. (2017). How toddlers think with their hands: social and private gestures as evidence of cognitive self-regulation in guided play with objects. *Early Child Development & Care*, *187*(12), 1971–1986. http://10.0.4.56/03004430.2016.1202944

Bath, C. (2012). “I can’t read it; I don’t know”: Young children’s participation in the pedagogical documentation of English early childhood education and care settings. *International Journal of Early Years Education*, *20*(2), 190–201. https://doi.org/10.1080/09669760.2012.715242

Baumfield, V., Hall, E., Higgins, S., & Wall, K. (2009). Catalytic tools: understanding the interaction of enquiry and feedback in teachers’ learning. *European Journal of Teacher Education*, *32*(4), 423–435. https://doi.org/10.1080/02619760903005815

Bazeley, P. (2007). *Qualitative Data Analysis with NVivo*. SAGE Publications Ltd.

Bazeley, P. (2012). Integrative Analysis Strategies for Mixed Data Sources. *American Behavioral Scientist*, *56*(6), 814–828. https://doi.org/10.1177/0002764211426330

Bazeley, P. (2018). *Integrating analyses in mixed methods research*. SAGE Publications Inc.

Berger, R. (2015). Now I see it, now I don’t: researcher’s position and reflexivity in qualitative research. *Qualitative Research*, *15*(2), 219–234. https://doi.org/10.1177/1468794112468475

Biesta, G. (2010). Pragmatism and the Philosophical and Theoretical Issues for Mixed Methods Research. In A. Tashakkori & C. Teddlie (Eds.), *SAGE Handbook of Mixed Methods in Social & Behavioral Research* (2nd ed., pp. 95–118). SAGE Publications.

Bjork, R. A. (2018). Being Suspicious of the Sense of Ease and Undeterred by the Sense of Difficulty: Looking Back at Schmidt and Bjork (1992). *Perspectives on Psychological Science : A Journal of the Association for Psychological Science*, *13*(2), 146–148. https://doi.org/10.1177/1745691617690642

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children’s functioning at school entry. *American Psychologist*, *57*(2), 111–127. https://doi.org/10.1037/0003-066X.57.2.111

Blaisdell, C., Arnott, L., Wall, K., & Robinson, C. (2019). Look Who’s Talking: Using creative, playful arts-based methods in research with young children. *Journal of Early Childhood Research*, *17*(1), 14–31. https://doi.org/10.1177/1476718X18808816

Borkowski, J. G., Chan, L. K. S., & Muthukrishna, N. (2000). A Process-Oriented Model of Metacognition: Links Between Motivation and Executive Functioning. In G. Schraw & J. C. Impara (Eds.), *Issues in the Measurement of Metacognition* (pp. 1–42). Buros Institute of Mental Measurements. http://digitalcommons.unl.edu/burosmetacognition

Bracken, S. (2010). Discussing the importance of ontology and epistemology awareness in practitioner research. *Worcester Journal of Learning and Teaching*, *4*.

Bradshaw, P. (2011). *Growing up in Scotland: Changes in child cognitive ability in the pre-school years*. papers3://publication/uuid/F5DDC841-9843-4374-89A5-CEE73D1E0AA9

Bragg, S., & Buckingham, D. (2008). “Scrapbooks” in media research. In Pat Thomson (Ed.), *Doing Visual Research with Children and Young People* (pp. 114–131). Routledge.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Harvard University Press. https://www.dawsonera.com/readonline/9780674028845

Brown, A. (1975). The Development of Memory: Knowing, Knowing About Knowing, and Knowing How to Know. *Advances in Child Development and Behavior*, *10*, 103–152. https://doi.org/10.1016/S0065-2407(08)60009-9

Brown, A. (1987). Metacognition, Executive Control, Self-Regulation, and Other More Mysterious Mechanisms. In F. Weinert & R. Kluwe (Eds.), *Metacognition, Motivation, and Understanding* (pp. 65–116). Lawrence Erlbaum Associates, Inc.

Bruce Thompson, R., Cothran, T., & Mccall, D. (2012). Gender and age effects interact in preschoolers’ help-seeking: evidence for differential responses to changes in task difficulty*. *Journal of Child Language*, *39*, 1107–1120. https://doi.org/10.1017/S030500091100047X

Bruner, J. S. (2006). In search of pedagogy Volume I: The selected works of Jerome Bruner, 1957-1978. In *In Search of Pedagogy Volume I: The Selected Works of Jerome Bruner, 1957-1978*. Routledge Taylor & Francis Group. https://doi.org/10.4324/9780203088609

Bryce, D., & Whitebread, D. (2012). The development of metacognitive skills: Evidence from observational analysis of young children’s behavior during problem-solving. *Metacognition and Learning*, *7*(3), 197–217. https://doi.org/10.1007/s11409-012-9091-2

Bryce, D., Whitebread, D., & Szűcs, D. (2015). The relationships among executive functions, metacognitive skills and educational achievement in 5 and 7 year-old children. *Metacognition and Learning*, *10*(2), 181–198. https://doi.org/10.1007/s11409-014-9120-4

Buehler, R., Griffin, D., & Ross, M. (1994). Exploring the “Planning Fallacy”: Why People Underestimate Their Task Completion Times. *Journal of Personality and Social Psychology*, *67*(3), 366–381. https://doi.org/10.1037/0022-3514.67.3.366

Burke, C. (2008). Children’s visual voice in research. In Pat Thomson (Ed.), *Doing Visual Research with Chidlren and Young People* (pp. 23–36). Routledge.

Calarco, J. M. (2014). Coached for the Classroom. *American Sociological Review*, *79*(5), 1015–1037. https://doi.org/10.1177/0003122414546931

Camerota, M., Willoughby, M. T., Kuhn, L. J., & Blair, C. B. (2018). The Childhood Executive Functioning Inventory (CHEXI): Factor structure, measurement invariance, and correlates in US preschoolers. *Child Neuropsychology*, *24*(3), 322–337.

https://doi.org/10.1080/09297049.2016.1247795

Cappello, M. (2005). Photo Interviews: Eliciting Data through Conversations with Children. *Field Methods*, *17*(2), 170–182. https://doi.org/10.1177/1525822X05274553

Castro, F. G., Kellison, J. G., Boyd, S. J., & Kopak, A. (2010). A Methodology for Conducting Integrative Mixed Methods Research and Data Analyses. *Journal of Mixed Methods Research*, *4*(4), 342–360. https://doi.org/10.1177/1558689810382916

Cavadel, E. W., & Frye, D. A. (2017). Not just numeracy and literacy: Theory of mind development and school readiness among low-income children. *Developmental Psychology*, *53*(12), 2290–2303. https://doi.org/10.1037/dev0000409

Chen, Z., & Klahr, D. (2008). Remote transfer of scientific-reasoning and problem-solving strategies in children. In *Advances in Child Development and Behavior* (Vol. 36, pp. 419–470). Academic Press Inc. https://doi.org/10.1016/S0065-2407(08)00010-4

Christensen, P. (2004). Children's participation in ethnographic research: Issues of power and representation. *Children & Society*, *18*(2), 165–176. https://doi.org/10.1002/chi.823

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

Clark, A. (2010). Young Children as Protagonists and the Role of Participatory, Visual Methods in Engaging Multiple Perspectives. *American Journal of Community Psychology*, *46*(1–2), 115–123. https://doi.org/10.1007/s10464-010-9332-y

Clerc, J., & Miller, P. H. (2013). Utilization deficiencies and transfer of strategies in preschoolers. *Cognitive Development*, *28*, 76–93. https://doi.org/10.1016/j.cogdev.2012.09.003

Clerc, J., Miller, P. H., & Cosnefroy, L. (2014). Young children's transfer of strategies: Utilization deficiencies, executive function, and metacognition. *Developmental Review*, *34*(4), 378–393. https://doi.org/10.1016/J.DR.2014.10.002

Cobb, J. B. (2017). Investigating Reading Metacognitive Strategy Awareness of Elementary Children: A Developmental Continuum Emerges. *Journal of Research in Childhood Education*, *31*(3), 401–418. https://doi.org/10.1080/02568543.2017.1309481

Cocks, A. J. (2006). The Ethical Maze: Finding an inclusive path towards gaining children's agreement to research participation. *Childhood*, *13*(2), 247–266. https://doi.org/10.1177/0907568206062942

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education* (8th ed.). Routledge. https://books.google.co.uk/books/about/Research_Methods_in_Education.html?id=uMI5vgAACAAJ&redir_esc=y

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge. http://reader.vlebooks.com/reader/open?accId=10579&cite=1&isbn=9781315456522&maxCopy=227&maxPrint=227&mmLimit=0&notes=1&pageLimit=0&shareLink=%2F

%2FWWW.VLEBOOKS.COM%2FVLEWEB%2FPRODUCT%2FINDEX%2F982307&startPage=0&timestamp=2019-03-05T11%3A56%3A41&userId=1

Cohrssen, C., Niklas, F., Logan, D., & Tayler, C. (2016). The self-reported academic self-concept of four-year-old children: Global and fixed, or nuanced and changing in the year before school? *Australasian Journal of Early Childhood*, *41*(3), 4–10. http://web.a.ebscohost.com/ehost/detail/detail?vid=10&sid=081deea7-2e44-4cdb-b5a3-efbd83a3c87a%40sessionmgr4007&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3D%3D#AN=118272506&db=ofs

Collingridge, D. S. (2013). A Primer on Quantitized Data Analysis and Permutation Testing. *Journal of Mixed Methods Research*, *7*(1), 81–97. https://doi.org/10.1177/1558689812454457

Connelly, R., & Gayle, V. (2019). An investigation of social class inequalities in general cognitive ability in two British birth cohorts. *The British Journal of Sociology*, *70*(1), 90–108. https://doi.org/10.1111/1468-4446.12343

Coughlin, C., Hembacher, E., Lyons, K. E., & Ghetti, S. (2015). Introspection on uncertainty and judicious help-seeking during the preschool years. *Developmental Science*, *18*(6), 957–971. https://doi.org/10.1111/desc.12271

Cross, D. R., & Paris, S. G. (1988). Developmental and instructional analyses of children's metacognition and reading comprehension. *Journal of Educational Psychology*, *80*(2), 131–142. https://doi.org/10.1037/0022-0663.80.2.131

Cypress, B. S. (2017). Rigor or Reliability and Validity in Qualitative Research. *Dimensions of Critical Care Nursing*, *36*(4), 253–263. https://doi.org/10.1097/DCC.0000000000000253

Danby, S., Ewing, L., & Thorpe, K. (2011). The Novice Researcher: Interviewing Young Children. *Qualitative Inquiry*, *17*(1), 74–84. https://doi.org/10.1177/1077800410389754

de Backer, L., van Keer, H., & Valcke, M. (2012). Exploring the potential impact of reciprocal peer tutoring on higher education students' metacognitive knowledge and regulation. *Instructional Science*, *40*(3), 559–588. https://doi.org/10.1007/s11251-011-9190-5

Deakin Crick, R., & Goldspink, C. (2014). Learner Dispositions, Self-Theories and Student Engagement. *British Journal of Educational Studies*, *62*(1), 19–35. https://doi.org/10.1080/00071005.2014.904038

Demetriou, D. (2009). *Interrelationships in children's socio-cognitive development : the case of false-belief understanding* [University of Cambridge]. http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.598489

Desautel, D. (2009). Becoming a Thinking Thinker: Metacognition, Self-Reflection, and Classroom Practice. *Teachers College Record*, *111*(8), 1997–2020.

Desoete, A. (2008). *Multi-method assessment of metacognitive skills in elementary school children: how you test is what you get*. https://doi.org/10.1007/s11409-008-9026-0

Destan, N., Hembacher, E., Ghetti, S., & Roebers, C. M. (2014). Early metacognitive abilities: The interplay of monitoring and control processes in 5- to 7-year-old children. *Journal of Experimental Child Psychology*, *126*, 213–228. https://doi.org/10.1016/J.JECP.2014.04.001

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the Conceptual Lens on Metacognition, Self-regulation, and Self-regulated Learning. *Educational Psychology Review*, *20*(4), 391–409. https://doi.org/10.1007/s10648-008-9083-6

Dockett, S., Einarsdóttir, J., & Perry, B. (2011). Balancing methodologies and methods in researching with young children. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young Children's Perspectives - Debating the ethics and dilemmas of educational research with children* (pp. 68–81). Routledge.

Dockett, S., Einarsdóttir, J., & Perry, B. (2012). Young children's decisions about research participation: opting out. *International Journal of Early Years Education*, *20*(3), 244–256. https://doi.org/10.1080/09669760.2012.715405

Dockett, S., & Perry, B. (2011). Researching with Young Children: Seeking Assent. *Child Indicators Research*, *4*(2), 231–247. https://doi.org/10.1007/s12187-010-9084-0

Donaldson, M. (1978). *Children's Minds*. Fontana Press.

Duncan, P., & Grogan, D. (2019). Changing pedagogy in Scottish primary schools: insights from the exploring pedagogy in primary 1 (EPP1) project. *SERA Research Education Bulletin*. https://pureportal.strath.ac.uk/en/publications/changing-pedagogy-in-scottish-primary-schools-insights-from-the-e

Duncan, R. J., Schmitt, S. A., Burke, M., & McClelland, M. M. (2018). Combining a kindergarten readiness summer program with a self-regulation intervention improves school readiness. *Early Childhood Research Quarterly*, *42*, 291–300. https://doi.org/10.1016/J.ECRESQ.2017.10.012

Dunlop, A.-W., Hughes, A., Fee, J., & Marwick, H. M. (2008). Positive behaviour in the early years : perceptions of staff, service providers and parents in managing and promoting positive behaviour in early years and early primary settings. In *Scottish Government*. Scottish Government.

Dunlosky, J., & Metcalfe, J. (2009). *Metacognition*. SAGE Publications.

Dunlosky, J., & Nelson, T. (1992). Importance of the kind of cue for judgments of learning (JOL) and the delayed JOL effect. *Memory & Cognition*, *20*(4), 374–380. https://link.springer.com/content/pdf/10.3758/BF03210921.pdf

Dunlosky, J., & Rawson, K. A. (2015). Practice Tests, Spaced Practice, and Successive Relearning: Tips for Classroom Use and for Guiding Students' Learning. *Scholarship of Teaching and Learning in Psychology*, *1*(1), 72–78. https://doi.org/10.1037/stl0000024

Dunphy, E. (2004). Children's perceptions of number and of learning about number as they enter formal schooling. *European Early Childhood Education Research JournalOnline)*

Journal European Early Childhood Education Research Journal, *12*(2), 1350–293. https://doi.org/10.1080/13502930485209461

Durkin, R. L. (2014). *Thinking About Thinking in the Primary Classroom* [Newcastle University]. http://theses.ncl.ac.uk/jspui/handle/10443/2622

East Dunbartonshire Council. (2017). *Play to Learn in East Dunbartonshire Council Audit document*. https://education.gov.scot/improvement/Documents/sac86-item2-play-in-p1-audit-document.pdf

Eccles, J. S., & Wigfield, A. (2002). *MOTIVATIONAL BELIEFS, VALUES, AND GOALS*. www.annualreviews.org

Education Endowment Foundation. (2018). *Metacognition and Self-regulated Learning guidance report*. https://educationendowmentfoundation.org.uk/tools/guidance-reports/metacognition-and-self-regulated-learning/

Education Scotland. (2020). *Realising the Ambition: Being me*. https://education.gov.scot/improvement/learning-resources/realising-the-ambition/

Education Scotland National Improvement Hub. (2019). *Literacy and English 3-18 curriculum review (impact report)*. https://education.gov.scot/improvement/self-evaluation/literacy-and-english-3-18-curriculum-review-impact-report

Efklides, A. (2006). Metacognition and affect: What can metacognitive experiences tell us about the learning process? *Educational Research Review*, *1*, 3–14. https://doi.org/10.1016/j.edurev.2005.11.001

Efklides, A. (2008). Metacognition: Defining its facets and levels of functioning in relation to self-regulation and co-regulation. *European Psychologist*, *13*(4), 277–287. https://doi.org/10.1027/1016-9040.13.4.277

Efklides, A. (2014). How Does Metacognition Contribute to the Regulation of Learning? An Integrative Approach. *Psychological Topics*, *23*(1), 1–30. http://pt.ffri.hr/index.php/pt/article/view/183/106

Efklides, A., & Touroutoglou, A. (2010). Prospective Memory Failure and the Metacognitive Experience of "Blank in the Mind." In *Trends and Prospects in Metacognition Research* (pp. 105–126). Springer US.

Efklides, A., & Vlachopoulos, S. P. (2012). Measurement of Metacognitive Knowledge of Self, Task, and Strategies in Mathematics. *European Journal of Psychological Assessment*, *28*(3), 227–239. https://doi.org/10.1027/1015-5759/a000145

Einarsdóttir, J. (2007). Research with children: methodological and ethical challenges. *European Early Childhood Education Research Journal*, *15*(2), 1350–293. https://doi.org/10.1080/13502930701321477

Einarsdóttir, J., Dockett, S., & Perry, B. (2009). Making meaning: children's perspectives expressed through drawings. *Early Child Development and Care*, *179*(2), 217–232. https://doi.org/10.1080/03004430802666999

Erikson, D., & Grant, W. (2007). Student perceptions of IWBs as a teaching and learning medium. *Australian Educational Computing*, *22*(2), 10–16. http://acce.edu.au/sites/acce.edu.au/files/pj/journal/AEC Vol 22 No 2 2007 Student perceptions of IWBs as a teachi.pdf

Fargas-Malet, M., McSherry, D., Larkin, E., & Robinson, C. (2010). Research with children: methodological issues and innovative techniques. *Journal of Early Childhood Research*, *8*(2), 175–192. https://doi.org/10.1177/1476718X09345412

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, *5*(1), 80–92. https://doi.org/10.1177/160940690600500107

Field, A. (2009). *Discovering statistics using SPSS : (and sex and drugs and rock "n" roll)*. SAGE Publications.

Field, A. (2013). *Discovering statistics using SPSS: and sex and drugs and rock'n'roll* (4th ed.). Sage. www.discoveringstatistics.com

Finn, B., & Tauber, S. K. (2015). When Confidence Is Not a Signal of Knowing: How Students' Experiences and Beliefs About Processing Fluency Can Lead to Miscalibrated Confidence. In *Educational Psychology Review* (Vol. 27, Issue 4, pp. 567–586). Springer New York LLC. https://doi.org/10.1007/s10648-015-9313-7

Fisher, J. (2013). *Starting from the Child: Teaching and Learning in the Foundation Stage* (4th ed.). Open University Press.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, *34*(10), 906–911. https://doi.org/10.1037/0003-066X.34.10.906

Flavell, J. H., Green, F. L., Flavell, E. R., Harris, P. L., & Astington, J. W. (1995). Young Children's Knowledge about Thinking. *Monographs of the Society for Research in Child Development*, *60*(1), i. https://doi.org/10.2307/1166124

Flavell, J. H., Miller, P. H., & Miller, S. A. (2002). *Cognitive Development* (4th ed.). Pearson Education, Inc.

Follmer, D. J., & Sperling, R. (2016). The mediating role of metacognition in the relationship between executive function and self-regulated learning. *British Journal of Educational Psychology*, *86*(4), 559–575. https://doi.org/10.1111/bjep.12123

Fox, E., & Riconscente, M. (2008). Metacognition and Self-Regulation in James, Piaget, and Vygotsky. *Educ Psychol Rev*, *20*, 373–389. https://doi.org/10.1007/s10648-008-9079-2

Frels, R. K., & Onwuegbuzie, A. (2013). Administering Quantitative Instruments With Qualitative Interviews: A Mixed Research Approach. *Journal of Counseling & Development*, *91*(2), 184–194. https://doi.org/10.1002/j.1556-6676.2013.00085.x

Fritz, K., Howie, P., & Kleitman, S. (2010). "How do I remember when I got my dog?" The structure and development of children's metamemory. *Metacognition Learning*, *5*, 207–228. https://doi.org/10.1007/s11409-010-9058-0

Gallagher, M. (2008). ‘Power is not an evil’: rethinking power in participatory methods. *Children’s Geographies*, *6*(2), 137–150. https://doi.org/10.1080/14733280801963045

Garner, J. K. (2009). Conceptualizing the Relations Between Executive Functions and Self-Regulated Learning. *The Journal of Psychology*, *143*(4), 405–426. https://doi.org/10.3200/JRLP.143.4.405-426

Gascoine, L. (2016). *Investigating Developmental Trends in Metacognitive Knowledge with School-aged Children using Pupil Views Templates* [Durham University]. http://etheses.dur.ac.uk/11555/

Gascoine, L., Higgins, S., & Wall, K. (2017). The assessment of metacognition in children aged 4-16 years: a systematic review. *Review of Education*, *5*(1), 3–57. https://doi.org/10.1002/rev3.3077

Geurten, M., Meulemans, T., & Lemaire, P. (2018). From domain-specific to domain-general? The developmental path of metacognition for strategy selection. *Cognitive Development*, *48*, 62–81. https://doi.org/10.1016/J.COGDEV.2018.08.002

Gold, M. (2014). *Exploring metacognitive development in the context of peer assisted writing using on-line and off-line methods* [Newcastle University]. http://theses.ncl.ac.uk/jspui/handle/10443/2640

Goupil, L., Romand-Monnier, M., & Kouider, S. (2016). Infants ask for help when they know they don’t know. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(13), 3492–3496. https://doi.org/10.1073/pnas.1515129113

Gray, C., & MacBlain, S. (2012). *Learning Theories in Childhood*. SAGE Publications.

Gray, S., Kvalsvig, A., O’Connor, M., O’Connor, E., Incledon, E., Tarasuik, J., & Goldfeld, S. (2018). Can a teacher-reported indicator be used for population monitoring of oral language skills at school entry? *International Journal of Speech-Language Pathology*, *20*(4), 447–457. https://doi.org/10.1080/17549507.2017.1294200

Greene, J. (2007). *Mixed methods in social inquiry*. Jossey-Bass.

Greene, J. (2012). Engaging Critical Issues in Social Inquiry by Mixing Methods. *American Behavioral Scientist*, *56*(6), 755–773. https://doi.org/10.1177/0002764211433794

Greig, A., Taylor, J., & MacKay, T. (2007). *Doing Research with Children*. SAGE Publications.

Guerrero, S., Cascado, C., Sausa, M., & Enesco, I. (2017). My teacher is wrong: Preschoolers’ opposition to non-conventional statements. *Early Childhood Research Quarterly*, *39*, 1–13. https://doi.org/10.1016/j.ecresq.2016.11.001

Gunderson, E. A., Sorhagen, N. S., Gripshover, S. J., Dweck, C. S., Goldin-Meadow, S., & Levine, S. C. (2018). Parent praise to toddlers predicts fourth grade academic achievement via children’s incremental mindsets. *Developmental Psychology*, *54*(3), 397–409. https://doi.org/10.1037/dev0000444

Haberkorn, K., Lockl, K., Pohl, S., Ebert, S., & Weinert, S. (2014). Metacognitive knowledge in children at early elementary school. *Metacognition and Learning*, *9*(3), 239–263. https://doi.org/10.1007/s11409-014-9115-1

Hacker, D. J., & Dunlosky, J. (2003). Not All Metacognition Is Created Equal. *New Directions for Teaching and Learning*, *2003*(95), 73–79. https://doi.org/10.1002/tl.116

Hakim, C. (2000). *Research design : successful designs for social and economic research* (2nd ed.). Routledge. http://eprints.lse.ac.uk/13012/

Halcomb, E. J. (2019). Mixed methods research: The issues beyond combining methods. *Journal of Advanced Nursing*, *75*(3), 499–501. https://doi.org/10.1111/jan.13877

Hanke, V. (2014). Guided reading: young pupils' perspectives on classroom practice. *Literacy*, *48*(3), 136–143. https://doi.org/10.1111/lit.12019

Harcourt, D., & Conroy, H. (2011). Informed consent - Processes and procedures in seeking research partnerships with young children. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young Children's Perspectives - Debating the ethics and dilemmas of educational research with children* (pp. 38–51). Routledge.

Hayes, N., O'Toole, L., & Halpenny, A. M. (2017). *Introducing Bronfenbrenner. A guide for practitioners and students in early years education*.

Heikkinen, H. L. T., Huttunen, R., & Syrjälä, L. (2007). Action research as narrative: Five principles for validation. *Educational Action Research*, *15*(1), 5–19. https://doi.org/10.1080/09650790601150709

Heyes, C., Bang, D., Shea, N., Frith, C. D., & Fleming, S. M. (2020). Knowing Ourselves Together: The Cultural Origins of Metacognition. In *Trends in Cognitive Sciences* (Vol. 24, Issue 5, pp. 349–362). Elsevier Ltd. https://doi.org/10.1016/j.tics.2020.02.007

Higgins, S., Katsipataki, M., Villanueva-Aguilera, A. B., Coleman, R., Henderson, P., Major, L. E., Coe, R., & Mason, D. (2016). The Sutton Trust-Education Endowment Foundation Teaching and Learning Toolkit. In *Manual. Education Endowment Foundation, London.* Education Endowment Foundation. https://educationendowmentfoundation.org.uk/resources/teaching-learning-toolkit

Higgins, S., Wall, K., Baumfield, V., Hall, E., Leat, D., Moseley, D., & Woolner, P. (2007). Learning to Learn in Schools Phase 3 Evaluation: Final Report. In *http://eprints.ncl.ac.uk*. Newcastle University. http://eprint.ncl.ac.uk/pub_details2.aspx?pub_id=155074

Hofer, B. K. (2004). Epistemological Understanding as a Metacognitive Process: Thinking Aloud During Online Searching. *Educational Psychologist*, *39*(1), 43–55. http://www.tandfonline.com/doi/pdf/10.1207/s15326985ep3901_5

Holton, D., & Clarke, D. (2006). Scaffolding and metacognition. *International Journal of Mathematical Education in Science and Technology*, *37*(2), 127–143. https://doi.org/10.1080/00207390500285818

Isquith, P. K., Crawford, J. S., Andrews Espy, K., & Gioia, G. A. (2005). Assessment of Executive Function in Preschool-Aged Children. *Mental Retardation and Developmental Disabilities Research Reviews*, *11*, 209–215. https://doi.org/10.1002/mrdd.20075

Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). More than Just Convenient: The Scientific

Merits of Homogeneous Convenience Samples. *Monographs of the Society for Research in Child Development*, *82*(2), 13–30. https://doi.org/10.1111/mono.12296

James, A., Jenks, C., & Prout, A. (1998). *Theorizing childhood*. Polity Press.

Jansen, M., Schroeders, U., & Lüdtke, O. (2014). Academic self-concept in science: Multidimensionality, relations to achievement measures, and gender differences. *Learning and Individual Differences*, *30*, 11–21. https://doi.org/10.1016/j.lindif.2013.12.003

Johnson, B., & Christensen, L. B. (2012). *Educational research : quantitative, qualitative, and mixed approaches* (4th ed.). SAGE Publications.

Johnson, R. B., Onwuegbuzie, A., & Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*, *1*(2), 112–133. https://doi.org/10.1177/1558689806298224

Johnson, R. H., & Hamby, B. (2015). A Meta-Level Approach to the Problem of Defining 'Critical Thinking.' *Argumentation*, *29*(4), 417–430. https://doi.org/10.1007/s10503-015-9356-4

Joslin-Callahan, C. A. (2018). *"It makes me feel like part of the world": How children in the International Baccalaureate Primary Years Programme understand international-mindedness* [Durham University]. http://etheses.dur.ac.uk/13183/

Jug, T., & Vilar, P. (2015). Focus group interview through storytelling. *Journal of Documentation*, *71*(6), 1300–1316. https://doi.org/10.1108/JD-01-2015-0008

Justice, L. M., Petscher, Y., Schatschneider, C., & Mashburn, A. (2011). Peer Effects in Preschool Classrooms: Is Children's Language Growth Associated With Their Classmates' Skills? *Child Development*, *82*(6), 1768–1777. http://www.jstor.org/stable/41289881

Kane, N. (2016). The Play-Learning Binary: U.S. Parents' Perceptions on Preschool Play in a Neoliberal Age. *Children & Society*, *30*(4), 290–301. https://doi.org/10.1111/chso.12140

Kanyal, M. (2014). *Children's rights 0-8 : promoting participation in education and care*. Routledge. https://books.google.co.uk/books/about/Children_s_Rights_0_8.html?id=sKAcmwEACAAJ&redir_esc=y

Kloo, D., & Sodian, B. (2017). The developmental stability of inhibition from 2 to 5 years. *British Journal of Developmental Psychology*, *35*(4), 582–595. http://10.0.4.87/bjdp.12197

Kohn, A. (2015, August 16). The "Mindset" Mindset What We Miss By Focusing on Kids' Attitudes. *Salon*.

Koriat, A. (2000). The Feeling of Knowing: Some Metatheoretical Implications for Consciousness and Control. *Consciousness and Cognition*, *9*(2), 149–171. https://doi.org/10.1006/CCOG.2000.0433

Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory Into Practice*, *41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Kuhn, D. (2000). Metacognitive Development. *Current Directions in Psychological Science*, *9*(5), 178–181. https://doi.org/10.1111/1467-8721.00088

Kuhn, D., & Dean, D. (2004). Metacognition: A Bridge Between Cognitive Psychology and Educational Practice. *Theory Into Practice*, *43*(4), 268–273. https://doi.org/10.1207/s15430421tip4304_4

Lai, E. R. (2011). *Metacognition: A Literature Review Research Report*. http://images.pearsonassessments.com/images/tmrs/Metacognition_Literature_Review_Final.pdf

Larkin, S. (2010). *Metacognition in Young Children*. Routledge.

Lee, N. (1998). Towards an Immature Sociology. *The Sociological Review*, *46*(3), 458–482. https://doi.org/10.1111/1467-954X.00127

Leech, N. L., & Onwuegbuzie, A. (2009). A typology of mixed methods research designs. *Quality & Quantity*, *43*(2), 265–275. https://doi.org/10.1007/s11135-007-9105-3

Leitch, R. (2008). Children's narratives through images. In Pat Thomson (Ed.), *Doing Visual Research with Children and Young People* (pp. 37–58). Routledge.

Lewis, A., & Smith, D. (1993). Defining Higher Order Thinking. *Theory Into Practice*, *32*(3), 131–137. https://doi.org/10.2307/1476693

Lewis, H. (2019). Supporting the development of young children's metacognition through the use of video-stimulated reflective dialogue. *Early Child Development and Care*, *189*(11), 1842–1858. https://doi.org/10.1080/03004430.2017.1417273

Livingston, J. A. (2003). *Metacognition: An Overview.* https://eric.ed.gov/?id=ED474273

Lockl, K., Händel, M., Haberkorn, K., & Weinert, S. (2016). Metacognitive Knowledge in Young Children: Development of a New Test Procedure for First Graders. In H.-P. Blossfeld, J. von Maurice, M. Bayer, & J. Skopek (Eds.), *Methodological Issues of Longitudinal Surveys: The Example of the National Educational Panel Study* (pp. 465–484). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-11994-2_26

Lockl, K., & Schneider, W. (2007). Knowledge About the Mind: Links Between Theory of Mind and Later Metamemory. *Child Development*, *78*(1), 148–167. https://doi.org/10.1111/j.1467-8624.2007.00990.x

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2010). *Methods in educational research : from theory to practice*. John Wiley & Sons.

Louca, E. P. (2019). Do children know what they know? Metacognitive awareness in preschool children. In *New Ideas in Psychology* (Vol. 54, pp. 56–62). Elsevier Ltd. https://doi.org/10.1016/j.newideapsych.2019.01.005

Lundin, M., & Jakobson, B. (2014). Situated meaning-making of the human body: A study of elementary school children's reasons in two different activities. *Cultural Studies of Science Education*, *9*(1), 173–191. https://doi.org/10.1007/s11422-013-9551-2

Lunn Brownlee, J., Curtis, E., Spooner-Lane, R., & Feucht, F. (2017). Understanding children's epistemic beliefs in elementary education. *Education 3-13*, *45*(2), 191–208. https://doi.org/10.1080/03004279.2015.1069369

Lynch, H. (2014). Seeking Ethical Symmetry—An Analysis of Criminal Justice Social Work Practice with a Female 'Offender.' *Ethics and Social Welfare*, *8*(4), 408–416. https://doi.org/10.1080/17496535.2014.954767

Lyons, K. E., & Ghetti, S. (2010). Metacognitive development in early childhood: New questions about old assumptions. In *Trends and Prospects in Metacognition Research* (pp. 259–278). Springer US. https://doi.org/10.1007/978-1-4419-6546-2_12

Lyons, K. E., & Ghetti, S. (2013). I Don't Want to Pick! Introspection on Uncertainty Supports Early Strategic Behavior. *Child Development*, *84*(2), 726–736. https://doi.org/10.1111/cdev.12004

Madill, A., Jordan, A., & Shirley, C. (2000). Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies. *British Journal of Psychology*, *91*(1), 1–20. https://doi.org/10.1348/000712600161646

Magno, C. (2010). The role of metacognitive skills in developing critical thinking. *Metacognition and Learning*, *5*(2), 137–156. https://doi.org/10.1007/s11409-010-9054-4

Mandell, N. (1988). The Least-Adult Role in Studying Children. *Journal of Contemporary Ethnography*, *16*(4), 433–467. https://doi.org/10.1177/0891241688164002

Mannion, G. (2007). Going Spatial, Going Relational: Why "listening to children" and children's participation needs reframing. *Discourse: Studies in the Cultural Politics of Education*, *28*(3), 405–420. https://doi.org/10.1080/01596300701458970

Martlew, J., Stephen, C., & Ellis, J. (2011). Play in the primary school classroom? The experience of teachers supporting children's learning through a new pedagogy. *Early Years*, *31*(1), 71–83. https://doi.org/10.1080/09575146.2010.529425

Marulis, L. M., Palincsar, A. S., Berhenke, A. L., & Whitebread, D. (2016). Assessing metacognitive knowledge in 3–5 year olds: the development of a metacognitive knowledge interview (McKI). *Metacognition and Learning*, *11*(3), 339–368. https://doi.org/10.1007/s11409-016-9157-7

Maxwell, J. A., & Mittapalli, K. (2010). Realism as a stance for mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *SAGE Handbook of Mixed Methods in Social & Behavioral Research* (2nd ed., pp. 145–167). SAGE Publications.

Mayne, F., Howitt, C., & Rennie, L. (2016). Meaningful informed consent with young children: looking forward through an interactive narrative approach. *Early Child Development and Care*, *186*(5), 673–687. https://doi.org/10.1080/03004430.2015.1051975

McGregor, D. (2007). *Developing Thinking Developing Learning: A Guide to Thinking Skills in*

Education. Open University Press.

McKendrick, J. H. (2005). *School Grounds in Scotland Research Report Summary*. www.sportscotland.org.uk

McNair, L. J. (2016). *Rules, Rules, Rules and We're Not Allowed to Skip* [University of Edinburgh]. https://www.era.lib.ed.ac.uk/bitstream/handle/1842/22942/McNair2016.pdf?sequence=3

Mercer, N., & Howe, C. (2012). Explaining the dialogic processes of teaching and learning: The value and potential of sociocultural theory. *Learning, Culture and Social Interaction*, *1*(1), 12–21. https://doi.org/10.1016/J.LCSI.2012.03.001

Miele, D. B., & Molden, D. C. (2010). Naive theories of intelligence and the role of processing fluency in perceived comprehension. *Journal of Experimental Psychology: General*, *139*(3), 535–557. https://doi.org/10.1037/a0019745

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook* (3rd ed.). SAGE Publications.

Mills, C. M. (2013). Knowing when to doubt: developing a critical stance when learning from others. *Developmental Psychology*, *49*(3), 404–418. https://doi.org/10.1037/a0029500

Misailidi, P. (2010). Children's Metacognition and Theory of Mind: Bridging the Gap. In A. Efklides & P. Misailidi (Eds.), *Trends and Prospects in Metacognition Research* (pp. 279–291). Springer US.

Morrison, K. (2009). *Causation in Educational Research*. Routledge.

Moseley, D., Baumfield, V., Elliott, J., Higgins, S., Miller, J., Newton, D., & Gregson, M. (2005). Moving from understanding to productive thinking: implications for practice. In *Frameworks for Thinking: A Handbook for teaching and learning* (pp. 296–318). Cambridge University Press. https://doi.org/10.1017/CBO9780511489914

Moshman, D. (2017). Metacognitive Theories Revisited. In *Educational Psychology Review* (pp. 1–8). https://doi.org/10.1007/s10648-017-9413-7

Muijs, D. (2004). *Doing quantitative research in education with SPSS*. Sage.

Mulholland Shipley, K. E. (2016). *"I think when I work with other people I can let go of all of my ideas and tell them out loud' : the impact of a Thinking Skills approach upon pupils'' experiences of maths"* [Newcastle University]. http://theses.ncl.ac.uk/jspui/handle/10443/3282

Nelson, T. (1996). Consciousness and metacognition. *American Psychologist*, *51*(2), 102–116. https://doi.org/10.1037/0003-066X.51.2.102

Nelson, T., & Narens, L. (1994). Why Investigate Metacognition? In J. Metcalfe & A. Shimamura (Eds.), *Metacognition: Knowing about Knowing* (pp. 1–25). The MIT Press. https://books.google.co.uk/books?hl=en&lr=&id=Ci0TDgAAQBAJ&oi=fnd&pg=PA1&dq=nelson+and+narens+metacognition&ots=qFcH2wYyXv&sig=M73JKLrJvSS5-

e2CTypr9Y-WJ7s#v=onepage&q=nelson and narens metacognition&f=false

Neuenhaus, N., Artelt, C., Lingel, K., & Schneider, W. (2011). Fifth graders metacognitive knowledge: general or domain-specific? *European Journal of Psychology of Education*, *26*(2), 163–178. https://doi.org/10.1007/s10212-010-0040-7

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*(3), 231–259. https://doi.org/10.1037/0033-295X.84.3.231

Noble, H., & Smith, J. (2015). Issues of validity and reliability in qualitative research. In *Evidence-Based Nursing* (Vol. 18, Issue 2, pp. 34–35). BMJ Publishing Group. https://doi.org/10.1136/eb-2015-102054

Norman, E., Price, M. C., & Duff, S. C. (2010). Fringe consciousness: A useful framework for clarifying the nature of experience-based metacognitive feelings. In *Trends and Prospects in Metacognition Research* (pp. 63–80). Springer US. https://doi.org/10.1007/978-1-4419-6546-2_4

Norman, G. (2010). Likert scales, levels of measurement and the “laws” of statistics. *Advances in Health Sciences Education*, *15*(5), 625–632. https://doi.org/10.1007/s10459-010-9222-y

Noyes, A. (2008). Using video diaries to investigate learner trajectories: researching the “unknown unknowns.” In Pat Thomson (Ed.), *Doing Visual Research with Chidlren and Young People* (pp. 132–145). Routledge.

Nutbrown, C. (2011). *Threads of thinking : schemas and young children’s learning*. SAGE.

Office for National Statistics. (n.d.-a). *ONS Occupation Coding Tool*. Retrieved June 28, 2019, from https://onsdigital.github.io/dp-classification-tools/standard-occupational-classification/ONS_SOC_occupation_coding_tool.html

Office for National Statistics. (n.d.-b). *The National Statistics Socio-economic classification (NS-SEC)*. Retrieved June 28, 2019, from https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/thenationalstatisticssocioeconomicclassificationnssecrebasedonsoc2010

Onwuegbuzie, A., & Collins, K. (2007). A Typology of Mixed Methods Sampling Designs in Social Science Research. *The Qualitative Report*, *12*(2), 281–316. https://nsuworks.nova.edu/tqr/vol12/iss2/9

Otain, F., Stanfield, J., & Woolner, P. (2019, June). Investigating Student Collaboration within Self-Organised Learning Environments (SOLEs). *International Conference on Modern Research in Education, Teaching and Learning*.

Palmer, S. (2017, October). Solving the P1 puzzle. *Children in Scotland Magazine*, 28–29. https://childreninscotland.org.uk/wp-content/uploads/2017/11/182-Oct-Nov-EXTRACTED.pdf

Paris, S. G., & Winograd, P. (1990). Promoting Metacognition and Motivation of Exceptional Children. *Remedial and Special Education*, *11*(6), 7–15. https://doi.org/10.1177/074193259001100604

Pauwels, L. (2011). An Integrated Conceptual Framework for Visual Social Research. In E. Margolis & L. Pauwels (Eds.), *The SAGE Handbook of Visual Research Methods* (pp. 3–23). SAGE Publications Ltd. https://doi.org/10.4135/9781446268278.n1

Pezzica, S., Pinto, G., Bigozzi, L., & Vezzani, C. (2016). Where is my attention? Children's metaknowledge expressed through drawings. *Educational Psychology*, *36*(4), 616–637. http://10.0.4.56/01443410.2014.1003035

Piaget, J. (1969). *Judgement and reasoning in the child*. Routledge & Kegan Paul.

Priestley, M., & Minty, S. (2013). Curriculum for Excellence: "A brilliant idea, but. . ." *Scottish Educational Review*, *45*(1), 39–52. https://www.stir.ac.uk/research/hub/publication/725801

Prosser, J. (2007). Visual methods and the visual culture of schools. *Visual Studies*, *22*(1), 13–30. https://doi.org/10.1080/14725860601167143

Prout, A. (2011). Taking a Step Away from Modernity: reconsidering the new sociology of childhood. *Global Studies of Childhood*, *1*(1). https://doi.org/10.2304/gsch.2011.1.1.4

Punch, S. (2002a). Interviewing strategies with young people: the "secret box", stimulus material and task-based activities. *Children & Society*, *16*(1), 45–56. https://doi.org/10.1002/chi.685

Punch, S. (2002b). Research with Children. *Childhood*, *9*(3), 321–341. https://doi.org/10.1177/0907568202009003005

Pyle, A., & Alaca, B. (2018). Kindergarten children's perspectives on play and learning. *Early Child Development and Care*, *188*(8), 1063–1075. https://doi.org/10.1080/03004430.2016.1245190

Qvortrup, J., Corsaro, W. A., & Honig, M.-S. (2009). *The Palgrave handbook of childhood studies*. Palgrave Macmillan.

Reber, R., & Greifeneder, R. (2017). Processing Fluency in Education: How Metacognitive Feelings Shape Learning, Belief Formation, and Affect. *Educational Psychologist*, *52*(2), 84–103. https://doi.org/10.1080/00461520.2016.1258173

Robson, C., & McCartan, K. (2016). *Real World Research* (4th ed.). John Wiley & Sons Ltd.

Robson, S. (2010). Self-regulation and metacognition in young children's self-initiated play and Reflective Dialogue. *International Journal of Early Years Education*, *18*(3), 227–241. https://doi.org/10.1080/09669760.2010.521298

Robson, S. (2016a). Self-regulation and metacognition in young children: Does it matter if adults are present or not? *British Educational Research Journal*, *42*(2), 185–206. https://doi.org/10.1002/berj.3205

Robson, S. (2016b). Self-regulation, metacognition and child- and adult-initiated activity: does it matter who initiates the task? *Early Child Development and Care*, *186*(5), 764–784. https://doi.org/10.1080/03004430.2015.1057581

Robson, S. (2016c). Are there differences between children's display of self-regulation and metacognition when engaged in an activity and when later reflecting on it? The complementary roles of observation and reflective dialogue. *Early Years: Journal of International Research & Development*, *36*(2), 179–194. http://10.0.4.56/09575146.2015.1129315

Roderer, T., & Roebers, C. M. (2014). Can you see me thinking (about my answers)? Using eye-tracking to illuminate developmental differences in monitoring and control skills and their relation to performance. *Metacognition and Learning*, *9*(1), 1–23. https://doi.org/10.1007/s11409-013-9109-4

Roebers, C. M., Cimeli, P., Röthlisberger, M., & Neuenschwander, R. (2012). Executive functioning, metacognition, and self-perceived competence in elementary school children: an explorative study on their interrelations and their role for school achievement. *Metacognition and Learning*, *7*(3), 151–173. https://doi.org/10.1007/s11409-012-9089-9

Roebers, C. M., & Feurer, E. (2016). Linking Executive Functions and Procedural Metacognition. *Child Development Perspectives*, *10*(1), 39–44. https://doi.org/10.1111/cdep.12159

Rowe, D. W. (1989). Pre-schoolers' use of metacognitive knowledge and strategies in self-selected literacy events. *National Reading Conference Yearbook*, *38*, 65–76.

Salmon, A. K., & Lucas, T. (2011). Exploring Young Children's Conceptions About Thinking. *Journal of Research in Childhood Education*, *25*(4), 364–375. https://doi.org/10.1080/02568543.2011.605206

Sandelowski, M., Voils, C. I., & Knafl, G. (2009). On Quantitizing. *Journal of Mixed Methods Research*, *3*(3), 208–222. https://doi.org/10.1177/1558689809334210

Saraç, S., & Karakelle, S. (2012). On-line and Off-line Assessment of Metacognition. *International Electronic Journal of Elementary Education*, *4*(2), 301–315. http://files.eric.ed.gov/fulltext/EJ1068610.pdf

Sargent, M. (2014). *The project approach in early years provision : a practical guide to promoting children's creativity and critical thinking through project work*. Andrews UK.

Schmitt, M. C., & Sha, S. (2009). The developmental nature of meta-cognition and the relationship between knowledge and control over time. *Journal of Research in Reading*, *32*(2), 254–271. https://doi.org/10.1111/j.1467-9817.2008.01388.x

Schneider, W. (2008). The Development of Metacognitive Knowledge in Children and Adolescents: Major Trends and Implications for Education. *Mind, Brain, and Education*, *2*(3), 114–121. https://doi.org/10.1111/j.1751-228X.2008.00041.x

Schneider, W. (2010). The Development of Metacognitive Competences. In B. Glatzeder, V. Goel, & A. Muller (Eds.), *Towards a Theory of Thinking* (pp. 203–214). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-03129-8_14

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, *26*(1/2), 113–125. https://doi.org/10.1023/A:1003044231033

Schraw, G., Crippen, K. J., & Hartley, K. (2006). Promoting Self-Regulation in Science

Education: Metacognition as Part of a Broader Perspective on Learning. *Research in Science Education*, *36*(1–2), 111–139. https://doi.org/10.1007/s11165-005-3917-8

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology Review*, *7*(4), 351–371. https://doi.org/10.1007/BF02212307

Scottish Government. (2011). *Income, employment and access deprived rural datazones*. Scottish Government. https://www2.gov.scot/Topics/Statistics/SIMD/deprivedruralpaper

Scottish Government. (2013). *Play Strategy for Scotland: Our Action Plan*. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2013/10/play-strategy-scotland-action-plan/documents/00437132-pdf/00437132-pdf/govscot%3Adocument

Scottish Government. (2016a). *Introducing The Scottish Index of Multiple Deprivation 2016*. https://www2.gov.scot/Resource/0050/00504809.pdf

Scottish Government. (2016b). *Scottish Government Urban Rural Classification - 2016*. http://www.gov.scot/Resource/0053/00533588.pdf

Scottish Government. (2017). *School Contact Details and Summary Statistics*. Scottish Government. https://www2.gov.scot/Topics/Statistics/Browse/School-Education/Datasets/contactdetails

Shannon-Baker, P. (2016). Making Paradigms Meaningful in Mixed Methods Research. *Journal of Mixed Methods Research*, *10*(4), 319–334. https://doi.org/10.1177/1558689815575861

Shaw, C., Brady, L.-M., & Davey, C. (2011). *Guidelines for Research with Children and Young People*.

Siraj-Blatchford, I. (2009). Conceptualising progression in the pedagogy of play and sustained shared thinking in early childhood education: a Vygotskian perspective. *Education and Child Psychology*, *26*(2), 77–89. https://ro.uow.edu.au/sspapers/1224

Skånfors, L. (2009). Ethics in Child Research: Children's Agency and Researchers' 'Ethical Radar.' *Childhoods Today*, *3*(1), 1–22. http://www.childhoodstoday.org/download.php?id=40

Slee, P., & Shute, R. (2003). *Child Development: Thinking about Theories* (P. Smith (ed.)). Arnold.

Smith, A. (2011). Respecting children's rights and agency - Theoretical insights into ethical research procedures. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young Children's Perspectives - Debating the ethics and dilemmas of educational research with children* (pp. 11–25). Routledge.

Smith, A., Duncan, J., & Marshall, K. (2005). Children's perspectives on their learning: exploring methods. *Early Child Development and Care*, *175*(6), 473–487. https://doi.org/10.1080/03004430500131270

Sodian, B., & Kristen, S. (2010). Theory of Mind. In B. Glatzeder, V. Goel, & A. Muller (Eds.), *Towards a Theory of Thinking* (pp. 189–201). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-03129-8_13

Sperling, R., Howard, B., Miller, L. A., & Murphy, C. (2002). Measures of children's knowledge and regulation of cognition. *Contemporary Educational Psychology*, *27*(1), 51–79. https://doi.org/10.1006/ceps.2001.1091

Spinks, J. D. (2012). *Students' Perception of Engagement in a Third-Grade Writing Classroom* [Georgia State University]. https://scholarworks.gsu.edu/eps_diss/100

Spyrou, S. (2011). The limits of children's voices: From authenticity to critical, reflexive representation. *Childhood*, *18*(2), 151–165. https://doi.org/10.1177/0907568210387834

Steffani, S., & Selvester, P. M. (2009). The Relationship of Drawing, Writing, Literacy and Math in Kindergarten Children. *Reading Horizons: A Journal of Literacy and Language Arts*, *49*(2), 125–142.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2004). *EPPE Technical Paper 12: The Final Report: Effective Pre-School Education*. https://discovery.ucl.ac.uk/id/eprint/10005308/

Symons, V., & Currans, D. (2008). *Using Marking Ladders to Support Children s Self-Assessment in Writing*. http://docplayer.net/30443399-Using-marking-ladders-to-support-children-s-self-assessment-in-writing-victoria-symons-and-deborah-currans-wooler-first-school-northumberland.html

Thiede, K. W., Griffin, T. D., Wiley, J., & Redford, J. S. (2009). Metacognitive Monitoring During and After Reading. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of Metacognition in Education* (pp. 85–106). Routledge.

Thomson, F. (2007). Are Methodologies for Children keeping them in their Place? *Children's Geographies*, *5*(3), 207–218. https://doi.org/10.1080/14733280701445762

Thomson, P. (2008). Children and Young People: Voices in visual research. In P Thomson (Ed.), *Doing Visual Research with Children and Young People* (pp. 1–20). Routledge.

Thorell, L. B., & Nyberg, L. (2008). The Childhood Executive Functioning Inventory (CHEXI): A New Rating Instrument for Parents and Teachers. *Developmental Neuropsychology*, *33*(4), 536–552. https://doi.org/10.1080/87565640802101516

Thorpe, K., & Satterly, D. J. H. (1990). The Development and Inter-relationship of Metacognitive Components among Primary School Children. *Educational Psychology*, *10*(1). http://www.tandfonline.com/doi/pdf/10.1080/0144341900100102?needAccess=true

Tiplady, L., & Laing, K. (2012). *Just For A Laugh? Evaluation Report*. Mentor UK: London https://eprint.ncl.ac.uk/186967

Tisdall, E. K. M., & Punch, S. (2012). Not so 'new'? Looking critically at childhood studies. *Children's Geographies*, *10*(3), 249–264. https://doi.org/10.1080/14733285.2012.693376

Tizard, B., & Hughes, M. (2002). *Young Children Learning*. Blackwell Publishing. https://www.dawsonera.com/readonline/9780470777398

Toplak, M. E., West, R. F., & Stanovich, K. E. (2013). Practitioner Review: Do performance-based measures and ratings of executive function assess the same construct? *Journal of Child Psychology and Psychiatry*, *54*(2), 131–143. https://doi.org/10.1111/jcpp.12001

Tourangeau, R., Rasinski, K. A., Bradburn, N., & D'Andrade, R. (1989). Belief accessibility and context effects in attitude measurement. *Journal of Experimental Social Psychology*, *25*(5), 401–421. https://doi.org/10.1016/0022-1031(89)90030-9

Vainikainen, M.-P., Stenberg, S. W., Kupiainen, S., Hotulainen, R., & Ki, J. H. (2015). Development of learning to learn skills in primary school. *International Journal of Lifelong Education*, *34*(4), 376–392. https://doi.org/10.1080/02601370.2015.1060025

van Loon, M., de Bruin, A., Leppink, J., & Roebers, C. M. (2017). Why are children overconfident? Developmental differences in the implementation of accessibility cues when judging concept learning. *Journal of Experimental Child Psychology*, *158*, 77–94. https://doi.org/10.1016/J.JECP.2017.01.008

van Loon, M., de Bruin, A., van Gog, T., & van Merriënboer, J. (2013). The effect of delayed-JOLs and sentence generation on children's monitoring accuracy and regulation of idiom study. *Metacognition and Learning*, *8*(2), 173–191. https://doi.org/10.1007/s11409-013-9100-0

van Loon, M., Destan, N., Spiess, M. A., de Bruin, A., & Roebers, C. M. (2017). Developmental progression in performance evaluations: Effects of children's cue-utilization and self-protection. *Learning & Instruction*, *51*, 47–60. https://doi.org/10.1016/J.LEARNINSTRUC.2016.11.011

van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard*, *16*(40), 33–36. https://doi.org/10.7748/ns2002.06.16.40.33.c3214

van Velzen, J. (2016). Metacognitive Knowledge in Theory. In *Metacognitive Learning* (pp. 13–25). Springer International Publishing. https://doi.org/10.1007/978-3-319-24433-4_2

Veenman, M. V. J. (2007). The assessment and instruction of self-regulation in computer-based environments: a discussion. *Metacognition Learning*, *2*, 177–183. https://doi.org/10.1007/s11409-007-9017-6

Veenman, M. V. J., Kok, R., & Blöte, A. W. (2005). The relation between intellectual and metacognitive skills in early adolescence. *Instructional Science*, *33*(3), 193–211. https://doi.org/10.1007/s11251-004-2274-8

Veenman, M. V. J., Pascal, W., & Beishuizen, J. J. (2004). The relation between intellectual and metacognitive skills from a developmental perspective. *Learning and Instruction*, *14*(1), 89–109. https://doi.org/10.1016/J.LEARNINSTRUC.2003.10.004

Veenman, M. V. J., & Spaans, M. A. (2005). Relation between intellectual and metacognitive skills: Age and task differences. *Learning and Individual Differences*, *15*(2), 159–176. https://doi.org/10.1016/J.LINDIF.2004.12.001

Veenman, M. V. J., Van Hout-Wolters, B. H. A. M., & Afflerbach, P. (2006). Metacognition and learning: conceptual and methodological considerations. *Metacognition and Learning*, *1*(1), 3–14. https://doi.org/10.1007/s11409-006-6893-0

Vo, V. A., Li, R., Kornell, N., Pouget, A., & Cantlon, J. F. (2014). Young Children Bet on Their Numerical Skills. *Psychological Science*, *25*(9), 1712–1721. https://doi.org/10.1177/0956797614538458

Vogl, S. (2015). Children's verbal, interactive and cognitive skills and implications for interviews. *Quality & Quantity*, *49*(1), 319–338. https://doi.org/10.1007/s11135-013-9988-0

Vogl, S. (2017). Quantifizierung: Datentransformation von qualitativen Daten in quantitative Daten in Mixed-Methods-Studien. *KZfSS Kölner Zeitschrift Für Soziologie Und Sozialpsychologie*, *69*(S2), 287–312. https://doi.org/10.1007/s11577-017-0461-2

Vygotsky, L. (1962). *Thought and language.* MIT Press. https://web-a-ebscohost-com.proxy.lib.strath.ac.uk/ehost/command/detail?sid=fa6b0ab1-3635-427b-a365-0a590f6f93b3%40sessionmgr4008&vid=3&bk=1&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3D%3D#jid=200610268&db=pzh

Vygotsky, L. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Wall, K. (2008). Understanding metacognition through the use of pupil views templates: Pupil views of Learning to Learn. *Thinking Skills and Creativity*, *3*(1), 23–33. https://doi.org/10.1016/J.TSC.2008.03.004

Wall, K. (2017). Exploring the ethical issues related to visual methodology when including young children's voice in wider research samples. *International Journal of Inclusive Education*, *21*(3), 316–331. https://doi.org/10.1080/13603116.2016.1260845

Wall, K. (2018). Building a bridge between pedagogy and methodology: emergent thinking on notions of quality in practitioner enquiry. In *Scottish Educational Review* (Vol. 50, Issue 2).

Wall, K. (2019). *Pedagogic appropriateness: Judging quality in practitioner enquiry | BERA*. BERA Blog. https://www.bera.ac.uk/blog/pedagogic-appropriateness-judging-quality-in-practitioner-enquiry

Wall, K., & Hall, E. (2016). Teachers as metacognitive role models. *European Journal of Teacher Education*, *39*(4), 403–418. https://doi.org/10.1080/02619768.2016.1212834

Wall, K., & Hall, E. (2020, March 18). *In a practitioner enquiry approach, is reflexivity the same as researcher metacognition?* BERA Blog. https://www.bera.ac.uk/blog/in-a-practitioner-enquiry-approach-is-reflexivity-the-same-as-researcher-metacognition

Wall, K., Hall, E., Baumfield, V., Higgins, S., Rafferty, V., Remedios, R., Thomas, U., Tiplady, L., Towler, C., & Woolner, P. (2010). Learning to Learn in Schools Phase 4 and Learning to Learn in Further Education Projects. In *https://eprints.ncl.ac.uk*. Newcastle University. https://eprint.ncl.ac.uk/155066

Wall, K., & Higgins, S. (2006). Facilitating metacognitive talk: a research and learning tool.

International Journal of Research & Method in Education, *29*(1), 39–53. https://doi.org/10.1080/01406720500537353

Wall, K., Higgins, S., & Packard, E. (2007). *Talking about Learning: Using templates to find out pupils' views*. Southgate.

Wall, K., Higgins, S., Remedios, R., Rafferty, V., & Tiplady, L. (2013). Comparing Analysis Frames for Visual Data Sets. *Journal of Mixed Methods Research*, *7*(1), 22–42. https://doi.org/10.1177/1558689812450211

Wall, K., Higgins, S., & Smith, H. (2005). "The visual helps me understand the complicated things": pupil views of teaching and learning with interactive whiteboards. *British Journal of Educational Technology*, *36*(5), 851–867. https://doi.org/10.1111/j.1467-8535.2005.00508.x

Wallerstedt, C., Pramling, N., & Pramling Samuelsson, I. (2011). In tune with the learner's perspective in music: Theoretical and analytical considerations with interviewing children. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young Children's Perspectives - Debating the ethics and dilemmas of educational research with children* (pp. 163–177). Routledge.

Wellman, H. M. (1977). Tip of the Tongue and Feeling of Knowing Experiences: A Developmental Study of Memory Monitoring. *Child Development*, *48*(1), 13. https://doi.org/10.2307/1128875

White, S. C., & Choudhury, S. A. (2010). Children's participation in Bangladesh: issues of agency and structures of violence. In B. Percy-Smith & N. Thomas (Eds.), *A Handbook of Children and Young People's Participation* (pp. 39–50). Routledge.

Whitebread, D., & Basilio, M. (2011). *The Emergence and Early Development of Self-Regulation in Young Children*. http://www.ugr.es/~recfpro/rev161ART2en.pdf

Whitebread, D., Coltman, P., Pasternak, D. P., Sangster, C., Grau, V., Bingham, S., Almeqdad, Q., & Demetriou, D. (2009). The development of two observational tools for assessing metacognition and self-regulated learning in young children. *Metacognition and Learning*, *4*(1), 63–85. https://doi.org/10.1007/s11409-008-9033-1

Whitebread, D., Pino Pasternak, D., Bryce, D., Vuillier, L., Buettner, G., Perels, F., Mevarech, Z., Shamir, A., Levi Reich, T., & Simchen, J. (2011). Identifying and measuring self-regulation in young children: the development and validation of the CHILD. *EARLI Biennial Conference University of Exeter*. https://doi.org/10.2174/138920312803582960

Whyburn, L., & Way, J. (2012). Student Perceptions of the Influence of IWBs on Their Learning in Mathematics. *Australian Educational Computing*, *27*(1), 23–27. https://www.learntechlib.org/p/89721/

Williams, J. P., & Grant Atkins, J. (2009). The Role of Metacognition in Teaching Reading Comprehension to Primary Students. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of Metacognition in Education* (pp. 26–43). Routledge.

Willis, E., & Dinehart, L. H. (2014). Contemplative practices in early childhood: implications for self-regulation skills and school readiness. *Early Child Development & Care*, *184*(4), 487–499. http://10.0.4.56/03004430.2013.804069

Wozniak, K. (2015). *Supporting Adult Learners' Metacognitive Development with a Sociotechnical System* [DePaul University College of Computing and Digital Media]. http://via.library.depaul.edu/cdm_etd/12

Wright, D. B., London, K., & Field, A. P. (2011). Using Bootstrap Estimation and the Plug-in Principle for Clinical Psychology Data. *Journal of Experimental Psychopathology*, *2*(2), 252–270. https://doi.org/10.5127/jep.013611

Zhang, H., & Whitebread, D. (2017). Linking parental scaffolding with self-regulated learning in Chinese kindergarten children. *Learning & Instruction*, *49*, 121–130. http://10.0.3.248/j.learninstruc.2017.01.001

Zimmerman, B. J. (1995). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist*, *30*(4), 217–221. https://doi.org/10.1207/s15326985ep3004_8