Exploring Metacognition in Primary School Classrooms

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Abstract

This thesis investigates the phenomenon of metacognition within primary school classrooms. The value of metacognition for academic performance has been demonstrated extensively in research, leading to the belief that metacognition is powerful for achieving educational success. Whilst the vast body of evidence is compelling, there are fundamental gaps in understanding about how the construct of metacognition relates to the ways students think about and manage their own thinking in classrooms. Seeking to characterise metacognition, this project formed three distinct yet related studies. Metacognition was investigated through observations of everyday classroom tasks, specific ‘metacognitive’ tasks (Structured Thinking Activities), and teacher interviews. Data were analysed using a distinctive thematic approach firmly grounded in practice, but clearly guided by psychological theory. Analysis revealed that metacognition is practiced in primary school classrooms, although not always in ways suggested by psychological theory. Metacognition was conceptualised as elements of knowledge and regulation employed before, during and after tasks in an iterative fashion, with a critical role of interaction in constructing metacognition. The re-conceptualisation of metacognition within the applied context of primary school classrooms makes an original contribution to psychological and educational fields; emphasising the iterative and relational nature of metacognition in the applied educational context. Given the identified critical role of teachers for facilitating metacognition through interaction, interviews revealed a surprising lack of explicit knowledge of the term by teachers. A critical factor in the adoption of metacognitive approaches was the perceived changing tide of restrictive ‘top-down’ policy, leading to a diminishing sense of agency. A novel ecological approach explains *why* there may be limited impact of metacognition research into the classroom, producing recommendations relating to future directions of university-based and classroom-based research.

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

BPS	British Psychological Society
CfE	Curriculum for Excellence
DA	Discourse Analysis
EF	Executive Functioning
EST	Ecological Systems Theory
FOK	Feeling of Knowing
GTCS	General Teaching Council for Scotland
HE	Higher Education
ICT	Information and Communication Technologies
IPA	Interpretive Phenomenological Analysis
ISN	Interactive Student Notebook
ITE	Initial Teacher Education
JOL	Judgement of Learning
L2L	Learning to Learn
LA	Local Authority
OECD	Organisation for Economic Co-operation and Development
PVT	Pupil Views Template
REF	Research Excellence Framework
SRL	Self-Regulated Learning
SRT	Self-Regulation Theory
STA	Structured Thinking Activity
TAP	Think Aloud Protocol
TOM	Theory of Mind
UoS	University of Stirling

Chapter 1: Introduction

Metacognition, broadly defined, relates to ways individuals think about and manage their own thinking (or ‘cognition about cognition’). Metacognition has been the subject of much research and debate, particularly in the fields of psychology and education where the enhancement of metacognition has been associated with gains in academic achievement. With advancements in research methods, however, there has been increasing debate surrounding the nature of metacognition in the classroom (and related pedagogies). Such ‘conceptual fuzziness’ (Scott & Levy, 2013) has resulted, ultimately, in a lack of knowledge about the ‘impact’ of metacognition in primary school education. To foreshadow the results of the classroom-based qualitative research presented in this thesis, the view presented here is that metacognition can best be understood as an iterative process that is particularly encouraged by interaction. To facilitate the reader’s understanding of the overall outcome of this thesis, the purpose of the introduction is to provide rationale and context for the inter-disciplinary project that follows. Thus, the current section provides an overview of the policy context within which this project is situated, before providing an explicit rationale for the focus upon metacognition, as well as outlining a brief thesis overview.

1.1 Context

The research described in this thesis is qualitative in nature, providing a detailed exploration of metacognition in Scottish primary schools. The following sections provide background context with which this project is situated, including the Scottish educational policy context, as well as the way in which research impact is viewed within Higher Education.

1.1.1 *Scottish context*

As of 2019, Scotland is a devolved country within the United Kingdom. Scotland has significant autonomy in terms of structuring the educational experiences of learners under the broad national curriculum, the Curriculum for Excellence (CfE). As documented in “A Curriculum for Excellence” in 2004, The CfE is built around 4 key ‘purposes’ that outline what every learner (aged three to eighteen years old) should develop: successful learners, confident individuals, responsible citizens and effective contributors (Scottish Executive, 2004). The CfE covers eight curriculum areas: there is a particular focus on literacy, numeracy and health and wellbeing, with other curriculum areas being expressive arts, Religious and Moral Education (RME), social studies, sciences and technologies (Scottish Government, 2015).

One of the aims of the CfE is to allow flexibility: “liberating the teaching profession from unnecessary bureaucracy to enable it to do what it does best – teach” (Swinney, 2016, p1). The Scottish Government provides guidance to Local Authorities (LAs) in relation to education, through policy, but also via documentation and advice. Within the context of the four capacities, LAs and schools are provided flexibility about how to implement the CfE, with the role of LAs being to set and communicate local level policy guidance to their schools (Scottish Government, 2015), and head teachers being responsible for the day-to-day implementation, management and organisation of the curriculum. Despite the explicit focus on flexibility for teachers in the CfE, there are nevertheless defined standards that teachers are expected to meet. The teaching profession in Scotland is regulated by the General Teaching Council for Scotland (GTCS), which supports the professional development of teachers (GTCS, 2012). Teachers are expected to undertake regular professional development, a requirement of 35 hours annually (Scottish Government, 2001). Such a requirement is reflective of the shift towards more ‘evidence-based teaching’ (Wrigley, 2018). In this context, therefore, under the broad aim of supporting flexibility, Scottish teachers are explicitly encouraged to take responsibility for their own professional learning and development.

1.1.2 *Developing the future workforce and skills for the future*

There is no doubt that with advancing technologies, the ways that we live our lives is ever-changing. With this, there is a challenge of the assumptions about how we learn, teach and think. Recently, Scottish Education has begun to consider the future of the economy, and the changing sphere of learning in the so-called ‘fourth industrial revolution’. In this way, education is concerned with the future of work in a world that will become increasingly dominated by technology and (specifically), artificial intelligence. For example, Andreas Schleicher, Director for Education and Skills at the Organisation for Economic Co-operation and Development (OECD) and the architect of the hugely influential Programme for International Student Assessment (PISA), stated: “The world no longer rewards people for what they know – Google knows everything – but for what they can do with what they know.” (Schleicher, 2014). As such, initiatives such as ‘Developing the Young Workforce’

(Education Scotland, 2015) now aim to develop skills for the work environment of the future. Skills Development Scotland are also considering the uniquely-human skills needed in this fourth industrial revolution through their ‘Skills 4.0’ model, including self-management, social intelligence and innovation (Skills Development Scotland, 2018). Thus, educational policy reforms place increasing focus on developing broad, transferrable skills.

1.1.3 *The Impact Agenda in Higher Education*

The impact of research and theory is a key point of consideration in the current educational climate. More than ever, university researchers are compelled to proactively demonstrate ways that their research has an impact beyond academia. The so-called ‘impact agenda’ is demonstrated by the inclusion for the first time of an assessment of research impact within the Research Excellence Framework (REF) in 2014. With this, impact contributed to 20% of the overall research assessment (REF, 2011), making it a key consideration to the overall standing of university researchers. For the purposes of the REF, impact is defined as: “An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia.” (REF, 2011, p26). For REF, impact is assessed in terms of its reach and significance (REF, 2011). In addition, to the increasing call for impact from REF, researchers are also asked to demonstrate the pathways to impact in all major grant applications (e.g., Economic and Social Research Council [ESRC], 2019). The clear imperative for researchers to demonstrate impact, therefore, leads to important questions about the ‘impact’ of research beyond academia.

1.1.4 *Describing learning and teaching*

Following consideration of the policy context within which this project is situated, it is pertinent to briefly consider the ways that learning and teaching are conceptualised in this thesis. Of course, the concept of *learning* is central to the current project. At its most basic level, learning can be described as a process of *change*, or *adaption* (Anderson & Gates, 1950; Cronbach, 1954). Learning encapsulates more than the mere accumulation of facts and ideas. Such a ‘transmission’ model of learning implies that the role of education is to deliver content “like building a brick wall with ideas being added, like bricks, into the right place” (Moon, 2002, p24). Instead, learning is viewed within constructivist viewpoints as a process in which learning is ‘constructed’ by incorporating new information with existing information (Bada & Olusegu, 2015). Originating from the work of Vygotsky (1978), for example, the sociocultural view emphasises the constructive nature of learning, through interaction with more experienced others. Learning, therefore, involves a complex "network of ideas and knowledge" (Moon, 2002, p24) that make up cognition itself. In his experiential theory of learning, Kolb (1984; Kolb & Kolb, 2011) emphasises the interactions between an individual and their environment throughout the process of learning. Also emphasising the process of learning, Bruner (1960) described three phases of learning as being the acquisition of new information, transformation and evaluation. Thus, constructivist standpoints explicitly view learning as something that is constructed over time.

Critically, a social constructivist view emphasises both active participation in the learning process, as well as the influence of social interactions upon learning (Phillips, 1995). Such a view is particularly evident in even the work of John Dewey: "If we see that knowing is not the act of an out-side spectator but of a participator inside the natural and social scene, then the true object of knowledge resides in the consequences of directed action" (Dewey, 1930 p. 188). Importantly, a social constructivist view sees learning and teaching as inherently interconnected, with the learner and the teacher together having critical roles in "building constructions of understanding" (Hattie, 2009, p26).

It is of course relevant to problematise teaching here, as the notion of what it means to 'teach' the types of skills addressed throughout this thesis is of interest. As learning is defined presently as inherently based around interaction, so too, is teaching. Indeed, Biesta and colleagues (2015) make this point in their argument against the so-called 'learnification' of education. That is, rather than stating that the purpose of education is that children learn, focus should instead be that "the point of education is that students[1] learn *something*, that they learn it for a *reason*, and that they learn it *from someone*." (Biesta, Priestley & Robinson, 2015, p76, emphasis in original). Such a view of learning and teaching shift emphasis from a focus upon how well a teacher supports learning, to deeper questions around what learning is being supported, why and how.

[1] Throughout this thesis, 'students' is the preferred term used to refer to the primary school children who participated in this research. Several terms are used throughout educational contexts and in research, including children and pupils. The term 'student' is preferred in the present thesis as it encapsulates a role children adopt in school contexts (under the supervision of a teacher), whilst being more inclusive and agentic in connotation (with 'pupil' being used almost exclusively in UK English, and derived from the old English for 'orphan' or 'ward'; Oxford English Dictionaries, n.d.).

1.2 Metacognition: Background and Rationale

As consideration of metacognition theory plays a significant component of this thesis, it is important to provide a definition at the outset. As discussed more in Chapter 2, accounts of metacognition broadly differentiate between a function of knowledge (as *thinking about* thinking, for example, of persons, tasks and strategies; Flavell, 1979) and regulation (as *managing* thinking, for example, controlling cognition through planning, monitoring and evaluating; Brown, 1987; Schraw & Moshman, 1995). As such, the present study adopts the broad description of metacognition as 'thinking about and managing one's own thinking'. Clearly, such a broad definition is inevitably somewhat cursory, with a more nuanced account being developed throughout this thesis.

Research has repeatedly demonstrated the educational benefits of metacognition, particularly in the formative years of primary school education. Several individual intervention studies have also demonstrated the effects of metacognitive approaches upon student academic success (Kurtz & Borkowski, 1987; Zohar & Peled, 2008; Özsoy & Ataman, 2009). Several meta-analyses (and meta-meta-analyses) have demonstrated the value of metacognitive and self-regulatory approaches for improving educational outcomes (Hattie, Briggs & Purdie, 1996; Dignath, Büettner & Langfeldt, 2008). Moreover, the Education Endowment Foundation has highlighted that teaching metacognitive strategies to students increases achievement, producing effect sizes equivalent to (on average) eight months additional progress (Higgins et al., 2016). Thus, metacognition appears to be a powerful tool for use in primary school education.

1.2.1 *Metacognition from an interdisciplinary perspective*

The current project is inter-disciplinary, in that it focuses upon metacognition in relation to psychological and educational fields. The study of metacognition is inherently interesting from a psychological perspective, allowing the exploration of fundamental processes involved with thinking, cognition and strategic action. For instance, whilst evidence has identified metacognition as a process distinct from cognition (Skavhaug, Wilding & Donaldson, 2010; 2013), there are still fundamental questions around what it truly means to engage with metacognition, and the ways this impacts upon engagement with tasks. Therefore, a focus of metacognition within the classroom setting is of significant importance in relation to providing insights for psychological theory.

In addition to being of psychological interest, metacognition is also intuitively related to key goals of education, such as enabling learners to take control of their own thinking, to make sense of new information, and to strategically work towards goals:

> "Knowing about one's own cognitive ability, and how best to use this ability in understanding new educational content, solving problems and making effective decisions is one of the holy grails of education!"
> (Mcmahon & Luca, 2006, p563)

Thus, a focus upon metacognition is clearly of significance for the educational field, by considering the role of metacognition in the educational experiences of learners, as well as related pedagogies. As this thesis will demonstrate, therefore, an inter-disciplinary approach to the investigation of metacognition allows consideration of metacognition from multiple viewpoints, drawing on cognitive psychology as well as constructivist theories of learning.

1.2.2 *Why metacognition?*

As the brief preceding review makes clear, the goals of education today are about more than memorising information and recalling facts. Metacognition is identified as a phenomenon that is important for educational success as well as supporting learners to thrive in this ever-changing world. Such a view suggests that metacognition should be a key focus of educational policy and practice. By promoting knowledge of and management of one's own thinking, metacognition is implicitly embedded throughout the CfE (particularly 'successful learners' and 'confident individuals'). There are several indirect references towards metacognition in the CfE (including 'deep learning' or 'transferable cognitive skills', see Bloomer & Mcllroy, 2012). Moreover, within 'Building the Curriculum 2[2]' there is particular allusion to metacognition, through a description of active learning as learners taking responsibility for instigating, planning and evaluating their own learning (Scottish Executive, 2007). However, there is a surprising lack of direct reference to metacognition in educational policy (Perry, Lundie & Golder, 2018). Such a scarcity of metacognition in educational policy raises questions about the impact that metacognition research is having on educational practice.

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[2] Building the Curriculum is a series of documents produced by Education Scotland to provide guidance in relation to the Curriculum for Excellence. For more information, see Education Scotland (2019b).

A critical consideration in relation to the psychological field is that upon close inspection, understanding about metacognition is not as clear as it may superficially appear. Now a thriving field of research, several terms have become associated with the ways individuals think about and manage their own thinking, including, “Metacognitive beliefs, metacognitive awareness, metacognitive experiences, metacognitive knowledge, feeling of knowing, judgement of learning, theory of mind, metamemory, metacognitive skills, executive skills, higher-order skills, metacomponents, comprehension monitoring, learning strategies, heuristic strategies, and self-regulation” (Veenman, Van Hout-Wolters & Afflerbach, 2006, p4). Unfortunately, as a consequence of the expanding metacognitive literature and the associated growth in both definitions and measures, it has become difficult to extract coherent theoretical understanding from the research as a whole. The challenge of reaching ‘conceptual merging’ (Azevedo, 2009) is further demonstrated in a recent systematic review that found a misalignment of definitions of metacognition between studies, and critically, that the definition of metacognition in a given study directly influenced the method of assessment and outcomes (Gascoine, Higgins & Wall, 2017).

The problem of conceptual ‘fuzziness’ (Scott & Levy, 2013) is particularly problematic when considering the educational ‘effects’ of metacognitive interventions out-with the controlled environment of experimental studies, causing questioning of the extent that intervention studies have impact in the situated learning context of the classroom. To fully harness the potential power of metacognition as a route to improved educational outcomes, it is fundamentally important that there is clarity about what metacognition is in the educational setting, as well as (and in order to) understand how best to support students to develop metacognitive skills. As such, the present study broadly aims to explore the impact of metacognition in primary school classrooms. To achieve this broad aim, the research presented herein explores how research and theory about metacognition relate to the ways students think about and manage their thinking in primary school classrooms, as well as the roles of teachers in facilitating metacognition.

This thesis adopts an interdisciplinary approach, seeking to explore the interface between psychology and education. Such an approach is important given the stated diverse fields of research in relation to metacognition. Whilst considerable insight has been gained through psychological experimentation, there is a fundamental lack of understanding about how these insights translate into the very area of interest – the learning process in the applied setting. Thus, an inter-disciplinary investigation has a powerful opportunity to explore the impact of metacognition, as well as to provide a basis for future (inter-disciplinary) research.

1.3 The Rationale for this Project: A Personal Reflection

This project was developed based on my own experiences in Higher Education. On completion of my undergraduate degree in psychology, I worked as a research assistant within the psychology department of the University of Stirling (UoS), investigating the idea of 'research impact' in preparation for the REF in 2014. I interviewed academic staff about their actual and/or potential research impact. One of these researchers (who became by PhD supervisor) had conducted previous research that identified neural mechanisms of metacognition as distinct from cognition (Skavhaug et al., 2010, 2013). However, less was known about the impact of metacognition out-with academia. Through investigating this query, I realised the complexity of this question – and so my project began.

What drew me to metacognition in particular, is a belief that to be an effective learner means to be proactive rather than reactive, to pose questions about the 'infallibility' of knowledge that is presented, but also to question the structures of thinking and beliefs developed internally. It is my belief that to be a successful learner in the modern world is to be able to evaluate information from a range of sources and to create justified views. It is also my view that ultimately, these skills are critical in terms of not just surviving in the job-market of the future, but more fundamentally, in providing future generations with critical thought and independence that will enable them to thrive as human beings. In broad terms, metacognition encapsulates the essence of these educational goals.

In developing this research project, collaborations were made with the (then) School of Education (now Faculty of Social Sciences) at UoS, with the goal of learning about the use of metacognition (and psychology more generally) in education. On more than one occasion, I encountered the opinion that metacognition was 'done' – it was in place in schools, and there was no pressing need for further research in this area. Conversely, however, talking with programme leaders in education suggested that there might not be as much psychological theory in general (and metacognition in particular) in teaching practice, as might be assumed by psychological and educational researchers alike[3].

This thesis, therefore, documents the process undertaken to explore the notion of 'impact' in relation to metacognition in education. Throughout this thesis, I document the process

[3] As documented in Section 3.9 of Chapter 3.

undertaken to address this overall aim – revealing evolving insights about the nature of metacognition in practice, and the further questions my investigation has revealed along the way. It is hoped that the insights from this project will pave the way for future research that seeks to cross disciplinary boundaries and grapple with conceptual and theoretical 'fuzziness', with the aim of achieving more sustainable, 'impactful' insights for theory and practice.

1.4 Thesis Overview

The preceding introduction outlines the context of this research project, both in terms of educational curriculum in Scotland, as well as the increasing debate around research impact throughout the academic field in the UK. As briefly outlined, there is a clear focus in current educational policy upon equipping children to survive in the competitive job-market of the future (Levy & Murnane, 2004). The central tenants of metacognition in creating learners that can independently think about and manage their own thinking means that it makes intuitive sense that metacognition would be of clear value in education. However, there are many unanswered questions regarding the 'impact' of metacognition out-with academia, and fundamentally, how the construct of metacognition relates to the way children do (and can be encouraged to) think about and manage their own thinking throughout everyday classroom tasks.

To summarise, the overarching aim of this thesis is to explore the 'impact' of metacognition in Scottish primary school classrooms. This aim entails characterising metacognition in the classroom in relation to psychological theory. An overview of the research process related to the current project is provided visually in Figure 1.1. Following presentation of literature review and methodology, this thesis is divided into three findings chapters. The thesis structure is reflective of the time-line of decisions made and data collected. The first study (Chapter 4) focuses on characterising metacognition throughout everyday tasks in the primary school classroom environment, including the talk of teachers. In Chapter 5, I outline the findings of a year-long case study of the use of Structured Thinking Activities (STAs) in one primary 4 classroom. In the final findings chapter (Chapter 6), I conclude with an interview study to explore teachers' perspectives of metacognition, including their knowledge and beliefs about encouraging metacognition in their classrooms. Discussion focuses on implications for theory as well as teacher practice.

Through exploring metacognition in the classroom environment, this project has the potential to reveal significant insights into what it means to be metacognitive in the classroom, ultimately examining the ‘impact’ of metacognition in educational settings. The next chapter extends on the brief overview by providing a detailed review of metacognition research, and culminating in a re-statement of the rationale of the study, including aims and research questions.

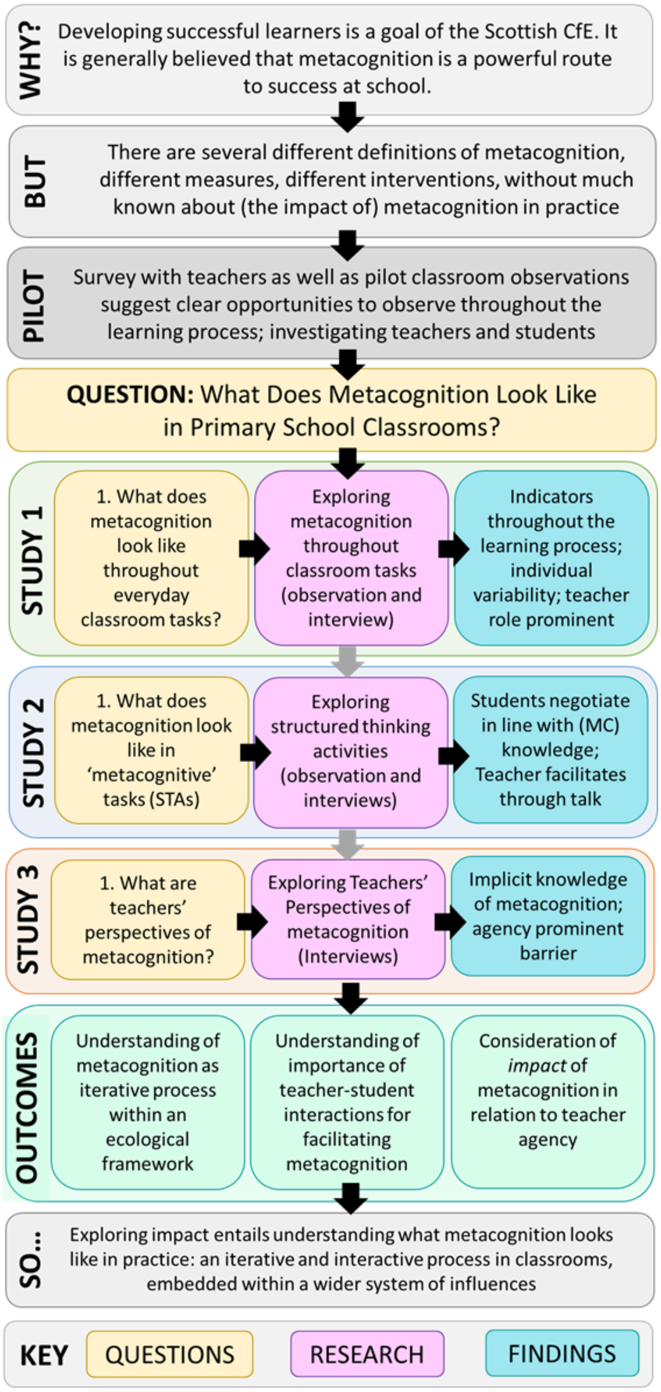

Figure 1.1. Visual flow of thesis structure
As this Figure shows, this project began with the overall aim of investigating what metacognition looks like in primary school classrooms, in exploration of the impact of metacognition. Across three studies, this project revealed that metacognition is iterative and interactive. Exploration of the impact of metacognition entails going beyond questions of ‘what’, to ‘why’, revealing influences upon the impact beyond teacher-student interactions.

Chapter 2: Mapping Metacognition Literature

In the following chapter, I review literature with the goal of providing a comprehensive yet focused context for the present research. To achieve this, the chapter is sub-divided into several key parts. I begin by overviewing the link between metacognition and academic success, before describing and critically evaluating key psychological theories of metacognition within the context of related fields. I then describe measures of metacognition prominent within the psychological and educational fields, beginning with an overview of cognitive paradigms, before turning attention to how metacognition has been measured in more applied, classroom-based research. Next, I consider research that examines the development of metacognition, focusing particularly on development throughout the primary school years (ages five to twelve years old). Finally, I overview literature relating to the promotion of metacognition in educational settings. The chapter concludes with a critical summary, drawing together the 'state of play' of understandings of metacognition and setting the scene for the work presented in this thesis.

2.1 The Educational Effects of Metacognition

Before reviewing the definitions and measures of metacognition that exist throughout the fields of psychology and education, it is pertinent to provide a rationale for such a focus. To do this, the following section provides an overview of the literature describing the educational effects of metacognition in relation to educational outcomes.

2.1.1 *Metacognition and educational success*

Several research studies have demonstrated an empirical link between metacognition and academic success. In one of the most provocative studies, for example, Kruger and Dunning (1999) demonstrated that individuals who scored poorly in cognitive ability tests also showed low awareness of their abilities by overestimating their performance, and were therefore characterised as 'un-skilled and unaware of it' (this effect has become known as 'the Dunning-Kruger effect', see Dunning, 2011). Similarly, Minnaert and Janssen (1999) investigated the relationship between metacognition, intelligence and performance in Higher Education, finding main effects of both intelligence and metacognition on students' academic performance. The authors suggest that metacognitive regulative activities add value in explaining performance above the influence of intelligence alone.

Empirical links between metacognition and academic performance has also been demonstrated in research focusing on the primary school years. In an influential study, Swanson (1990) investigated both cognitive ability and metacognitive knowledge in relation to performance in problem-solving tasks. After being assigned to either high or low ability groups based on cognitive ability scores, nine- to eleven-year-old children completed a metacognitive questionnaire followed by two problem-solving tasks. For both tasks, there was a stronger relationship between metacognitive knowledge and performance than between cognitive ability and performance. These findings suggest that being highly metacognitive is related to positive performance in problem-solving tasks. Notably, the pattern of performance also demonstrated that metacognition added most benefit for problem solving performance when cognitive ability was low (Swanson, 1990).

More recently, Freeman, Karayanidis and Chalmers (2017) investigated the relationship between metacognition and performance in nine to ten-year-old children, finding that the accuracy of students' metacognition (as measured through the comparison of estimates of performance to actual performance) was positively related to students' academic performance. In a related study, Bryce, Whitebread and Szücs (2015) investigated the relationship between metacognitive skills, executive functions and achievement in young children finding that at five and seven years old, metacognitive skills were the greatest predictor for educational achievement in comparison to executive functioning. A recent meta-analysis indeed found that when controlling for intelligence, metacognition predicted academic performance (Ohtani & Hisasaka, 2018). Thus, evidence overall identifies metacognition as having significant beneficial effects on academic performance, independent from cognition.

2.1.2 *A brief history of intervention Studies*

Many of the research articles presented in the field of metacognition in education, particularly those focusing on the education of young children, seek to evaluate an intervention based around the inclusion of metacognitive instruction. For example, Paris and Oka (1986) evaluated their 'Informed Strategies for Learning' programme in relation to reading, finding that increasing students' metacognitive knowledge about reading led to improvements in both reading comprehension and metacognitive knowledge about reading. Similarly, Kurtz and Borkowski (1987) investigated the effects of a metacognitive instructional program on the ability to summarise information. In this study, nine- to twelve-year-old children given metacognitive instruction (metacognitive strategy information about summarising) had the greatest improvement at summarising information, beyond those only given cognitive instruction, or practice controls. Using different terminology but an equivalent approach, Carr, Kurtz, Schneider, Turner and Borkowski (1989) found that American eight-year-old children benefited the most from strategy instruction – they became significantly more successful at using strategies during a memory task.

The effects of metacognitive interventions have been shown to be robust. Georghiades (2000) investigated the effects of metacognition on important aspects of a 'Thinking Skills' programme (Conceptual Change Learning, CCL), namely transfer and durability. Primary school children were assigned to either an experimental or a control group. All students were taught a weekly science class over a five week period, where the experimental groups undertook metacognitive activities (consisting of metacognitive discussions and written exercises), whilst the control group received no metacognitive training. Georghiades (2000) found that providing students with metacognitive instruction led to long-term improvements in science performance, and notably, these benefits transferred to new learning contexts.

Here I highlight two studies that illustrate a link between laboratory-based and classroom-based findings. In an experimental study, Zohar and Peled (2008) evaluated an intervention aimed to improve 'meta-strategic knowledge' in science problem-solving with nine- to ten-year-old children. Students completed two computerised science experiments involving controlling variables. Students were then provided with general information about the science topic (control), or with training pertaining to strategy use (experimental group); namely identifying particular strategies, and discussing when, why and how to use strategies. Compared to controls, experimental group training resulted in significant improvements in both metacognitive knowledge (assessed through interviews) and performance in science problem-solving tasks. Similar to the study by Swanson (1990), performance improvements were particularly striking for previously low-achieving students. Crucially, the benefits of the intervention were replicated in a follow-up study that repeated the procedure in a classroom environment (Zohar & David, 2008).

2.1.3 *Systematic reviews of metacognition*

As studies of metacognition have increased in popularity, several meta-analyses (and meta-meta-analyses) have been conducted to explore the relative influence of different educational approaches within the classroom. For instance, Higgins et al. (2004) conducted a systematic review of thinking skills initiatives, evaluating 23 studies that included qualitative and quantitative findings. Overall, the researchers found that most thinking skills approaches did improve student outcomes throughout the school years (4-16 years of age). Many of the studies reported immediate improvements in attainment, with others finding longer-term improvements. Furthermore, the greatest impact on attainment was for lower attaining students when the programme included metacognitive instruction. In a subsequent meta-analysis of solely quantitative studies, Higgins, Hall, Baumfield and Moseley (2005) evaluated 29 studies in relation to the effects of thinking skills interventions on school students' attainment compared to no intervention. Overall, taking into account measures of cognitive performance, curricular outcome as well as affect, the researchers found an overall high effect size of 0.74.

Here, for the purpose of demonstrating the extent of evidence in support of metacognition, I will describe the findings of three research syntheses that have been particularly influential in the field of metacognition research. These are; (1) Dignath and colleagues' (2008) meta-analysis; (2) John Hattie's 'Visible Learning' work (2009; Hattie & Donoghue, 2016), and (3) the Education Endowment Foundation's Teaching and Learning Toolkit (Higgins et al., 2016).

(1) Dignath et al. (2008) – Charlotte Dignath has conducted several meta-analyses focusing on educational issues. One such study was conducted a decade ago (Dignath et al., 2008), investigating the educational effects of training programmes focused on self-regulated learning. This meta-analysis included 48 studies focusing on the primary school years, and investigated a total of 263 effect sizes. In total, the researchers found that there was an average effect size of .69 (moderately high) for students trained in metacognitive strategies. Dignath et al. (2008) found that interventions that had the highest effect sizes were those that combined metacognitive and motivational strategies or metacognitive and cognitive strategies. Metacognitive strategies alone resulted in moderate effect sizes. In relation to the content of metacognitive strategy instruction, the highest effect sizes were found for interventions that included aspects of planning and monitoring together, or planning and evaluation together. As such, planning was identified as particularly important for facilitating metacognition in the studies included.

(2) *Hattie's Visible Learning* – John Hattie's work on visible learning and feedback is hugely influential in the educational context. In his book, 'Visible Learning', John Hattie (2009) details a synthesis of over 800 meta-analyses (over 50,000 studies) focusing on the effects of several educational techniques and initiatives upon student achievement. His goal in such a wide-scale analysis was to go beyond stating 'what works', and instead, to provide explanation and understanding for teachers – to take into account the vibrant environment of the classroom and appeal to teachers' common sense (Hattie, 2009). Programmes including metacognitive strategies were identified as having a high effect size, in comparison to other factors such as learning styles or teacher subject-specific knowledge (both having low effect sizes, Hattie, 2009). Hattie's work continues, with a more up-to-date synthesis in 2016 including 228 meta-analyses (Hattie & Donoghue, 2016). In this meta-synthesis, metacognition was again highlighted as critical throughout the learning process, with an effect size of 0.61 for metacognitive strategies upon the promotion of 'deep' learning.

(3) Teaching and Learning Toolkit – Within the educational context of the UK, the Education Endowment Foundation Teaching and Learning Toolkit is very influential for policy and practice (Perry et al., 2018). Taking into account three factors (cost, quality of evidence and impact), the Toolkit states the effect sizes of several different educational approaches, demonstrating 'what has worked', and therefore providing comparative suggestions for what is most likely to work in classrooms (Katsipataki & Higgins, 2016). In the latest Toolkit, metacognition and self-regulation was identified as having a high effect size of 0.62, equivalent to an average of eight months additional progress (Higgins et al., 2016). Furthermore, the evidence was described as extensive in relation to the educational benefits of self-regulation and metacognitive approaches, and the associated cost was low. Of note, similarly to Hattie's (2009) work on visible learning, the Toolkit can be considered a meta-meta-analysis, in that it combines the results of several meta-analyses.

2.1.4 *Summary*

A large body of research has demonstrated the beneficial effects of metacognition on performance in the context of a number of different learning tasks. Students with good metacognition have been found to perform better academically than those with poor metacognition, with metacognition being identified as an important predictor of educational achievement (Minnaert & Janssen, 1999; Bryce et al., 2015; Freeman et al., 2017; Ohtani & Hisasaka, 2018). Wide-scale systematic reviews of metacognition have yielded consistently positive results in relation to the beneficial effects of metacognitive approaches. Metacognitive and self-regulatory approaches have been identified as amongst the most beneficial and cost-effective programmes available in the educational setting (Higgins et al., 2016), and the effect sizes of training programmes have been identified as high (Dignath et al., 2008; Higgins et al., 2016). Cumulatively, therefore, there appears to be evidence of a strong benefit of metacognitive training upon performance in a number of tasks, including problem-solving and reading comprehension – with evidence suggesting that the benefits of metacognition are particularly prominent when cognition itself is poor (Swanson, 1990; Zohar & Peled, 2008; Higgins et al., 2004). Thus, evidence firmly suggests a particular prominence of metacognition in notions of 'what works' in education (Perry et al., 2018; Wrigley, 2018). Having outlined the educational effects of metacognition, the following section considers definitions of metacognition in more depth, in order to explore the theory that underlies such a promising concept.

2.2 Defining Metacognition

> *"We cannot effectively teach cognitive skills in the absence of very clear and precise understandings of what those skills are" (Kuhn & Dean, 2004, p269).*

The term metacognition comes from the Greek "meta", meaning "beyond" and the Latin cognitiōn, meaning to learn, or to know. Metacognition as a term has increased in popularity since it was first coined by John Flavell in 1976. Broadly, metacognition is defined as 'cognition about cognition' or 'thinking about thinking'. Flavell (1976) defined metacognition as referring to "one's knowledge concerning one's own cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data" (Flavell, 1976, p232). A clear distinction can be drawn between cognition and metacognition, with metacognition being cognition relating to the cognitive processes itself. This distinction is also supported by research exploring activity of the brain (Skavhaug et al., 2010, 2013). Such a view suggests a hierarchy – between higher (meta) cognition (including strategy use and reflection) and with lower level cognition (such as performing cognitive actions, developing understanding, and the acquisition, retention and transfer of information, Moseley, Elliot, Gregson & Higgins, 2005; Beran, Brandl, Perner & Proust, 2012).

Now a diverse field of research, metacognition has been associated with several different terms (Veenman et al., 2006). Given the array of terms associated with metacognition, it is important to explore the ways that metacognition has been conceptualised in the field of psychology. Throughout the following sections, I will describe some of the most influential metacognition theories, before drawing insights together in relation to the understanding of metacognition going forward.

2.2.1 *Metacognitive knowledge*

Drawing from a body of cognitive research, Flavell (1979) defined metacognition as "knowledge and cognition about cognitive phenomena" (p906), further highlighting four components: metacognitive knowledge, metacognitive experiences, goals/tasks and actions/strategies (as shown in Figure 2.1). Flavell (1979) focused heavily on metacognitive knowledge, which is subdivided into three categories; person (knowledge individuals hold about the self and others as cognitive beings, such as 'I am better at solving mathematics problems than sums in textbooks'), task (knowledge about goals, demands and relevant information, such as 'this mathematics problem is going to be more difficult than the last one as there is less information'), and strategy (knowledge about the usefulness of different strategies to meet task demands, such as 'I can use a sum to check my working out is correct'). Knowledge of strategies include such strategies as rehearsal, elaboration or recording (Flavell & Wellman, 1977). The person variable is further divided into sub-categories of intra-individual differences (knowledge of the self); inter-individual differences (knowledge of others), and universals of cognition (general knowledge about cognition and learning). The person variables include transient and enduring attributes or states (Flavell & Wellman, 1977).

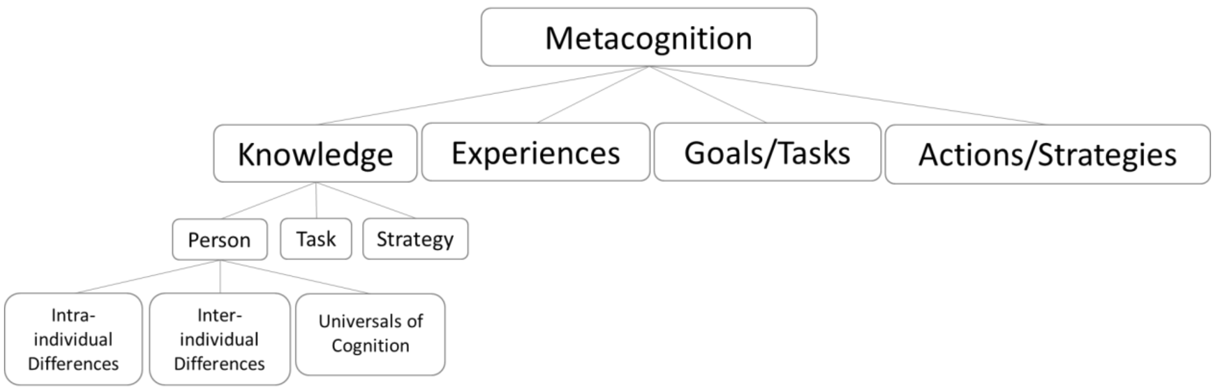

Figure 2.1. Flavell's (1979) Model of Metacognition.
Flavell (1979) conceptualised metacognition as comprising of four components, focusing primarily upon metacognitive knowledge and metacognitive experiences. Metacognitive knowledge is subdivided into three sub-components, with the person category being itself sub-divided.

Similarly, Schraw and Moshman (1995) provided an influential descriptive account of metacognition that focuses on both knowledge and regulation components. In their model (shown in Figure 2.2), knowledge of cognition is divided into declarative knowledge (knowledge of 'what', for example of the self as a learning individual), procedural knowledge (knowledge about 'how', the performing of skills) and conditional knowledge (knowledge of what cognitive actions are appropriate at certain times, and for what reasons). Similarly, drawing on a body of developmental research, Kuhn (2000) also differentiated between components of metacognitive knowledge (termed 'meta-knowing', Kuhn, 1999b), terming declarative knowledge 'metacognitive knowing' and procedural knowledge 'metastrategic knowing'. Metacognitive knowledge about procedural aspects of cognition ('metastrategic knowing') was further differentiated into 'metatask' knowledge (about task goals) and 'metastrategic knowledge' (about strategies to achieve goals). Thus, metacognition theory highlights the existence of a component of metacognitive knowledge, with several different sub-components being identified (Table 2.1 provides an indication of the variety of definitions of metacognitive knowledge employed).

Table 2.1. Definitions of metacognitive knowledge.
As shown in the table, several terms have been associated with metacognitive knowledge, including knowledge of cognition and metastrategic knowledge. Definitions share similarities but also can be seen as distinct, for example with some definitions suggesting an explicit or 'stateable' nature of metacognition, and others emphasising more general knowledge or 'awareness'.

Term	Definition	Reference
Metacognitive Knowledge	Knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises.	Flavell (1979)
Metacognitive Knowledge	The knowledge, awareness, and deeper understanding of one's own cognitive processes and products.	Desoete (2008)
Metacognitive Knowledge	A person's declarative knowledge about the interactions between person, task, and strategy characteristics.	Veenman et al. (2006)
Metastrategic knowledge	General knowledge about cognitive procedures that constitute higher-order thinking skills and strategies. The pertinent metacognitive knowledge is awareness of the type of cognitive procedures being used in specific instances.	Zohar & Peled (2008)
Knowledge of Cognition	Statable information about one's cognitive processes, including knowledge of one's strengths and weaknesses as a learner, knowledge about strategies, and knowledge about when and where to use strategies.	Schraw (1994)
Knowledge of Cognition	What individuals know about their own cognition about cognition in general. It usually comprises three different kinds of metacognitive awareness; declarative, procedural and conditional knowledge.	Schraw & Moshman (1995)
Knowledge about Cognition	Stable, Statable, often fallible, and often late developing information that human thinkers have about their own cognitive processes.	Brown (1987)
Knowledge about Cognition	Includes three sub-processes that facilitate the reflective aspect of metacognition: declarative knowledge … procedural knowledge … and conditional knowledge.	Schraw & Dennison (1994)

2.2.2 *Metacognitive regulation*

Whilst Flavell (1976, 1979) devoted much attention to the description of metacognitive knowledge, his definition of metacognition also critically includes an account of the regulation of cognition: “Metacognition refers, among other things, to the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal or objective” (Flavell, 1976, p232). Indeed, in one of the earliest pieces of metacognition research, Flavell, Friedrichs and Hoyt (1970) distinguished between awareness of memory performance, and strategic use of memory strategies. The research of Ann Brown and Gregory Schraw has also been highly influential in terms of the conceptualisation of metacognitive regulation. Brown (1980) highlighted various aspects of the ‘efficient problem-solving system’ (p7), focusing on aspects of metacognition: predicting limitations; awareness of strategies and their appropriateness; planning of strategies; monitoring effectiveness of strategies as they are utilised; and evaluation of strategies with respect to success or failure.

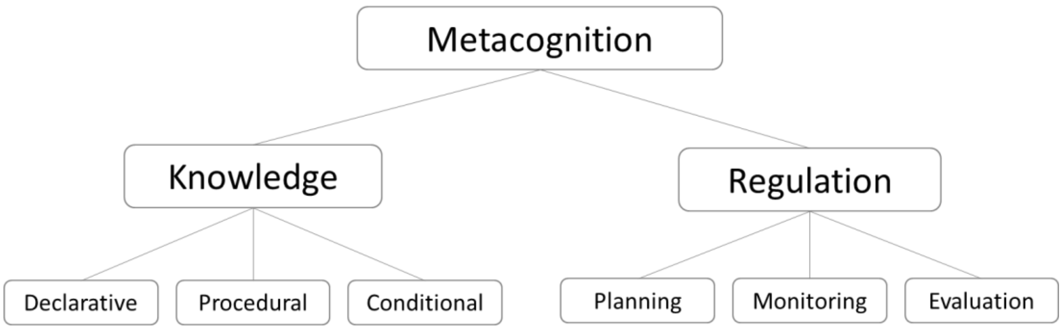

Figure 2.2. Schraw and Moshman’s (1995) Model of Metacognition.
Developing from the work of Brown (1980, 1987), Schraw and Moshman (1995) highlight the existence of a component of metacognitive regulation, in addition to metacognitive knowledge. Knowledge and regulation are each sub-divided into three components.

Developing the work of Brown (1987; Brown, Campione & Day, 1980), Schraw and Moshman’s (1995) model (shown in Figure 2.2), defines regulation of cognition as the metacognitive processes employed to control one’s own thinking, including planning (deciding strategies and strategically allocating resources), monitoring (checking understanding and performance in a task as it is being performed) and evaluating (reflecting on the process and products of a cognitive task). Similarly, Efklides (2006) stated that metacognitive ‘skills’ include “orientation/monitoring the comprehension of task requirements, planning the steps to be taken for task processing, checking and regulating cognitive processing when it fails, and evaluating the outcome of processing” (p5). Table 2.2 contains some of the definitions of metacognitive regulation described throughout research literature, again demonstrating the varied terminologies and definitions employed.

Table 2.2. Definitions of metacognitive regulation.
This table demonstrates that the regulation of cognition has been described in several ways, including skills, regulation and strategy use. Definitions are similarly diverse, with some defining skills as a form of knowledge, and others focusing more on specific actions such as planning or evaluation.

Term	**Definition**	**Reference**
Regulation of Cognition	Activities used to regulate and oversee learning, including planning, monitoring and checking outcomes.	Brown (1987)
Regulation of Cognition	Includes a number of sub-processes that facilitate the control aspect of learning. Five component skills of regulation have been discussed extensively, including planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation.	Schraw & Dennison (1994)
Regulation of Cognition	Metacognitive activities that help control one's thinking or learning. Although a number of regulatory skills have been described in the literature, three essential skills are included in all accounts: planning, monitoring and evaluation.	Schraw & Moshman (1995)
Regulation of Cognition	Consists of planning, monitoring, and correcting one's on-line performance.	Schraw (1994)
Metacognitive Skills	A person's procedural knowledge for regulating one's problem-solving and learning activities.	Veenman et al. (2006)
Metacognitive Skills	The voluntary control people have over their own cognitive processes. A substantial amount of data has been accumulated on four metacognitive skills important for mathematics: prediction, planning, monitoring and evaluation skills.	Desoete (2008)
Metacognitive Control	Help seeking, opting out/withdrawing answers, information seeking, changing own work in response to a model, study time allocation, terminating memory search and selecting materials (for review while studying).	Roebers (2014)
Metacognitive strategies	Asking questions, planning, monitoring, checking, revising and self-testing.	Nisbet & Shucksmith (1986)
Actions (or strategies)	The cognitions or other behaviours employed to achieve goals or tasks.	Flavell (1979)

2.2.3 *Monitoring and control*

Several accounts of metacognition characterise metacognition by outlining the basic processes involved, generally describing individual components as isolated, independent processes. By contrast, Nelson and Narens (1990; Nelson, 1996) describe the cycle of monitoring and control that occurs during acquisition, retention and retrieval of information. Nelson's (1996) Model of Metacognition describes an interplay of 'on-line' metacognitive processes. More specifically, monitoring and control are described as a cyclical relationship between an object-level (the 'face-value' cognitions of an external object, such as ‘hirsute is a synonym for hairy’[4]) and a meta-level (cognitions about object-level cognitions, such as ‘I’m going to struggle to remember that hirsute is a synonym for hairy’). As shown in Figure 2.3, Nelson (1996) proposed that monitoring occurs when information passes from an object-level to a meta-level, thereby providing information about the state of the object level (‘hirsute-hairy is a difficult word pair to remember’). Conversely, control occurs when information passes from the meta-level to the object-level, thereby providing information to the object-level about what to do (‘study the hirsute-hairy word pair now’). The meta-level contains goals (‘I want to remember this word pair’) and strategies (‘I can study it immediately rather than delay’), and therefore can act as a communicator with the object-level to achieve goals (Nelson, 1996). Kuhn (2000) distinguishes similarly between two levels in relation to metacognition. The ‘meta-level’ is responsible for deciding the appropriate strategies for a particular event, thus informing the ‘performance-level’. These accounts draw on insights from cognitive psychology, with monitoring activities including Judgements of Learning or Feelings of Knowing, and control actions including selecting appropriate strategies or allocating study time (as described in more detail in Section 2.3.1).

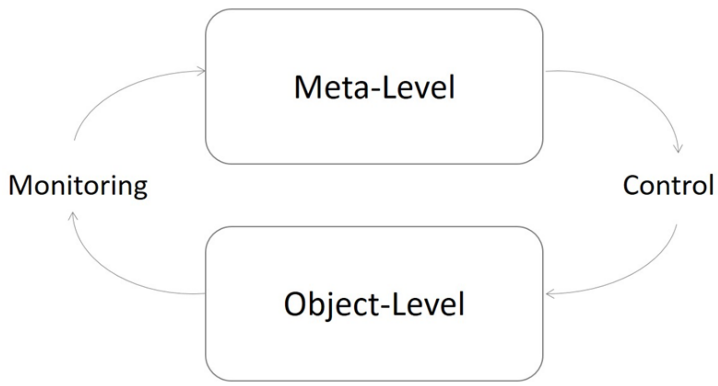

Figure 2.3. Nelson’s (1996) Model of Metacognition.
The theoretical framework proposed by Nelson (1996) separates metacognition into two components of monitoring and control. Nelson accounts for the interaction between monitoring and control processes through the movement of information between an object-level and a meta-level. In this figure, arrows denote the movement of information, with monitoring occurring when information flows from the object-level to the meta-level, and control occurring when information flows from the meta-level to the object-level.

2.2.4 *Metacognitive experiences*

Notably, Flavell’s (1979) influential account of metacognition made a clear distinction between metacognitive knowledge (the understandings people have about the way numerous factors interact to influence their cognition) and metacognitive experiences (task-specific feelings, judgements and knowledge). In his influential theoretical account,

[4] Example from Son (2004).

Flavell (1979) defined metacognitive experiences as conscious thoughts or feelings that occur when engaging in thinking or learning, for example the feeling that you have not understood something you have just heard. He argued that in some cases, metacognitive experiences are solely metacognitive knowledge that has become a conscious thought or feeling. These experiences vary in their length and can influence both your metacognitive knowledge, and the strategies used to achieve a goal or task.

Building on the work of Flavell, Efklides' (2006, 2008, 2009) examination of the role of metacognitive experiences provides additional theoretical distinction; whereas metacognitive knowledge can be understood as the more general, 'off-line' cognitions about cognition, metacognitive experiences are the on-line feelings that occur during a task. Drawing on a body of experimental research eliciting on-line experiences of cognition during learning tasks (such as feelings of familiarity, feelings of knowing; as reviewed in Section 2.3.1), Efklides (2006, 2008) described metacognitive experiences as affective in nature. Experiences comprise of both implicit feelings about elements of a learning event (such as the feeling that you might remember a name that is in the 'tip of your tongue'), and more conscious, explicit on-task knowledge (such as identifying the most crucial information in a task). Metacognitive experiences inform the learner about attainment of and progress towards one's goals (Efklides, 2008).

2.2.5 *Critical review*

The preceding review of metacognition theory highlights that there are multiple definitions of metacognition used throughout literature. The diverse terminologies used results in an important lack of conceptual clarity, with Veenman et al. (2006) listing 16 associated terms and Destan, Hembacher Ghetti and Roebers (2014) highlighting 28 terms. Definitions range from general accounts such as "thinking about what one is thinking", "cognition of cognition" (both Beran et al., 2012, p4), to more specific accounts which incorporate factors of knowledge, regulation, experiences, monitoring and control, as emphasised in key accounts. Indeed, given the diverse components outlined, difficulties arise when attempting to achieve an overall understanding of metacognition as a construct.

Despite the variability in terms, taken together, influential theoretical frameworks often highlight the existence of a metacognitive knowledge component, in addition to an element of regulation of cognition. This two-component definition has been further divided into various sub-components by Flavell (1979), as well as Schraw and Moshman (1995), reflecting the multi-faceted nature of metacognition. Sub-components of metacognition have been explored by Scott and Levy (2013), who conducted exploratory factor analysis on a metacognitive questionnaire to investigate sub-components of metacognition (knowledge, planning, monitoring, control/regulation and evaluation). Overall, the researchers found that two components were revealed: knowledge and regulation.

Given the identification of knowledge and relation components, a critical point in relation to defining metacognition is the relationship between these two components and the extent that they can be distinguished in practice. For example, many of the variables cited by Flavell and Wellman (1977) as examples of the strategy component of metacognitive knowledge are acts of 'doing': "he may mentally rehearse, cluster, or elaborate on the material to be retrieved, but may also store it by making notes, photocopies, photographs, or tape recordings" (p19). Indeed, Flavell (1976) described knowledge and regulation of cognition as interlinked. This is evident in the examples he provides of metacognition in action:

> I am engaging in metacognition (metamemory, metalearning, metaattention, metalanguage, or whatever) if I notice that I am having more trouble learning A than B; if it strikes me that I should double-check C before accepting it as a fact; if it occurs to me that I had better make a note of D because I may forget it; if I think to ask someone about E to see if I have it right. Such examples could be multiplied endlessly (Flavell, 1976, p232).

Furthermore, Flavell and Wellman (1977) distinguish between the knowledge of strategies to prepare for future retrieval and knowledge of strategies used at present, arguing that future preparation is a form of planning. In this context, therefore, the distinction between knowledge variables and regulation (or 'doing') is far from clear.

Whilst there is a degree of agreement regarding the existence of metacognitive knowledge and regulation, less is understood about how these components relate to other identified components of metacognition (namely, monitoring, control and experiences). For instance, whilst the terms 'monitoring and control' are often used synonymously with 'knowledge and regulation', Efklides (2006) describes monitoring and encapsulating metacognitive knowledge and experiences, and metacognitive control as encapsulating regulation. By contrast, Brown (1987) as well as Schraw and Moshman (1995) describe monitoring as a key aspect of metacognitive regulation. Thus, there are clear difficulties in bringing together theories to explore the distinct and related properties of individual conceptualisations.

2.2.6 *Summary*

In sum, several different accounts of metacognition have been influential throughout the field of psychology. As described previously, reaching a level of conceptual clarity is beneficial, however this is difficult to achieve in practice. Given the difficulties in agreeing a coherent understanding of metacognition, Destan et al. (2014) highlights the need to look beyond the terminology used and to look instead, at the operational definition of terms described. Thus, whilst appropriate to provide a broad description of the definition of metacognition adopted in this study, it is important that this discussion takes into account the measures of metacognition used throughout the field, as discussed in the following section.

2.3 Measuring Metacognition

The definition of metacognition is inherently related to the measure used to capture metacognition in research, both in the artificial laboratory setting and in the ‘situated’ classroom setting (Kuhn, 1999b). Several methods have been developed to assess metacognition, including cognitive experimental paradigms, self-report measures, third-party assessments, practical assessments and classroom-based approaches such as interviews or observations. In the following section, I provide an overview of the dominant methods used in the field of metacognition research, before critically evaluating measures used.

2.3.1 *Cognitive paradigms*

Traditionally, metacognition has been predominantly measured using experimental paradigms that involve participants making estimations about their own performance in experimentally controlled tasks, such as memorising strings of numbers or word pairs and controlling discrete aspects of tasks (such as study time). Cognitive experimental paradigms have been incredibly influential in the development of metacognition theory. Indeed, the very foundations of metacognition research can be tracked back to the meta-memory experiments conducted in the 1970s, particularly the research by Flavell and colleagues. Table 2.3 provides an overview of experimental judgements.

Judgements of Learning (JOLs) are measures of metacognitive monitoring, operationally defined as discrete 'on-line' responses. These JOLs are estimates given during acquisition about how well items have been learnt (Schwartz, 1994). In one of the first pieces of metacognition research, Flavell et al. (1970) compared three- to ten-year-old children's prospective estimations of memory to their actual memory performance using a Judgement of Learning (JOL) paradigm. By asking participants to rate how many words they would be able to remember consecutively and comparing this to the number that they remembered, Flavell et al. (1970) found that children overestimated their memory at all ages, demonstrating a difference between cognitive performance and metacognitive judgements. JOL tasks have also been adapted to other tasks, including mathematics tasks and psychomotor tasks (Schneider, 1998).

Table 2.3. Experimental 'calibration judgements'.
Adapted from Schraw (2009). As this table demonstrates, several different judgements have been used throughout cognitive literature to measure participants' judgements of performance in cognitive tasks.

Judgement Type	**Description**
Judgement of Learning (JOL)	Judgement of future recall of studied information
Ease of Learning (EOL)	Judgement of the ease with which information can be learnt
Feeling of Knowing (FOK)	Judgement of the ease with which information can be recalled
Feeling of Difficulty (FOD)	Judgement on the difficulty with which tasks can be performed
Online Confidence Judgements	Judgement of the confidence of current performance
Judgements of Performance	Judgement of performance following task

Control of cognition is often measured experimentally through discrete actions, such as allocating study time or selectively withdrawing answers in memory tasks. Such measures operationally define metacognitive control as making discrete changes to cognition as a result of monitoring. As an example, Son (2004) found that undergraduate participants controlled their cognition by choosing to immediately study items that they rated as more difficult, delaying study for easier to remember items. Measuring control in addition to monitoring, Roebers, Schmid and Roderer (2009) provided nine- to twelve-year-old students with a modified JOL paradigm in which they were asked to fill in blanks in a portion of text about a science topic (the production of sugar). Monitoring was measured by confidence ratings, and control by the selective withdrawal of answers, comparing between reward (+3 points for correct and +1 point for incorrect answer) and penalty (+1 point correct and -3 points incorrect) conditions. All children showed more confidence for correct answers than for incorrect answers, with older children (eleven to twelve years old) being more able to selectively control in response to possible penalties. Therefore, JOL paradigms can distinguish between monitoring and control.

Metacognitive experiences are also typically operationally defined as on-line judgements about performance and progress towards a goal (i.e., as synonymous with monitoring). For example, Efklides, Samara and Petropoulou (1999) explored the relationship between metacognitive experiences (monitoring) and control strategies during problem-solving tasks. Participating school-aged students' Feelings of Difficulty (FODs) during tasks influenced their reported control strategies, including finding the rule for the problem and seeking help from others. Interestingly, these on-line FODs during task completion resulted in different control strategies than FODs at the beginning or end of the task. For example, at the beginning, metacognitive strategies tended to be general (such as seeking help from others), whereas with metacognitive experiences during the task, control strategies reported tended to focus more upon intra-personal factors (such as the importance of thinking to produce a solution). As the monitoring assessed in this study was directly related to on-line control behaviours, the findings demonstrate the intricate inter-relation between on-line monitoring and control processes, with metacognitive experiences taking several forms (including feelings of confidence, feelings of satisfaction, feelings of familiarity and feelings of difficulty; Efklides & Misailidi, 2010).

Cognitive paradigms are beneficial for developing insight into metacognition insofar as they constitute highly controlled tasks that allow for the close examination of metacognitive monitoring and control, as well as the manipulation of task characteristics such as reward, task type or difficulty (e.g., Roebers, von der Linden, Schneider & Howie, 2009; Schneider, 2008). The nature of paradigms such as JOLs or FOKs means that they can be employed within the classroom setting, providing a more naturalistic setting for the experiments (Roebers et al., 2009). Nevertheless, an important limitation still remains regarding the extent to which the artificial nature of the tasks employed are truly reflective of the types of tasks or skills that children adopt in life (Roebers, 2014).

A clear limitation of cognitive paradigms is the narrow operational definition of metacognition used in research. Not only do these paradigms on face value only investigate a very narrow process, they also do not correspond to the definitions of metacognition that are widely utilised in research. Cognitive measures that focus on feelings of difficulty or feelings of familiarity are particularly related to the 'experiences' component described by Flavell (1979; Efklides, 2006, 2008), whereas measures such as online confidence judgements and discrete control measures align with the concepts of monitoring and control of cognition (Schraw, 2009). This type of research is meaningful, in that it allows us to further understand children's on-line experiences and behaviours. Due to the narrow operational definition of metacognition used, however, these measures fail to investigate the varied and contextualised ways in which children think about their learning throughout the learning process (i.e., including before and after tasks), including their wider knowledge and regulation of cognition.

2.3.2 *Self-report inventories*

Self-report inventories are a very common approach to the study of metacognition in both children and adults. There are several self-report measures available for assessing metacognition as a global construct, as well as in various learning domains. One of the most common self-report measures of metacognition is the Metacognitive Awareness Inventory (MAI). The MAI was developed by Schraw and Dennison (1994) and is based upon the cognitive research and theory of Ann Brown and Gregory Schraw (e.g., Brown, 1980; Schraw & Moshman, 1995). Sperling, Howard, Miller and Murphy (2002) developed the Metacognitive Awareness Inventory to be applicable to children: the Jr MAI versions A (for eight to eleven years old) and B (for twelve to fifteen years old). This assessment (with examples also provided in Table 2.4) is useful as it measures both knowledge of cognition and regulation of cognition (Sperling et al., 2002). Through factor analysis, Sperling et al. (2002) confirmed that the questionnaire outcomes could be separated into two components consistent with knowledge and regulation, however there was little evidence to support separation into the sub-components proposed by Schraw and Moshman (1995).

An important observation in relation to self-report inventories is the great diversity in the ways different self-reports operationally define metacognition. Whilst the MAI and Jr MAI measure components of metacognition that align closely with components of metacognitive knowledge and regulation described by Schraw and Moshman (1995), others focus on specific areas such as strategy use or problem solving. For example, there are measures for measuring metacognition of reading (Index of Reading Awareness; Jacobs & Paris, 1987; Metacognitive Awareness of Reading Strategies Inventory; Mokhtari & Reichard, 2002), learning and studying (Motivated Strategies for Learning Questionnaire; Pintrich, Smith, Garcia & McKeachie, 1991), and problem solving (Metacognitive Questionnaire; Swanson, 1990).

Table 2.4. Items from the MAI and Jr. MAI.
As shown in this table, the MAI and its variant for children measure metacognition based on the theory of Schraw and Moshman (1995).

Component	**Example: MAI (Schraw & Dennison, 1994)**	**Example: Jr MAI version B (Sperling et al., 2002)**
Knowledge: Declarative	I understand my intellectual strengths and weaknesses	I know when I understand something
Knowledge: Procedural	I try to use strategies that have worked in the past	I try to use ways of studying that have worked for me before
Knowledge: Conditional	I learn best when I know something about the topic	I can make myself learn when I need to
Regulation: Planning	I pace myself while learning in order to have enough time	I think about what I need to learn before I start working
Regulation: Monitoring	I ask myself periodically if I am meeting my goals	I think of several ways to solve a problem and then choose the best one
Information management strategies	I slow down when I encounter important information	I draw pictures or diagrams to help me understand while learning
Regulation: Evaluation	I know how well I did once I finish a test	When I am done with my schoolwork, I ask myself if I learned what I wanted to

An example of a measure of metacognition that is considerably different from (for example) the MAI, is Swanson's (1990) Metacognitive Questionnaire. As shown in the examples below, Swanson (1990) posed hypothetical scenarios to participants and measured metacognition in relation to participants' responses:

> 1. What makes someone really smart?
> 7. Who is smarter, someone who knows the answer to a math problem without having to figure out or someone taking some time to figure out the problem? Why?
> 8. Suppose Jeff has 50 eggs on his head in a sack. One egg is brown and all the others are white. Jeff walks across a log on a river with the sack of eggs on his head. Suddenly while he's in the middle of the log, somebody says, "show me the brown egg before you can pass." The person says, "I want to see the brown egg immediately." What do you think is Jeff's problem?
> 9. How could he solve that problem? Why? (Swanson, 1990, p308)

Such a measure operationally defines metacognition as the 'learning strategies' employed during problem solving. Swanson's (1990) measure of metacognition was compared to participants' performance in problem-solving tasks (in the form of a science experiment). Critically, not only does Swanson's (1990) questionnaire highlight the diversity of self-report measures of metacognition, it also raises important considerations regarding the design of measures of metacognition more generally. That is, it may be argued that the items in the Metacognitive Questionnaire are so related to problem-solving that it may lead to an undesirable overestimation of the observed effect of metacognition upon problem-solving performance. The use of measures of metacognition that are highly related to outcome measurements mean that there is a circularity between measurement and results.

When examining questionnaires in more depth, it is unclear whether some self-report measures metacognitive knowledge (which inherently will differ from person to person) or in fact, whether it instead measures 'good' metacognition. For example, Paris and Oka (1986) measured metacognitive knowledge using the Index of Reading Awareness (Jacobs & Paris, 1987), which includes items such as 'what do you do if you don't know what a sentence means? (a) read it again (for 1 point), (b) sound out all of the words (for 0 points) or (c) think about the other sentences in the paragraph (for 2 points)'. Importantly, all three response options could indicate metacognitive knowledge (defined as knowledge of strategies, tasks or persons). Although some might be argued to be more effective strategies, this may differ for each individual, and therefore this approach measures how 'good' a strategy is, rather than knowledge of the strategies used. This confounding in the operational definition fails to acknowledge that an individual can have knowledge that they use a poor strategy, which is indicative of high metacognitive knowledge. Indeed, both Flavell (1979) and Brown (1987) asserted that metacognitive knowledge is not necessary utilised in a useful way; it may be inaccurate or non-adaptive, or have little influence on performance. This highlights the importance of understanding the operational definitions of metacognition used in research, to avoid over-interpreting the significance of results.

A related consideration of the operational definitions of metacognition through self-reports is the extent to which knowledge and regulation components can be separated. For example, the Jr MAI item "I really pay attention to important information" (Sperling et al., 2002) is categorised as a regulation component, however it may also require having knowledge about, for example, how much the statement applies to you, what the goal is, and what constitutes 'important' information with respect to that goal (not to mention knowledge of the expected behaviour or actions within the school or research context). Thus, whilst self-reports have been valuable for characterising metacognition (particularly by providing clear definitions of metacognitive knowledge and regulation), the distinctions between these components is difficult with self-report measurements.

Self-report inventories have clear strengths, not least the fact that they are quick and easy to administer to large groups. In addition, they can be validated and subject to reliability analyses, making them a fairly well trusted approach for statistical analyses. There are, however, criticisms of self-report measures. In addition to the considerations outlined in the preceding paragraphs, a clear limitation is that self-reports rely on reading and verbal processing abilities (Misailidi, 2010; Whitebread & Basillo, 2012). Whilst some of these limitations may be mitigated slightly, by (for example) reading the questionnaire items to children as an interview (e.g., Swanson, 1990), self-reports may still critically underestimate the metacognitive abilities of children. In addition, self-report inventories carry the inherent assumption that metacognition is a stable construct, minimising influences such as context and time (Patrick & Middleton, 2002). Due to the various limitations outlined, therefore, self-report measures may be problematic for use in applied contexts, particularly with children inexperienced in reflecting on their own learning.

2.3.3 *Third-party assessments*

Measures by a third party (most commonly a teacher) are also used to assess metacognition, often as a supplement to a self-report or experimental measure. For example, Sperling et al. (2002) developed a teacher rating of metacognition alongside their self-report Jr MAI (discussed above). Their ‘Teacher Rating of Student Metacognition’ includes five items that describe behaviours of high (e.g., “Makes study plans”) and low (e.g., “Doesn’t plan much”) metacognition. Using these behavioural statements, teachers are asked to score students on a scale from 1 (very low metacognition) to 6 (very high metacognition). Desoete (2008) also developed a teacher questionnaire to supplement behavioural assessments of metacognition. This teacher-report contained items that asked teachers to rate students’ metacognitive regulation (prediction, planning, monitoring and evaluation).

Findings suggested that teacher ratings in fact correlated more highly with behavioural assessments than students’ own self-assessments (Desoete, 2008). Critically, however, teacher ratings of metacognition may have the limitation of actually measuring students’ general competence rather than their metacognitive ability. For instance, Sperling et al. (2002) found significant but low correlations between teacher assessments and the Jr. MAI: teachers’ ratings of their students’ metacognition correlated more with performance than did students’ own self-reports of their metacognitive knowledge. As metacognition is an integral part of the learning process, teachers may inadvertently gauge their students' general aptitude, rather than specifically assessing metacognition.

2.3.4 *Behavioural assessments*

Behavioural assessments are popular methods of assessing metacognition. These often involve a third party (most often a researcher) assessing an individual's use of metacognition as they perform a task or answer questions. Think-Aloud Protocols (TAPs) are one of the most popular behavioural assessments for metacognition and are used in children as young as six years old (Gascoine et al., 2017). With TAPs, participants are asked to verbalise or 'think-aloud' their thoughts whilst they complete a task (Desoete, 2008). A similar approach, originally developed by Paris (1991) is the 'think-along' approach, in which a child reads a text aloud and the teacher asks questions relating to metacognition throughout. For example, questions about their knowledge of the text, how they know what they do and how they would find out information they do not know (Baker & Cerro, 2000). Research has used various methods to code responses observed, often using a trained researcher (Desoete, 2008).

There are potential limitations to behavioural assessments such as TAPs. For example, it has been suggested that encouraging students to verbalise their mental processing through eliciting TAPs may disrupt the mental processes that occur during task completion, or that students may not be aware of their processing (Van Zile-Tamsen, 1996). This potential limitation is a particular concern for younger children, who may not understand the task or be able to articulate their thinking. The act of children verbalising their cognitive processing may alter the cognitive process, for example by slowing it down (Veenman, Kok & Blöte, 2005). In addition, asking a child to think aloud as they complete a task does not replicate the natural way of performing a task for students, and therefore is limited in the extent that it replicates the metacognitive processing conducted in everyday classroom tasks. As a result, the practical efficacy of such approaches in children has been questioned (Baker & Cerro, 2000).

With the shift to investigating metacognition in more applied contexts, methodological advancements have begun to explore the temporal and sequential characteristics of metacognition. For example, Malmberg et al. (2014) used 'log file traces' to record patterns of strategies used by students as they completed well and ill-structured computerised tasks, finding that students tended to use patterns of strategies throughout the learning process. Such a methodological approach allows real-time tracking of actions when completing computerised tasks, including organising and selecting important information. Malmberg, Järvelä and Kirschner (2014) indeed used such technology in conjunction with the recording of verbal information, for example indicators of evaluation: ‘I don’t understand’. Methodological advancements such as log file traces provide interesting opportunities to further develop understanding about the metacognitive processes engaged with by learners throughout more situated tasks.

2.3.5 *Classroom-based methods*

Observational methods have been developed as an alternative approach to experimental paradigms in the applied classroom setting. For example, Whitebread et al. (2009) observed metacognition in the everyday classroom activities of young students (three to five years old). By videotaping ‘meaningful’ activities elicited by the teacher, Whitebread et al. (2009) recorded both verbal and non-verbal indicators of metacognition using the Children’s Independent Learning Coding Scheme (C.Ind.Le). Several components of both metacognitive knowledge (of persons, tasks, strategies) and metacognitive regulation (planning, monitoring, control, evaluation) were observed, for example “explains procedures involved in a particular task” (Knowledge: Strategies) and “Sets goals and targets” (Regulation: Planning). Since its development, the C.Ind.Le coding scheme has become increasingly used in classrooms as a measure of metacognition, for example in the investigation of features of the learning environment that influence metacognition and self-regulation (Robson 2016a, 2016b).

The distinction between knowledge and regulation has also been evidenced by interviews with students, including through the additional support of prompts. For example, Lee, Teo and Bergin (2012) interviewed ten-year-old children about problem solving used whilst making every-day monetary decisions. Knowledge (procedural, conditional, and of self, parents, strategies) was highlighted, as well as components of regulation: planning (goal setting, fact finding), monitoring, and evaluation (strategies, alternatives, reflecting comparison). In another study, Wilson (1998) used ‘action cards’ containing metacognitive statements as prompts during interviews about solving maths problems. Ten action cards contained items related to awareness, evaluation and regulation. ‘Upper-elementary school-aged students’ indicated that they monitored and regulated their own problem-solving in many ways. For example, the most selected card was “I checked my answer as I was working” (evaluation). Although limited to the elements of metacognition stated on the ‘action cards’, this research again highlights both knowledge and regulatory functions of metacognition.

Despite an increasing focus on applied studies of metacognition, many investigations employing qualitative methods within the classroom still primarily measure components by coding excerpts using specific predefined categories or operational definitions. Indeed, most observational studies assess metacognition by observing video recorded scenarios of classroom activity and analysing them with structured checklists (Whitebread et al., 2009; Robson, 2016a, 2016b). Structured checklists retain a focus upon counting instances of metacognitive knowledge and regulation from pre-defined indicators, rather than allowing the identification of themes that emerge from everyday tasks.

Another key classroom-based approach for gauging metacognition within the classroom is the recording of observations using running records (based primarily on the work of Nancy Perry, 1998; Perry, VandeKamp, Mercer & Nordby, 2002). In comparison to other prominent observational tools that are based on coding video-recorded excerpts of classroom activity, running records allow ‘real-time’ recording of verbal and non-verbal behaviour (Perry, 1998). Such an approach is particularly valuable for characterising the metacognitive process in a minimally intrusive manner (Perry et al., 2002). To conduct running records, the researcher records all verbatim speech and observed behaviour as far as possible in a given task, also detailing of relevant supplementary information such as task content. Perry et al. (2002) investigated characteristics that influenced the promotion of self-regulation, and so analysis of running records included a list of pre-defined categories predicted to characterise low and high ‘self-regulated-learning environments’. A strength of running records, therefore, is that they are a flexible tool that enables multiple forms of analysis, including ‘top-down’ analysis based on pre-defined codes, as well as the analysis of emerging themes (Perry et al., 2002).

Novel classroom-based methods have been developed to elicit children’s understanding of their own thinking and learning through concept maps (Ritchhart, Turner & Hadar, 2009) and Pupil Views Templates (Wall, 2008; Wall, Higgins, Remedios, Rafferty & Tiplady, 2012). Pupil View Templates (PVTs) are visual tools to support students to describe their thinking and/or learning in a specific scenario. In PVTs, a cartoon scenario is presented to students, with empty thought and speech bubbles for students to document their thinking in a given (most commonly familiar) situation, such as a literacy lesson or numeracy lesson (Wall & Higgins, 2006; Wall et al., 2012). The inclusion of both thought and speech bubbles allow for exploration of the internal thought process and the external processes respectively. As such, PVTs can be seen as a powerful tool for assessing metacognitive as well as cognitive domains (Wall & Higgins, 2006).

Ritchhart and colleagues (2009) explored children's thinking about thinking using concept maps. Using a 'ground up' approach to analysis, results indicated that younger (grade three to four) students tended to provide more 'associative' comments in concept maps (i.e., they comment on people/places/items associated with thinking, but do not actually relate this to the thinking process itself). By contrast, older students (grades seven to eleven) tended to refer more to strategic aspects of thinking (i.e., comments related to an action described, either general or specific). The authors described no relationship between age and emotional responses (relating to emotional aspects of the thinking process, such as 'excited' or 'unsure') or meta-responses (relating to the experience of thinking more widely). Continuing analysis, Ritchhart et al. (2009) scored concept maps for 'sophistication', finding that younger students tended to provide less 'sophisticated' maps than older students, indicating that younger students focused more on cognitive strategies, with older students reflecting more self-regulatory and process-related strategies.

Critically, PVTs and concept maps can be used in discussion with students, as a tool to encourage students to provide deep reflections on their learning in specific contexts, rather than superficial reflections on the general content of learning tasks (Wall et al., 2012). As such, PVTs can be considered as pedagogical tools to support metacognition, as well as research tools to investigate metacognition (Wall & Higgins, 2006; Wall, 2008). One clear benefit of PVTs is that they can be subject to rich, context-specific qualitative analyses, as well as broader and larger scale quantitative analysis (Wall et al., 2012). Indeed, in their investigation of the use of PVTs, Wall et al. (2012) explored deductive and inductive approaches to analysing PVTs in research. Thus, PVTs provide an accessible and flexible approach that may complement other classroom-based methods such as observation.

2.3.6 *Critical review*

As described, a multitude of measures of metacognition have been employed throughout research. Critically, the diversity of measures employed leads to consideration of what is in fact being measured. That is, whilst there are general strengths and limitations of each methodological approach, deeper questions can be asked regarding the understanding of metacognition associated with each measure. Desoete (2008) investigated metacognitive skills using multiple methods, including teacher ratings, as well as prospective and retrospective ratings from children themselves. Comparing measures, Desoete (2008) found that whilst there were general correlations between measures, there was a relationship between the measure and the result. That is, the type of measure employed corresponded to the predicted influence of metacognition upon performance. As such, Desoete (2008) concludes that “how you test is what you get” (p204).

More recently, Gascoine et al. (2017) conducted a systematic review of measures of metacognition throughout childhood (4 to 16 years old). The researchers analysed a total of 80 measures of metacognition, from 149 research studies, finding that self-reports were by far the most common measure of metacognition (accounting for 61% of the measurements included). Other measures used were interviews (14%), observation (8%), task-based methods (8%), teacher ratings (6%), and multi-method studies (4%). There was also a clear relationship between age and measurement, with self-report measures and task-based methods being used exclusively for children aged above seven years of age, whereas observational tools were used to gauge metacognition at a much younger age (four to eight years old). As such, the authors conclude that the measure used is inherently linked with the study finding, and this in turn is inherently linked with the definition of metacognition that underpins the measurement employed. As such, Gascoine et al. (2017) add to the findings by Desoete (2008) by showing that measures of metacognition can not only be understood by the maxim of how you test is what you get (Desoete, 2008), but also “how you define metacognition is also what you get and, in the planning and execution of empirical research influences how you test” (Gascoine et al., 2017, p36).

A consideration to be made in relation to measures of metacognition is the narrow operational definitions of metacognition utilised in some research, particularly cognitive paradigms. That is, many studies measuring metacognition only operationally focus on certain particular components of the complex construct at the ‘micro-level’ (Azevedo, 2009). For example, JOL tasks measure ‘on-line’ monitoring and control of cognition through the measurement of behaviour, a somewhat different operational definition of metacognition compared to (for example) the knowledge and regulation of cognition throughout the process of learning that is investigated in self-report, observational and interview research (e.g., Schraw & Dennison, 1994; Whitebread et al., 2009; Wilson, 1998).

Perhaps most importantly, given the close associations between measurement and theory it is critical to consider the methodological underpinnings of the influential theories described in Section 2.3. As noted, psychological theories of metacognition stemmed from experimental cognitive research (spanning from a large body of meta-memory research, see for example Flavell et al., 1970). When looking in detail at the underpinnings of influential theories, however, there exist difficulties in determining an influence of distinct methods upon theoretical development. That is, whilst much is known about 'on-line' monitoring and control processes of metacognition in carefully controlled experimental tasks, less is understood about how these processes relate to more general constructs of knowledge and regulation (with these terms being at times, used interchangeably, Tarricone, 2011). Thus, the difficulties in determining coherent paths between measure and theory between (and within) research strands adds to the 'fuzziness' of metacognition as a construct, and leads to particular questions regarding how these components might be characterised throughout situated classroom tasks.

Finally, the issue of ecological validity is particularly pertinent for research into metacognition. Classroom tasks are often diverse, complex and active. The clear differences between experiments and situated classroom tasks has been acknowledged from early days of metacognition research: "The real world's tasks generally have the properties of an open-book, take-home exam, even if the memory researcher's tasks do not" (Flavell, 1976, p233). Whilst such a criticism can be made of laboratory-based approaches to measure metacognition (e.g., JOLS), this is also critical in terms of developing understanding about metacognition in applied settings – given the clear influence of cognitive research upon dominant metacognition theory, this not only raises questions regarding the ecological validity of research studies, but more deeply, questions the applicability of the very theories of metacognition that dominate the field. Ultimately, this leads to questions of how metacognition can be effectively characterised within classroom settings as children undertake everyday tasks. This is a key question that will be explored in the present research project.

2.3.7 *Summary*

In sum, research generally suggests that the lack of validation of metacognitive assessments is problematic (Baker & Cerro, 2000). Traditionally, metacognition was investigated at the 'micro-level' (Azevedo, 2009), often measured quantitatively through laboratory-based cognitive paradigms that compare participants' estimations of performance (e.g., Flavell et al., 1970). At the 'macro-level' (Azevedo, 2009) metacognition is explored more widely, often using diverse measures from self-report inventories to classroom-based visual methods such as PVTs (e.g., Sperling et al., 2002; Wall, 2008). Clearly, it is critical to bear in mind that any study of metacognition is bound within the measure used, as supported by recent systematic review findings (Gascoine et al., 2017). The present thesis aims to increase understanding of metacognition in the applied setting. Such a goal entails rich, context-related description that goes beyond generalisable assessments of ‘how metacognitive’ people are, but to explore instead what metacognition might *look like* in the classroom. As such, it is important to use methods that allow deep exploration in the situated learning environment, to look at what is happening, and to talk to students and teachers to investigate their perspectives.

2.4 Development of Metacognition

The research presented in this thesis is situated within the context of primary school education. Below, I overview research exploring the development of metacognition in childhood, providing a rationale for the current focus.

2.4.1 *Development in later primary school years*

Traditionally, it was believed that metacognition did not develop until around the age of eight years old. This belief has its roots in early developmental theory. Piaget described the development of infants in terms of successive invariant stages (as presented in Table 2.5). The theory of Piaget suggests that metacognition develops from the age of seven and continues towards adolescence: “up to the age of 7, introspection seems to be completely absent, and […] from 7–8 until 11–12 there is a consistent effort on the part of thought to become more and more conscious of itself” (Piaget, 1928, p143). Indeed, Flavell (1992) aligned metacognition with Piaget’s formal operational stage of development: “Formal-operational thinking is clearly metacognitive in nature because it involves thinking about such cognitive entities as propositions, hypotheses, and imagined possibilities” (p118). The theory of Vygotsky similarly suggests that metacognition may not develop until the later primary school years: “the ability to regulate one’s actions by using auxiliary means reaches its full development only in adolescence” (Vygotsky, 1986, p108). Thus, early theory of both Piaget and Vygotsky conceptualised metacognition as developing incrementally from the age of around seven years old through to adolescence.

Table 2.5. Piaget's stages of cognitive development
As can be seen in the table, Piaget described development as a series of invariant stages that occur throughout childhood (adapted from Mitchell & Ziegler, 2007).

Stage	Description of stage achievements
Sensorimotor	0-2 years old Development of object permanence and intentionality. Differentiation between the self and the surrounding environment.
Pre-operational	2-7 years old Development of symbolism and mental imagery (including language). Egocentrism prevalent.
Concrete operational	7-12 years old Development of mental operations based on real-life operations. Less egocentrism.
Formal operational	12 years old and beyond Development of abstract thinking and hypothetico-deductive (if-then) thinking

Cognitive research has also supported a view that emphasises metacognitive development in the middle to upper primary school years. For example, Flavell et al. (1970) compared three- to ten-year-old children's (nursery, kindergarten, grade two and grade four) prospective estimations of memory to their actual memory performance using a Judgement of Learning (JOL) paradigm, finding that whilst children overestimated their memory at all ages, older students had a much smaller difference between their actual and estimated performance. At this older age (nine to ten years old), children demonstrated higher memory performance as well as more accurate estimations. More recently, Veenman, Wilhelm and Beishuizen (2004) explored intelligence and metacognitive skills across different age groups; fourth grade (nine to ten years old), sixth grade (eleven to twelve years old), eighth grade (thirteen to fourteen years old) and university students (averaging 22-23 years old). Participants completed a series of age-appropriate reasoning tasks as well as a computerised learning tasks (science and geography experiments) that allowed the additional tracing of on-line actions (such as scrolling to previous experiments) that were coded for metacognitive skilfulness. The research found that metacognition was independent from cognition, with metacognitive skills improving significantly from grade four to university level.

In a more situated study, Bartsch, Horvath and Estes (2003) investigated 470 adult and children's use of the words 'learn' and 'teach' in naturally occurring talk. In total, children (aged two to seven years old) used the term 'learn' only 77 times compared to 252 uses by adults in conversation with children. Relating to 'teach', children used the term 44 times, compared to 97 references by adults. Examination of the context of the utterances revealed that both adults and children tended to focus on ‘what’ and ‘who’ in relation to learning, with less of a focus on the process of the learning (the ‘how’). McCallum, Hargreaves & Gipps (2010) investigated how children think about learning, finding that both young (seven-year-old) and old (eleven-year-old) children can conceptualise learning and have awareness of the conditions for learning – older children were more aware of learning and had more in-depth knowledge. Younger children conceptualised learning as being about possessing the ‘right’ learning, and was often associated with being ‘intelligent’ or ‘brainy’. Such findings suggest that younger children not only are less accurate at making estimations of their own cognition, but they also less commonly use words relating to the thinking and learning process, and perceive learning to be associated with performance. Such evidence supports a view of metacognition developing in the later primary school years, with skills becoming more complex into adulthood (Kuhn, 1999a).

2.4.2 *Evidence of earlier development*

As the examples described above demonstrate, traditionally, it was thought that metacognition develops during the middle to later primary school years (Flavell et al., 1970; Veenman et al., 2004). However, with the advancement of more diverse methods of assessing metacognition, there has been increasing acknowledgement that cognitive research may have underestimated the metacognitive capacities of students, confounding metacognition with other developing skills. For example, several measures rely heavily on children’s verbal and working memory, particularly self-report or verbal experimental studies (Misailidi, 2010; Whitebread & Basillo, 2012). The difficulty of measuring metacognition in experimental procedures is evident from the earliest studies. For example, Flavell et al. (1970) found that younger children were unable to complete their experimental task (making predictions of future memory span) in a “responsive and realistic manner” (p330), with older participants spending longer attempting to memorise the objects than any other group, suggesting that the older group also spent more effort on the task.

Some laboratory research has revealed that children might be able to monitor and control their thinking from early childhood. For example, research suggests that at as early as 26-32 months of age, children show signs of monitoring their own thinking by comparing their built toy (e.g., a tower made of bricks) with a target, and around half of children at this age make changes based on their building from comparing with the target (Bullock & Lütkenhaus, 1988). Further, Coughlin, Hembacher, Lyons and Ghetti (2013) found that three-, four- and five-year-old children all provided significantly more accurate confidence judgements for correct responses in a perceptual identification task, suggesting children as young as three years old can accurately monitor their own cognition. Moreover, children who were less ‘sure’ (as measured by their confidence judgements) were more likely to control their cognition by seeking help (Coughlin et al., 2015).

In another cognitive experimental study, Schneider (1998) found that four-year-old children could accurately estimate their memory performance retrospectively (i.e., give an accurate confidence judgement about their past performance), but they could not accurately predict their performance in a future task (i.e., they predict that they perform better than they do, in both memory and psychomotor tasks). By five to six years, research demonstrates that children can monitor their own cognition with some accuracy, differentiating with increasing nuance between correct and incorrect responses. For example, Destan et al. (2014) found that five-year-old children provided accurate confidence judgements in a paired recall task. Further, children from five to seven years of age studied longer for items given a lower confidence judgement, and selectively withdrew responses they were less confident about, indicating metacognitive control. Therefore, studies cumulatively suggest that children can monitor and control their cognition, by making estimations, seeking help, selectively allocating study time and selectively withdrawing items that they are unsure about.

Recent research using more sensitive and varied methods has also revealed metacognition within classrooms from the early years (see for example, Bryce & Whitebread, 2012; Robson, 2010, 2016c). Whitebread and colleagues (Whitebread et al., 2009) – in developing the C.Ind.Le coding framework – demonstrated that three- to five-year-old children regularly monitored and controlled their cognitive and emotional thinking. Similarly, Larkin (2006) observed two five-year-old children over a year period, through case study research. Over a number of tasks throughout the school year, she found that children did commonly show indicators of knowledge of self, evaluating strategies, monitoring progress.

Research using Pupil Views Templates to explore metacognition in the classroom has also revealed that children do in fact demonstrate metacognitive knowledge and regulation from the early years, between four and five years old (Wall, 2008). Robson (2010) also found extensive evidence of metacognition and self-regulation in observations and reflective dialogues (post-task discussion when viewing recorded activity). In reflective dialogues, the most frequent indicator was of metacognitive knowledge, whereas the most frequent indicator in observations was regulation. This was replicated in a more recent study of 29 children in the early years (Robson, 2016c), finding more evidence of metacognitive planning and monitoring throughout observation compared to more evidence of metacognitive knowledge and evaluation in discussion with children. Clearly, therefore, these findings suggests something important about methods. It is not necessarily the case that children use more or less knowledge or regulation in particular studies, but rather different methods explore different aspects of metacognition, or explore metacognition in different ways. For example, the findings of Robson (2016b) suggests that children may simply verbalise differently when an adult is present, or engage more in discussions about learning, than when they are absent.

One clear reason for the debate around the developmental profile of metacognition is the diverse understandings of the conscious nature of metacognition. Indeed, there is considerable debate regarding the extent to which metacognition is required to be explicit and stateable, versus implicit and non-conscious. It has been suggested that metacognition might emerge as non-conscious and become more explicit across time (Kuhn, 2000). Such an implicit awareness suggests a differentiation between developing metacognitive *experiences* and metacognitive *knowledge*, in that children may first develop a sense that something is wrong (Veenman et al., 2004), before developing explicit metacognitive knowledge. Flavell (1992) termed this more implicit awareness of cognition 'proto-metacognition', describing a developing awareness of other people's perspectives akin to Theory of Mind. Indeed, this distinction between more implicit experiences and more explicit knowledge is summarised by Roebers (2014), who describes emerging metacognition as "somewhere in between conscious and unconscious, short-term or long-term psychological experiences of uncertainty" (p879). Thus, where there has been acknowledgement of the role of implicit forms of metacognition as it emerges in young childhood, this has further challenged the traditional view that metacognition does not develop until around the age of eight (Whitebread & Basillo, 2012).

2.4.3 *Summary*

In sum, therefore, it has become increasingly clear in the field of metacognition research, that the measure used to explore metacognition is inherently related to the finding of the research study – the finding that "how you test is what you get" (Desoete, 2008, p204). Further, this relationship is also inherently related to the definition of metacognition employed (Gascoine et al., 2017). With the increasing use of more sensitive and appropriate methods (both experimental and qualitative), it has been revealed that children do indeed engage with metacognition from the early years (Robson, 2010; Whitebread et al., 2009; Bryce & Whitebread, 2012; Wall, 2008). Taken together, evidence suggests that metacognitive abilities begin to develop alongside cognition from early childhood. Moreover, findings suggest that metacognition may emerge as implicit feelings or experiences that become more explicit as a child develops, thus being open to conscious control (Kuhn, 2000; Veenman et al., 2004). Development of metacognition, therefore, can be understood as an incremental and nuanced qualitative change in thinking about and managing thinking, inherently inter-related with the context and situation and becoming more ‘fine- tuned’ (Roebers, 2014), rather than achieving a stage-like developmental milestone.

A final point to make in terms of the development of metacognition relates to the influences upon development. Particularly within the classroom environment, a view of metacognition as developing in complexity over time raises questions about the influence of the educational environment. Such a consideration is appropriate given the findings of the influence of the presence or absence of a teacher, or the extent that tasks were adult or child-initiated, as described previously (Robson, 2016a, 2016b). Given the importance of this particular point for the present thesis, the following section will consider literature regarding the promotion of metacognition.

2.5 Contextualising Metacognition

Having considered theory and measurement of metacognition as a construct and from a developmental perspective, it is pertinent to contextualise metacognition alongside other related fields of research. As such, the following section briefly explores the relationship between conceptualisations and related terms in educational and psychological fields. Then, consideration is given to this project’s current focus upon metacognition in relation to the wider body of literature in developmental, clinical and educational psychological fields.

2.5.1 *Metacognition in education and psychology*

Given the inter-disciplinary nature of the present study, it is important to contextualise this research (and understandings of metacognition, specifically) within not only the psychological literature, but also the education literature. Figure 2.4 provides a diagrammatic representation of several of the terms associated with metacognition throughout psychological and educational literatures (and indeed, throughout this thesis). As the figure shows, there are several similarities in terms used between psychological and education literatures, particularly the sub-components of metacognition as described in the theories of Flavell (1979) as well as Schraw and Moshman (1995).

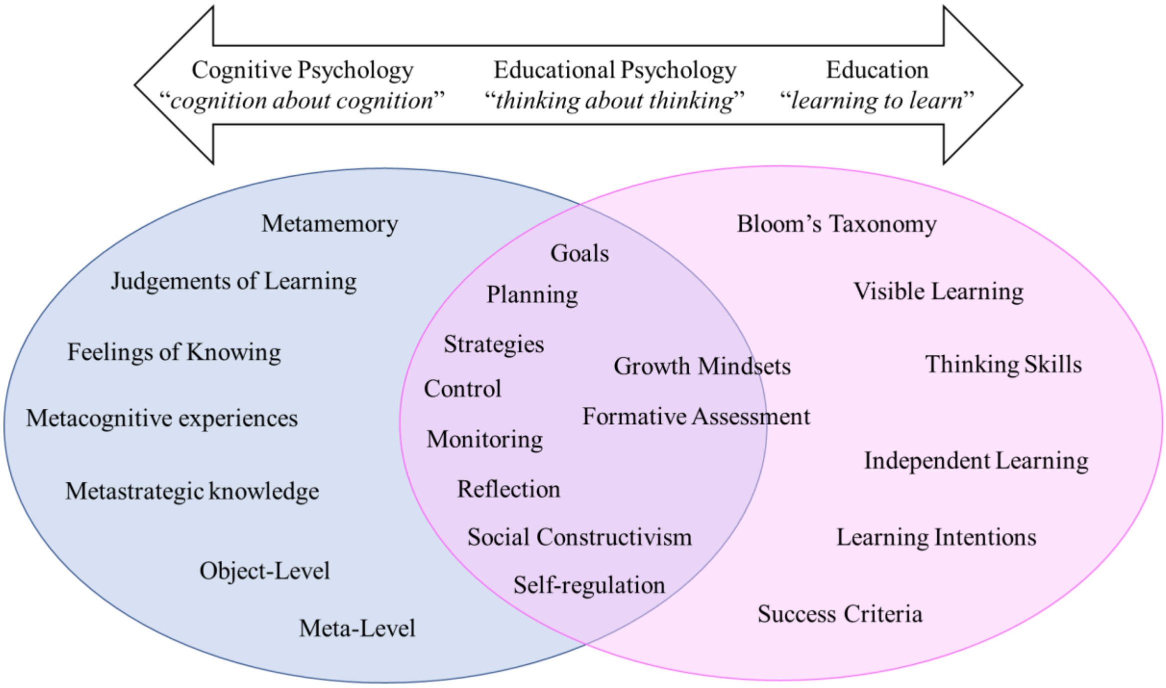

Figure 2.4 Terms associated with metacognition in psychology and education
As the figure shows, several terms have been associated with metacognition throughout psychological and educational domains. Whilst there are certainly similarities in some terms used, there are also important divergences to be aware of, with descriptions of metacognition being broadly characterised as ranging from 'cognition about cognition' to 'learning to learn'.

Having already considered several of the terms used throughout the psychology field, I will turn attention to conceptualisations within education literature (as indicated on the right-hand-side of Figure 2.4). As shown in Figure 2.4, conceptualisations of metacognition broadly range from "cognition about cognition (see Section 2.2) to "Learning to Learn" (See section 2.5.1 below). Several terms are associated (with broad definitions provided in Table 2.6). Rather than providing an exhaustive list, the intention in Table 2.6 is to highlight broad similarities and differences in terminologies employed, with several concepts intending to make the process of thinking and learning explicit to students. In the following sections, I will elaborate on some of the key terms used across fields, before considering key educational terms and how they link to metacognition (specifically learning to learn). Discussion of terminology is then continued throughout the thesis.

Table 2.6. Terms associated with metacognition in educational literature.
This table provides a snapshot of some of the terms associated with metacognition in educational literature.

Term	Definition	Reference
Growth Mindsets	A growth mindset entails believing that effort is important to reach goals (i.e., a mastery orientation), rather than believing that that we have a fixed ability level (i.e., performance orientation).	Dweck and Legget (1988); Ames (1992)
Formative Assessment	Assessment is used as a pedagogical tool, with results from assessments used to adapt future learning and teaching. Often includes: questioning, feedback, peer and self-assessment	Black & Wiliam (1998); Black et al. (2002)
Bloom's Taxonomy	A hierarchical taxonomy of cognitive skills that are intended to be used by teachers in classrooms to clarify the cognitive skills employed, supporting engaged dialogue with students about learning. Cognitive skills range from knowledge and comprehension, to synthesis and evaluation.	Bloom et al. (1956)
Visible Learning	A large-scale meta-synthesis focusing on pedagogical approaches related to increasing student independence and involvement in their own learning. Skills include feedback and dialogue with students.	Hattie (2009); see also section 2.1.3.
Thinking Skills	thinking is made explicit to students, using the language of thinking and learning to explicit awareness. Students are encouraged to themselves describe and evaluate thinking and learning	Higgins et al. (2004); Higgins et al. (2005)
Independent Learning	An approach to learning and teaching which emphasises the key values of responsibility, autonomy and creativity. Students are provided with choice and control over the learning process, and the learning process is made explicit.	Williams (2003)
Learning Intentions and Success Criteria	Terms linked to the Scottish CfE, detailing learning goals and indicators of success for specific tasks. Often used in Scottish classrooms to make the thinking and learning process (and goals) explicit, and as a tool to support formative assessment.	Scottish Government (2011)

2.5.1.1 Metacognition, Self-Regulation Theory and Learning Orientations

As shown in figure 2.4, self-regulation s a concept that is commonly referred to in both psychological and educational literature, in the psychological field, Self-Regulated Learning (SRL) has been proposed by Zimmerman (1990) to comprise of three components: self-regulated learning strategies (behaviour), responsiveness to self-orientated feedback about learning (metacognition), and motivational processes (motivation). Zimmerman (2000) proposed a model of SRL throughout the learning process (encapsulating forethought, performance, and self-reflection). Although not explicitly termed Self-Regulation Theory, Mayer (1998) proposed a similar model for learning which takes into account, students' "skill, metaskill and will". In this framework, 'skill' (knowing what to do), 'metaskill' (knowing how to control and monitor processes) and 'will' (motivation) are the key elements of learning, all able to be influenced by instruction (Mayer, 1998). SRL has mounting evidence to demonstrate its positive effects on performance (Robson, 2012), with this term crucially, often being used interchangeably with metacognition (e.g., see Sperling et al., 2002; Higgins et al., 2016).

From a psychological perspective, the way that metacognition itself is related to self-regulation is a matter of debate. That is, whether self-regulation is 'subordinate' or 'superordinate' to metacognition (Veenman et al., 2006). This lack of conceptual clarity is also evident in descriptions of aspects of SRL. Zimmerman's (1990) definition of the 'behavioural' aspect of SRL states that within this, individuals "select, structure and create environments that optimise their learning, selectively seek information, and self-instruct and self-reinforce" (Zimmerman, 1990, p5). However, these 'selecting' or tactical behaviours might in other definitions be termed 'regulation of cognition' (an established component of metacognition, Schraw & Moshman, 1995). Despite these debates, it is generally agreed that metacognition can be best understood as a key component of wider self-regulation (Pintrich & De Groot, 1990; Zimmerman, 1995).

Given its relationship to learning and pedagogy, SRL is also a commonly-used term in the educational field. That is, inclusion of motivation in a model of self-regulation compels a view of learning from a more social cognitive viewpoint, allowing consideration of the varying influences of the social world and indeed, highlighting the 'human' element of self-regulation (Zimmerman, 1995). Indeed, self-regulation has been explored in the educational domain, with evidence suggesting (for example) that students' self-regulation is influenced by the presence or absence of the teacher (Robson, 2016b). critically, given its focus on self-management and ownership of one's own learning, self-regulation is inherently related to educational concepts such as Learning to Learn (Thoutenhoofd & Pirrie, 2015).

Another key area of research that is related to self-regulation theory and cognition in psychological and educational literatures is the body of work that considers learning orientations. The orientations of learners are often closely associated with the 'Growth Mindsets' work of Carol Dweck, which has been particularly influential in UK classrooms. Dweck and Legget (1988) distinguished between mastery-orientations and helpless responses in learning situations. Similarly, Ames (1992) describes a distinction between performance and mastery orientations. Learners with performance orientations are described as focused on outcome and comparison with others, often focused on reaching (normative) goals. By contrast, mastery orientations centre on the perception of the learner of an association between the effort and the outcome of a cognitive task, with individuals with mastery orientations demonstrating persistence in order to reach understanding and develop new skills (Ames, 1992).

A growing body of research has demonstrated an association between learner orientation, SRL and performance in cognitive tasks. For example, Pintrich and De Groot (1990) compared learners' self-regulation, learner orientation (termed 'intrinsic value') and academic performance. Results revealed that for seventh grade students (12-13 years old), intrinsic value was not directly related to performance but was related to self-regulation (which was a predictor of performance). Such evidence suggests a close association between orientation, self-regulation and performance. More recently, Grant and Dweck (2003) considered different forms of performance goals, finding that ability-linked goals (seeking to demonstrate one's abilities), normative goals (seeking to perform better than others) and outcome goals (seeking to achieve a good grade) were distinguishable in terms of their influence upon student behaviour (in comparison with mastery-goals, termed 'learning goals'). The researchers found that as expected, there was an association between learning goals and both motivation and achievement. Moreover, there was a negative association between ability-linked goals and both motivation and performance, but no association between normative goals and either motivation or performance on tasks. Evidence suggests, therefore, that learners' perceptions and goals for learning are inherently related to engagement and self-regulation and performance in tasks, with achievement goals being multi-faceted.

Investigating the motivational and affective elements of the learning process compels examination of ways that affective elements interplay with learning and metacognition (Paris & Oka, 1986; Pintrich & De Groot, 1990). The brief review of the relationship between metacognition, SRL and learning orientations highlights the extent that these constructs are inextricably related across psychological and education literatures. Thus, in the present study, metacognition is considered as one component of wider SRL and inherently related to learning orientation.

2.5.1.2 Metacognition and Learning to Learn

Given metacognition's focus on the processes related to 'cognition about cognition, this can be contrasted to broader conceptualisations of 'learning to learn' (Ritchhart et al., 2009; see Figure 2.4). According to the European Commission's report on key skills for lifelong learning, learning to learn (L2L) is defined as "the ability to pursue and persist in learning, to organise one's own learning, including through effective management of time and information, both individually and in groups" (European Commission, 2006, p8). The term L2L is commonly associated with metacognition in educational research and has been defined as a family of processes relating to the advancement of learning (Higgins et al., 2007). At its core, learning to learn captures approaches that bring the cognitive process to the awareness of learners and/or encourage learners to themselves engage with the learning process by planning, describing and evaluating (Higgins et al., 2004). As such L2L is "a process of discovery about learning" (Baumfield, Hall, Higgins & Wall, 2009, p425). Clearly then, there are close associations between metacognition and L2L, with both entailing an awareness of, as well as regulation over, aspects of the cognitive processes of thinking and learning. However, the conflation between L2L and 'thinking about thinking' has also been subject to criticism, for example, "although learning broadly construed is clearly central as a product of metacognition, we assert that metacognitive awareness must first and foremost be centered on thinking" (Ritchhart et al., 2009, p5, underline in original).

2.5.2 *Wider Contextualisation*

2.5.2.1 Metacognition, Executive Functioning and Theory of Mind

Executive Functioning (EF) describes the "cognitive system that control and manages other cognitive processes, including flexibility of thought, planning, inhibition and co-ordination and integration of information" (Drayton, Turley-Ames, & Guajardo, 2011, p534). Rather than being a unitary construct, EF describes a suite of processes associated with frontal lobe functioning (Stuss & Alexander, 2000). Clearly, there are similarities between EF and metacognition, with both viewed as playing a role in the control of everyday tasks (Fernandez-Duque, Baird & Posner, 2000). Working memory is critical for SRL as it supports goals being actively represented (i.e., supporting attention towards the goals, Hoffman, Schmeichel & Baddeley, 2012). The specific EF of set-shifting is also inherently related to metacognition, by supporting the flexible shift of strategies or processes to achieve goals, or to change the goals themselves (Hoffman et al., 2012). The relationship between EF and metacognition is clearly complex, with some arguing that restrictions in young children's observed metacognitive skills may in fact be due to limitations in their EF (Lyons & Ghetti, 2013; Roebers, 2014). Moreover, in reviewing research literature associating metacognition and EF, Roebers (2014) argues that the ability to form 'meta-representations' is a critical feature of both EF and metacognition, therefore suggesting that theory of mind may also be an incorporated feature.

Theory of Mind (ToM) is defined as knowledge of minds, including contents of the mind, such as what people believe or desire (Premack & Woodruff, 1978). Children are thought to develop ToM between the ages of four and five years old (Astington, 1998). ToM is often measured through false belief tasks, which measure an individual's ability to understand that beliefs can be false (Milailidi, 2010). The relationship between metacognition and ToM has also been the matter of some debate in the psychological field. It has been argued that ToM is an overarching skill that supersedes metacognition. This 'Theory of Minds' approach understands metacognition and ToM as being components of a 'meta-knowing' framework (Kuhn, 1999b, 2000), with meta-knowing being defined as any cognition that has cognition itself as the object (Kuhn, 2000). Such a view sees both ToM and metacognition as being dependent upon the development of meta-representations (representations about representations, such as of one's own mind or the minds of others, Feurer, Sassu, Cimeli & Roebers, 2015). As such, it is widely believed that ToM is a precursor to metacognition (Schneider, 2008; Veenman et al., 2006). Clearly, therefore, this brief review highlights the extent to which metacognition is associated with other key ideas of developmental psychology such as executive functions and theory of mind.

2.5.2.2 Metacognition and Clinical Psychology

This thesis explores metacognition as a cognitive construct in the educational domain, however it is important to situate this investigation within the wider context of research throughout educational and psychological fields. For instance, a considerable body of literature has investigated metacognition in the field of clinical psychology, with a strand of research exploring metacognitive therapy for patients experiencing mental health conditions such as depression and generalised anxiety disorder (for example, see Teasdale, 1999; Wells & King, 2006). Whilst investigation of metacognition in the clinical domain is beyond the scope of this study, it is relevant to acknowledge that this is a field which would benefit from further research in relation to education and childhood, such as for children who have experienced adverse childhood experiences such as abuse or neglect. Leonhardt, Hamm, Belanger and Lysaker (2015) investigated the relationship between metacognition and emotional distress in schizophrenic patients that had experienced childhood sexual abuse. The authors found that metacognitive knowledge was positively correlated with increased emotional distress for individuals who had experienced childhood sexual abuse, with no association being present for those with an absence of abuse. This finding raises important questions regarding the associations between metacognition in the cognitive domain (in which research consistently demonstrates positive associations between metacognition and academic performance; see Section 2.1), and metacognition in the clinical domain, which suggests the potential for increased metacognition to have adverse effects on emotions. Whilst full investigation of this relationship is beyond the scope of the present study, it does suggest important avenues for further investigation; for example, by tracking the associations between cognitive and clinical metacognition, whilst considering the divergent assessment scales commonly adopted.

2.5.2.3 Metacognition, Demographic Characteristics and Individual Differences

In the cognitive domain, metacognition has been investigated in relation to individual differences, socio-demographic factors as well as family characteristics. For instance, whist some evidence has suggested no significant correlation between big five personality constructs (extraversion, openness, conscientiousness, agreeableness, and emotional stability) and metacognitive control (Washburn, Smith & Taglialatela, 2005), Batteson, Tormey and Ritchie (2014) conversely found strong overlaps between metacognition and conscientiousness through Factor Analysis. Research has also demonstrated gender differences in metacognition, with females demonstrating more planning, monitoring of performance and strategy use than males (Zimermann & Martinez-Pons, 1990; Bidjerano, 2005). At a wider level, Akyola Sungurb and Tekkaya (2010) found that several family characteristics associated with SES were positively correlated with metacognition in thirteen-year-old students, including parental education as well as number of books and newspapers in the home environment. Moreover, Le, Park and Ginsburg (2016) found that early years students from middle-SES families demonstrated more advanced mathematics strategy use when compared to families from a low-SES background. Thus, whilst full consideration of the interplay between these multiple social, emotional and individual differences is beyond the scope of this study, it is clearly important to keep these factors in mind when interpreting the findings of this (and indeed, any) research study in the field of metacognition research.

2.5.3 *Summary*

In sum, the description of prominent metacognition theories highlights the complexity of metacognition as a construct, making its boundaries difficult to define. Comparing metacognition to other psychological concepts suggests that metacognition is distinct from, but highly related to, both executive functioning and ToM. In this thesis, I acknowledge the relationship and the fact that there is overlap and an interesting discussion to be had about the theoretical links, but full consideration of the complexities of the relationships between these constructs is beyond the scope of this research.

Given the inter-disciplinary nature of the present subject-matter, it is important to consider how metacognition is situated within psychological and educational fields. In the present thesis, I largely attempt to focus on investigation of metacognition (as thinking about and managing one's own thinking) in particular (rather than the interplay between cognition, metacognition and motivation, or a focus on learner orientation). Given the particularly clear associations between metacognition, SRL and L2L, much previous research drawn on in this study explores processes wider than metacognition. Indeed, developing understanding of metacognition in applied educational contexts entails (to an extent) an embrace of the 'fuzziness' of metacognition (Wall & Hall, 2016) whilst maintaining awareness of the debates surrounding metacognition. As such, whilst this thesis will explicitly focus on metacognition as 'thinking about and managing one's own thinking', a degree of flexibility in terminology is adopted (with the extent that it is possible to focus solely on metacognition being an interesting point of consideration that will be discussed throughout).

2.6 Promoting Metacognition in the Classroom

"Psychology is a science but teaching is an art" (James, 1899, p7)

Previously, I have described a vast array of research suggesting the educational benefits of metacognition, as well as growing evidence suggesting that metacognition can indeed be promoted from the early primary school years. A clear consideration, then, is how to promote metacognition in the educational setting. The following section provides an overview of literature relating to the promotion of metacognition in primary school education. Following this initial review of the literature, this thesis will describe three research projects conducted with Scottish primary school students and teachers. In doing so, the discussion surrounding the facilitation of metacognition is continued throughout Chapters 4 through to 6. To avoid repetition, the current review focuses on a broad overview of insights, with further discussion of specific issues embedded throughout data chapters. As such, it is pertinent to note the aspects of pedagogy in relation to metacognition that are *not* considered in great detail in the following review, but are instead considered at a later point:

- Teacher talk and metacognition (Chapter 4)
- Structured Thinking Activities, e.g., learning logs or learning portfolios (Chapter 5)
- Teacher perspectives about metacognition (Chapter 6)

2.6.1 *Programmes to improve student metacognition*

Several approaches are used in classrooms to encourage students to develop awareness and control of their own thinking and learning. Such approaches include pedagogical practices embedded throughout everyday classroom activities as well as more structured approaches, often under the broad headings of thinking skills and learning to learn (e.g., Baumfield, 2006; Higgins et al., 2007). In their review of 'thinking skills' programmes throughout formal schooling, Higgins et al. (2004) identified seventeen specific programmes used in classrooms Furthermore, review of professional enquiry approaches used in English schools identified a diverse range of approaches to encourage thinking skills, under the '5 Rs' of Resilience, Readiness, Reflectiveness, Resourcefulness and Remembering (Higgins et al., 2007).

As highlighted by Higgins et al. (2007), some of the most prominent approaches used in British schools include Cognitive Acceleration through Science Education (CASE, Adey & Shayer 1990), Instrumental Enrichment (Feurstein, Rand, Hoffman & Miller, 1980) and Philosophy for Children (Lipman, Sharp & Oscanyan, 1980; Fisher, 2007). In addition to more structured activities, approaches are also embedded (or 'infused') throughout everyday lessons, though discussion, questioning and modelling thinking (Baumfield, 2006; Wall & Hall, 2016). Table 2.7 provides a brief overview of the content of prominent educational initiatives and programmes, with particular focus on those that are available in Britain.

Table 2.7. Instructional programmes associated with metacognition.
Summaries of educational programmes that are associated with the development of thinking skills and metacogntion. As the table shows, programmes include several different pedagogical approaches, including direct instruction, scaffolding and Think Alouds.

Approach	Description	Reference(s)
CASE	Aims to develop students' formal operational thinking in relation to science. Based on several principles; (1) challenging tasks; (2) social learning; (3) metacognition (i.e., reflection on the learning process); (4) formal operational content (e.g., controlling variables).	Adey & Shayer (1990); Adey et al. (2002)
Instrumental Enrichment	Focuses on metacognition, encouraging students to independently employ higher level thinking through increasingly complex tasks. Systematic steps employed (gathering information, processing, providing a solution).	Feurstein, et al. (1991)
Philosophy for Children	Based on a 'community of enquiry' approach, with open-ended, philosophical questions. Key principles include reasoning and discussion, with teacher facilitation and 'Think-Alouds'.	Lipman, (1985); Fisher (2007)
Conceptual Change Learning	Involves introducing evidence to students that conflicts with their existing cognitive frameworks, introducing alternative solutions to students, and new frameworks based on scientific theory/rationale.	Driver (1988); Georghiades (2000)
Reciprocal teaching	Students take turns leading group discussions with teacher scaffolding. Based upon four aims of predicting, clarifying (monitoring, using strategies), questioning, and summarising.	Brown & Palincsar, (1982)
Cognitive apprentice-ship	Learners incorporate new information to change existing knowledge. Consists of teaching mental processing to solve cognitive tasks, scaffolding, and making the thinking process visible.	Collins et al. (1989)

2.6.2 *Encouraging metacognition*

Clearly, thinking, or thinking about thinking, does not occur in a vacuum, and so several situational, contextual and inter-personal aspects of the environment will influence metacognition, both in terms of the immediate situation, and upon wider development. Overall, research suggests the power of three aspects of the learning and teaching environment that are conducive for metacognition. These are the type of task, the type of instruction, and the type of environment (as shown in Figure 2.5). The following sections review each in turn.

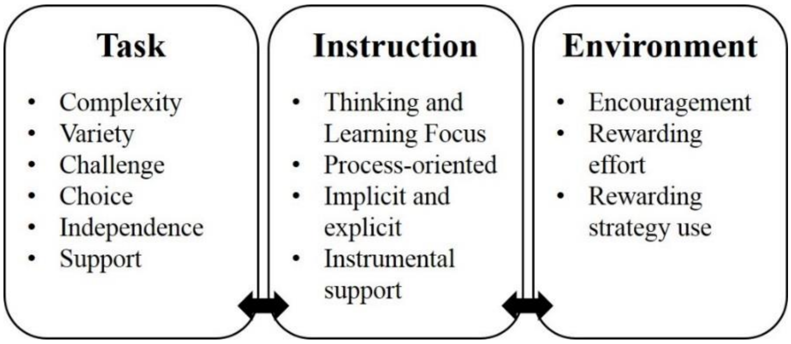

Figure 2.5. Literature relating to the promotion of metacognition.
As shown, much research has considered how best to promote metacognition, and literature can be broadly categorised as providing insight about the type of task, the type of instruction, as well as the environment.

2.6.2.1 Task

There have been clear findings relating to the influence of task upon students' developing metacognition. For instance, Robson (2016a, 2016b) explored the influence of the type of task that children are engaged with and their influences upon metacognition from the early years, finding that students exhibit more evidence of metacognition when tasks are child-initiated, and more evidence of metacognitive regulation (but not metacognitive knowledge) when the teacher was absent. Research also emphasises the importance of the content of tasks – particularly tasks being complex to elicit challenge (Perry, 1998; Perry et al., 2002), being varied to avoid boredom (Paris & Paris, 2001) and containing a mixture of structured and child-initiated tasks (Whitebread et al., 2005). Finally, evidence has highlighted the importance of tasks being designed to give a degree of control (or choice) to students, including control over strategies used, time, resources and the level of challenge (Perry, 1998; Perry et al., 2002; Whitebread et al., 2005).

At a more direct level, planning and evaluation have been identified as key components of task structure in relation to promoting metacognition. For instance, Dignath et al. (2008) found that metacognitive interventions that included planning strategies were associated with largest effects upon student performance. Student independence is a critical part of the planning identified in literature, with students being provided with the opportunity to set themselves goals and plan accordingly (Paris & Paris, 2001). In relation to evaluation, one such approach is to ask students to reflect on the aspect of the task that they found most challenging, or the 'muddiest point' (Tanner, 2012). Research suggests the critical nature of evaluation, as well as the content of evaluation. That is, evaluations should be embedded within the task, non-threatening, and mastery-oriented (Perry, 1998; Perry et al., 2002).

2.6.2.2 Instruction

Research in the field of metacognition has consistently highlighted the key importance of instruction, particularly in teachers adopting appropriate talk about thinking and learning (Robson, 2010; Hacker & Dunlosky, 2003) and providing instrumental support that provides just enough scaffolding for students to perform a task independently (Perry, 1998; Perry et al., 2002)[5]. Previous literature has also outlined the importance of explicit instruction about metacognition and how it can be used as a tool for learning. For example,

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[5] In describing what evidence suggests teachers *should* do to encourage metacognition, it is also critically important to consider teachers' *perspectives* about they should do to encourage metacognition. This will form a key component of the current project (Chapter 6). It is also pertinent to consider what teachers are *trained* to do. This was the focus of some pilot research, as outlined in Section 3.9.

explicit discussions about aspects of metacognition and the rationale for adopting a metacognitive approach to learning has been linked to students becoming more invested in metacognition (Veenman et al., 2006). In their meta-analysis of thinking skills initiatives, Higgins et al. (2004) found that initiatives were most successful when they were explicitly instructed, with a particular benefit of talk and discussion to make the thinking process explicit to students. Explicit instruction of thinking and learning is also a key component of Conceptual Change Learning (e.g., Georghiades, 2000).

Consistently, discussions about metacognitive strategies are highlighted as a key aspect of explicit approaches to facilitating student metacognition, including the description of strategies and their benefits, as well as when to use strategies (Dignath et al., 2008; Paris & Paris, 2001). Moreover, several intervention studies demonstrate the benefits of training students about when and how to use metacognitive strategies, such as summarising or identifying important information. For example, Özsoy and Ataman (2009) provided a 'Metacognitive Problem Solving Table' and directly instructed eleven-year-old students to use these steps when solving problems. Similarly, Kurtz and Borkowski (1987) provided information to students about strategies, such as the variability of strategies that can be used for given tasks, and the transferability of strategies. In their successful metacognitive intervention Zohar and Peled (2008) instructed learners about the 'what, when, why and how' of strategies, such as discussing when a particular strategy might be appropriate for a particular task.

In addition to the more explicit, structured forms of metacognitive instruction, research has consistently demonstrated the benefits of 'indirect' or implicit means of promoting metacognition[6]. For example, previous research has highlighted the vital role of teacher talk in encouraging students to explain and justify their own thinking (Mercer & Howe, 2012). Asking students about *how* thoughts are being generated *as* they are being generated is strongly evidenced to facilitate metacognition. These 'metacognitive probes' (Hacker & Dunlosky, 2003) include teachers using talk and questioning to prompt students to describe their thoughts and strategies, to justify their reasoning and verbalise their thinking process. For example, some of the questions posed by Fisher (1998) include "What kind of thinking did you do?", "What did you think about? Why?" and "How could you improve your thinking next time?" (p10). In asking students questions that cause them to think about and

[6] Importantly, 'explicit' does not necessary entail solely transmission of information from teacher to learner (Zohar & Peled, 2008). Explicit promotion encapsulates direct teaching of metacognitive components (including metacognitive strategies) as well as providing experiences for learners to themselves construct understanding (performed in a relatively more 'explicit' fashion compared to implicit methods).

verbalise their thought processes, teachers effectively cause students to ‘think aloud’, which is associated with enhanced metacognition (Jacobs, 2004). Indeed, the use of Think-Aloud Protocols and questioning to introduce the language of learning is associated with pedagogical approaches such as Philosophy for Children (as described in Table 2.7, see Fisher, 2007). Two terms are particularly relevant in terms of the implicit promotion of metacognition, namely: scaffolding, and modelling.

Scaffolding is a term often associated with Vygotsky, first coined by Bruner (1975) and elaborated upon by Wood, Bruner and Ross (1976). Scaffolding has been identified as a key technique for teachers, promoting the provision of appropriate support within students' Zone of Proximal Development (Vygotsky, 1978). Scaffolding is a process where the teacher alters the level of support in response to the student's ability at a given task. So, when a student performs proficiently, prompting is kept vague, and when problems occur, the prompting becomes increasingly specific until it is either understood by the student or demonstrated by the teacher (Wood et al., 1976). As described by Wood and Wood (1996), the role of the ‘scaffolder’, is to provide support where needed, without the learner becoming over-reliant on support, and thus, removing scaffolds (or ‘fading’) as the child learns (a style of teaching named ‘contingent instruction’ by Wood & Wood, 1996). This approach has the advantages of responding well to the needs of the student, and explicitly encouraging the teacher to provide as little assistance as necessary (thus promoting independence). Unfortunately, however, maintaining individual scaffolding can be extremely time-consuming for teachers, particularly for teachers with large classes.

Modelling is an established approach to uncovering mental processing in relation to a learning activity (Schraw, 1998). Modelling involves using talk to make the mental process visible (often through ‘thinking aloud’), and so, involves an aspect of ‘doing’ or action (Schunk, 1981). To model metacognition, the language of learning is made explicit to students by teachers, with the intention that students will themselves begin to use this language to describe their own learning (Fisher, 1998). The internal metacognitive process is made visible to students, providing an impetus for students to develop personal ownership of their own thinking and learning (Wall & Hall, 2016). Modelling has been associated with greater effects upon performance compared to direct instruction (Gorrell & Capron, 1988). Modelling and scaffolding are also key features of programmes to promote metacognition, such as cognitive apprenticeship and reciprocal teaching (Järvelä, 1996, see also, Table 2.7).

Some research has compared implicit and explicit promotion of metacognition. For example, Kistner et al. (2010) investigated the way that teachers promote students' self-regulation in relation to complex mathematical ideas, finding that teachers most commonly instructed cognitive strategies (compared to metacognitive or motivational). Teachers also most commonly instructed strategies in an implicit way (85% of the total strategy instructions were implicit). Importantly, however, explicit teaching of strategies was positively related to students' mathematics performance, whereas implicit strategy instruction was not associated with improved performance in understanding complex mathematical ideas. As such, it was found that in explicit instruction of learning strategies was most rare, but most useful. A key finding, therefore, is the diverse ways that metacognition can be promoted, including through implicit and explicit teaching practices (Schraw, 1998; Paris & Paris, 2001). As summarised by Kuhn (1999b), "Practice is essential, we know, but practice does not make perfect in the absence of understanding" (p281). In other words, learners must not only understand what, but they must also understand why. Overall, then, evidence suggests that both explicit and implicit forms of instruction are clearly critical in terms of developing the metacognitive capacities of learners.

2.6.2.3 Environment

The classroom environment is also clearly essential for facilitating metacognition, particularly due to the social nature of metacognition within the classroom. Early literature has discussed the importance of the classroom environment. For instance, stress, frustration, embarrassment and boredom have all been highlighted as leading to aversive attitudes towards learning (Mager, 1984). Conditions of the classroom environment associated with an aversive attitude include being inconsistent in the message about what is required by students, comparing students against each other, forcing students to reveal their lack of understanding publicly, or stunting enthusiasm by ending a task or not answering student questions (Schraw, 1998; Kistner et al., 2010; Robson, 2010). Ultimately, research suggests that an environment of opportunity is critical – opportunity to interact in relation to learning, to control the learning environment to a degree, and to participate (Black, Harrison, Lee, Marshall & Wiliam, 2004).

Rewards provided to students is evidenced to be a way of influencing the classroom environment. Some reward systems can be counter-intuitive to metacognition, for example by rewarding high performance rather than effort (Black & Wiliam, 1998). Research has suggested that rewards should be focused upon the behaviours that are the goal, for instance by rewarding effort and the use of strategies (Schraw, 1998). The importance of interactions in relation to praise and reward has continued to be an important component of the learning environment discussed in the field, with research highlighting the importance of encouragement to learners rather than praise for outputs (Whitebread et al., 2005). Such research draws associations between metacognition, self-regulation and learning orientations (as outlined in Section 2.5.1). Prominent classroom approaches, including Growth Mindsets and student-led learning, place explicit value upon affective attributes such as persistence, whilst also clearly valuing students' own perspectives about their thinking and learning. Such approaches can positively impact upon students' experiences with learning by making it clear that students' own perspectives are valued and equal to the teachers' perspectives, an aspect of the classroom that is supportive of metacognition (Schraw, 1998).

One of the reasons for the limited impact of interventions is that, by their nature, they typically do not take into account the rich social processes and unique contextual influences of classrooms. Dart and colleagues (1999) found a relationship between classroom environment and learning, with environments that were personalised and facilitative of participation being associated with deeper learning (Dart et al., 1999). Indeed, interventions are not only implemented, they are *enacted* (Ritchhart & Perkins, 2005). By contrast, however, in exploring the learning environment, Kistner et al. (2010) found that cooperation, constructivism, self-direction and transfer aspects of the environment were very low – suggesting that supportive aspects of the classroom environment were limited. When seeking to promote metacognition, therefore, evidence points towards the critical importance of taking into account social processes of the learning environment, such as the classroom culture.

2.6.3 *Summary*

The present separation into task, instruction and environment is not intended to signify a distinction between each influence on metacognition, but rather to highlight three prominent areas of research. As such, it is important to note the interactions between task, instruction and environment in promoting metacognition. For example, Robson (2012) described features of the classroom that are important for metacognitive development, highlighting task, interaction and environmental influences. The extent that aspects combine to promote metacognition is highlighted in the meta-analysis of John Hattie and colleagues (1996), who found that successful interventions included several key characteristics: instruction of strategies (including what, when and why), an environment supportive of a metacognitive approach, support to transfer strategies between learning contexts, and opportunities for learners to engage in metacognitive activities (including evaluation of learning). In sum, research suggests that metacognition can be facilitated by explicitly training students about strategies, emphasising the process of thinking and learning, as well as embedding opportunities for metacognition throughout everyday tasks within a supportive environment.

2.7 Summary and Gaps

The purpose of the preceding literature review was, rather than providing answers, instead to "develop sharper and more insightful *questions* about the topic" (Yin, 1994, p9). An underpinning principle throughout this thesis is the importance of understanding metacognition throughout the learning process in situated educational contexts. As outlined in the literature review, cognitive experimental research has contributed to understanding by providing a fine-grained examination of the accuracy and sophistication of monitoring and control processes. Whilst theories have developed to include more comprehensive accounts of metacognitive knowledge and regulation throughout the learning process (using numerous diverse research methods), a resulting implication is a distinct lack of 'conceptual merging' (Azevedo, 2009). Thus, the variety of measures used in the study of metacognition and the multiplicity of operational definitions create barriers to understanding the nature of metacognition, particularly in relation to learning tasks in the classroom environment. To progress research in this field, and indeed, to effectively promote deep, reflective thinking in education, it is imperative to consider the many ways in which metacognition can be conceptualised, and the ways that metacognition transpires in the learning environment.

It is important to acknowledge that the field of metacognition research is so vast that it is impossible to do full justice to the field in such a short review. However, what has been covered highlights the sheer breadth of the research area and the difficulties this creates for understanding metacognition within the educational context. This raises several key questions: What does metacognition look like in classroom (particularly in the middle primary school years, in which literature suggests is a critical time for metacognition)? Relatedly, how do teachers facilitate metacognition in the classroom? Ultimately, what is the impact of metacognition in classrooms? These are key questions that this thesis aims to consider, as detailed below.

2.7.1 *What does metacognition look like in classroom?*

Clearly, there has been much debate throughout the field regarding definitions of metacognition. Resulting from the numerous theoretical approaches, metacognition has been criticised as being a 'many-headed monster' (Beran et al., 2012, p3). Even more applicable now than when stated by Kuhn (2000): "metacognition is […] "about" more than it was in 1979" (p180). Laboratory studies have been valuable in identifying the existence of metacognition, both behaviourally (Flavell et al., 1970) and more recently, and neurally (Skavhaug et al., 2010, 2013). Even so, it has been acknowledged that cognitive measures of metacognition "do not necessarily mirror children's everyday life" (Roebers, 2014, p880). There is therefore, an increasing focus upon the need to investigate how learners think about and manage their own thinking "in real contexts and real time, in events rather than as aptitudes" (Perry et al., 2002, p1).

For the purpose of the current thesis, the analysis of metacognitive theory provides a clear context for the work presented in Chapters 4 – 6. Whilst there are evident differences in theoretical accounts of metacognition detailed in Section 2.2, there are also key similarities between existing constructs. That is, models generally differentiate between a function of knowledge (as thinking about thinking) and regulation (as managing thinking). Thus, metacognition is broadly understood at present to encompass both knowledge and regulation of one's own cognition. Metacognitive knowledge encompasses all the knowledge an individual brings to a cognitive task, including knowledge about oneself, knowledge about the task at hand, and knowledge about the 'what, when, why and how' of strategies (Flavell, 1979; Brown, 1987; Schraw & Moshman, 1995). Metacognitive regulation (also termed metacognitive skills) encompass the acts taken to control one's own cognition, including "activities such as orientation/monitoring the comprehension of task requirements, planning the steps to be taken for task processing, checking and regulating cognitive processing when it fails, and evaluating the outcome of processing" (Efklides, 2006, p5).

Critically, rather than seeking to continue to define and measure a definitive set of *correct* sub-components, the present research study is guided by a view of the fundamental importance of developing understandings that account for how metacognition can be characterised in practice (i.e., throughout tasks in the classroom setting). As such, whilst the present research is guided by psychological theories as outlined above, the explicit intention is to maintain ‘grounded’ in practice. Therefore, rather than attempting to quantify or compare metacognition in different contexts or with other skills (which has been the subject of several of the studies described in the preceding literature review), the focus in the present research project is to illuminate what metacognition looks like in everyday classroom tasks. As will be discussed more in Chapter 3, a qualitative approach to the study of metacognition is appropriate given the intricate ways that metacognition is bound within the learning environment of the classroom (Butler, 2002).

This thesis focuses on investigating metacognition in the middle primary school years (primary three to five; seven to ten years old). The primary school years are a critical time to develop key skills that learners can take forward into future education and beyond: “Early investments are productive because early skills promote the development of later skills and, through dynamic complementarity, make later investments more productive.” (Kautz, Heckman, Diris, Ter Weel & Borghans, 2014, p49). As described in Section 2.4, the primary school years have been highlighted as a critical time for the development of metacognition (Roebers, 2014). Moreover, it is widely agreed that students’ abilities to think about and manage their own thinking are most often developed sufficiently to be observed by the age of eight (e.g., Veenman et al., 2004), with more recent evidence suggesting emergence of metacognition from as early as three to five years old (Whitebread et al., 2009; Roebers, 2014; Gascoine et al., 2017). As detailed in Chapter 3, pilot research conducted throughout the primary school years provided further rationale for focusing the research described in this thesis on the middle primary school years. The middle primary school years are, therefore, deemed an appropriate focus for this research study, providing a characterisation of metacognition in the primary school classroom.

2.7.2 *How do teachers facilitate metacognition in the classroom?*

A critical consideration in understanding both the development and the promotion of metacognition, is the extent to which metacognition is considered to be a disposition that individuals develop, or a skills that can be promoted (Kuhn, 1999b). The research presented in the present review has suggested that rather than being a developmental milestone, metacognition increases in complexity throughout childhood and into adulthood, with the developmental progression being influenced by factors within the child’s learning environment. It is, therefore, critical to investigate the influence of the teacher within the classroom in relation to the metacognitive process, including the tasks and interactions that take place in classrooms.

Despite the stated value of metacognitive approaches within the classroom, there exists a large gap in the research literature. That is, approaches typically seek to change teacher practice by developing structured interventions that are researched with the view of 'giving' these approaches to teachers. By contrast, however, very few studies have investigated the ways that teachers encourage students to think about and manage their thinking throughout everyday classroom tasks. As a result, less is known about the promotion of metacognition in the dynamic environment of the classroom (Järvelä, 1996). Indeed, despite the clear presence of educational approaches relating to metacognition, evidence suggests that these approaches have also lacked traction in classrooms (Perry et al., 2018). The rich context-dependent nature of one classroom to the next means that it cannot be assumed that specific interventions will produce metacognitive improvements in all students, across all contexts. As this review makes clear, then, there is a significant gap in understanding about the 'impact' of research upon practice.

Given the complex social nature of classrooms, then, an additional benefit of examining specific instances of metacognition in everyday tasks is enhanced understanding of the role that teachers play in facilitating metacognition. Therefore, in addition to investigating the impact of research in the classroom, this project also aims to develop insights for practice, by investigating teachers' perspectives of metacognition, as well as by investigating the role of teachers in facilitating students' developing metacognition.

2.7.3 *What is the impact of metacognition?*

Ultimately, this research project aims to investigate the translation of metacognition research into the classroom environment. Such an aim entails examining the characterisation of metacognition in the classroom, as well as the practices and perspectives of teachers. Whilst the skills that are underpinned by metacognition are clearly valued within the educational setting, metacognition itself is rarely an explicit component of educational curriculum (see Section 1.2 of Chapter 1). As such, less attention has been paid to metacognitive practices in the primary school setting compared to specific approaches in key curriculum areas such as literacy or numeracy (Perry et al., 2018). Unfortunately, given the lack of prominence of metacognition in educational curriculum, little is known about the impact of metacognition in the classroom setting. Indeed, deeper questions exist, for instance about how psychological paradigms that underpin metacognition theory actually relate to how children think about and manage their own thinking in classrooms (and how teachers facilitate it). Given the prominence of academic research supporting the value of metacognition, but the minimal focus on skills for learning in the wider policy context, the present study explores how ideas about metacognition relate to the ways students are encouraged to think about and manage their thinking throughout the learning process in the classroom.

2.8 Thesis Overview: Aims and Research Questions

To summarise, the overarching aim of this thesis is to explore the ‘impact’ of metacognition in Scottish primary school classrooms. Such an aim entails characterising metacognition in the classroom in relation to psychological theory. Given this aim, the approach taken in the present thesis is to employ qualitative methods (observation and interviews) with both teachers and students, gauging metacognition throughout ‘everyday’ classroom tasks (i.e., without researcher intervention).

Research Questions:

1. How do children think about and manage their own thinking primary school classrooms, and what roles do teachers play in this process? That is, how can metacognition be characterised throughout (a) everyday classroom tasks, and (b) specific ‘metacognitive’ tasks (Structured Thinking Activities, or STAs)?
2. What are teachers’ perspectives about metacognition in the primary school classroom? That is, what knowledge and beliefs do teachers hold about the metacognition?

This thesis describes three studies that were conducted to explore dimensions of the research questions. For clarity, a brief summary of each chapter is provided below.

Chapter 4 describes a classroom-based observational study that sought to characterise metacognition throughout everyday classroom tasks in four Scottish classrooms. The initial focus of this observational study was on characterising instances of student metacognition throughout the learning process. As data collection progressed, however, examination also turned to the role of the teacher throughout the learning process. As such, Chapter 4 explores metacognition in the classroom by examining student metacognition, as well as the role of teacher talk in relation to classroom metacognition.

Chapter 5 describes an observational study that aimed to explore the role of activities intended to promote metacognition in classrooms, referred to as Structured Thinking

Activities (STAs). This study aimed to provide a detailed and specific account of the role of STAs within the classroom, by conducting a case study of one classroom throughout an academic year. A focus on two students (Laura and Amy) promoted the use of 'thick' descriptions of student metacognition through STAs, as well as considering aspects of the classroom environment that were facilitative of, or acted as barriers to, metacognition throughout STAs.

Chapter 6 builds on findings from Chapters 4 and 5 that highlighted the fundamental role of class teachers in supporting children's metacognition throughout classroom tasks. Given the key role of class teachers, Chapter 6 aimed to explore teachers' perspectives of metacognition, including their knowledge and beliefs of metacognition as a construct, and the factors perceived by teachers to promote and/or inhibit their practices relating to metacognition.

As evident in the study descriptions, this classroom-based research project explored both student metacognition as well as the role of teachers throughout everyday classroom tasks and during STAs. As will become clear, this structure was appropriate given the inter-connectedness between students and teacher. To facilitate focused discussion, however, Chapters 4 and 5 are each divided into sections exploring students and teachers in turn.

Summary point 1: Metacognition has been identified as beneficial for academic success, supported through the findings of several meta- and meta-meta-analyses.

Summary point 2: There exist several similar yet distinct models of metacognition, with definitions and insights about development being bound by the measurement employed.

Summary point 3: All existing accounts of metacognition differentiate between come sort of knowledge of cognition and some form of regulation of cognition.

Summary point 4: Several initiatives and interventions have been developed to enhance student metacognition, with diverse insights about teachers' roles in relation to tasks, interaction and classroom environment.

Summary point 5: The diversity of definition, measurement and intervention has resulted in a high degree of 'conceptual fuzziness' and questions around the 'impact' of metacognition in education.

Summary point 6: The goal of the present thesis is to explore the impact of metacognition in classrooms, by characterising metacognition and teachers' roles in supporting metacognition, as well as exploring teachers' perspectives about metacognition.

Chapter 3: Methodology

This project was interpretive in design, with analysis drawing on insights from psychological theory whilst being firmly grounded in practice. Such an original approach is powerful in bridging education and psychology fields, seeking to provide insights about the application of psychology theory in practice by exploring the characterisation as well as the promotion of metacognition in primary school classroom settings. The methodological approach adopted in the present study was underpinned by my belief that a key way of achieving 'impact' in relation to metacognition is to combine insights from classroom-based qualitative designs with findings produced by traditional cognitive paradigms, a powerful approach for illuminating what metacognition does and can look like in the classroom.

In this research project, qualitative research methods [7] are used to explore the characterisation and promotion of metacognition in the classroom environment. Qualitative methodologies provide a detailed examination of metacognition within the naturalistic setting (Miles, Huberman & SaldaNa, 2014). A qualitative approach is appropriate to ask "what, how, why and when" questions" (Patrick & Middleton, 2002, p30), particularly when there are difficulties isolating a phenomenon from its context (Yin, 1994). Unlike experimental paradigms or structured checklists, qualitative methodologies allow flexibility, which is important for understanding and challenging ideas (Adler & Adler, 1998). Indeed, contextualising cognitive research with qualitative approaches is important for developing understanding about the external factors that might influence, disrupt, or distract from student metacognition in classrooms, capturing 'nuance' that may not be present in experimental research (Roebers, 2014).

The present study sought to gather data from several sources, using multiple interconnected methods (Denzin & Lincoln, 1998; Yin, 1994). The use of multiple related methods has been identified as valuable for investigating issues from multiple perspectives

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[7] It is pertinent to briefly note that whilst the term 'qualitative research' is adopted throughout this thesis, may be argued that this description does not adequately harness the rich, interpretive nature of the data obtained. Indeed, as evidenced in the review of research methods in Chapter 3, there is a clear distinction between data collection method and analytic approach, with qualitative data commonly being analysed in a top-down, ultimately quantitative manner (for example, see Whitebread et al., 2009). Thus, as explored in more detail in Section 3.5, it is important to highlight that the present research is interpretive in design, utilising a range of qualitative research methods.

as “Reliance on any one method implies that researchers will continue viewing the constructs of interest from the same angle” (Patrick & Middleton, 2002, p28). Indeed, triangulation from multiple sources provides broader insight than single methods, and enhances rigour (Robson, 2011; Fontana & Frey, 1998). Moreover, the collection of multiple sources of data was fundamental to support immersion in the research site and thus, achieve a contextualised understanding of metacognition in the classroom (Hammersley, 2006; Robson, 2011). The use of multiple methods is particularly important given the particular difficulties in ‘seeing’ metacognitive knowledge (Efklides, 2006). Therefore, the inclusion of observations and interviews as main sources of data collection facilitated consideration of both metacognitive knowledge and skills in the classroom.

Case studies are a broad and flexible tool, particularly beneficial for exploratory research questions focused on a particular phenomenon, and when aligned with the collection of multiple sources of evidence (Yin, 2009; Robson, 2011). The project reported in this thesis did not constitute a case study *per se*, however elements of case study design were present. That is, the focus within the classroom-based research studies was upon schools based in one LA (with more detail on the rationale for this decision provided in Section 3.3). Moreover, Study 5 adopted techniques more closely aligned with case studies: namely, the focus of investigation within one setting (in this case, one classroom), with attention focusing on specific individuals in the setting in relation to a phenomenon or idea of interest (Yin, 2009). Whilst case study designs are at risk of critiques about limited representativeness and thus generalisability (as discussed in Section 3.6, the decision to focus investigation within one school in Chapter 5 was a result of the iterative design of the overall project. That is, the findings of Chapter 4 suggesting that a more focused investigation of the interactions between specific students and their teacher would provide more insight about the metacognitive process in primary schools.

Classroom observations were conducted across two studies, seeking to use illustrative examples to characterise metacognition in classrooms. To this end, I draw on principles from ethnography to investigate metacognition ‘first-hand’ in the applied setting (Hammersley, 2006). Insights from ethnography are appropriate given the goals of *describing* and *understanding*, drawing specifically on the notion of ‘thick description’, locating action within context to establish deeper meaning (Geertz, 1973). Such an approach is particularly useful for describing metacognition from the perspectives of participants from inside (Robson, 2011, p143). Miles et al. (2014, p11) term data that are of close proximity to the specific context observed “local groundedness”, a principle that underlies the observational approach adopted here.

Whilst principles from ethnography underlie the observational approach adopted in both observational studies (with more detail provided in Section 3.4.1), the more extended, contextualised focus of the investigation of STAs in Chapter 5 is particularly suited to the traditional ethnographic approach (Robson, 2011). What sets ethnography apart from other forms of observation, is the goal of providing detailed ‘thick descriptions’ in naturally occurring settings (Robson, 2011; Hammersley, 2018). A key point to note in relation to the approach adopted presently is that in observational research drawing on ethnography, as well as the researcher seeking to understand the setting ‘from within’; there is also a clear role of construction in analysis: “what we call our data are really our own constructions of other people’s constructions of what they and their compatriots are up to” (Geertz, 1973, p9). As such, those adopting ethnographic observations must be critically aware of their role in the process of data collection as well as analysis (see Section 3.7 for my own critical reflection).

Due to their rich, descriptive nature, findings are presented with the intention that they can serve as a reflective lens to both researchers and practitioners, who themselves can interpret or find meaning in the findings due to their unique perspectives (Altheide & Johnson, 1998; Butler, 2002). Providing in-depth examples can therefore be one method of achieving ‘impact’, enabling teachers to identify aspects of the research that relate to their classrooms and suggest ways that the concept of metacognition might be encouraged in practice (Pring, 2000b).

3.1 Theoretical Perspectives

The inter-disciplinary nature of the present project means that the role and nature of theory is of interest. Metacognition has been a focus of research in education research, as well as developmental and educational psychology. Education and psychology are both diverse disciplines spanning broad subject areas. Whilst the inter-relations between these two fields is intuitive, their connectedness is not always apparent, with each drawing on several distinct theoretical approaches and a diverse suite of methods (Heberlein, 1988). It is therefore important to provide a broad overview of the overarching theoretical principles that have guided the questions asked and the analysis conducted in this thesis. Thus, in the following section, I summarise the particular influences of cognitive theory and social constructivist theories on this project, reflecting the theoretical roots of insights about metacognition (Järvelä, 1996).

This project began from a developmental and cognitive psychological perspective. That is, psychological research has indeed been highly influential in developing cognitive models of metacognition, describing the processes that occur at the 'micro-level' (as described in Chapter 2). Cognitive psychology therefore, plays a clearly influential role in this project; in critical review, in the development of research questions, and in forming methods of analysis. Key aspects of constructivist theory also permeate this project, particularly sociocultural theory, which focuses on the critical social influences upon learning (for example between novice and expert), placing emphasis on the context, both historically and culturally (Packer & Goicoechea, 2000). In particular, the present thesis draws on the work of Vygotsky (1978) who emphasised the constructive nature of learning through interaction with more experienced others. Indeed, sociocultural theory is predominant throughout metacognitive literature, particularly in more situated research and in the exploration of the practical applications of metacognition research in the applied setting (Järvelä, 1996). Thus, as will be described throughout, this thesis draws on ideas from both cognitive theory (through identification of indicators of metacognition) and sociocultural theory (particularly the roles of interaction and dialogue).

Given these two distinct yet connected fields of study, it is important to consider more widely, the nature of understanding within the context of the present research. In the traditional sense, the generation of a theory is understood in terms of establishing 'truth'. This notion is embedded with a positivist worldview, which posits that there is a "reality out there", with the aim of research being to capture this reality through experimentation (Denzin & Lincoln, 1998, p8). Such a view is associated with ideas of objectivity and reality – to the measurement of variables, to control groups, and to statistical analyses. Theories that emphasise the constructive nature of reality in many ways contrast the positivistic (otherwise termed realist or essentialist) worldview. That is, constructivist views of learning acknowledge the importance of interactions between social actors (Braun & Clarke, 2006). With such a view, "our knowledge is a 'construction', reflecting the world, not as independent of our deliberations, but as something constructed by them" (Pring, 2000b, p44-45). One direct implication of such differences is upon understandings about how metacognition should be viewed, with positivistic approaches (such as cognitive paradigms) promoting a measurement of metacognitive indicators, and more social constructivist stances seeking to understand how metacognition is constructed in contexts such as the classroom.

In an inter-disciplinary project, such diverging theoretical perspectives are difficult to negotiate. However, Pring (2000a) argues that this is perhaps exacerbated by a 'false-dualism' between paradigms, between qualitative and quantitative research, between the natural sciences and social sciences, and (I would argue, generally), between psychology and education. That is, acknowledging that meaning can be constructed (and therefore, that researchers play a role in the constructive process of understanding in research) does not deny that certain external realities do exist: "one is forced to acknowledge 'reality' as something not entirely 'created' or 'constructed' or 'negotiated', but constraining and limiting – something which *is* independent of us, which shapes the standards of what we can *justifiably* say, and which restricts the conclusions that can be *correctly* drawn from the evidence given" (Pring, 2000b, p50, emphasis in original).

What are the implications, then for the development of theory? Thomas (2010) argues that given the complex nature of the social world, it is not appropriate to consider wide-scale generalisations (induction), such as those associated with transferrable insights about causal relationships, but rather to seek *abduction*, inferences that can be made from everyday generalisation. Thomas (2010) describes the appropriateness of abduction for providing "ways of analyzing complexity that may not provide watertight guarantees of success in providing for explanation or predication but are unpretentious in their assumptions of fallibility and provisionality" (p577). Abduction is associated with the development of different insights, practical 'everyday' theory that is linked closely to practice (Thomas, 2010). Thus, rather than creating wide-scale generalisable findings, the present intention is to build everyday theory that aligns closely with the research context whilst being guided by (to a large degree) existing concepts.

Having outlined the theoretical paradigms that underpin this project, I will now turn to consider how theory is incorporated into the research process in this thesis. Some qualitative researchers have argued against the use of fixed concepts in qualitative research. For example, Blumer (1954) argued that 'definitive' concepts, aligned with quantitative research, tend to become fixed and associated with specific 'indicators', acting restrictively on the understanding produced about the social world. As Bryman (2012) elaborates, such a view sees the use of concepts as leading to a focus upon the commonalities of phenomena in relation to indicators, rather than the embracing of variety and nuance. Rather, Blumer (1954) promotes the use of “sensitizing concepts” (p7) as an approach that provides a general direction for enquiry whilst allowing for the uncovering of variety and complexity. In relation to the specific role of theory in this study, then, it is important to reiterate that psychological concepts did of course play a prominent role throughout planning, data collection and analysis, however the use of metacognition theory acted as a guide (a ‘sensitising concept’) rather than a fixed ‘definitive’ concept (Blumer, 1954).

In sum, the research methods and questions presented in this thesis stem heavily from cognitive psychological theory. In particular, I aim to understand metacognition by developing understanding of the aspects of metacognition identified in psychological theory (e.g., Flavell, 1979, Shraw & Moshman, 1995; Nelson, 1996; Eflkides, 1996). However, my research challenges the view that metacognition is a uniform construct that can be experimentally modelled and manipulated. Instead, I see metacognition as something that is by its nature, connected to tasks within the learning environment of the classroom, and therefore, embedded within the social environment of the classroom and the interactions that take place therein (Vygotsky, 1978; Packer & Goicoechea, 2000). As such, the present project is clearly guided by existing theory, but I also aim to build theory based on the research findings presented in this thesis. The theory that I aim to build can best be understood as everyday generalisations, or ‘abduction’, rather than overarching accounts that seek to explain the world (Thomas, 2010).

3.2 Thesis Structure

It is important to note here that the thesis structure is reflective of the research process – both in terms of chronological time, and in terms of the iterative development of insights about metacognition in primary school classrooms. Each study was undertaken with an overall aim of exploring the metacognitive process within the applied classroom setting – with each study being informed by the insights produced from preceding studies. To clarify this process, Figure 3.1 provides a diagrammatic representation of the timeline of this project, detailing the iterative flow of empirical studies conducted throughout this PhD project. In addition, each empirical chapter (Chapters 4-6) begins with a short ‘where are we now?’ introductory section that describes the rationale for each study in relation to preceding chapters as well as the overall study aims.

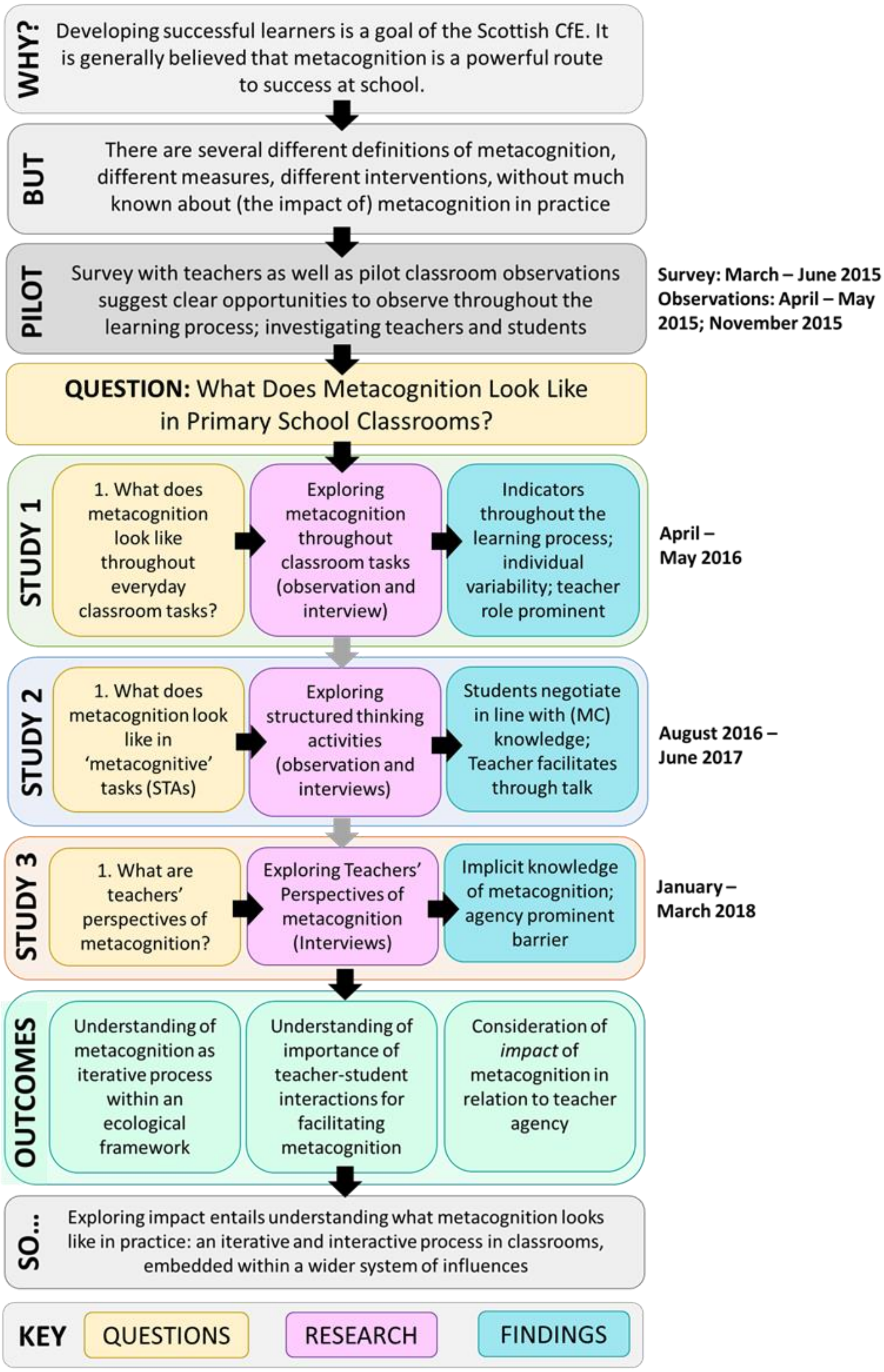


Figure 3.1 Visual flow of thesis structure
Recalling back to Figure 1.1 presented in the introduction, this Figure additionally demonstrates the process of the research project across chronological time. That is, the studies presented in Chapter 4-6 follow the timeline of the studies conducted.

3.3 Participants

Participants in the present study were students and teachers from Scottish mainstream primary schools. Specifically, I observed classrooms from the middle primary school years (primary three to five). This decision was based on literature suggesting that the primary school years are a key time for the development of metacognition (Kuhn, 2000; Veenman et al., 2004; Roebers, 2014), as well as pilot research (see Section 3.9). Other considerations were based the aims of specific studies and will be summarised in the below sections (and elaborated upon within respective chapters).

All observational research was conducted in one Local Authority (LA) in central Scotland. The decision to base investigations within one LA was taken to minimise variation in the local policies enacted by LAs (as described in Chapter 1). To aid in interpretation, it is relevant to provide some contextual information regarding to LA in which classroom-based research was conducted[8]. Across the local authority, 15% of the areas in the LA were most deprived zones in Scotland in the educational domain, as measured by Scottish Index of Multiple Deprivation (or SIMD)[9]. In terms of authority-wide statistics on achievement, above 85% of students achieved the expected level of the CfE at primary four and primary seven according to the latest available data (2016). In terms of reading, over 90% of students in primaries one, four and seven achieved their expected CfE level. School-level statistics for achievement and deprivation are provided in Table 3.1 for each of the schools (sites) included in classroom-based research. Key educational aims described by the LA pertain to raising attainment, supporting vulnerable children and their families, as well as providing a learning environment suitable for learning.

Table 3.1. Achievement of expected CfE levels
Percentage of pupils achieving expected CfE levels (P1, 4 & 7 combined) across participating schools

Site	**Subject**			
	Reading	Writing	Listening & Talking	Numeracy
Site 1	80 - 89	80 - 89	> 90	80 - 89
Site 2	80 - 89	80 - 89	80 - 89	80 - 89
Site 3	70 - 79	70 - 79	80 - 89	70 - 79

[8] Exact values are not given to protect the anonymity of the LA and schools.
[9] The SIMD is the measure of deprivation used by the Scottish Government to identify schools in areas of Scotland with the highest concentration of individuals facing deprivation. The estimates are from the latest statistics, 2013. For further information on SIMD, see Scottish Government (2019).

In relation to recruitment, initial contact with the participating LA was made when disseminating a pilot survey to all Scottish LAs (see Section 3.9). After initial contact was made, I met with representatives from the LA prior to conducting classroom-based research in 2016, to discuss requirements regarding data collection. From this initial visit, the Child and Families Unit within the LA identified specific schools who may be interested in participating in the research project, and the service acted as a mediator in negotiating access in classrooms. Moreover, once initial contact had been made with schools, I met with a senior management staff member (head teacher or depute-head teacher) of each school to discuss the research and my requirements in terms of the age group of interest. The senior staff member then approached staff members within their schools to identify class teachers who were willing to take part. Thus, it is difficult to make claims regarding the representativeness of participating schools and participating teachers in particular, given the importance of voluntary participation and negotiation with the appropriate gatekeepers in schools.

Whilst both classroom-based research projects (detailed in Chapters 4 and 5) were conducted within one LA, Chapter 6 describes interviews with teachers from six LAs in Scotland, with an intentional aim being to explore a wide range of perspectives. Again, participation was voluntary, and teachers were approached to participate by contacting LAs throughout Scotland as well as through word-of-mouth. Table 3.2 displays an overview of participants by chapter. Of note, there is a commonality in the classrooms observed between Chapters 4 and 5. That is, the single case study described in Chapter 5 was conducted in a classroom in one of the participating schools from Chapter 4 (Forestview Primary School). Moreover, three teachers from Forestview Primary School participated in the teacher interviews presented in Chapter 6 (however no individual teachers took part in more than one study). Despite the commonality of research site, it is important to note that for the present analysis, the focus is not on specific characterisation of particular research sites, but instead a more holistic view of student and teacher activity across sites.

In this project, individual information about children's' personal background (for example, health status, histories of trauma) were not collected due to ethical considerations of this sensitive data. What is available is authority-wide information about health characteristics from the SIMD, which documents that 15% of the areas in the LA were in the most deprived zones in Scotland in the health domain, and 12% of areas were in the most deprived zones in Scotland for crime. The potential associations between metacognition in the cognitive and more emotional domains are generally under-explored in the existing literature, however given the finding that (for instance) childhood trauma is correlated with metacognition and mental wellbeing (Leonhardt et al., 2015), it is likely that participants experiences may impact upon their cognitive (and metacognitive) processing. Thus, whilst the present study aimed to explore metacognition across students (rather than specifically detailing individual students' histories), it is of course important to acknowledge that each student who participated in the project had their own history with hugely diverse childhood experiences which may have influenced the results presented.

Table 3.2.Participant overview by chapter
As shown, Chapters 4 and 5 present observations conducted in classrooms in one LA in Scotland, whereas Chapter 6 presents interviews with teachers from six Scottish LAs.

Study		Participants		
Chapter 4	Characterising metacognition	4 classrooms	3 schools	1 Local Authority
Chapter 5	Structured Thinking Activities	1 classroom	1 school	1 Local Authority
Chapter 6	Teacher Perspectives	20 teachers	9 schools	6 Local Authorities

Characterising Metacognition: Observations were conducted within four classrooms. All classrooms were enclosed, with class sizes ranging from 24 to 33 (average 25 – 26 students). All observations took place in the morning session (between 9am and 12.40pm), providing data from 24 distinct tasks[10], conducted over 14 days. The tasks varied in length, from 24 to 85 minutes, with an average length of 55 minutes. Observed tasks included Literacy, Numeracy, Handwriting, Problem Solving, Physical Education (PE), and Information and Communication Technologies (ICT). A full description of all 24 observed tasks included in the present study is provided in Appendix B.

Structured Thinking Activities (STAs): This study focused on two children (Laura and Amy) and their class teacher (Ms Abbot). In this class, STAs were delivered through two routes: (1) weekly 'class meets' that included both 'learning chats' between Ms Abbot and the whole class, and short written activities in the form of sentences completed in individual 'learning logs', and (2) termly STAs presented in an 'achievement log'. In total, nine hours were spent observing STAs, over nine data collection episodes (each averaging 60 minutes, ranging 45-105 minutes). A full description of all data collection episodes is provided in Appendix C.

Teacher Perspectives: In total, 20 teachers took part in this research, over 10 interview sessions. The majority (18 out of 20) were female (90%), and the average length of

[10] The term 'task' is used to refer to one complete activity set by the teacher, for example a creative writing task, the creation of a PowerPoint presentation, or a numeracy worksheet.

experience reported was 13 years (range 0.5 to 29 years). Participants were class teachers, learning support teachers, a supply teacher, depute and head teachers[11]. Interviews varied in length from 22 to 65 minutes with an average duration of 35 minutes. Full characteristics of each interview (including the teachers interviewed) are presented in Appendix D.

3.4 Research Methods

As mentioned above, multiple qualitative methods were used in the current project. Methods consisted of observations, interviews and written texts. In the following sections, a brief rationale and description is provided for each method of data collection, which will be re-visited in relation to each study presented in Chapters 4 through to 6.

3.4.1 *Observations*

The present study used observations as a main source of data collection, both in exploring metacognition throughout everyday classroom tasks, and in exploring Structured Thinking Activities (STAs). A classroom-based observational approach facilitated investigation of other external factors in the social environment of the classroom that might interact with metacognition, such as the role of the teacher or interactions with peers. Observations were an appropriate method to address the current research questions, given the directness of this methodological approach and the power of observations for "getting at 'real life' in the real world" (Robson, 2011, p316).

Several observational techniques exist, ranging from structured, quantitative protocols with pre-defined categories, to unstructured, more interpretivist techniques (Robson, 2011; see also section 2.3.5 of Chapter 2). In the present project, participant observation formed a main source of data collection. In participant observation, the researcher adopts a role in the environment of study (Robson, 2011). Participant observation supported focused investigation within the context of interest (Miles et al., 2014). My intention throughout observations was generally to minimise disruption of everyday classroom tasks as much as feasibly possible. Throughout observations, I often participated minimally in classroom tasks, sitting discreetly taking notes (Bryman, 2012). Such an approach was appropriate given my aim of observing classroom activity without intervention (Adler & Adler, 1998).

[11] To avoid breaching confidentiality, a participant by participant breakdown of job role is not presented.

My approach to observation in participating classes is most appropriately described as a 'participant as observer' stance; in which all members of the group were aware that I was there to observe. As such, students and teachers had awareness of the purpose of my participation, whilst also allowing me opportunities to discuss the events in the classroom with participants (Robson, 2011). I took part in some classroom tasks as appropriate, for example through discussing with students, assisting when required, or sometimes being part of a small group as students worked on tasks. This position was appropriate as maintaining a solely 'outsider observer' status would have been an unnatural position for a visitor to take (particularly over repeated visits that extended up to a school year in the investigation of STAs described in Chapter 5). Furthermore, involvement helped to develop trust within the setting (Bryman, 2012). Involvement with classroom activities was also a more natural route to discuss the activities with students, on the basis that "as well as observing through participating in activities, the observer can ask members to explain various aspects of what is going on" (Robson, 2011, p322). Discussion of classroom tasks with students is elaborated on in the following section.

All observations were documented in field notes (with an example provided in Figure 3.2). Rather than adopting a structured 'checklist' or observation schedule (e.g., Whitebread et al., 2009), I used real-time narrative running records to record observations (Perry, 1998). Running records afforded the opportunity to record verbal and non-verbal behaviour in 'real time'. Short focal child observations facilitated recording of behaviours. That is, I focused attention on specific children in the classrooms, noting all behaviour and interactions (for instance, with peers at a table or with the teacher). In each task, I recorded all verbatim speech and observed behaviour as far as possible, with a watch being used to record time. I aimed to document as far as possible, information that was relevant to the research, aided by focusing on specific focal children (Walford, 2009). The recording techniques used allowed me to honour the time-course of learning, without rigid adherence to components of metacognition identified in psychological theory. Such an approach was critical for answering the present research questions, characterising metacognition throughout everyday classroom tasks and STAs (as described in Chapters 4 and 5).

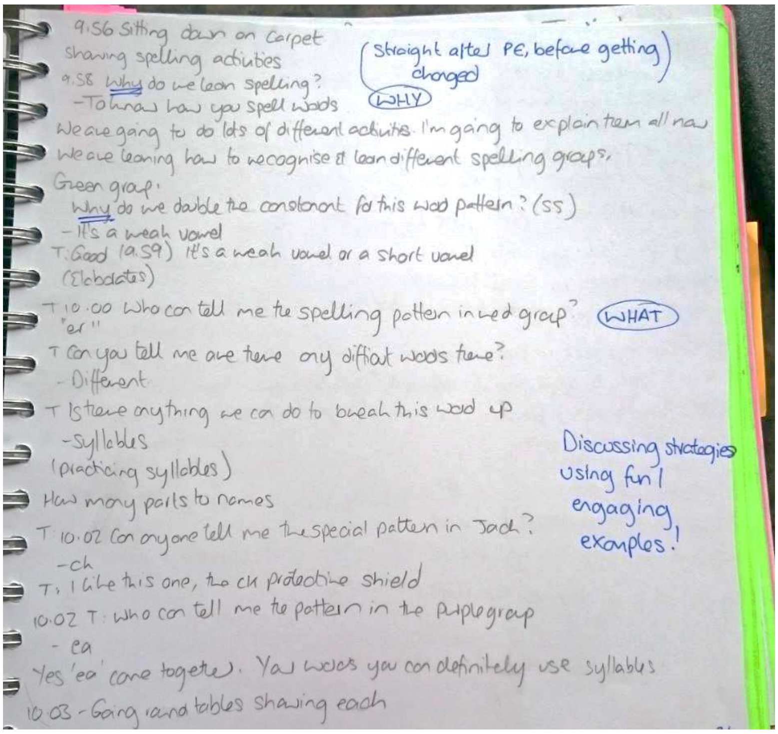


Figure 3.2: Excerpt of running records recorded in field notes
Excerpt taken from Chapter 5 (Characterising Metacognition)

3.4.2 *Interviews*

Metacognition is an internal process that is difficult to observe (Audet, Hickman & Dobrynina, 1996; Wall, 2008). As such, interviews were a key source of data in the current project. Different forms of interviews were utilised throughout studies presented in this thesis, including semi-structured interviews with teachers and more un-structured 'ad-hoc' interviews with students in classrooms[12]. In the following sections, I will briefly overview the methods employed in relation to interviews with students and teachers respectively. Before doing so, it is appropriate to reflect on the particularities and considerations of interview as an overarching research method.

3.4.2.1 Interviews with students

As described above, my 'participant as observer' stance within classrooms allowed me to discuss aspects of tasks with students (Robson, 2011). Throughout observed tasks, I conducted short semi-and un-structured discussions with students. Incorporating the voices of students into the research was critical to add depth to the data collected through observations and to provide insight into students' experiences (Lewis & Porter, 2007). By

[12] The term 'discussion' is also used in description of findings to refer to short interviews with students in Chapters 4 and 5, differentiating to more lengthy semi-structured interviews presented in Chapter 6.

listening to the descriptions and interpretations of students themselves, I aimed to form a more rounded understanding about what happens in the classroom 'from inside' (Robson, 2011). Combining observation and discussion also allowed a much richer analysis of the data, enabling me to go beyond interpretation of observable behaviour and to investigate the meanings students' place on what they are doing in lessons and why (Miles et al., 2014). The intention throughout these discussions was not to adopt the common interview structure, in which the social dynamics of everyday conversation are disrupted by the researcher taking a dominant, questioning role (Fontana & Frey, 1998; Walford, 2009). Instead, I sought to explore participants' perceptions of what was occurring, as a route to deeper understanding about the observed behaviours (Patrick & Middleton, 2002; Hammersley, 2006). As such, discussions were often initiated by the students themselves, or through short questions by the researcher relating to the current task. Like observations, interviews were documented in researcher field notes. Given the short, ad-hoc nature of these interactions, speech was noted immediately after each episode to maximise the thoroughness of the notes.

Discussions with students were consistent with questions used in previous research of Perry (1998):

- The purpose(s) of the current activity ("what do you need to do here?")
- Students' thoughts as they completed the activity ("how are you getting on?")
- Difficulties experienced ("What are you stuck on?")
- Handling difficulties ("What can you do when you are stuck?")

In addition, discussion also focused on:

- Methods of completing activities ("how do you decide what to write about?")
- Strategies and comparisons with others ("it's interesting that some people find a plan useful and others don't – what do you prefer?")

It is important to rationalise my decision not to employ any prompts or aids for students to discuss their thinking in interviews. Indeed, such tools such as Pupil Views Templates or concept maps of have been highly valuable for uncovering students thinking (e.g., Wall, 2008; Ritchhart et al., 2009). In the present project, however, the explicit goal was to explore everyday classroom activities in an attempt to understand the 'state of play' of metacognition in the classrooms observed. Whilst of course, my presence as a researcher within the classroom will undoubtedly have influenced the setting, I did explicitly seek to minimise disruption. As such, I did not introduce any novel activities to students, and focused interview questions on everyday questions that would not differ substantially from the sorts of questions students would expect from an adult in class (see examples above). Given the clear power of PVTs in not only gauging student metacognition, but also inherently in promoting it (Wall & Higgins, 2006; Wall, 2008), I decided that taking such an approach would introduce another level of interpretation upon my investigation (complicating rather than simplifying the answering of the current research questions).

3.4.2.2 Interviews with teachers

In the present study, interviews with teachers took two forms. Firstly, in classroom-based observational research, teachers adopted mostly an 'informant' role. That is, short interviews with teachers were used to contextualise tasks, and to provide supplementary information about meaningful events that had occurred between data collection episodes. Often, the interviews with the class teacher were initiated by the teacher her or himself, who would approach me (before, during or after the task) to describe, explain or elaborate on an activity or event. Secondly, Chapter 6 describes interviews exploring teachers' perspectives of metacognition. The goal of this research was to provide insight into teachers' perspectives about metacognition, and semi-structured interviews were selected for their appropriateness in providing a focused structure for interviews, whilst allowing the researcher to demonstrate commitment to understanding what is important to participants by following up on topics described (Hugh-Jones, 2010). As described in more detail in Section 6.3 of Chapter 6, teacher interviews were conducted as one-to-one semi-structured interviews as well as small semi-structured focus groups (between two and five participants in each group). Data were recorded using an audio recorder, and later transcribed in full.

Of course, it is important to acknowledge that in interviews, my role as an outsider was particularly important. More specifically, it was clear to all participants that I was a researcher in psychology with an interest in the impact of metacognition in the educational setting, and this might have brought particular expectations about my thoughts and ideas. Such expectations may indeed have influenced participants' responses, for example by altering descriptions of lessons (e.g., teachers feeling compelled to provide 'good' evidence of metacognition). I tried to minimise potential limitations by being explicit about my research aims and perspective, adopting a non-judgemental attitude. Whilst potential limitations are perhaps (to an extent) unavoidable in relation to the researcher's position in such research, my positionality also provided certain advantages. For instance, my outsider status allowed me "to understand people's perspectives from the inside while also viewing them and their behaviour more distantly, in ways that may be alien" (Hammersley, 2006, p11). My 'outsider' status further allowed an additional benefit of encouraging teachers to describe and elaborate in a way that they might not if I was a fellow teacher.

3.4.2.3 Written evidence

The final source of data collected in the present research was the written artefacts of students' written work (specifically, written excerpts of students' STAs, as presented in Chapter 5). Written evidence was not produced at the request of the researcher, but rather was in the form of photographs taken of written products of teacher-initiated STAs. The primary use of such visual data was in the triangulation of findings, providing additional 'illuminative' evidence in addition to interviews and observations (Craft, Cremin, Hay & Clack, 2014, p21). The comparison of written evidence to observed behaviour provided another route to developing deep insight into the metacognitive process that occurs throughout STAs, through comparing the 'products' to the 'process' of the STAs (Hammersley, 2006).

3.5 Analysis

Data were analysed using a distinctive thematic approach firmly grounded in practice, but clearly guided by psychological theory. Thematic analysis is a popular approach given its flexibility with regards to theory (Braun & Clarke, 2006). At its basic level, thematic analysis involves the identification of themes across texts[13], and can be inductive or deductive (Hayes, 2000). Such an analytic approach was particularly useful for the methodological and theoretical perspectives utilised in this thesis, supporting analysis of different kinds of texts, and allowing the identification of themes that are closely associated with the data whilst being guided by psychological theory (Braun & Clarke, 2006). In this thesis, analysis was guided by an understanding of metacognition identified in existing psychological theory, including metacognitive knowledge (of self, tasks and strategies) and metacognitive regulation (planning, monitoring and controlling cognition).

Although clearly guided by psychological theory, an important aspect of this project is the aim to identify themes that closely resembled the data; to *build* understanding about metacognition rather than to formally test theory (Strauss & Corbin, 1991; Braun &

[13] The term 'texts' is used to describe interview transcripts and field notes.

Clarke, 2006). The analytic process focused on the importance of 'emergence', allowing codes and themes to emerge rather than to be guided by pre-defined categories[14] (Adler & Adler, 1998). Inductive thematic analysis is described as "a process of coding the data without trying to fit it into a pre-existing coding frame, or the researcher's analytic preconceptions" (Braun & Clarke, 2006, p83). By seeking to build understanding from the 'ground up', this inductive thematic analysis draws on the principles of Grounded Theory (GT). GT is useful for building rich understanding of processes, developing theory that "closely approximates the reality it represents" (Strauss & Corbin, 1991, p57). Thus, the unique analytical approach adopted allowed for the use of psychological theory in relation to providing 'sensitising concepts' (Blumer, 1954), whilst allowing space for rich insights that are 'grounded' in the data (Robson, 2011). The iterative process of data collection in the present research is also reflective of the grounded nature of analysis, with GT analyses commonly provoking the collection of new data, with more refined research questions and methods (Charmaz, 2000).

3.5.1 *Reflection on analytic approach*

Having outlined the approach to data analysis in this project, it is important to rationalise my decisions about why to use particular analytic approaches versus other available approaches such as discourse analyses or phenomenology. Discourse Analysis (DA) is an approach that acknowledges the constructive work of language and interaction (Wiggins & Riley, 2010). Such an approach aligns with a social constructivist viewpoint and the important role of co-construction of understanding between participants, but also by the researcher (Denzin & Lincoln, 1998). The value of discourse analysis, then, is intuitively apparent in the present research, particularly given the emergent finding of the role of teacher-student interactions for facilitating metacognition. Another common approach to analysis is Interpretative Phenomenological Analysis, or IPA. With a particular focus on the experiences of individuals, IPA is a relevant technique given its data-driven focus and emphasis upon interpretation (Shaw, 2010; Braun & Clarke, 2013).

As stated above, thematic analysis (drawing on ideas from Grounded Theory) was used to analyse both observational and interview data. Given the novel inter-disciplinary approach adopted, the methods adopted were flexible in order to address the open-ended and

[14] It is pertinent to promlematise the notion of 'emergent' themes. Whilst this is a useful term used throughout descriptions of inductive research designs, the idea of emergence has erroneous connotations of passivity on the part of the researcher (Braun & Clarke, 2006). Of course, the analytic process is intentional and active, with 'emergent' themes describing themes identified by the researcher that are inductive, closely resembling the data.

exploratory research questions posed. Whilst an approach such as DA entails a detail of examination of the constructive nature of interaction (Braun & Clarke, 2013) that in hindsight poses interesting avenues for studying the interactive nature of metacognition, for the present study, thematic analysis was adopted as an appropriate technique given its flexibility as a method for explorative questions – both practically and theoretically (Braun & Clarke, 2006). Likewise, whilst this research did indeed seek to explore participants' experiences with their own thinking (and teachers' experiences of teaching metacognition in Chapter 6), this analysis did not constitute an IP analysis per se, as the aims of the current study were focused specifically on exploring the construct of metacognition, drawing on psychological theory. Thematic analysis thus allowed me to incorporate key ideas from psychological theory in relation to metacognition whilst allowing me to stay grounded in the data themselves. Critically, the findings of the thematic analysis described in this project do indeed suggest exciting avenues for future research using diverse methods for design and analysis (including discourse analysis and action research – as discussed in Section 7.4 of the general discussion).

Finally, it is important to rationalise my decisions regarding research design in relation to the roles of researcher and participants. In the present study, I was the main researcher and analyst, and whilst I did collaborate with a team of educational practitioners and academics throughout the research process, the design was not overall participatory. Action research (otherwise termed practitioner enquiry or cooperative enquiry) is a research approach in which the traditional roles of external researcher and participant are disrupted, and instead all involved in a research project act as researchers (Riley & Reason, 2015). Action research is a particularly popular approach in educational settings, given its value for disrupting power dynamics, giving practitioners voice, and addressing research questions of particular relevance for practice (Riley & Reason, 2015; Wall & Hall, 2017). In the present research, there were both practical and analytical reasons for not adopting an action research design. In the practical sense, given my positionality (as a researcher with a background in psychology), there were difficulties in accessing participants who could feasibly act as co-researchers within the timescale of the project. Moreover, analytically, my intention in conducting a qualitative project within an inter-disciplinary inductive design, was to bring to the analysis my own unique perspective as an analyst. As such, the flexible design and unique thematic approach to analysis adopted was deemed appropriate to explore the research questions posed[15].

3.5.2 *Analytic Process*

In creating themes, I followed the procedures common to qualitative analysis; interrogating data to assign codes, sorting codes with examples and generating themes (Miles et al., 2014). Themes can be distinguished from codes, "If your analysis is a brick-built house with a tile roof, your themes are the walls and roof and your codes are the individual bricks and tiles" (Braun & Clarke, 2012, p61). More specifically, analysis consisted of the following procedures (drawing from the 'phases of thematic analysis' by Braun & Clarke, 2006);

- *Familiarisation with the data* – Field notes were scanned and interview recordings were transcribed. Field notes of all interviews with students were also typed into electronic transcripts. In each study, texts (field notes and interview transcripts) were read and re-read multiple times, with emerging codes (i.e., units of meaning), thoughts and ideas being noted. Initial codes were also noted *during* data collection. That is, to support the integration of findings as they developed, data collection and analysis took place concurrently (Jeffrey, 2008; Menzies & Santoro, 2017), with codes and examples being reflected upon throughout analysis, and explored in greater depth as data collection progressed (e.g., through discussing emerging codes and themes from observations in conversation with the teacher or students, see Robson, 2011).
- *Generation of initial codes and themes* – I adopted open coding of texts systematically for the entire dataset of each study, achieved through manual annotation alongside texts in Word files. These codes were revisited several times and grouped into wider themes (i.e., wider units of analysis) as guided by the research questions (Braun & Clarke, 2006).
- *Naming and defining themes* – Codes were grouped into themes with examples (Miles et al., 2014). Codes and themes were continuously grouped, condensed and reassigned (Strauss & Corbin, 1991). Defining and grouping of codes and themes was achieved through tables, diagrams and text files. For instance in Chapter 4,

[15] Of course, the approach to data collection and analysis was guided by the importance of communication and collaboration with both practitioners and researchers – strategies essential to ensure the robustness of my analyses. These actions are outlined in more detail in Section 3.6.

organisation of indicators was supported by the use of diagrams to structure analysis around the learning process (as demonstrated in Section 4.3 of Chapter 4).

- *Review of themes* – Themes were reviewed throughout analysis, by constantly revisiting the data and actively exploring the association between themes and evidence (i.e., I revisited themes to determine whether they were coherent and that they accounted for the essence of associated excerpts). Where necessary, examples were re-assigned or merged to ensure themes were associated with clear and distinct examples from texts.
- *Producing report* – Writing played a fundamental role throughout the analytic process. That is, throughout the process of analysis, identified codes and themes were written about in field notes as well as summarised in text and PowerPoint documents that were discussed amongst the supervisory team.

Throughout observational data collection, my intention was to develop characterisation of metacognition throughout observed classrooms, rather than to compare and contrast the metacognitive 'abilities' of students, or to compare practices of individual teachers (for example, a teacher who is particularly 'good' at facilitating metacognition versus one who is particularly unhelpful). Although a degree of individual variation is expected (and is reflected upon throughout findings), the research questions in the present study supported a broader and more holistic approach, thus the focus was on the identification of themes *across* texts (a characteristic of thematic analysis; Braun & Clarke, 2006). The appropriateness of identifying specific contrasting examples is also challenged due to the complexity of the classroom environment, "the muddiness of 'reality' may not be adequately represented in the extremes, so that distinctions that seem clear in 'theory' have less relevance in practice" (Butler, 2002 p62).

3.6 Ensuring Quality: A Reflection on Methodological Approaches

Given the importance of methodology for developing insights about metacognition, it is pertinent here to reflect on the methods adopted within the present project, including the strengths but also the potential limitations of approaches. As such, the following sections provide a brief reflection on the methodology adopted, with reflection continued in each empirical chapter (see 'reflection on methodology' sections in Chapters 4-6).

In relation to ensuring quality, it is commonplace to consider aspects of research design such as reliability and validity. However, with qualitative research it is necessary to be cognizant of the previously discussed difficulties with the idea that observations and interviews can provide a fixed view of an objective reality, rather than forming the researcher's interpretation of what is experienced (Pring, 2000b; Miles et al., 2014). Given these difficulties, Miles and Huberman (1994, p263) state that a more appropriate question in qualitative designs is "How can we increase our – and out readers' – confidence in what we've found?" Such a question brings to mind considerations of *trustworthiness* and *transparency* (Bryman, 2012), principles that underlined this project. In the following paragraphs, I provide a summary of some of the considerations and actions taken. Discussion is in line with some of the tactics, described by Miles and Huberman (1994) that can be used in qualitative research to increase confidence in findings. These include checking the representativeness of particular cases, triangulation, checking extreme or negative evidence, replication and feedback from participants. Rather than being an exhaustive checklist, this is intended to guide researchers to make appropriate decisions throughout the research process, with the ultimate goal of enhancing the robustness of research findings.

Throughout description of this research project, there has also been a persistent effort to maintain a spirit of transparency and reflexivity. Reflexivity refers in its most basic sense, to an active engagement from a researcher throughout the research process; being critically aware about "what you are doing and why" (Mason, 2002, p5). Thus, reflexivity empowers the researcher to be critically reflective of their role throughout the research process, and so increases the trustworthiness of findings in an interpretivist design (Braun & Clarke, 2013). I adopted a reflexive perspective throughout the research process, as discussed in 'reflections on methodology' sections in Chapters 4-6, as well as in the following section. In addition to reflexivity, transparency is sought throughout the research process culminating in the writing up phase of research. In the final product, that is, "an audience has to be convinced about the credibility and significance of the interpretations offered" (Bryman, 2012, p386). Thus, the 'grounded' nature of the present data offers one way of providing transparency by clearly stating the evidence associated with analysis (seeking to achieve *verisimilitude*, as described in Section 3.6.1).

In terms of representativeness, it is important to consider that the teachers who participated in this study (through inviting me into their classes in observational studies as well as discussing their perspectives of metacognition in interviews) may not be considered representative of the teaching community at large. Participating teachers volunteered to take part in the research, presumably from an interest in the subject area. Whilst this may not in fact be assumed about all teachers, it does still provide meaningful insight about the practices and perspectives of teachers who are interested in encouraging thinking about thinking in their lessons. It is also clearly critical to note the representativeness of the children who took part in the various strands of the research project. Unlike teachers, the children did not actively volunteer to be observed. Although I sought to gauge a view of the ‘everyday’ classroom by conducting multiple observations with focal children, it must be acknowledged that my decisions may have been informed by my perceptions of the willingness of children to participate. As such, the findings in this study can be considered perhaps more representative of those children who display confidence and ease with a relative stranger in the class.

Given the rich, context-bound nature of the present research, it also has to be acknowledged that others may indeed interpret the data in different ways. Observations are "‘filtered’ … through the understandings, preferences and beliefs of the observer" (Pring, 2000b, p35). Rather than seeking to act as a neutral relayer of teacher or student experience, therefore, it was explicitly intended that my perspective as a researcher in psychology would be brought to analysis (as described above). As such, a systematic approach of feeding back research findings to participants was not adopted in the present research. However, to maintain ‘grounded’ in the classroom experience, it was important to consistently check findings with an inter-disciplinary team, particularly given the particular paradigmatic challenges associated with this inter-disciplinary project. Thus, I interacted continuously with several ‘critical friends’ throughout the project, namely two qualified primary school teachers, an educational psychologist from the LA in which the observational research took place, as well as researcher colleagues from education and psychology. For example, final codes relating to teacher talk (Chapter 4) were examined by a qualified teacher external to the research team to provide peer support in ensuring credibility and reducing bias (Robson, 2011; Bryman, 2012). This wide community supported this project, and assisted in negotiation of the complexities of inter-disciplinary research (Golde & Gallacher, 1999).

This thesis did not explicitly seek to replicate findings between studies, with each empirical chapter exploring a different aspect of the overall aims. Of note, however, a degree of replication is a natural aim in research studies across sites, employing multiple interconnected methods (i.e., triangulation). That is, the use of multiple methods, or triangulation "is not so much a tactic as a way of life" (Miles & Huberman, 1994, p267), and is a critical method of enhancing the reliability of findings in a qualitative design (Adler & Adler, 1998). Triangulation was achieved through different data collection methods within studies (through the use of observation, interview and the analysis of written texts). Crucially, triangulation was also achieved across studies, to explore different aspects of the construct of metacognition (throughout the learning process, in STAs and from teachers' perspectives). Associated with the use of multiple sources of data was the seeking of negative evidence, with such conflicting findings being sought-after to challenge assumptions, strengthen explanations and importantly, to reduce bias (Robson, 2011). As such, conflicting evidence (including that revealed from different methods) is highlighted throughout analysis. As described above, such approaches utilising triangulation are associated with "rigor, breadth, complexity, richness, and depth" (Denzin & Lincoln, 2000, p5), by enabling the analyst to investigate issues from multiple perspectives (Patrick & Middleton, 2002).

3.6.1 *Observations*

Several potential issues or biases have been associated with observations as a research approach, and it is important to consider these in relation to the present project. For instance, a major concern relates to the extent to which the observer influences the setting of interest by their very presence (i.e., the idea of reactivity; see Robson, 2011). Therefore, the effects that my presence may have had within the classrooms involved in the research project must be acknowledged. My presence undoubtedly disrupted or altered the classroom activity, with one common documented effect being an increase in social behaviour (Miles & Huberman, 1994).

Although effects related to observer presence is somewhat inevitable in field research, I took several steps to attempt to minimise my effects on the research environment (and their effects on me). For example, one established technique to minimise reactivity is to ensure participants are familiar with the observer prior to data collection (Robson, 2011). Thus, I undertook initial visits to classrooms to allow participants to get to know me, without any overt data collection. In interactions, I positioned myself as an interested other, seeking to learn from the experiences of participants. I was also explicit about my research aims and perspectives from the outset, adopting a non-judgemental attitude. Further, I sought (particularly in Chapter 4) to maintain a minimally obtrusive presence within the classroom. I was clear and honest in my description about the aims, purpose and methods of data collection, to both teacher and student participants. Lastly, even in relation to studies that involved extended durations of observations (STAs described in Chapter 5), I avoided spending several extended periods of time in the classroom (most often conducting data collection only at the time of STA completion), minimising the risk of becoming overly familiar with the setting and therefore potentially losing perspective (Bryman, 2012). Finally, having not undergone any formal teacher training, I was aware from the outset that it was important to pay close attention to the context of the observations, including the context in which teachers teach. Clearly the policy context and the training received by teachers within Scotland directly influences what occurs in classrooms in often subtle ways that might not be immediately apparent. Therefore, it was important to regularly communicate with an inter-disciplinary team (as detailed in Section 3.6 above).

Beyond potential biases of observation as a research approach, there are specific concerns to acknowledge regarding the method of recording observations used in the present project. Of course, there are potential limitations of using real-time observations, recorded in field notes. That is, I could only record what I saw as fast as I could record it, and it is therefore possible that I missed some information. To ensure field notes were as comprehensive as possible, at the end of each observation episode, I reviewed running record notes and expanded upon notes to describe or elaborate on any observed behaviour as best as memory allowed. Such an approach of re-vising provided opportunity to elaborate on any events not fully recorded, and also provided structure to the field notes to aid analysis (Walford, 2009).

A related consideration regarding my use of running records (and observations more generally) is that I might have been biased to look for particular things and discount others, with such potential biases posing a threat to the validity of my analyses (Adler & Adler, 1998). Indeed, with any research study, but arguably qualitative research in particular, the analyst is compelled to make decisions regarding how best to condense, analyse and report findings: "When faced with the mass of data typically collected in qualitative studies, researchers are forced to be selective in terms of data they analyze and report" (Butler, 2002, p62). Indeed, a key role of the researcher in qualitative research is making 'choices' about what data to present, and the relative benefits and pitfalls of the chosen approach (Butler, 2002).

Several techniques have been described in observation literature to minimise threats to validity. For instance, it is important to triangulate findings and to seek contrasting evidence (techniques I adopted and discuss in more detail above). Moreover, reflexivity is a key way to negotiate the potential of bias that this design entails – being reflexive as a researcher and highlighting areas that might have been most prominent to me. For example, I was very aware of the role of the teacher in lessons; whereas I played less attention to the role of peers. This was potentially due to my own perspective about the psychological literature relating to the intervention (or facilitation) of metacognition. More widely, as a researcher with an interest in metacognition, I was particularly sensitive to indicators of metacognition in the classroom, and it was important for me to ensure that I was maintaining critical reflection about whether observed behaviours were in fact evidence of metacognition (my own personal reflection is considered in more detail in Section 3.7). Finally, a key strategy to maximise validity of observational findings is in the very method of presenting the analyses – seeking to describe findings that closely resemble the observed scenario to ensure that analyses are coherent and plausible to readers (a technique known as *verisimilitude*; see Adler & Adler, 1998).

3.6.2 *Interviews*

One important consideration to make is that interviews are not a "neutral tool". Instead, they are an interaction, meaning that the interviewer plays a role in constructing the reality of the interview with the interviewee (Denzin & Lincoln, 1998, p36). Indeed, the interview situation itself is somewhat different from normal conversation as the whole situation has a particular significance (in that it is recorded and used at a later point), the interviewer takes a leading role in questioning, and the interviewee is expected to have responses to each of the questions asked (Walford, 2009). One way that I attempted to minimise the influence that the 'unusual' set-up of the interviews had on the situation was by adhering to the principle of *treating people as people* (Fontana & Frey, 1998). That is, interviews were powerful (arguably more so than experimental or survey research) for enabling the interviewer and interviewee to interact as people together, each with valuable perspectives. As such, interviews were approached in a friendly manner, from a place of genuine interest in the perspectives of interviewees. Throughout interviews with both teachers and students, the focus was upon flexibility (Bryman, 2012). As such, whilst I had a set of ideas or questions to focus upon, questions were open-ended and encouraged interviewees to provide an account that was based on their experiences.

In addition of the constructive nature of interviews, it is also important to be reflective of the lens through which the present analysis was conducted. That is, the analysis presented in Chapter 6 constitutes my interpretation of teachers' experiences, and I cannot make claims regarding the 'truth' of participants' words at face value. Indeed, in qualitative research designs, it is necessary to be cognizant of the previously discussed difficulties with the idea that observations and interviews can provide a fixed view of an objective reality, rather than forming the researcher's interpretation of what is experienced (Pring, 2000b; Miles et al., 2014). Thus, throughout presentation of interview analysis, it is important to consider not only my positionality, but also the context in which participants were situated (with the local and national policy context being particularly important for the interpretation of the results). This contextual information is introduced in Section 1.1 of the introduction and explored in greater detail in Chapter 6.

3.7 A Personal Reflection on Methodology

Given the unique perspective that any researcher brings to analysis in an interpretivist design, it is important to reflect upon my role as a researcher within the research sites across studies. My personal background stems from the study of psychology, and I have no formal teaching experience within the school setting. To participants in each study, it was clear to all involved that I was a researcher from a background in psychology with an interest in metacognition (i.e., encouraging students to think about and manage their own thinking). In teacher interviews, my role as an outsider was particularly important. That is, it was clear to all participants that I was a researcher in psychology with an interest in the impact of metacognition in the educational setting, and this might have brought particular expectations about my thoughts and ideas. Such expectations may indeed have influenced participants' responses, for example by altering descriptions of lessons (e.g., teachers feeling compelled to provide 'good' evidence of metacognition).

Of course, then, my role in the research studies may have brought certain perceptions that might have influenced my role within schools and classrooms. For instance, my role as a researcher may have introduced an unequal power dynamic, with teachers seeking to please or impress me as a researcher. The influence of power relationships between researcher and participant is a matter of interesting discussion: whilst it is often assumed that the researcher maintains the power in such a relationship (Braun & Clarke, 2013), this view has been challenged in some qualitative research, with findings from studies with 'vulnerable' populations such as the elderly suggesting that in each interview situation, the power dynamics were constructed, with participant involvement in describing their experiences being a route to control (Russell, 1999). Therefore, whilst the construction of power dynamics is clearly nuanced, it is acknowledged that to an extent, my role in the classroom will have influenced the classroom dynamics solely by my very presence (this indeed, being an important component of reflection within an interpretive design that embraces construction).

Given my positionality in the research, I took specific steps to minimise potential biases (as discussed in Section 3.6 above). Moreover, whilst my positionality in the research design bring with it potential limitations that are perhaps (to an extent) unavoidable in qualitative research designs, my positionality also provided certain advantages. For instance, my outsider status allowed me "to understand people's perspectives from the inside while also viewing them and their behaviour more distantly, in ways that may be alien" (Hammersley, 2006, p11). It is my perspective that my background provides me with a somewhat unique position, allowing me to observe the classroom with a different perspective, arguably useful given the focus of the present research upon characterising behaviours that occur in the classroom. My 'outsider' status further allowed an additional benefit of encouraging teachers to describe and elaborate in a way that they might not if I was a fellow teacher.

3.8 Research Ethics

The research reported in this thesis conforms to the ethical procedures outlined in the manual of the British Psychological Society (2014). All studies were granted full ethical approval through appropriate ethical avenues at the University of Stirling (UoS). Part way through the research project, the ethical procedure at the UoS changed to adopt a university-wide ethical review process. As a result, the two classroom-based studies reported in Chapters 4 and 5 were reviewed and granted approval by the Psychology Ethical Committee, and the interview with teachers reported in Chapter 6 was reviewed by the university-wide General University Ethics Panel at the UoS. In addition, all classroom-based research studies were granted approval by the Education and Children's Services Directorate within the Local Authority in which the research took place.

The LA played a key role in negotiating access to schools, identifying schools that were interested in taking part. Within each school, teachers took part on a voluntary basis, and communication was initiated through the Head Teacher at each school. Data collection episodes were agreed in conjunction with the class teacher, to allow the observation of key events whilst causing minimal disruption to classroom routine. To protect anonymity, all names are pseudonyms throughout the described research, and any identifying information has been removed or changed.

All participating schools and class teachers provided informed consent to take part in the research. The researcher worked with schools on an individual basis to determine the appropriate method for ensuring informed consent from student guardians. Student guardians were provided with an information form (either in paper or in an electronic format through the school distribution procedures). Most schools adopted an ‘opt-out’ approach, wherein guardians were invited to contact the school or research team to discuss the project or withdraw consent to take part in the research at any time. In addition, verbal permission was sought by students, who were informed of the research project and invited to discuss or ask questions at any time.

In relation to the design and conduct of this research project, there were some ethical issues that required particular attention, regarding gaining informed consent when conducting research with children. This was considered especially significant when the focus was upon specific students in classrooms. Whilst the ethical standards for the BPS requires parental or guardian consent, it was also important that the children were informed and in agreement with participation, in line with the BPS principle of “monitoring the assent of the child” (British Psychological Society, 2014, p32). Thus, an information sheet was provided to each participating school to share amongst students (Appendix A), and on my first visit to classrooms, I introduced myself and welcomed questions. Furthermore, I minimised the potential of children feeling uncomfortable or ‘singled out’ by consciously spending time talking with several children in classrooms (rather than visibly singling out individual students), and being aware of any visual signs that children were uncomfortable.

3.9 Pilot Research

Prior to starting data collection for the studies presented in Chapters 4-6, I conducted pilot research in classrooms, as well as with teachers. The following section outlines the lessons learnt from pilot research.

3.9.1 *Teacher training and metacognition*

A full review of the training teachers receive is beyond the scope of this study, however there was an attempt to contextualise this study by exploring the role of metacognition in Initial Teacher Education (ITE). In May 2016 I contacted ITE coordinators at Scottish universities. This contact led to communication with four universities, one of which indicated inclusion of metacognition in their curriculum, and a further one describing a module focusing on metacognition. Two further universities provided descriptions in writing, indicating a variable degree to which universities taught teachers in training about metacognition:

> "We look at metagocnition [sic] a little in [module]. Additionally, when we work on pedagogy with our students, we encourage them to explore questioning which leads many of them to explore Bloom's taxonomy. […] We also explore critical analysis in their assignments so they are constantly working on their own development of critical analysis."

> "Much of the teacher education for primary (and secondary) students is based within a social science, constructivist paradigm and thus tends to draw heavily on the work of Dewey, Vygotsky rather than Psychological perspectives. The language of Meta cognition and self regulation tends not to be used, rather we get students to reflect on learning and assessment for learning, or formative assessment and in turn teach education students strategies where they get pupils to self regulate (self assess) or in groups peer assess their learning…"

3.9.2 *Classroom observation pilots*

Pilot observations were conducted in two phases in one primary school in central Scotland. In April to May 2015, I spent seven full days observing in four different classrooms: a composite primary one/two class, a primary two class, a composite primary five/six class, and a primary seven class. Then, in November 2015 I spent 15 hours observing in three different classrooms: a primary five class, a composite primary six/seven class and a primary seven class. One aim of these pilot observations was to immerse myself in the classroom setting, becoming more familiar with the primary school learning environment. During pilot observations, I also experimented with several different observational techniques. This process was documented in a field journal. Pilot research was instrumental in informing my research design, specifically in relation to the age group observed and the observational schedule.

Age or year group of focus: Whilst there would clearly be opportunities to observe indicators of the ways students think about and manage their thinking throughout all year groups, there were characteristics of particular age groups that meant a focus upon classrooms in the middle primary school years was appropriate. Firstly, it was apparent that in the early primary school years, the role of the teacher was particularly prominent;

students spend less time on-task, and more time in un-structured play. Whilst play provides useful opportunities to observe metacognition (Whitebread, 2010), I wished to focus more upon the indicators of metacognition that could be observed throughout more defined lessons, such as literacy or numeracy lessons set by the class teacher. By contrast, towards the upper school, students were clearly more disrupted by my presence in class; with students showing signs of feeling self-conscious or embarrassed discussing their learning amongst peers. Furthermore, and as the students progressed through the school years they also spent more time in activities that took them out of the lesson (for instance to take part in activities for preparation for high school). As such, there were practical, ethical and theoretical influences upon the decision to focus on children in the middle school years.

Observation schedule: As shown in Figure 3.3, pilot observations allowed exploration of different observation methods in classrooms. In these observations, one reflection was that using more structured checklist approaches (whilst perhaps being more systematic) did necessitate a level of pre-defined categories rather than allowing themes to be identified from the ‘ground up’. I concluded that a ‘timeline’ (running record) approach would be most appropriate to address my research questions, allowing the tracking of observed verbal and non-verbal behaviour throughout tasks. It was during pilot observations that the utility of focusing on specific children was also conformed, allowing a focused tracking of verbal and non-verbal behaviour.

<u>Tuesday 3rd November 10.55am – 12.35pm P6/7</u>

Task: Handball in gym hall with whole class
Took unstructured field notes

Task: Writing term-time targets as a whole class activity. Teacher would discuss possible targets, write them on whiteboard, then ask pupils to choose one from each category and write it in their jotters.
Took unstructured field notes
Explored categories for teacher observations: clarification/questioning/ behavioural correction

Task: Reading class book as a group
Took unstructured field notes

<u>Tuesday 10th November 9am – 10.35am P7</u>

Task: (numeracy) Bus timetable task– working in pairs to answer various questions about real bus timetables handed out by the teacher
Observed pre-numeracy discussion between teacher and class:
Categories: question from teacher / meta-talk / notes
[change to] questions from teacher / expectations / notes
Observed one pair of girls: P and B
Categories: Whitebread et al. (2008) categories
Observed post-numeracy discussion between teacher and class:
Categories: Questioning – understanding / meta-questioning / teacher scaffolding

<u>Wednesday 18th November 9am – 10.35am P5</u>

Task: (numeracy) taking away using tens and units – one table working closely with the teacher using tens and units to learn how to carry over when doing subtraction sums. The group is of low ability.
Observed one girl (BH) during table work:
Categories: self-directed / peer-directed / teacher / notes

Figure 3.3. Excerpts of pilot research observation log
As shown, several approaches to observation were adopted in pilot research, including unstructured field notes and the use of pre-specified categories.

3.9.3 *Teacher survey*

In March to June 2015, I conducted a pilot survey of teachers' perspectives of metacognition. The purpose of this was to gauge overall insight about teachers' knowledge and beliefs about metacognition, to guide the direction as well as conduct of future research. In total, I surveyed 88 teachers from 15 Scottish LAs. This pilot survey was particularly informative for two aspects of my research design, namely descriptions of metacognition in research, and a focus on Structured Thinking Activities (STAs).

Describing metacognition: I was interested in the terminologies associated with metacognition. That is, in this project, I was not only interested in teachers' perspectives and practices relating to the specific construct of metacognition as defined in psychological theory, but rather to explore teachers' own understandings of this phenomenon in relation to their practices. When asked about their familiarity with the term, most respondents indicated that they were either fairly familiar (n=47) or very familiar (n=31). Metacognition was indicated as less familiar than other terms used in the educational community such as active learning or learning styles. When asked about other related terms, respondents used several terms including Higher Order Thinking (HOT) skills; self/peer assessment; Growth Mindsets and reflection. This insight was useful for informing future study, exploring teachers' knowledge of metacognition as a construct as well as wider perspectives about how to encourage metacognition without relying on explicit awareness of psychological terminologies. As such, this research influenced communication with teachers in subsequent research, supporting the appropriateness of the use of the term 'think about and manage one's own thinking'.

Structured Thinking Activities: When asked how they encouraged students to think about and manage their own thinking, teachers described several structured thinking activities (STAs) with a specific focus on encouraging students to think about their thinking and learning. Such activities included personal learning plans, personal learning folders, learning logs, learning books, weekly reflective journals, learning mind maps, pupil planners and achievement profiles. In total, 42 teachers described such activities. This high proportion of STAs influenced the direction of the project by indicating an important area of study to understand the promotion of metacognition in classrooms, resulting in the case study focus of STAs in Chapter 5.

Chapter 4: Characterising Metacognition

4.1 Where are we now?

This chapter explores metacognition throughout everyday tasks in primary school classrooms. The aims of this chapter were developed through review of educational and psychological literature as well as through pilot research. More specifically, as I sought to explore definitions of metacognition in more detail, the diversity of conceptualisations of metacognition as well as measures of metacognition were striking (as documented in Sections 2.2 and 2.3 of the literature review). Concurrently, pilot research (as described in Section 3.9) identified to me the clear role of teachers in the metacognitive process. That is, in surveys teachers described their talk as facilitative of metacognition, and classroom observations revealed interesting opportunities to explore metacognition from the perspectives of teachers and students throughout the learning process. Thus, in order to explore the impact of metacognition in primary school classrooms, it was identified as important to characterise metacognition throughout everyday tasks.

4.2 Introduction

In the present chapter, I report on findings from the first classroom-based study, which used observations to investigate how metacognition can be characterised throughout the learning process from the perspective of both students and teachers. The primary aim was to investigate metacognition as it occurs during real-world learning, seeking to provide 'sightings in the field' (Wall & Hall, 2016). Consequently, and consistent with definitions of learning that have change across time at their core (e.g., Kolb & Kolb, 2011), metacognition was examined throughout the time-course of learning. The following section provides a brief overview of previous literature and the focus of this chapter.

4.2.1 *Metacognition and the learning process*

The focus of the present study is on exploring metacognition throughout the learning process. Here, the learning process is conceptualised as: "from the moment the person comes across a learning task to its end" (Efklides, 2006, p3). This focus is guided by the inherent connection between metacognition and the learning process: "thinking cannot be separated from the world since thinking is always directed towards something' (Pramling, 1988, p11). Given the time-course of learning, there has been surprisingly little focus in metacognition theory on describing the metacognitive process as it occurs across time, a fact that has received criticism (Molenaar, 2014). The absence of overtly temporal accounts is perhaps surprising, given that existing models do clearly imply a time-course to metacognition, particularly through the description of the components of regulation or control (Efklides et al., 1999; Schraw & Moshman, 1995). Moreover, the extent that metacognition occurs across time is inferred in items from existing measures that refer to aspects such as reflecting on past experiences: "I thought about something I had done another time that had been helpful" (Wilson, 1998), as well as in the increasing research focus upon investigating the sequential relationship between components of metacognition (Molenaar & Järvelä, 2014).

Psychology theory suggests instances throughout the learning process that provide opportunities to develop insight about metacognitive knowledge and skills. For example, at the beginning of the learning process, key metacognitive skills can be expressed via planning, setting goals and organising. Metacognitive knowledge may also be called upon when planning, for example through thinking about the current task in relation to previous tasks. Similarly, theory suggests that monitoring and control form key metacognitive skills during tasks, with monitoring being experienced through feelings such as ease or struggle. Controlling cognition during tasks involves the use of strategies, including selecting and adapting strategies in accordance with monitoring. At the end of the learning process, evaluation and reflection provide clear opportunities to observe metacognitive processing. Thus, given the myriad opportunities for observing metacognition within the classroom, the detailed qualitative approach adopted presently clearly requires a targeted examination of specific aspects of the learning process – informed by both metacognition theory and task structure.

4.2.2 *Teacher talk and metacognition*

Metacognition and its roles in facilitating deep, critical thought have clear routes in teacher talk. Teacher talk takes several forms, including instruction, conversation, discussion and dialogue (Fisher, 2007). The construction, deconstruction of ideas, critical thinking and sharing experiences are key educational pursuits that are bound in talk. Robson (2012) highlights the critical importance of interaction between teacher and students for metacognitive development. Indeed, research highlights the important role of teacher talk in encouraging students to explain and justify their own thinking (Mercer & Howe, 2012). 'Metacognitive probes' (Hacker & Dunlosky, 2003) include teachers using talk and questioning to prompt students to describe their thoughts and strategies, to justify their reasoning and verbalise their thinking process, and such probes have been evidenced to facilitate metacognition.

One area of investigation in relation to teacher talk is the use of questioning by teachers. For example, research has suggested that the quality of teachers' questions is important for students' learning skills. As Mercer and Howe (2012) discuss, research has differentiated between questioning that evokes superficial responses from students, and that seeks the 'correct' answer, to more thought-provoking, content-based questioning, that (through encouraging the student to elaborate and articulate on the learning process) encourages the use of language to be a constructor of learning itself (see Wolf, Crosson & Resnick, 2006). To summarise, "good learning outcomes result when teachers use questions not just to seek right answers, but also to elicit reasons and explanations" (Mercer & Howe, p13).

4.2.3 *The present study*

In sum, this study aims to characterise metacognition throughout the learning process of everyday classroom tasks. Given the clear role of teachers throughout the learning process, this study focuses on the content of teacher talk as well as observed verbal and non-verbal behaviour of students. The broad research questions that guided this study are:

1. In what ways do students think about and manage their own thinking (i.e., engage with metacognition) throughout everyday tasks in primary school classrooms?
2. What role does teacher talk play throughout the learning process, particularly in relation to facilitating student metacognition?

The chapter itself is divided into two sections, (a) describing student metacognition and teacher talk throughout the learning process, and (b) exploring planning and the experience of struggle. As explained in more detail below, the first part of the chapter seeks to provide an overall characterisation of student metacognition and teacher talk. Exploring particular aspects of tasks in more depth, the second part of this chapter explores the ways that students think about and manage their own thinking (i.e., engage with metacognition) when planning and experiencing struggle, as well as the role of teachers in supporting students to plan, as well as to respond to struggle.

4.3 A Note on Methodology

This study was conducted in four primary school classrooms in central Scotland throughout April and May 2016. Class sizes ranged from 24 to 33 (averaging 25-26 students). Participating students were in the middle primary school years (primary three to five; seven to ten years old). An overview of the four participating classrooms is provided in Table 4.1. Given the rationale for honouring the time-course of learning, observations were conducted in a series of individual classroom activities (referred to henceforth as tasks), each examined from beginning to end. The present findings focus particularly on the description of 24 distinct tasks observed over 14 days[16]. All observations took place in the morning session (between 9am and 12.40pm). Observed tasks included literacy, numeracy, handwriting, problem solving, Physical Education (PE), and Information and Communication Technologies (ICT). Tasks varied in length from 24 to 85 minutes, averaging 55 minutes. Appendix B contains a brief overview of every task observed.

Table 4.1. Overview of four classrooms observed.
As shown in the table, all observed classrooms were in the middle primary school years (primary three to five) and class sizes ranges from 20 to 33 students.

Site	Teacher	Class	Age Range	Class Size
1	Ms Smith	P3/4	8 years old	24
2	Mr White	P5	9-10 years old	33
3	Ms Alexander	P3	7-8 years old	20
3	Ms Bruce	P5	9-10 years old	26

The main source of data collection was short focal child observations as students completed everyday tasks, with findings documented in field notes using running records. As I aimed to characterise metacognition broadly across tasks, I selected multiple students to observe across episodes of data collection, rather than repeatedly focusing on the same individuals. My role as a “partially-participating” observer also enabled me to ask students to elaborate on the tasks they were completing. Detailed running records were also maintained of talk by the teacher to the whole class. This observed teacher talk was most commonly when the teacher gathered students as a class at the ‘base’ area of the classroom or when all students were asked to turn in their seats and listen to the teacher. In my examination of teachers’ everyday talk, I (as far as possible) recorded all teacher talk,

[16] The inclusion of 24 distinct tasks allowed the observation of metacognition throughout the learning process. However, in several observation sessions, some observed tasks were less ‘complete’, for example when a task from the previous day was being completed for a short time. This data is drawn on particularly in the discussion of planning and struggle (Section 4.6), with tasks indicated with an asterisk (*).

meaning the communicative acts by a teacher to students, such as asking a question, providing an instruction, and discussion with students (Fisher, 2007). Short discussions were also conducted with students to explore their perceptions of the tasks (Lewis & Porter, 2007; Miles et al., 2014). Discussions with students were consistent with questions used in previous research of Perry (1998; as detailed in Chapter 3).

Following data collection, I undertook a series of analytic steps (as outlined in more detail in Chapter 3). Of particular relevance to the present study is the process of identifying indicators of metacognition and teacher talk throughout the learning process. To achieve this, I created cyclical diagrams denoting each task, and annotated with indicators throughout each task (an example is provided in Figure 4.1). Across successive iterative phases of analysis, a table was constructed, including all observed indictors of student metacognition, and this formed the basis of the descriptive account that follows. Clearly, it is not practical in any qualitative investigation to list all examples of identified themes, and therefore, the findings present brief indicative examples. For full transparency however, all instances are provided in Appendix B. The same procedures were repeated for the characterisation of teacher talk, with the full analysis table also included in Appendix B. Throughout findings, quotes are used to denote teacher talk. Findings pertaining to non-verbal behaviour of teachers are presented in square parentheses, and any student speech is presented in parentheses.

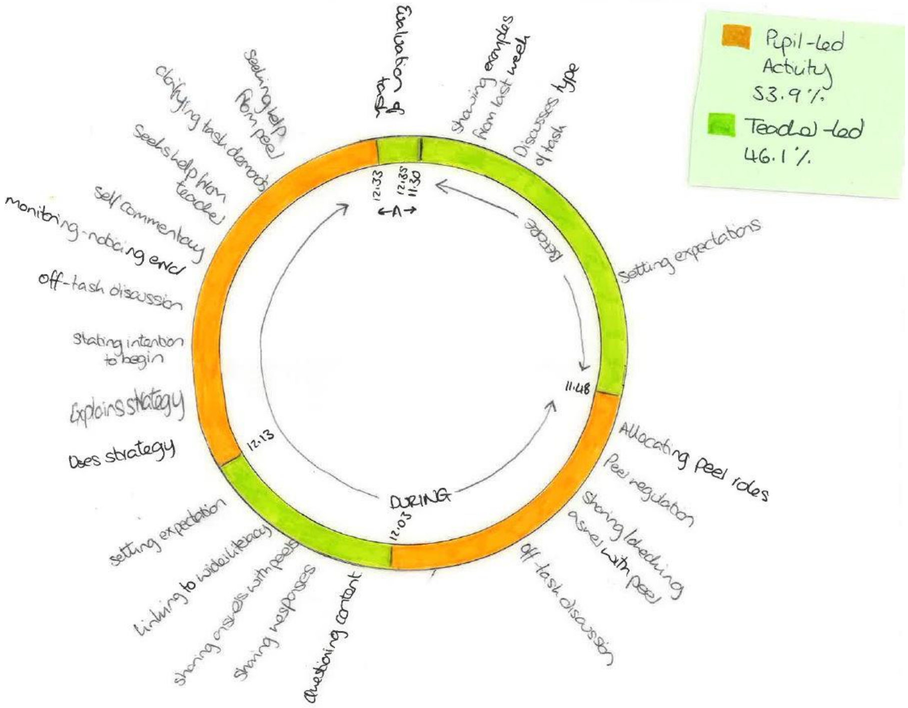


Figure 4.1. Excerpt of task analysis
As the figure shows, all 24 tasks were analysed using circle diagrams on tracing paper. Such a process allowed initial indicators to be recorded in association with time, with the distinction between teacher-led and student-led activity also being noted.

4.3.1 *A Reflection on Methodology*

When reflecting on my role as a researcher, it is pertinent to consider the influence of my 'participant as observer' stance within the classroom. That is, whether there may have been tensions within the classroom produced by my presence as an observer, both from the perspective of the teacher and the students observed. For instance, one possible influence is for the teacher to feel as though s/he must alter the task in some way to please me as a researcher or to give a favourable impression. As discussed in greater detail in Section 3.7, I sought to minimise my influences in the classroom by being honest with the teacher and students about my position and research interests. Moreover, I discussed the research in detail with each teacher from the outset, indicating my desire to learn from the activities that occur in the classroom and using this to build understanding when bringing together insights from psychology and education.

Whilst the main source of data collection was short focal child observations as students completed everyday tasks, short discussions were conducted with students to explore their perceptions of the tasks (Lewis & Porter, 2007; Miles et al., 2014). Discussions with students were consistent with questions used in previous research of Perry (1998; as detailed in Chapter 3), with findings documented in field notes using running records. It is pertinent to reflect on the methods of data collection in this project and the possible limitations of such an approach. Namely, discussions with students were recorded in field notes by the researcher immediately after each discussion excerpt. To ensure records of discussions were as comprehensive as possible, discussions were often short in duration (often lasting only one or two minutes). This may have influenced the data collected, for example by limiting the depth that can be explored in a short space of time. Such a point promotes consideration of other methods of data collection such as video recording, which is considered in more detail in the general discussion (Section 7.4).

A final reflective point to be made is the iterative process that underlies the analysis presented in this chapter. That is, Tables 4.2 and 4.3 are the end product of an analytic process in which I strived to negotiate the tensions between embracing the inherent 'messiness' of the classroom with the imperative to produce comprehensible and structured analyses. Of relevance here is the steps taken to produce the analysis presented in Section 4.5. Rather than intending to suggest a clear distinction between indicators presented, the tables are presented with the aim of providing insight into the way that indicators of metacognition were identified in the classrooms observed prior to more detailed analysis of instances of metacognition presented in Section 4.6. To ensure full transparency, full tables are presented in Appendix B. Given the inherent 'messiness' of such an analysis, it is useful to draw on examples of particular difficulty in identifying indicators. For instance, the indicator 'peer control' was observed both in terms of a student actively seeking help from a peer, and in a student providing help to a peer (i.e., assisting a peer in controlling his/her cognition). Such instances are described throughout the analysis. More widely, such a reflective point is of course, indicative of the inherent influence of measure and insight produced, which is discussed in greater depth in the general discussion (Chapter 7).

4.4 Findings Overview

As mentioned above, findings are divided into two broad sections. Firstly, I present an overall (largely descriptive) characterisation of classroom metacognition, to facilitate discussion about the indicators observable in the middle primary school years. Secondly, I investigate instances of classroom activity that provide particularly rich examples of metacognition. In doing so, I draw specifically on observed approaches to planning in creative writing tasks, as well as monitoring and controlling of thinking through the experience of struggle.

The first section is itself sub-divided into two sections, (a) characterising student metacognition, and (b) exploring teacher talk and metacognition. The two-part structure is not intended to imply a perceived dissociation between what students and teachers do in classrooms, but rather reflects the finding that an analysis of classroom metacognition entails consideration of what teachers do just as much as consideration of what students do. The prominent role of the teacher was a finding that emerged relatively early on in data collection, and as I will go on to describe throughout data collection chapters, influenced my subsequent research focus, allowing the investigation of the role of teachers in facilitating metacognition.

4.5 Findings 1: Characterising Metacognition

When analysing data, the first aim was to gauge an overall impression of the structure of tasks. To achieve this, the task was divided into phases of before task, during task and after task. To support a broad categorisation of student-led versus teacher-led activity, I also sub-divided the task at each phase according to whether the observed task phase was generally teacher-led (defined as the teacher playing a dominant role, such as leading class discussion at 'base') or student-led (defined as students working independently on tasks, most often sitting at tables or working on group tasks). As can be seen in Figure 4.2, across the twenty-four tasks, there was a large proportion of teacher-led discussion before tasks. Indeed, all but one task observed had some element of teacher discussion before the task began. By contrast, during tasks, activities were mainly student-led, albeit with a still notable element of teacher-led talk. Finally, after tasks, activity was exclusively teacher-led, and the proportion of time spent 'after' the activity was lowest of all phases.

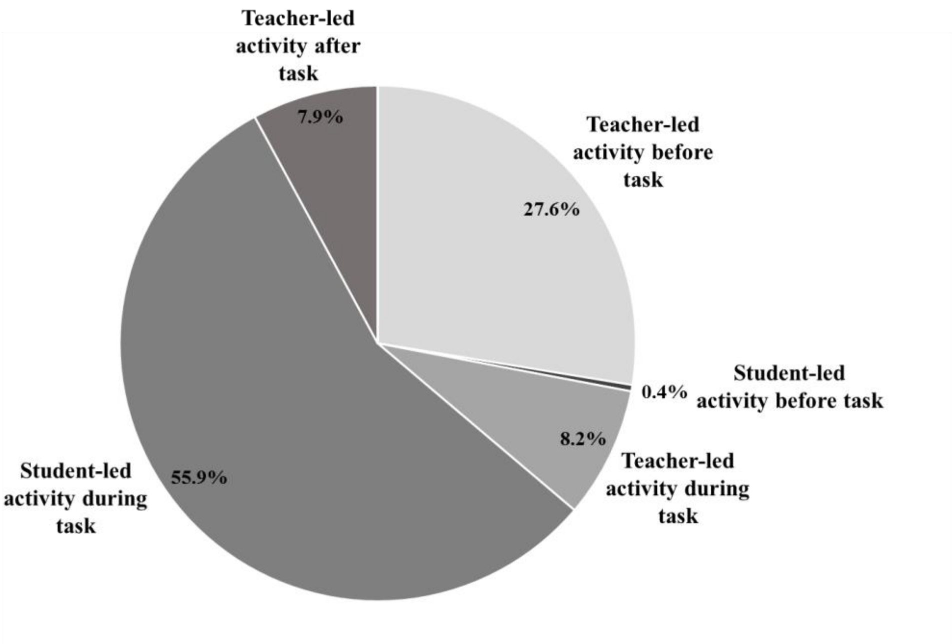


Figure 4.2. Mean time before, during and after tasks.
The graph shows the mean percentage of time across 24 observed tasks, revealing that the largest proportion of time spent in each task was student-led activity during tasks. Contrastingly, before and after tasks the activity was mainly teacher-led, with a very small proportion of the complete task spent after tasks.

4.5.1 *Characterising student metacognition*

As shown in Figure 4.2, despite a large proportion of the overall task structure being teacher-led, the highest proportion of time, on average, was spent on student-led activity during tasks (accounting for an average of 56% of tasks). In this student-led phase, observed behaviour was reflective in itself, of a start, middle and end, with the observed indicators forming the basis of this current section. An outline of the main categories observed is provided in Table 4.2, with a full outline provided in Appendix B.

At the start of student-led activity, there were few observable indicators of students independently thinking about the task ahead. Although infrequent, three main themes of student metacognition were observed; referring to goals, organising and planning. Spontaneous verbalisations of goals were infrequent. Most commonly, students referred to goals in discussion with peers, by referring to expectations set by the teacher and discussing the expectations of the task with each other. Organising roles and responsibilities was also infrequently observed. When it was observed, a key function of organising was to negotiate roles for the task, particularly in tasks where students worked in pairs or in groups (as shown in Example 2 from Table 4.2). Independent planning was infrequently observed, and most commonly occurred through discussions amongst peers. Where planning was observed, this usually resulted from direct instruction about planning by the class teacher, for example when teachers encouraged students to plan their writing in literacy tasks (as discussed in Section 4.6.1).

During student-led activity, students were frequently observed to think about and manage their own thinking, either independently or with peers. Several indicators of monitoring were observed as students completed classroom tasks. Some of the most common indicators of metacognitive monitoring were verbalisations; both to the self (including self-commentary, Example 6) and with peers (including monitoring with peers, Examples 7 and 8). Control was also a commonly observed indicator of metacognition throughout the learning process, including discrete behaviours (such as using an eraser, Example 9), using an established strategy (such as classroom resources, Example 10) and help-seeking (from a peer or adult, Example 11)[17]. As students completed tasks, a clear indicator of student monitoring and control was the awareness and reaction to struggle (expanded upon in Section 4.6.2).

[17] Peer control was observed both in terms of an individual actively seeking help from a peer, and in providing spontaneous control towards a peer. As these behaviours can be distinguished only in terms of the individual being observed, these behaviours were combined in the current analysis.

Table 4.2. Student metacognition throughout the learning process.
As shown, several main indicators of student metacognition were identified throughout the learning process. The table displays indicators with description and examples. Tasks are indicated in (brackets), with FN referring to field notes.

Indicator	Description		Example
Goals	Student verbalises a goal or refers to a goal, to self or peer(s).	1	"I set myself the goal of running 'round 20 times and I got 19 so almost 20" (6).
Organise	Organising task ahead, e.g., collecting resources, organising responsibilities with peer(s).	2	"[Rebecca and Hannah] decide to take turns reading and are designating portions to read" (FN, 7).
		3	"[The teacher] said we had to do page 82-87 but now he says we just have to do the first bit" (11).
Plan	Student creates a verbal or written plan for how to complete the forthcoming task, including the sharing of ideas with peer(s).	4	"What do you want to do?" (1).
		5	"What colour are you going to do yours?" (14).
Monitor	Student monitors progress, comparing progress to an internally-held standard or 'goal', e.g., checking progress, acknowledging difficulty.	6	"I've went past where I'm supposed to read" (7).
		7	"What page are you on?" (11).
		8	"How many facts have you got?" (11).
Control	Student takes action or makes a change, often in response to monitoring. Incudes intra-personal and inter-personal (e.g., with peer(s)).	9	"[Uses eraser] I did car instead of calm" (7).
		10	"What's multiply again? [to self, looks at wall display] ah, multiplication" (9).
		11	"Tina: It would be sixty-four hundred Steve: No, it would be 64 thousand, look – I'll show you [types it in and moves on]" (9).
Share	Student shares completed work, either with peer(s) or teacher.	12	"Look Ms Alexander [shows some writing in jotter]. Teacher: looking good Sophie" (17).
		13	"Polly: [Showing Ms Alexander her work] Ms Alexander: The mask fell off - what would happen? Polly: I can't even see! Ms Alexander: What would happen if you couldn't see? Polly: I might fall over" (18).
Evaluate	Student evaluates the process or products of a task, compared to a goal or plan.	14	"I set myself the goal of running 'round 20 times and I got 19 so almost 20" (6).
		15	"I went to sit next to Henry to watch. He started speaking aloud as he worked […] he went back to the start and read it aloud. As a result, he noticed he had missed an 'and' and went back to correct it." (FN, 4).

At the end of tasks, the teacher often stopped the class and engaged all students in a short plenary session to recap or summarise the task. Out-with these teacher-led discussions (discussed in the following section), there were few instances of students visibly being observed to reflect on their thinking at the end of tasks. As shown in Table 4.2, once the task was finished, two main themes were observed; sharing work and evaluating. Sharing work was observed frequently, and was most commonly with the teacher (Example 12). Sharing work with the teacher at times led to a brief discussion about the task (Example 13). Spontaneous verbalisations that indicated students' own evaluations of the task were observed very infrequently (Example 14).

4.5.2 *Teacher talk and metacognition*

Analysis revealed that whereas students routinely monitored and controlled their cognition *during* tasks, the highly visible key role of teacher talk was evident throughout the learning process, particularly before and after tasks. Most tasks began with a discussion between the teacher and students (as a class or in groups) about the forthcoming activity. As shown in Figure 4.2, teacher-led discussions before tasks accounted for an average of 28% of the total time, and teacher- led activity after tasks accounted for almost 8% of overall task length.

As outlined in Table 4.3, at the beginning of the learning process, teacher talk encompassed four broad themes; describing task, setting expectations, revisiting/revising, and sharing ideas. Unsurprisingly, all tasks included a description by the teacher of the activity and associated goals, including describing the intended learning and/or skill development expected (Examples 1 and 2 from Table 4.3). Overall, there were three types of expectation provided to students: describing the expectation related to the aim of the task (Example 3), expectations about the quality expected in relation to the task (Example 5), and relating to logistical aspects of the task (Example 6). A key finding is that in all instances, expectations were discussed in terms of describing to the students what their goal was, rather than having students set their own goals. Questioning was also commonly used to encourage students to elaborate on how they might fulfil the task requirements, or what might constitute 'success' in the task, for example by drawing on success criteria[18] (Example 4).

Another key theme of teacher talk before tasks was revisiting and revising through description and questioning. By revisiting and revising, teachers made connections to previous learning; both through explicit references to previous tasks (Example 8), as well as questioning about existing knowledge at the beginning of tasks. In some cases, the

[18] 'Success criteria' are statements for students and teachers, to describe what 'success' in a task entails. These are associated with learning intentions; statements about what students should know or achieve by the end of a task. For more information see Education Scotland (2014).

teachers' questioning of current knowledge was comprehensive (Example 7). Overall, teachers rarely encouraged students to plan their work using specific strategies, however teachers did regularly encourage students to think about the task ahead, often through providing an example and encouraging students to share ideas (Examples 9-10). In sum, the most common indicator of teacher talk at the beginning of tasks was *description* – of the current task and expectations.

In comparison to the beginning of the learning process, teacher talk was relatively infrequent during tasks, with teachers spending an average of 8% of the total task length talking with the class during tasks. Teacher talk encompassed setting expectations, monitoring and controlling. Teachers continued to discuss expectations frequently during tasks, by setting, reiterating and re-evaluating expectations. As before the task, expectations were diverse in content, relating to aims (Example 11) and quality (Example 12). One of the most frequent forms of teacher talk during tasks related to monitoring, through sharing work and checking progress (Examples 13 and 14). Sharing work was observed mostly at the ends of the learning process, however it was also occasionally observed during tasks to monitor student progress (Example 14).

Teachers were observed to frequently control students' cognition, with control often directly following teachers monitoring of student progress (particularly by encouraging students to share their work). A key finding of the present research is that during tasks, teachers often noticed and responded to students' reactions to struggle by providing additional support or guidance in relation to the task (explored in more detail in the following section). Teachers controlled students' cognition in different ways, most commonly by providing procedural instruction (Example 15), but also by providing scaffolding (Example 16) and modelling cognition (Example 17).

Overall, I found that post-task discussions were observed to occur less frequently than pre-task discussions, with teacher talk after the task accounting for an average of only 8% of the average total task time across all tasks. As shown in Table 4.3, the content of post-task discussions fell within three overall themes; evaluating, sharing work and linking to the future. Specific post-task evaluations were infrequent, short in duration, and focused almost entirely on short exercises or closed questions from the teacher to students. The most common evaluation led by teachers related to difficulty (Example 18), often through short formative assessment techniques or closed questions (Example 19). Despite the relative infrequency of evaluation at the end of the learning process, teachers did regularly encourage students to share their work, including the products of the task (Example 20). Although less common than sharing the products of work completed, teachers also encouraged students to share the strategies they used (Examples 21 and 22). Moreover, when students shared their work, the teacher would often provide feedback (Examples 23 and 24). At the end of tasks, there was a clear indicator of teacher talk related to linking to future tasks (Example 25). Throughout tasks, teachers also made connections towards wider learning skills or linked the current task to the wider world (Example 26).

Table 4.3. Indicators of teacher talk
This table displays indicators of teacher talk observed, including description and examples. As shown in the table, teachers played a dominant role throughout tasks, with several identified indicators focusing on description and instruction. Tasks are indicated in (brackets), with FN referring to field notes.

Indicator	**Description**		**Example**
Describe task	Describes task, including learning objective, skills or task itself	1	"We are learning to use our knowledge about a character to create a poster" (24).
		2	"You are learning how to get information from the graphs" (20).
Describe expecta-tions	Relating to the overall aim, quality or logistics of task	3	"Make sure you have made a column or a pie chart and then you can explore. I want you to be able to give me some information about your chart" (15).
		4	"Can you tell me one thing I'm going to want, for you to be successful?" (14).
		5	"Practice handwriting. Copy as neatly as you can. Remember your tall letters, finger spaces, capital letters and full stops" (12).
		6	"Take your time, there is no rush. Do this individually first and then we'll come back and discuss it" (11).
Revisit and revise	Elicits students' existing understanding relating to the present task, or links knowledge to previous experiences	7	"Why do we double to consonant for this word pattern? … Who can tell me the spelling pattern in the red group? … Can anyone tell me the special pattern in Jack? … Who can tell me the pattern in the purple group?" (3).
		8	"Who can remember what our tricky words were last week?" (23).
Share ideas	Encourages students to think about the task ahead, often through providing an example and encouraging students to share ideas	9	"Think about the kind of information you would like to include in a document all about me… what do you need to put on it?" (4).
		10	"Find yourself a partner. Tell your partner which teacher you'd like next year and why … tell me either who you would like or who your partner would like and why" (17).

Indicator	Description		Example
Describe expecta-tions	Stating or re-stating; relating to the overall aim, quality or logistics of task	11	"I'm also looking to see what group works well together" (1)
		12	"Remember to add lots of details to your pictures so I know what's going on" (18).
Monitor	Monitors student progress through sharing work or checks progress through questioning	13	"Ms Smith comes to me and mentions that some of the students aren't using sensible methods for the tallies, e.g., Sam is not leaving enough room to keep the tallies next to the categories" (15).
Share work	Encourages students to share progress	14	"Kelly can you give me the first adjective you got… can you read the sentence it was in" (7).
Control – procedural instruction	Provides step-by-step guidance or completes an aspect of the task for students	15	"You need to highlight the data and then go to insert recommended charts" (15).
Control – scaffold	Discusses the task in more detail or uses questioning to elaborate	16	"A few people are getting quite confused about what we need to do. 'Expand these sentences' – what does expand mean? If something expands it gets (bigger)" (13).
Control – model	Models thinking for students, 'thinking-aloud'	17	"A table is another word for writing down information. It is handy because it helps us organise it. [Draws example of 'hobbies' table]. First, I need to decide what I'm going to ask. […] The first thing I need to do for information handling is to find the best way to record the information" (20).
Evaluate	Elicits students' evaluations of task, including evaluations of difficulty, confidence and knowledge	18	"What did you find tricky about using PowerPoint? (Getting a picture) Still quite tricky, did you manage?" (9).
		19	"How does everyone feel about knowing what alliteration is? [Students show thumbs]" (19).
Share work	Encourages students to share their work, including products and strategies	20	"If you don't want to share, say pass. If you would like to read it, be brave" (17).
		21	"Can you tell me how you worked that out?" (9).
		22	"So Daniel – which bit did you fall down on? Stage 1? I don't think so, stage 2? Stage 3? Stage 4? Probably" (5).
Feedback	Provides feedback about task	23	"That is exactly what we are talking about – absolutely perfect, but you haven't done question two, too slow" (5).
		24	"What we notice is, there are quite a lot of adjectives and we might have missed some" (7).
Link to future	Links to a future task or learning	25	"Next time we write I want you to put alliteration into a poem or story" (19).
		26	"People collect information all the time. For example, governments. Survey is a part of everyday life, so it's important we learn how to do it" (20).

To summarise, this study investigated metacognition by observing students throughout the learning process in everyday tasks in primary schools. In characterising of metacognition, it is evident that tasks generally followed a traditional pattern of initiate-response-evaluation (Sinclair & Coulthard, 1975). Perhaps unsurprisingly, many of the identified categories of student activity and teacher talk were routine and procedural (e.g., the prominence of description in teachers' talk or the sharing of work by students). Perhaps most interesting in terms of answering the present research questions, then, is in exploring beyond the routine indictors observed, to investigate specific instances of particular theoretical interest in relation to metacognition. For instance, analysis of the data suggests that students rarely independently planned or evaluated their thinking, however they did regularly monitor and control cognition during tasks. Moreover, observational data confirmed that teachers play a key role in facilitating metacognition throughout the learning process. Thus, the following section builds on the descriptive characterisation presented in Section 4.5, investigating classroom metacognition in more depth by exploring particular aspects of classroom practice from the point of view of both students and teacher.

4.6 Findings 2: Planning and Struggle

The following section provides deeper analysis of two specific aspects of observed behaviour that were particularly insightful in terms of characterising metacognition; planning and the experience of struggle. Whilst a more comprehensive justification for the focus upon planning and struggle is provided in the following sections, in short, these are two aspects of classroom activity that align closely with metacognition theory – particularly metacognitive skills of planning, monitoring and controlling cognition (Brown, 1987; Schraw & Moshman, 1995; Efklides, 2006). Given the goal of providing a more focused investigation of planning and the experience of struggle, the following section differs in structure in comparison to the first part of findings. That is, in the following section, findings are presented in relation to planning and then struggle, each describing data for students and teachers in turn. Given the goal of exploring the connection between psychological theory and educational practice, metacognition theory is drawn on throughout analysis.

4.6.1 *Planning in creative writing*

Planning is identified as a metacognitive skill in theory, in which students make decisions about the task ahead. Schraw and Moshman (1995) describe that planning includes "the selection of appropriate strategies and the allocation of resources that affect performance" (p354). Planning is also identified as a key aspect of metacognition interventions. For example, a meta-analysis that investigated interventions for promoting self-regulated learning found the largest effect sizes for interventions that included planning as well as monitoring and control strategies (Dignath et al., 2008). With particular reference to literacy, an intervention study found that 3rd grade students given metacognitive instruction about planning produced longer and better-quality writing than students who received no training (Tracy, Reid & Graham, 2009). The metacognitive intervention focused on instructing students about the value of planning, and explicit instruction of planning strategies, such as the mnemonic device 'WWW', using 'What When and Why' prompts (Tracy et al., 2009). As such, written plans themselves have been identified as tools to support students to think ahead and to provide a structure to thinking (i.e., as tools to support metacognition).

4.6.1.1 Teacher-led planning

Explicit references by teachers towards specific planning strategies were generally infrequent at the beginning of the learning process, with most instances of planning being confined to creative writing literacy tasks (referred to here as writing tasks). In these writing tasks, teachers adopted different approaches to planning in their classrooms, albeit with most providing some advice in terms of content or structure of planning. Teacher talk at the beginning of tasks often focused on stating an expectation about planning, both in terms of the expectation of having a plan in place, and expectations about the content or form of planning. A particularly clear example of a specific strategy for planning was provided by Mr White, who referred to the '5Ws' of 'Who, What, When, Why, Where'. Mr White displayed the 5Ws at the front of class and referred to them in most writing tasks. For example, when discussing planning, Mr White stated, "You need to answer these questions before we begin [points to the 'when/where/who/how/why' on the board]" (Task 21). Mr White often encouraged (but did not insist upon) students creating a plan. At the beginning of one writing task, Mr White stated "those who don't do plans tend to run out of steam. The least I would expect is for you to have an idea in your head" (Task 21). In another task, students were asked to write 'no plan needed' at the top of the page if they decided against creating a plan:

> Take a bit at the top of your page to plan it. Anyone not going to do any planning? [Some hands up]. OK, if you haven't done any planning, I

> want you to write 'no plan done'. I'm all for freedom of choice, I do think some sort of planning is a good idea. (Task 16)

Planning often adopted a relatively unique role in writing tasks, as an aspect of classroom practice used to support the writing task, whilst also being, at times, a task in itself. For example, Ms Alexander was observed to devote an entire lesson to creating a plan (Task 18). When discussing how to create an 'interesting' story, Ms Alexander provided an example of the thinking process related to planning in discussion with the class:

> What could I write for the start of my plan? … Maybe I could draw a picture. Remember I am not writing the whole story. Ms Alexander is just doing this quickly, but you can spend a lot more time over your picture. Then I'm going to write a little bit underneath, so I can remember what I'm writing about … remember I am not writing the whole thing … what's going to happen in my story that's going to be exciting? … What idea will I use because there are lots of good ideas. (Task 18)

Here, Ms Alexander used modelling to 'think aloud' the process of planning and make the thinking process explicit. By taking students through the journey of generating the superhero story, Ms Alexander provided students with an example of the kinds of thinking that were required in the process of the task, whilst also eliciting ideas from students. This excerpt provides a clear demonstration of the flexible nature of modelling, not just to generate ideas ("what idea will I use") but also providing reasons behind her actions ("so I can remember what I'm writing about"). At a later point, Ms Alexander also explicitly discussed the function of planning, "remember we're just writing plans, just notes – not the whole story" (Task 18).

In a similar way to Ms Alexander's tasks, writing tasks observed in Ms Bruce's class were often 'planning' tasks in themselves, often presented as discreet worksheet tasks such as creating a storyboard or creating a poster with text. In these tasks, however, Ms Bruce did not advocate any specific planning strategy beyond spending time discussing the expectations with the class before the task began. For example, in a writing task that involved creating a poster about a character in the class novel, Ms Bruce encouraged students to share ideas before the task began: "talk with the person next to you, or think in your head about what you think he looks like and what you think he might be like" (Task 24).

In sum, observations revealed that teachers differed in their approaches to planning in writing tasks (i.e., where planning might be particularly expected), with some providing specific examples of planning structures, and others devoting entire lessons to planning to the extent that planning clearly constituted a task in itself. Most teachers either encouraged or required students to plan their writing in some way, providing strong evidence that teachers promoted the metacognitive skill of planning. Consistently, teachers focused upon the content or procedural aspects of planning, with teachers supporting students to develop understanding about *how* to plan to differing degrees. The purpose (or the '*why*') of planning was not explicitly described in any classroom, a finding perhaps surprising given the finding in wider literature of the particular efficacy of planning (Tracy et al., 2009). Furthermore, teachers did not provide a rationale for planning as a metacognitive skill, or explain the ways that plans might be productive in relation to the current task[19]. Nonetheless, out-with literacy tasks, whilst infrequent references towards specific planning strategies were observed, there was clear evidence of teachers encouraging the generation of ideas and sharing of examples.

4.6.1.2 Student planning

In creative writing tasks, observations revealed that students engaged with planning in individual ways, with both the absence and presence of written plans revealing crucial insight into the ways students do (and do not) think about tasks ahead. Across observed tasks, where the teacher provided no direct instruction about how or why to plan, no students independently chose to create a (written) plan for their writing. A complete absence of planning by several students was observed in writing tasks. For example, in Ms Bruce's literacy tasks where no specific guidance on planning was provided, field notes indicated that students often appeared to conduct no spontaneous written planning:

> No student did any sort of planning in any written form – if they did [plan], it was in terms of thinking in their head what they were going to do or discussing with their friend … [many students] I asked just made it up as they went along. (Field notes, Task 14)

This finding was consistent between research sites, and throughout the primary three to five classes observed. Some students without written plans also did not verbalise any

[19] Of course, it would not be expected that teachers directly link to the purpose of planning in every literacy task, however it is still important to state this observation to provide context for the interpretation of student planning observed.

mental plan in discussion with the researcher. For example, when asked whether they had a plan in their head or were making the story up as they went along, several students stated that they were "making it up" (Task 14) or "just winging it" (Task 21). In a writing task that involved creating a storyboard, one student described their title:

> Sarah: It's going to be Kevin and Bill's worst nightmare
> Researcher: […] what's going to be their worst nightmare?
> Sarah: I don't know yet, I just know that's the title. (Task 14)

In Ms Bruce's class, some students who provided no written plan for their work did state that they had thought about the activity before beginning: "I have [a plan] in my head" (Task 14). Furthermore, several students visibly discussed ideas with their peers, constituting a verbal mental 'plan'. For example, in discussion with two friends, one stated about planning, "We're just talking about it. When we have to write it we always talk about it" (Task 14). Therefore, although students appeared to have no structured or written 'plan', discussions revealed that some students had thought ahead and generated ideas, either independently or with a peer.

Through discussion, it was apparent that some students chose not to write a structured plan for a justified reason, and so could articulate *why*. For example, Chantelle stated:

> Researcher: You prefer not to do a plan?
> Chantelle: Yes, I like to write what the first sentence is and then think about what I'm going to write about
> Researcher: So, what makes that work better for you than writing a plan?
> Chantelle: Because if I write a plan, I copy it as I write, and I don't think, and so it doesn't make sense. (Task 16)

This excerpt provides clear evidence that discussion with students can reveal deeper insight into the metacognitive process beyond that suggested by written plans. The last comment by Chantelle in this excerpt signifies rather sophisticated metacognitive knowledge. That is, Chantelle has clearly considered the value of planning in relation to her writing, demonstrating conditional knowledge of the use of planning as a strategy to support her writing (Schraw & Moshman, 1995). This example is also illuminating in terms of exploring what it means to create a plan. Here, evidence suggests that Chantelle sees plans as being a restrictive act of documenting what you are going to do (i.e., as a cognitive tool), rather than as a tool to think about the process of the task ahead (i.e., as a metacognitive tool). As such, the plan is another piece of work, one that restricts the actual work on the writing task. This finding may in part be due to the way that planning is talked about by Chantelle's teacher Mr White, as something that is a 'good idea' but without discussions of why or how planning can be useful.

Another illustration of students justifying planning strategies comes from the following example, in which Claire demonstrated knowledge about circumstances in which a plan might be useful:

> Claire: When it's a test or something really important I do a plan but for this I don't. Because the teacher gives the sentence and as soon as you see this you start thinking of ideas.
> Researcher: Oh, so you just like to think of your ideas as you go along?
> Claire: Yeah. I could do a plan to show the teacher, but it just takes time and so now I've written all this [shows me a paragraph of text]
> Researcher: So, you just plan in your head really?
> Claire: Yeah, and well it depends on the task. Like, if it just started with one word, like wow, I might do a plan. But even then, I get an idea.
> (Task 16)

Here, Claire appeared to have thought about the task and strategies in depth: assessing the 'importance' of the task, responding by making a judgement about the level of quality needed (influencing the 'goal') and regulating her behaviour accordingly by deciding whether to expend resources (time) creating a plan. Additionally, Claire explicitly acknowledged that the teacher might like to see a plan, but weighed that consideration against the quantity of work she could produce without one. Such evidence suggests that Claire employed her metacognitive knowledge of tasks and strategies to guide her planning (Flavell, 1979). Moreover, Claire did not describe plans as something that supported her own work (i.e., as metacognitive tools), but instead described plans as something that was for the teacher. As such, through discussion with Chantelle and Claire it became clear that the absence of a written plan did not necessarily indicate an absence of any metacognitive engagement with the task, but it does suggest that neither student viewed planning as tools to support cognitive engagement with tasks, rather seeing them as restrictive 'tick boxes' that are for the teacher rather than the self.

Discussions with students who *had* created a written plan also revealed differences in the ways students thought about and used planning. For instance, one group of students focused very heavily on the strategy of the '5Ws' (Who, What, When, Where, Why) that had been suggested by Mr White. For example, Charlie used the '5Ws' approach to plan her story, but made no link between the plan and the story:

> Researcher: How are you getting on planning?
> Charlie: OK, I'm finished my plan. I did it like last time.
> Researcher: Great, you said last time that was the way that worked best
> Charlie: Yeah […]
> Researcher: Great, so what do you think will happen next [in the story]?
> Charlie: I don't really know [pauses]. But at least I've finished my plan and now I'm about to start. (Task 21)

In this excerpt, Charlie appeared to have successfully engaged with the teachers' suggested planning strategy by following the '5W' headings. However, in discussion with Charlie it became clear that she did not use planning to think ahead to the writing task (and as such, to use it as a tool to support thinking about the task). To be clear, this example suggests that Charlie perceived the plan to be another aspect of the task itself; something to be completed before the next task of thinking about what to include in the writing.

As the above examples suggest, therefore, students adopted a variety of different approaches to planning, often revealed meaningfully through discussion with the researcher. In a particularly revealing discussion with a group of students, Megan described the planning structure that she used, adapted from the '5Ws' strategy advocated:

> Researcher: How are you all getting on, has anyone made a plan?
> Tom: I did a plan in my head […]
> Olivia: I did too.
> Researcher: Do you think it works better to do it in your head?
> Olivia: Yeah, it's much quicker.
> Megan: Yeah, but you forget it all.
> Olivia: Yeah, but then you can make it up.
> Megan: Well I just write like these words and then they remind me what I want to write about [points].
> Researcher: So, you write the words at the top to remind you?
> Megan: Yeah. It looks like a lot of rubbish, but it helps me.
> Researcher: And how did you come up with that strategy?
> Megan: I just do it 'cause it works best for me. (Task 21)

In this excerpt, talking to Megan about her planning strategy revealed insight into the way she used planning to support her cognition. Looking solely at written evidence of planning, it might have been assumed that Megan did not use planning to support her work. In discussion, however, Megan articulated her strategy of adapting the planning structure offered by the teacher to one that she felt was particularly useful for her. As such, Megan demonstrated metacognition by internalising and adapting the taught strategy in accordance with her metacognitive knowledge about the task, herself as a learner and the strategies available (Flavell, 1979).

Continuing an examination of planning in creative writing literacy tasks, findings revealed a clear impact of planning on students' experiences when completing the writing tasks themselves. That is, rigid adherence to a taught planning strategy often led to students experience struggle during writing tasks. To illustrate this finding, the following example describes a discussion about the different ways of planning, in which Poppy revealed that she used several different planning strategies based on Mr White's suggested '5Ws' approach:

> Researcher: How do you like to plan?
> Poppy: Well I do it all differently. Sometimes I do it like this [shows who/where/when list] Sometimes like this [shows past similar list]. Sometimes like this [shows two mind maps].
> Researcher: You do have lots of ways. What way works best for you?
> Poppy: I think this one worked best [showing mind map] because there were lots of opinions about who and when and what. Then this one [shows current what/when/where]. But not this one [shows why/how – different order]. This didn't work out.
> Researcher: Why did that not work out?
> Poppy: It's not the right order. Like first you need who. Who, me! But I'm stuck on why. (Task 16)

In this example, Poppy described different approaches to planning, and reflected upon what plans had been particularly helpful or unhelpful. As the example demonstrates, although clearly perceiving each plan as distinct, they were in fact different ways of organising the same '5Ws' prompts. Poppy's reflection suggests that she had a clear idea about the way a plan 'should' be structured – beginning with 'who' and then going on to 'why'. Critically, Poppy also experienced struggle as she completed her plan using this structure. As such, by systematically following the rigid structure of the plan despite experiencing struggle in using the plan, this excerpt suggests that Poppy did not use planning as a metacognitive tool, to support the writing task itself.

In a discussion with another student in Mr White's class, Sophie described her experience of struggle when planning: "I'm stuck. I can't think of how to order it [pause]. Normally I do 6 paragraphs and it is one for each [pointing at who/were etc. written in jotter] but I can't do it for this one" (Task 16). As the excerpt demonstrates, the rigid adherence to the planning structure led to Sophie experiencing struggle when the task differed in format. Here, the presence of a plan did not necessarily signify the use of planning as a tool to support cognition (i.e., planning as a metacognitive skill). From this it was inferred that Sophie did not understand the role of a plan and therefore did use planning to regulate her thinking in this task.

In another example of struggle in creative writing, Jade indicated confusion that her plan did not translate into successful completion of the task. After showing her finished writing to the teacher, Jade commented to the researcher:

> Jade: I managed to get my 5 Ws into one paragraph, but now I have to go back and change it […] I did one paragraph and it's got to be around 4 paragraphs.
> Researcher: Oh, so you need to make it a bit longer?
> Jade: Yes, but I don't know how to do that. (Task 16)

In this example, Jade did not adapt her strategy in the face of struggle and appeared not to have a sense of 'ownership' in relation to the function of planning – seeing it as a 'tick-box' to success rather than a tool to improving the quality of her text. Through discussion it was clear that Jade was surprised that her achievement of fitting all the planned aspects into one paragraph did not align with the teacher's expectations. By failing to understand the goal of the task, Jade experienced struggle – she did not effectively adapt her planning strategy to fit the demands of the task. In short, findings suggest that several students faced struggle when they adhered to a rigid structure of planning offered by the teacher without any (metacognitive) understanding about the *purpose* of planning, instead perceiving planning as an additional task that is detached from the writing task itself.

4.6.1.3 Planning: A summary

In sum, by going beyond written plans and talking to students, evidence revealed variation in students’ experiences of planning. The production of written plans provided less evidence of metacognition than expected based on psychological theory. Several students did not plan, and did not think about the task ahead. Others shared ideas with peers or thought ideas in their head. Of those who were encouraged to adopt specific planning approaches, discussions suggested that these were not always perceived by students as helpful – instead constituting restrictive ‘tick boxes’ that bore no relation to the writing task itself. Indeed, rigid adherence to planning strategies often *caused* struggle. Where students adapted advocated planning structures, this was in order to harness the perceived usefulness of planning – to track ideas. Overall, findings suggest that students perceived planning as being an opportunity to track or document ideas for subsequent writing activities. As such, planning was mostly perceived as a tool to support cognition (i.e., memory), rather than a tool to necessarily support metacognition (i.e., to think ahead about the task and strategies to perform the writing task).

4.6.2 *The Experience of Struggle*

The previous section found that several students faced struggle in creative writing tasks as a result (at least in part), to a rigid reliance upon structured ‘plans’ without internalisation of the purpose of planning (i.e., as metacognitive tools). The experience of struggle was indeed identified as a clear indicator of metacognitive monitoring and control in the present study, both in literacy tasks and beyond. In the context of cognitive experimental paradigms, monitoring of online cognition is a core facet of metacognition, for example operationally defined as children’s confidence judgements (Roebers, von der Linden, Schneider & Howie, 2007; Destan et al., 2014). Furthermore, psychological paradigms have attended to actions that individuals take to control their cognition in response to on-line monitoring.

In cognitive research, control of cognition is often measured through discrete activities such as selectively withdrawing answers or allocating study time (Serra & Metcalfe, 2009; Roebers, 2014). In the applied setting, one key way to explore metacognitive control is by investigating how students adapt in the face of struggle (i.e., when encountering something that is difficult to accomplish or understand). For example, Perry and Van de Kamp (2000) found that in interviews, kindergarten to grade three students described using several different strategies in response to struggle in reading and writing (including seeking help from others, altering the task to make it easier, expending more effort and using strategies). Experiencing struggle is therefore identified as a pivotal moment to explore the ways individuals monitor and control their cognition (Nelson & Narens, 1990).

4.6.2.1 Student Experience of Struggle

Students frequently articulated struggles they experienced, providing evidence of monitoring cognition. Indicators included short remarks when thinking out loud: “No it couldn’t be 16, what about … I can’t do this [moves on]” (Task 9). In another task, one student made her frustration clear through her verbalisation as she completed a task on the computer: “Ah, why this not work [clicking the mouse repeatedly]” (Task 4). Thus, spontaneous verbalisations to the self during tasks therefore provided insight into students’ monitoring, particularly when students experienced struggle.

In a task that involved collating facts and opinions from a piece of text, Jack articulated his struggle in discussion:

> Researcher: How are you getting on?
> Jack: I’m struggling. I am struggling to find them again after I read them.
> Researcher: So you read all the writing and now you’re going back to find the facts and opinions?
> Jack: Yeah.
> Bert: You should do it like me. I am just writing them as I find them.
> Researcher: So, you don’t need to read it all through first?
> Bert: No, I’m doing it as I read.
> Researcher: I suppose it might be difficult to hold all the facts in your head as you read.
> Jack: Yeah. (Task 11)

In another example, Henry explained to the researcher that he had made a mistake in an ICT task, and provided direction about how his work should be interpreted in light of his mistake: “I’ve made a mistake. I forgot I put those numbers [points at 3,6,9 etc.], so they don’t mean that, they just mean one each” (Task 20). The above examples are typical of discussions with students where the experience of struggle was discussed openly. Across examples a pattern emerged: most students routinely monitored their performance towards a goal and articulated knowledge of their own progress during tasks (providing evidence of online monitoring of cognition, Schraw & Moshman, 1995; Nelson, 1996). Not only does the example above suggest that Jack was aware that he was experiencing struggle, it also highlights the natural tendency for peers to discuss struggle between themselves. Furthermore, Henry reflected on his struggle, demonstrating awareness of the implications of this mistake upon another's perceptions of the output, directing the researcher to take this into account.

Whilst most students openly discussed the experience of feeling 'stuck', a contrasting example was observed when Sam appeared to lack awareness of struggle in an ICT task. Students worked in pairs to survey their peers on a topic of their choice, and then input the data into Excel to make a chart. Despite the teacher spending time at the beginning explaining the steps of the task, Sam was observed to repeatedly survey peers, creating a chart of tallies before beginning again on another topic:

> Researcher: How is Excel, do you think it's easy or hard or in the middle?
> Sam: Easy! I'm doing sports now.
> [A few minutes later]
> Researcher: How are you getting on Sam, have you made your chart yet?
> Sam: Yeah, I've done food and now I'm doing sports.
> Researcher: Ok great. Can you tell me what the goal of this task is? What do you need to do by the end of the lesson?
> Sam: Well basically, you need to count them up and then see which one wins. (Task 20)

When asked how he was getting on, Sam replied that he was doing well. However, discussion about the nature and goal of the task suggested that Sam did not understand the intended goal of the task, in addition to not understanding his lack of understanding. The finding that Sam did not appear to monitor his struggle is critical in discussing metacognitive monitoring. Indeed, it seems as if this might be an example of the Dunning-Kruger effect (Kruger & Dunning, 1999), with Sam both inadequately completing the task, and misunderstanding his own cognition in relation to the task. This finding is not entirely surprising (it would not necessarily be expected that *all* students would exhibit metacognitive monitoring), but it does highlight how difficult it can be to explore metacognition (and particularly the 'accuracy' of metacognition) in the classroom. That is, it was possible to gauge some estimation of the accuracy of Sam's assessment of the task by comparing Sam's perceptions of the task and his progress, to the actual goal and his actual progress. However, classroom tasks often do not contain easily-captured 'objective' criteria for success. Such an example, therefore, emphasises the difficulty of gauging metacognitive 'accuracy' in the classroom setting (as discussed in more depth in Chapter 7).

Having discussed students' monitoring of their experience of struggle, attention now turns to the experience of struggle as a route to understanding the ways that students *control* their own cognition. Similarly to Perry and Van de Kamp (2000), observations suggested that in the face of struggle, students responded in several different ways. Control behaviours observed included avoidance, trial and error and seeking help. Some students responded to struggle by avoiding the task, as evidenced through verbalisations such as, "Too hard, easier please" (Task 25*[20]). In another example, John avoided struggle by changing the difficulty of the task set by the teacher:

> Teacher: Try a challenge for me [selects task on computer rated three stars for difficulty].
> John: [Looks at screen, shrugs shoulders. Selects wrong answer, moves on to next question]. This one's quite hard [goes back to 'select test' page and selects task with one-star difficulty … Finishes test, scores 3/15]. (Task 9)

Some minutes later when the teacher asked John about his progress, John replied, "I got 6 out of 15 but I did three stars. It was quite hard. It didn't show you which ones you got wrong" (Task 9). Here, John responded to struggle by altering the task to make it easier. Whilst admitting to the teacher that he faced struggle, he misrepresented his actual score and concealed from the teacher that he had altered the task to make it easier, indicating a relatively sophisticated strategy of controlling not only the task, but the teacher's perceptions.

Another strategy that was often used in response to struggle was to seek help from peers. In the following example, Eleanor described that she sought help from a peer, but continued to experience frustration whilst struggling to create a graph from the data she had been entering into Excel:

[20] The (*) used here is used to draw attention to tasks that were not included in the analysis of task structure. As described previously, 24 complete tasks were observed, however several shorter excerpts of tasks were also observed. Where relevant, these are included here and indicated with an (*) for clarity. Descriptions of these tasks are provided in Appendix B.

> Eleanor: I'm getting so frustrated.
> Researcher: Why are you getting frustrated?
> Eleanor: I can't find the chart. Ali did the pie chart for me, but I can't find the other one [repeatedly opens and closes the 'recommended charts' but doesn't see any as she hasn't highlighted any information].
> Eleanor: I want to go on [other programme]. (Task 15)

This excerpt suggests that although Eleanor appeared very aware that she was struggling (providing evidence of metacognitive monitoring), she did not independently control her cognition in relation to her goal of creating a graph, leading to a clear sense of frustration. In fact, Eleanor's control strategy of seeking help from a peer was relatively unhelpful, because she did not gain any useful information from this strategy other than the 'answer'. Consequently, Eleanor soon faced struggle again when the peer was no longer available (indicating a continuous relationship between monitoring and control of cognition as tasks are completed, as per Nelson, 1996). The lack of control strategies was further demonstrated by Eleanor's repeated attempts to use the same action on the computer, despite it having no effect.

When students were observed to respond to struggle, a prominent strategy was to seek help from an adult. As a result, it was common for students to appeal to me (as the researcher in class) when they experienced struggle. For example, on separate occasions discussions began with a student stating to the researcher "I don't know what to do" (Task 19) or "I'm getting so frustrated" (Task 16). In one example, a student found the answer by asking the researcher:

> Susan: Can you tell me what day Halloween is on?
> Researcher: Yes, it's 31st October.
> Susan: You just gave me the answer to one of my questions.
> Researcher: Oh really! Were you supposed to find that in the text?
> Susan: Yes. (Task 26*)

In this interaction, the very verbalisation of struggle was the strategy used to control cognition, by appealing to an adult for assistance.

Seeking help from a teacher was another commonly observed inter-personal control strategy. This help-seeking behaviour ranged from declarations of being 'stuck', to asking the teacher for assistance on elements of the task. For example, in a task that involved finishing sentences from a list of words, Paula asked the teacher for help:

> Paula: I'm stuck on number two.
> Teacher: Have a look through all the words. Water the plant or it will…thirteen? That doesn't make sense, does it?
> Paula: [Pauses] Die?
> Teacher: Well, what happens when you don't water plants?
> Paula: They die! (Task 23)

In short, students regularly controlled their cognition by appealing to others for help – particularly by copying a peer or asking an adult.

Although relatively infrequent, some students independently controlled their cognition using strategies such as trial and error. For example, Henry was comfortable making mistakes and using the 'un-do' function when completing activities on the computer. In an ICT lesson, field notes described Henry's use of trial and error, "[Henry] highlighted the wrong areas of his table, meaning that his pie chart was not working out properly. He tried with a few different charts, and once he had made the chart he actively worked with it – playing around with the program" (Task 15). This evidence suggested that Henry was comfortable in trialling strategies and then 'un-doing' when a problem occurred.

In sum, students were observed to control their cognition in several different ways, with the experience of struggle being particularly enlightening in relation to control of cognition. Many students adopted relatively 'superficial' behaviours to control cognition, such as changing aspects of the task to make them easier, as well as checking an answer with (or copying) a peer. Relatively few instances of independent control (such as adapting a taught strategy or trialling a different approach) were observed, with students often appealing to the researcher or teacher for help[21]. Given the clear role of the teacher, therefore, the following section considers teachers' responses to student struggle.

4.6.2.2 Teachers' response to struggle

A key finding of the present research is that during tasks, teachers often noticed and responded to students' struggle by providing additional support or guidance in relation to

[21] This observed lack of independent (intra-personal) control was unlikely (at least in part) due to the difficulty in observing mental processing. The inclusion of discussions with students was critical for this very reason, however it is acknowledged that this does rely on a degree of verbal acuity.

the task. Teachers monitored student progress by asking students to share their work as well as by checking progress through questioning, “Thumbs up if you have chosen your climate… your animal…?” (Task 1). Occasionally, teachers mentioned to the researcher that he or she had noticed something about the task progress, as researcher field notes indicate: “Ms Smith comes to me and mentions that some of the students aren’t using sensible methods for the tallies” (Task 15). Indeed, during tasks, it was common for the teacher to comment on students’ progress, for example: “Come sit down. A few people are getting quite confused about what we need to do” (Task 13).

Teachers were also observed to frequently control students’ cognition, often directly following monitoring progress through sharing work. The most frequently-observed form of teacher talk relating to controlling students’ cognition was procedural instruction, in which the teacher either provided step-by-step guidance, or simply completed an aspect of the task for students for example, “You need to highlight the data and then go to insert recommended charts” (Task 15). In some cases, the teacher provided additional scaffolding to students, by discussing the task in more detail and using questioning to elaborate. For example, “A few people are getting quite confused about what we need to do. ‘Expand these sentences’ – what does expand mean? If something expands it gets … (bigger)” (Task 13). Here, after realising that some students were struggling, the teacher gathered students together to discuss the task in more detail.

Although less frequent than procedural instruction, another observed aspect of teacher-led control during tasks was modelling thinking, or ‘thinking aloud’. For example, in an ICT task, students surveyed their peers using a table and then used Excel to create a chart. On noticing that several students used a tally rather than a table to record responses, Ms Smith stopped and asked students to gather as a class:

> [Ms Smith stops and asks students to gather around the table. Some had started to ‘tally’ rather than create a table of responses] A table is another word for writing down information. It is handy because it helps us organise it. [Draws example of ‘hobbies’ table]. First, I need to decide what I’m going to ask. How many categories. I’m going to do 3 [draws]. I might have swimming, gymnastics, karate, judo. If I want to find out boys and girls I can add it here. The first thing I need to do for information handling is to find the best way to record the information.

For example, last week Sam didn't leave enough room for his tallies, so we had to organise it so we could record the information. (Task 20)

Here, Ms Smith responded to difficulty by drawing the class together to provide an example of the steps required to complete the task whilst describing important task characteristics. In addition, Ms Smith linked her example to the process of completing the task the previous week, describing how this task may be adapted in relation to issues that were identified previously.

In another example, Ms Bruce provided a solution for Leon when he struggled in a numeracy task:

Leon: I'm stuck.
Researcher: What can you do when you're stuck?
Leon: Use my fingers. 25 plus 25. 1, 2 … 6… I don't have that many fingers.
Researcher: Is there anything else you can do when you are stuck?
Leon: Mmm [pause].
Researcher: [Hands Leon the number square].
Leon: [Pauses, teacher comes over] I'm stuck.
Teacher: If you're really stuck, leave a question mark and we will discuss it in our self-assessment. (Task 27*)

In this excerpt, Leon verbalised his struggle to the researcher and then the teacher in quick succession. Although Leon could describe strategies to aid with struggle, he also faced struggle in using the taught strategy and therefore appealed to the teacher for assistance. As described in field notes, when Ms Bruce advised Leon to leave a question mark when stuck, he then proceeded to leave a question mark for all subsequent questions: "the teacher told him the strategy of leaving a question mark, which he did for the next 4 questions" (Field notes, Task 27*). Overall, this example suggests that when facing struggle, instead of using teacher-advocated strategies to control his cognition, Leon instead appealed to adults for help. Moreover, when Ms Bruce provided a strategy that allowed Leon to avoid the struggle, he readily adopted this strategy for the remainder of the task. Such an interaction highlights a fundamental difference between students being given strategies that will increase understanding of a task, and being given strategies that allow them to complete the task. Moreover, this excerpt highlights a difference between ‘on-line’ control strategies for struggle, and more structured opportunities to explore students’ thinking and learning (as explores in more detail in Chapter 5).

4.6.2.3 Struggle: A summary

In sum, talking to students about the experience of struggle provided clear evidence of the metacognitive processes of monitoring and controlling. Observation confirmed that whilst most students could articulate a struggle they experienced (i.e., monitor performance towards a goal), many students reacted to struggle by utilising relatively superficial control strategies of avoidance, copying or seeking the answer from another (rather than advice on *how* to reach the solution). Critically, evidence suggests that during tasks, teachers frequently monitored and responded to students’ struggle; often by providing additional support or guidance in relation to the task. As such, the data reported here strongly suggests that teachers monitored and controlled cognition *for* their students. Importantly, then, findings point towards the significance of teacher-student interactions for not only observing metacognition in the classroom, but also for encouraging the development of students’ metacognitive skills, particularly through the experience of struggle.

4.7 Discussion

This chapter aimed to characterise classroom metacognition by observing both students and teachers throughout everyday classroom tasks. Indicators of metacognition were observed throughout the learning process; whereas teacher talk played a key role before tasks, students frequently monitored and controlled their cognition during tasks. However, surprisingly little discussion was observed after tasks, when examining students as well as teacher talk. Planning and the experience of struggle revealed clear differences in the way students thought about ad managed their own thinking. Planning in creative writing tasks revealed clear interactions between teaching practices and student activity, with no student creating written plans in the absence of direction from the teacher. Even when teachers promoted the use of planning, however, students most commonly used plans as cognitive prompts to support recall, and often perceived these to be restrictive ‘tick box’ activities for the teacher rather than as tools to support students’ own cognition. Furthermore, when students experienced struggle during tasks (often directly in response to planning strategies), students often used straightforward control actions focused on completion rather than understanding, with this finding being often paralleled by teachers’ procedural instruction in controlling cognition *for* students.

4.7.1 *Characterising metacognition*

Overall, the present findings provide fundamental insight into ways that psychological ideas about metacognition relate to observable metacognitive processing throughout everyday classroom tasks. By exploring metacognition throughout the learning process in the classroom, the present findings lend support for a view of metacognition as a process that is enacted over time. Whilst tasks generally followed a traditional pattern of initiate-response-evaluation (Sinclair & Coulthard, 1975), amongst the clearest evidence of metacognition was students' monitoring and control of their own cognition during tasks.

Extant theory and literature clearly indicates that individuals can monitor and control their own thinking during tasks. Although much focus has been placed on the influence of metacognitive monitoring on subsequent control (e.g., Roebers et al., 2009), the cyclical relationship between monitoring and control has also been highlighted (Nelson, 1996). The present findings suggest that whereas there are some instances of control occurring as a result of monitoring, the relationship between monitoring and control was often close and continues (i.e., students continually monitored and controlled their cognition until they reached a solution). Such evidence suggests that monitoring and control form a cyclical process – with on-line monitoring influencing control, which in turn influences monitoring (and so on). Such a view describes how information can iteratively be processed between an 'object' and a 'meta' level until a task has been completed (Nelson, 1996).

Whilst monitoring and control form the main aspects of 'on-line' metacognition during tasks (for example, through the awareness of, and reaction to, struggle), the evidence presented suggests that students also think about and manage their own thinking at the beginning and end of the learning process. Whilst Nelson's (1996) and Kuhn's (2000) models of metacognition detail the 'on-line' shift of information between meta and performance levels as tasks are completed, they focus less on the metacognitive processes that are engaged before and after tasks (such as planning, setting goals and reflecting on performance). Planning was identified in the present study as an interesting time point at which to observe students' metacognition, particularly through discussions with peers, in writing, or internally.

Following tasks, there was limited evidence of students independently evaluating their work, however teachers did play a key role in encouraging students to think about the products and process of tasks. As such, both the product and the process of the on-line monitoring and control may be reflected upon through evaluation, creating knowledge that can be carried forward into subsequent tasks (Tarricone, 2011). As such, In addition to 'on-line' monitoring and control during tasks, the present findings suggest that metacognitive regulation encapsulates wider skills such as planning, checking, coordinating, strategy use and evaluating (Tarricone, 2011; Schraw & Moshman, 1995), with metacognitive knowledge and regulation forming 'manifestations' of monitoring and control processes (Efklides, 2006).

By continuing to view metacognition throughout the learning process, the role of metacognitive knowledge was also apparent. Indeed, one of the key findings was the prominence of teacher talk, particularly before and after tasks. At the beginning of the learning process, teachers described tasks and discussed goals and expectations. Clear instances of teacher talk were also evident after tasks, particularly through sharing work and connecting to future tasks. Data also revealed that teachers encouraged students to situate the current task within the wider time-course of learning. For instance, at the beginning of the learning process, teachers frequently revisited previous tasks, using questioning and discussion to recall students' knowledge about the content and topic area of the current task. Similarly, at the end of the learning process, teachers often referred to future learning, for example by describing how the current task would relate or contribute to future tasks. The finding that teachers regularly make connections to other tasks highlights that whilst the present focus has been upon investigating metacognition throughout the time-course of individual tasks, metacognition clearly extends more widely and can be understood as an iterative process across successive tasks.

Examination of the role of teacher talk indeed raises questions relating to the role that metacognitive knowledge plays in shaping the iterative metacognitive processes: knowledge may be used (for example when planning, making decisions and evaluating), and knowledge may also be developed (for example being generated through the selection and adaption of strategies to control cognition, or through evaluating performance). It is this creation of knowledge 'to take forward' that allows an understanding of the development of metacognitive skills over time, as an iterative process. Findings of the present study did indeed highlight a function of teacher talk as linking between past and future tasks. Thus, the placement of the cycle of monitoring and control during tasks, within the wider cycle of task completion, is important for capturing the iterative nature of metacognition throughout the learning process.

Developing a wider understanding of metacognition within the applied educational context leads to the consideration of the role of metacognition between tasks over time. Indeed, wider influences of metacognitive knowledge and control between tasks are implied in models of metacognition that refer to planning and evaluation, as well as accounts that refer specifically to task goals. For example, the act of planning at the beginning of a task is inherently related to previous tasks, by drawing on previous knowledge and experiences in relation to the current task. Likewise, the core function of evaluation is to think to future tasks; thinking about how to improve. Surprisingly, although Flavell and Wellman (1977) describe an aspect of metacognition as including 'looking to the future', existing accounts do not typically explicitly consider the development of metacognitive processes from one task to the next, with the cyclical nature of metacognition being more a focus of literature on self-regulation (Zimmerman, 1990, 2002). The predominant use of cross-sectional designs that investigate specific components of metacognition at one point in time (e.g., Zohar & Peled, 2008) may explain why there has been limited emphasis on understanding the process of metacognition from one task to another.

The present findings suggest the need for a re-examination of the role of metacognitive knowledge throughout the learning process. More specifically, it is pertinent here to distinguish between feelings relating to cognition that occur during on-line 'monitoring', and wider declarative, procedural and conditional knowledge throughout the learning process. In the present study, it was apparent that on-line monitoring manifests as metacognitive experiences towards the progress and attainment of goals. A good example of this is the experience of struggle described previously. The experience of feeling 'stuck' can be described as a somewhat different type of knowledge compared to more declarative metacognitive knowledge (such as knowledge of tasks, persons or strategies, see Flavell, 1979). Knowledge utilised particularly before and after tasks is inherently declarative in nature; insofar that it is conscious, 'statable' information 'about' things (Brown, 1987; Schraw, 1994). By contrast, metacognitive experiences can be described as more affective in nature, referring to task-specific knowledge or implicit feelings during tasks, as evidenced at present by feelings of difficulty or frustration (Flavell, 1979; Efklides & Misailidi, 2010).

4.7.2 *Implications*

A main finding in the present research is the important role of the teacher for facilitating student metacognition. Findings suggest that in observed primary school classrooms, students were exposed to thinking skills including planning, monitoring and controlling cognition. Indeed, through talk, teachers often enacted metacognition *for* students. For example, teachers clearly placed differing levels of importance upon planning strategies, however, even when strategies such as mnemonic planning devices (Tracy et al., 2009) were advocated, the recommendation of a strategy alone was not sufficient for students to demonstrate metacognition. Moreover, given that one of the main strategies used by students facing struggle was to seek help, this further emphasises the importance of teacher-student interactions. More specifically, the present findings point towards the particular importance of interactions that support students in their ability to think about available strategies and to seek deeper understanding with increasing student independence (rather than a simple solution as a 'quick fix').

In the present study, there were clear implications in relation to the measurement of metacognition and how this relates to practice. Clearly, given the difficulties in gauging an inherently internal process, observable indicators of metacognition do not necessarily capture all metacognitive processing of an individual. Discussions, however, provided a particularly good opportunity to reveal the different ways that students thought about and managed their own thinking. The finding of the particular usefulness of discussion for revealing insights into the metacognitive process provides potential implications for not only measurement, but also the very use of metacognitive tools in the classroom. For example, written plans may be restrictive in terms of student engagement, and may also have limited value in terms of documenting students' metacognitive skills. Thus, an implication of the present findings is in promoting a re-examination of the purpose and delivery of established classroom practices, suggesting that talk and interaction provide greater opportunities to gauge (and promote) student metacognition in the middle primary school years.

4.7.3 *Summary*

The findings of the present chapter highlight several components of student metacognition and teacher talk throughout the learning process. By conducting classroom-based research throughout everyday classrooms tasks, it is possible to map activity in relation to insights about metacognition, highlighting the iterative function of teacher talk and student metacognition. Focusing on specific aspects of classroom activity reveals clear insight about metacognition, with students adopting varied approaches to planning that were somewhat distinct from observed planning (i.e., the presence or absence of a written plan).

The experience of struggle highlighted differences in the ways students were observed to monitor and control cognition during tasks, with the most common indicator being to seek help from teachers or peers. Ultimately, the findings of this chapter highlight the importance of understanding the interactions between teacher and student in the classroom environment and the role that these exchanges play in the metacognitive process.

Finally, in this chapter, the observations revealed a clear differentiation between teacher talk and student talk, perhaps suggesting an arbitrary distinction between what students do and what teachers do. This distinction was appropriate in the current study because it allowed focus on the overall aim of characterising metacognition by identifying indicators throughout everyday classroom tasks. The results, therefore, highlight the crucial role of the teacher in supporting student metacognition. Clearly, however, the emerging finding of the critical role of the class teacher throughout tasks leads to questions regarding the ways students and teachers interact throughout tasks, and the influence such interactions may have on students' metacognition. As such, the next study (described in the following chapter) aims to more deeply explore the interaction between students and teachers, by focusing investigation upon two students and their teacher over time.

Summary point 1: Indicators of metacognition were observed throughout the learning process, particularly during task completion; less evidence was observed for indicators before or after tasks.

Summary point 2: The talk of teachers played a dominant role throughout the learning process, particularly in providing description and instruction before tasks.

Summary point 3: Planning and struggle were critical points to investigate students' experiences of metacognition, including teachers' roles in supporting students' metacognition.

Chapter 5: Structured Thinking Activities

The data presented in this chapter has contributed to a peer-reviewed journal article, as follows:

Branigan, H. E. & Davidson, D. I. (2019). Learning from learning logs: A case study of metacognition in the primary school classroom. *British Educational Research Journal.* 45(4), 791-820. doi:10.1002/berj.3526.

5.1 Where are we now?

In Chapter 4, metacognition was explored throughout everyday classroom tasks, seeking to characterise metacognition throughout the learning process. Whilst such an approach was a critical first step in order to explore the 'impact' of metacognition in classrooms, it was acknowledged from the outset of this project that everyday tasks were only one route to explore metacognition in classrooms. That is, pilot research (as described in Section 3.9) revealed the prominence of a range of classroom activities delivered to students with the specific goal of encouraging students to engage in metacognition. Thus, an intention from early in the design in this project was to explore such activities in more depth. Moreover, the value of the flexible design adopted in this PhD project is that it allows a degree of iteration, and indeed, the research process detailed in Chapter 4 was instrumental for developing insight about the design of this present chapter. More specifically, with the specific role of interaction between teacher and students being identified in Chapter 4, the present study was designed to more explicitly investigate metacognition through the interactions between teacher and students. With the depth of detail produced in classrooms being clearly evident, it was decided to conduct a more detailed case study within one classroom in the present study, allowing the exploration of students' experiences of metacognition in addition to the role of the teacher in the metacognitive process.

5.2 Introduction

One main way that teachers in Scottish primary schools describe encouraging students to think about their own thinking (i.e., to encourage metacognition) is through tools such as learning logs or planning books (as discussed in Section 3.9 of Chapter 3). These activities have been described using several different terms, including learning logs, learning diaries, personal development logs and achievement books (Moon, 2002), with learning logs and

E-Portfolios being identified in the review of thinking skills approaches by Higgins et al. (2007). In the present study, I use the term ‘Structured Thinking Activities’ (hereafter STAs) to refer to specific pedagogical tools used within the classroom to provide a specific platform for students to think about their own thinking as a separate lesson in itself. I draw a contrast between STAs and everyday classroom activities that may include an aspect of thinking about thinking, but where thinking about thinking itself is not the sole goal of the task. That is, STAs are *not* classroom activities such as numeracy tasks or literacy tasks, as described in Chapter 4. STAs contain several diverse prospective and retrospective activities, such as creating weekly or termly targets, evaluating pieces of work (of the self or a peer) and reflecting on targets for the week, term or year. Furthermore, STAs are often also used as tools to support discussion between students and teachers, meaning the definition of STAs is not confined to written activities in isolation.

STAs have been associated with several benefits for learners. Moon (2002) highlights some of the key benefits of activities as: demanding time and intellectual space; promoting independent learning; providing a focusing point to order thinking; supporting emotional or affective components of learning; and assisting with non-straightforward aspects of learning. Barclay (1996) describes a STA as:

> A flexible method which recognizes that learning is a personal, individual process. By planning development activities, it incorporates elements of active self-directed learning, and reinforces individual responsibility in development. (p30)

From this quote, the connections between metacognition and STAs are clear: activities provide not only a platform upon which to reflect on learning (i.e., develop metacognitive knowledge), but also to regulate one’s own cognition through planning, monitoring and evaluating.

Despite their popularity and intuitive relationship to metacognition, few studies have investigated the ways that teachers and students use STAs, and how these activities relate to students’ developing metacognition (Paris & Paris, 2001). As a result, little is known about the processes that may underlie a purported ‘benefit’. Where studies do exist, these predominantly measure the ‘effects’ of specific STAs, often in high school or Higher Education (HE) contexts. For example, Audet et al. (1996) found that learning logs supported high school students’ understanding of scientific concepts, and Smith, Rook and Smith (2007) found that asking metacognitive questions in learning logs improved high school students' history grades more than asking purely cognitive questions. In HE, McCrindle and Christensen (1995) found that students who documented their learning in journals had increased metacognition, cognitive strategy use and science performance compared to controls who completed a scientific report. Also in HE, Nückles, Hübner and Renkel (2009) found that cognitive performance was improved when students were given cognitive and metacognitive prompts in learning journals (compared to no prompts).

In a more recent study, Mallozzi and Heilbronner (2013) investigated the impact of different content delivered through Interactive Student Notebooks (ISNs) in science classes. The researchers compared between the delivery of metacognitive instruction plus teacher feedback, to metacognitive instruction alone, to no ISN at all. In the metacognitive condition, students were supported to make interpretations, reflect on their work, and make connections between subject areas. Results of the study indicated that students perceived the ISNs as useful for improving learning in science, and the use of ISNs did indeed improve students' performance (compared to no ISN use). Student performance was improved in both conditions that included metacognitive instruction; those who received metacognitive instruction alone, as well as those who received metacognitive instruction in addition to written feedback from teachers. Some evidence does, therefore, suggest beneficial effects of STAs upon students' academic performance – particularly when STAs explicitly encourage metacognition.

Despite some evidence suggesting their educational benefits, the diversity of approaches to STAs and the general lack of research about their use in the primary school years is striking. Clearly, one cannot assume that the mere presence of STAs will influence students' reflection, metacognition or (ultimately) learning. Although some research has identified a relationship between STA use and performance, little is known about the content of STAs, and most importantly, the ways that students are supported to think about and manage their own thinking whilst completing STAs. For example, the finding that low-achieving students benefit more from metacognitive interventions (Swanson, 1990; Zohar & Peled, 2008; Higgins et al., 2004) leads to questions about whether students identified as traditionally 'low-achieving' will differ in their engagement with STAs compared to their 'high-achieving' peers. In sum, given the popularity of STAs in primary schools, further research is clearly needed to investigate their use in the primary school setting, and the way they are used to facilitate students' developing metacognition.

A related issue that has received little attention in the literature is the key factors in the context of the classroom that might facilitate or inhibit the use of STAs. For example, teachers clearly play a role in facilitating STAs, as highlighted by Barclay (1996, p41): "it is important […] that learning logs should not be given to learners and just 'left to get on with it'. It is a developmental technique which requires good support". Furthermore, the role of the teacher in providing opportunities for students to independently think about their thinking through STAs has been emphasised by Kleinsasser and Horsch (1992, p15): "when teachers relinquish some control of what is learned and how to learn it and when students are allowed to monitor their own progress, learning is enhanced and accelerated". Thus, given the vital role of the teacher in supporting student metacognition, the lack of research regarding the role of STAs within teaching practice is surprising.

5.2.1 *The present study*

The present study is guided by the observation that despite the prominence of STAs in Scottish education (see Section 3.9 of Chapter 3) and their apparent relationship to metacognition, very little is known about how STAs are used in primary school classrooms, or the ways that teachers and students interact with the activities themselves. This study aims to investigate the ways that STAs are used within the classroom, including factors that might facilitate or inhibit metacognition through STAs. To summarise, this study is guided by the following research questions:

1. What do STAs reveal about the metacognitive process? That is, in what ways do students think about and manage their own thinking as they complete STAs?
2. What similarities and differences in STA use exist between students identified by the teacher as differing in terms of traditional academic skills?
3. What factors in the learning and teaching environment facilitate and/or inhibit students' metacognition through the use of STAs?

Chapter 5 extends upon Chapter 4 in several ways. In comparison to Chapter 5, the present study comprises a more focused exploration of classroom metacognition by conducting research in a single classroom over an extended time period (i.e., a school year). By providing such a focused investigation, I aim to provide a rich characterisation of students' engagement with STAs over time. The approach adopted in this chapter also affords the opportunity to explore the interactions between the classroom teacher and students in classrooms. I focus specifically on the experiences of two students (Laura and Amy), identified as differing in terms of traditional academic skills. This is an interesting area to explore given that research demonstrates specific benefits of metacognitive approaches for ‘low attaining’ students (Swanson, 1990; Zohar & Peled, 2008; Higgins et al., 2004). The present focus on one classroom facilitates exploration of students’ metacognition over an extended period of time, moving beyond individual discrete tasks. Critically, this approach allows investigation of the role of the class teacher in structuring and facilitating STAs, as evidenced by the interactions between teacher and students.

As in Chapter 4, the present findings are reported in two sections. Firstly, the first two research questions are addressed by exploring students’ individual experiences of STAs as metacognitive tools. The second part of the findings presented in this chapter addresses the third research question of this chapter, focusing more generally on the role of STAs within the classroom, including areas identified as facilitating and inhibiting Laura and Amy’s use of STAs as metacognitive tools. In describing findings pertaining to this third question, it is appropriate to consider the whole class, and as such, Section 5.6 includes analysis of students throughout the class (including, but not limited to, observations of Laura and Amy). Given the focus on factors within the classroom, the latter half of this chapter also places more focus on the role of the teacher throughout STAs, and particularly the interactions between teacher and students.

5.3 A Note on Methodology

The present research formed a case study of the use of STAs within one classroom, a qualitative approach appropriate given the goals of *exploring* and *understanding* the role of STAs in relation to metacognition (Robson, 2011). The present study draws specifically on ethnographic methods, seeking to investigate “first-hand what people do and say in particular contexts” (Hammersley, 2006, p4). Data collection took place throughout one academic year (2016 – 17), using intermittent periods of data collection (i.e., using a ‘selective intermittent time mode’, see Jeffrey & Troman, 2004). In total, I spent nine hours observing STAs throughout the course of the school year, over nine data collection episodes (averaging 60 minutes, ranging 45-105 minutes)[22]. An outline of the STAs observed is provided in Appendix C.

To enable exploration of the differing experiences of students as they interacted with STAs, I followed two specific students in the class, Amy and Laura (as outlined in more

[22] There was a gap in observations between September 2016 and February 2017 as I had a brief suspension of studies. Anticipating a gap in data collection, I provided the class teacher with a log book to note any pertinent reflections or tasks. I also provided an audio-recorder to record STA discussions. The teacher did not record any discussions, and as such this is not included in the analysis.

detail below)[23]. Multiple methods were used to investigate STAs, triangulating data by conducting participant observation, interviews and analysis of written texts. The main source of data collection in the present study was participant observation, adopting a 'participant as observer' stance (as detailed in Chapter 3). In addition to participant observation, I also investigated STAs through open-interviews with participants (students and the teacher) and through analysis of texts produced by students (such as excerpts of written STAs). Following each episode of data collection, I adopted open coding of field notes, with photographs of documents providing additional 'illuminative' evidence (Craft et al., 2014). Through this flexible research design, emerging themes were explored in greater depth as data collection progressed; for example, through discussing emerging themes from observations in conversation with the teacher or students (Robson, 2011).

5.3.1 *A Reflection on Methodology*

Several characteristics of the present study benefit from reflection, specifically my role as a researcher within the classroom, as well as the characteristics of participants. When reflecting on my role as a researcher, it is pertinent to consider the influence of my 'participant as observer' stance within the classroom. That is, whether there may have been tensions within the classroom produced by my presence as an observer, both from the perspective of the teacher and the students observed. For instance, one possible influence is for the teacher to feel as though she must alter the STA task in some way to please me as a researcher or to give a favourable impression. As discussed in greater detail in Section 3.6, I sought to minimise my influences in the classroom by being honest with the teacher and students about my position and research interests. Moreover, I discussed the research in detail with Ms Abbot from the outset, indicating my desire to learn from the activities that occur in the classroom and using this to build understanding when bringing together insights from psychology and education. Thus, I aimed to minimise power imbalances.

As described below, Laura and Amy were identified for observation through discussion with Ms Abbot at the beginning of the school year. It is pertinent to reflect on how the selection of these two students may be understood within the wider context of the classroom. One clear similarity between the students is gender, with both participants presenting as female. As described in Section 2.5.2, previous research has demonstrated

[23] From an ethical perspective, it is important to note that the focus on Amy and Laura in the classroom was not made explicit to students, and I interacted with several students within the class as they completed their STAs. This was critical to avoid students feeling singled out, which might have altered students' behaviour and at worst, made students feel uncomfortable.

gender difference in metacognitive skills, with females demonstrating more metacognitive skills (such as planning or monitoring) than males (Zimermann & Martinez-Pons, 1990; Bidjerano, 2005). Another pertinent characteristic is the students' described personality. Whilst research regarding individual differences has found that only neuroticism correlates with metacognition (Washburn et al., 2005; Batteson et al., 2014), it is important to note that Ms. Abbot identified students who were similar in personality, with both Laura and Amy being described as extraverted and talkative. Therefore, whilst the goal of this research is not to be representative, it is important to bear in mind the specific characteristics of participants when interpreting the findings of the present research.

It is possible that students may react to having a researcher in the class by providing 'good' (potentially more metacognitive) responses. That is, the mere questioning of aspects of STAs in relation to metacognition may have increased the likeliness of indicators of metacognition being revealed. To minimise this possible influence (and as discussed in Section 3.6), I adopted a position of interest throughout data collection – allowing me to benefit from my outsider status within the class by encouraging students to explain what was occurring in activities and their perspectives of the STAs. As such, I sought to emphasise my genuine interest rather than suggesting any notions of 'correctness'. In relation to the possible circularity of research method and evidence produced, it is important to emphasise that whilst of course there is a clear inter-relation between method and insight (discussed in more detail in Section 5.7), the questions asked in the present research were intentionally broad and open, focusing on exploring students' activities and perceptions of the STAs themselves. Thus, I did not seek to assess how metacognitive students were, and this was evident in both the questions explored and the insights produced.

5.4 Structured Thinking Activities at Forestview Primary School

Data collection took place within one primary four classroom in Forestview Primary School in central Scotland. Opened in the late 1800s, Forestview Primary School is a non-denominational Local Authority school comprised of 14 classrooms. The school is situated in an area identified as in the most deprived quintile in Scotland (i.e., falling within the 20% most deprived postcodes within Scotland) by the SIMD[24]. At the time of data collection, there was an explicit focus upon approaches to encourage students to think

[24] The estimates for Forestview Primary School are from the latest statistics, 2013. For further information on SIMD, see Scottish Government (2019).

about their own thinking and learning within Forestview Primary School. This was described in the inside of the students' achievement log:

> At Forestview Primary School we aim to […] actively involve the children in planning and assessment to ensure they have a well-developed sense of ownership of their learning and help one another […] Children should be able to articulate clearly, according to their age and stage of development, their **strengths** as a learner and what they **need to do to improve**. (excerpt from achievement log cover page, bold in original)

The importance of including students in their own thinking and learning was also explicit: "In all classes there is an ongoing rich dialogue between the children and the teacher about children's progress in their learning, key areas if strengths and next steps in learning" (excerpt from achievement log aims, inside cover page). Approaches to encourage visible learning and Growth Mindsets were also embedded within school planning, for example: "our school are focusing a lot just now on making learning visible and a lot of that is the Growth Mindset, higher order questioning, and involving them in planning and all that sort of stuff" (discussion between Ms Abbot and researcher, 8th September 2016).

5.4.1.1 Ms Abbot

The specific classroom that formed the basis of the current case study was Ms Abbot's primary four class, with all students aged between seven and eight years old at the beginning of the study. Ms Abbot indicated interest in participating following discussion with the Head Teacher of Forestview Primary School. At the beginning of the study, Ms Abbott had been a teacher for four years. In discussing her interest in STAs, Ms Abbot described her initial teacher education in relation to the research project:

> I didn't get any input about metacognition when I was at Uni, nothing about children thinking about their learning. It was only when I came here and the whole Carol Dweck, Growth Mindset thing came in and I was quite interested in it. I was hardly at the same level as yourself, but I did a bit of psychology as part of my degree, so I find it quite interesting. (discussion between Ms Abbot and researcher, 5th May 2017)

Despite not receiving any formal training on metacognition, Ms Abbott demonstrated her interest in encouraging students' wider skills in self-regulating their own learning, drawing on a prominent approach within the school – Growth Mindsets.

5.4.1.2 Laura and Amy

The present study focused upon two students within the primary four class in Forestview Primary School. Laura and Amy were both aged eight at the beginning of the study (with Laura being one month older than Amy), and were identified by Ms Abbot as students who were similar in some regards, but different in relation to academic performance:

> They are very similar in personalities. [Amy] is one of the poorest in the class and [Laura is] probably one of the most able. So, they are poles apart but at the same time it is quite good to see the range. (discussion between Ms Abbot and researcher, 3rd February 2017)

Ms Abbot also described the differences between Amy and Laura in terms of thinking about thinking:

> Laura is always on about her learning and talking about the ways that she learns, whereas Amy is one of the ones who at the beginning was so unwilling to talk about that. She is one of the ones who was like "just give me the instruction and I'll do it". She was kind of like "so what are you actually asking me to do?" (discussion between Ms Abbot and researcher, 3rd February 2017)

5.4.1.3 Class Meets and Achievement Logs

STAs were delivered through two main routes: (1) weekly 'class meets', and (2) termly 'achievement logs'. The following sections describe both STAs in turn:

Class Meets – I joined the class to begin data collection as weekly STAs were being introduced to students. These 'class meets' were typically conducted once a week, on Friday afternoons following 'star time' – free time to reward students who had showed good behaviour throughout the week. In class meets, Ms Abbot gathered students together as a whole class at the front of the classroom to discuss their learning from the week (referred to henceforth as a 'learning chat'). In class meets, Ms Abbot often structured learning chats around three sentences that were presented on the whiteboard at the front of the class. Sentences included:

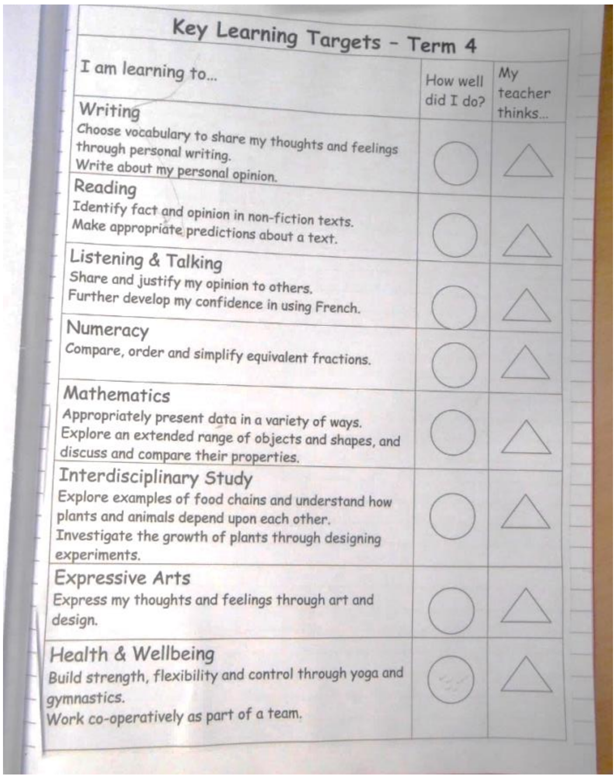
- This week I have enjoyed…
- Something I've found tricky this week has been…
- It will help me next week if I…
- One thing I have learned this week was…
- This week I am proud of myself for...
- I am showing strength in…
- Next week I want to put lots of effort in…

Following discussion, students were often asked to sit at their desks and complete the sentences in their 'learning logs'. Learning logs were provided to each student to reflect on their thinking by completing sentences set by the teacher: "It's just for you to reflect on your week. It's all about what's happened in the week, and what you can do next week to keep improving" (observed learning chat, 7th September 2016). When Ms Abbot introduced the learning logs to students, she was clear in her intention to embed the learning logs as part of the afternoon activities:

> Every Friday after star time […] you'll take your learning logs out. I'll put three sentences up on the board, and these sentences might be different every week, but your job every week is to put the little date in, and then you are finishing off these sentences. And there will always be three. And once you get the sentences done, you can do relaxation. (observed learning chat, 9th September 2016)

Ms Abbot intended for class meets to form a routine for students, "I know that if I make it like, you get back from star time, you do your sentences, and then you can relax, then they won't mind doing it, it will be more of a routine" (discussion between Ms Abbot and researcher, 9th September 2016).

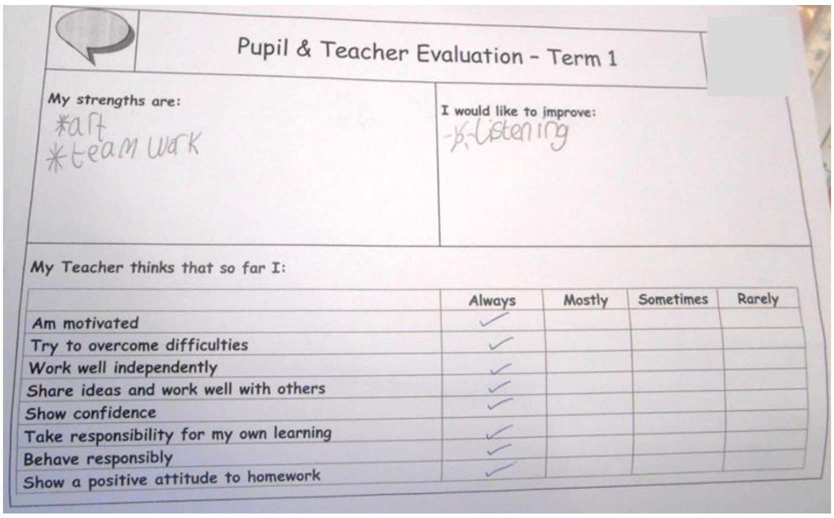
Achievement Logs – At the beginning of data collection, achievement logs were a more established practice within the classroom and were completed in all classes throughout Forestview Primary School. Achievement logs were typically conducted at least twice a term during the research study. Achievement logs were used as a tool to encourage students to create targets at the beginning of the term, and to reflect on targets at the end of each term (see Figures 5.1 and 5.2 for examples). In addition to supporting planning and reflection, achievement logs were also used as a platform to celebrate successes and demonstrate achievements. As such, achievement logs were primarily kept by the teacher within the classroom, but were also taken home by students periodically to share with guardians (who were invited to comment).



Key Learning Targets – Term 4

I am learning to...	How well did I do?	My teacher thinks...
Writing Choose vocabulary to share my thoughts and feelings through personal writing. Write about my personal opinion.		
Reading Identify fact and opinion in non-fiction texts. Make appropriate predictions about a text.		
Listening & Talking Share and justify my opinion to others. Further develop my confidence in using French.		
Numeracy Compare, order and simplify equivalent fractions.		
Mathematics Appropriately present data in a variety of ways. Explore an extended range of objects and shapes, and discuss and compare their properties.		
Interdisciplinary Study Explore examples of food chains and understand how plants and animals depend upon each other. Investigate the growth of plants through designing experiments.		
Expressive Arts Express my thoughts and feelings through art and design.		
Health & Wellbeing Build strength, flexibility and control through yoga and gymnastics. Work co-operatively as part of a team.		

Figure 5.1. Achievement log planning sheet



Pupil & Teacher Evaluation – Term 1

My strengths are:
*art
*team wark

I would like to improve:
-*-Listening

My Teacher thinks that so far I:

	Always	Mostly	Sometimes	Rarely
Am motivated	✓			
Try to overcome difficulties	✓			
Work well independently	✓			
Share ideas and work well with others	✓			
Show confidence	✓			
Take responsibility for my own learning	✓			
Behave responsibly	✓			
Show a positive attitude to homework	✓			

Figure 5.2. Achievement log reflection sheet

5.5 Findings 1: Laura and Amy

In the following sections, I describe Laura and Amy’s use of STAs throughout an academic year. Findings and analysis are presented together, before combining insights in a general discussion at the end of the chapter. Throughout, observed non-verbal behaviour is indicated by squared parenthesis. In this section, findings firstly focus on key themes that arose from analysis of Laura's engagement with STAs, followed by Amy's engagement with STAs, before discussing similarities and differences between students.

5.5.1 *Laura's experience of STAs*

5.5.1.1 Discussions of learning

From the beginning of the school year, Laura appeared to be confident discussing her own learning. For example, when discussing goals in a learning chat, Laura provided one of the most detailed and specific goals in comparison to the rest of the class. Whereas others in the class described goals such as "doing the pummel" or "more maths", Laura stated, "mine is to speak at least three sentences in fluent French" (observed learning chat, 2nd September 2016). Laura also articulated her beliefs about how she works best: "I work best when I have at least one person to work with, or when we're doing maths activities, and when people around me aren't being silly" (observed learning chat, 2nd September 2016). Here, Laura again provided more depth to her response than most of the class, who tended to repeat the teacher's suggestions, such as "when it's quiet" or "when I'm working by myself" (observed learning chat, 2nd September 2016). In discussion with the researcher while completing her learning log, Laura justified her responses about her assessments of the difficulties of tasks:

> Researcher: Is reading a tricky thing to do, or…?
> Laura: It's um, an easy thing, because I can understand nearly all the words.
> Researcher: And what do you do when there are words that you don't understand?
> Laura: I just have a go at them.
> Researcher: […] and what about something that you found tricky this week?
> Laura: Maths. Because, I'm just too tired, and I just can't be bothered.
> Researcher: […] what do you do when you have a tricky thing to do in maths though?
> Laura: I just do um, what I've been taught to do, and just see how it goes.
> Researcher: […] and what do you do if you get stuck?

Laura: I ask three people and then ask the teacher. (discussion between Laura and researcher, 9th September 2016)

This discussion highlighted that Laura, from the beginning of the school year, could confidently talk about her own thinking and learning, demonstrating metacognitive knowledge. Laura justified why something was deemed easy or difficult, saying reading is easy because she understands most words. In addition, Laura began to reflect on strategies used in the face of struggle, by relaying strategies advocated by the class teacher; 'giving it a go' and seeking help from peers before asking the teacher. As such, Laura provided clear evidence of having metacognitive knowledge of herself as a learner, as well as strategies available in order to complete tasks (Flavell, 1979). In describing a specific goal, Laura also demonstrated metacognitive skills that were relatively sophisticated compared to those of peers, including thinking to the future and planning (Schraw & Moshman, 1995). This example also suggests that Laura's motivation in different subject areas influenced her performance.

When looking in more depth at Laura's description of her own learning, evidence suggested that whilst she at times provided in-depth responses, Laura also frequently tended to reflect on the general topic or the output of a task, rather than the process (see Figure 5.3). For example, in conversation with the researcher about strengths and targets, Laura again focused on topics and subjects:

Laura: My strengths are coding and drawing […].
Researcher: What is it about these things that you are good at?
Laura: I'm just good at drawing in general.
Researcher: Just good in general? What about coding?
Laura: Um, I'm good at making cartoons.
Researcher: […] and what about your targets?
Laura: Uh… maths, maths, maths.
Researcher: Maths? What is it in maths that you need to work on a bit?
Laura: Everything. (discussion between Laura and researcher, 21st April 2017)

In this excerpt, whilst Laura again demonstrated metacognitive knowledge of herself as a learner (Flavell, 1979), she focused on the output as evidence of her skill, rather than reflecting on the process, and this influenced her assessment of her strength in the subject. Rather than self-reflecting on her thinking process throughout the activities, Laura based her self-assessments on her performance. Thus, whilst this is evidence of metacognition (i.e., evaluation), it is perhaps evidence of a less ‘sophisticated’ level of evaluation compared to reflecting on the thinking process, reflecting an orientation towards reaching the end rather than developing understanding (Ames, 1992).

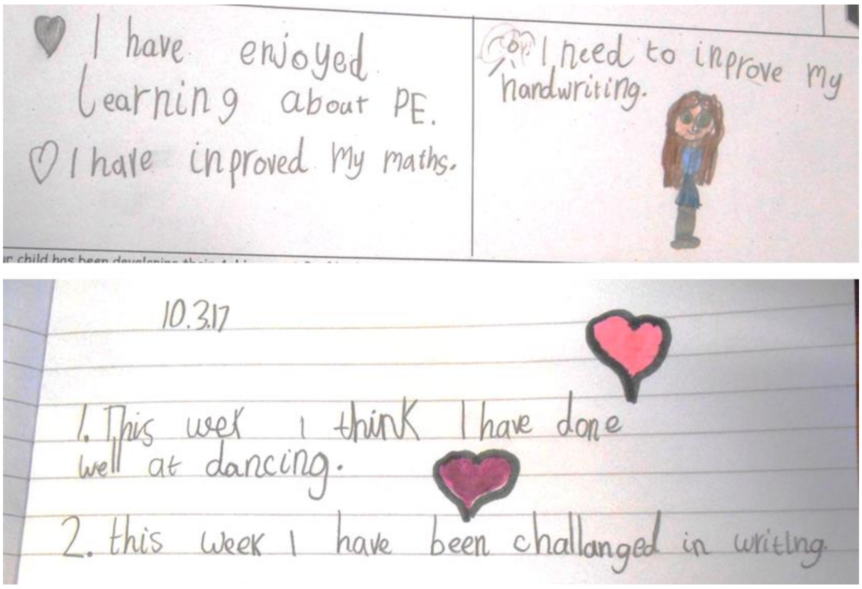


Figure 5.3. Excerpts from Laura’s achievement log
Demonstrating Laura’s focus on topics/subjects in achievement log from term 2 (above) and learning log from 10th March 2017 (below).

5.5.1.1 ‘Funny’ responses

At the beginning of the school year, Laura appeared to be initially engaged in the STAs, as demonstrated by her enthusiasm to discuss her own learning and in excerpts from her learning log (as shown in Laura’ first learning log entry in Figure 5.4). Over the course of the year, however, Laura’s talk about her thinking and learning in discussions became more and more ‘funny’, indicating that Laura began to lack motivation throughout STAs.

Laura initially indicated that she was lacking motivation for the activities in discussion with the researcher:

> Researcher: How do you like answering these – is it fun writing in your [learning log]?
> Laura: No.
> Researcher: No? How is it not fun?
> Laura: It takes up my good energy of my hand. It’s sad. (discussion between Laura and researcher, 10th February 2017)

Laura’s lack of motivation for STAs was well captured in discussion with the researcher whilst completing strengths and targets for her achievement log:

> Researcher: Do you think doing things like this helps you to learn?
> Laura: No, not at all. All we do is sit on chairs and write the boring stuff.
> Researcher: […] what about writing targets for yourself. Do you think that’s useful for your learning?
> Laura: No. (discussion between Laura and researcher, 21st April 2017)

As these examples demonstrate, evidence from observations and interviews marked a shift in Laura’s engagement with STAs. Indeed, while Laura was initially engaged with STAs at the beginning of the school year, evidence suggested that she quickly became disillusioned with the STAs. Such a finding highlights the interplay between metacognition and motivation in the classroom, suggesting the value of students not only having the metacognitive knowledge and skills to participate in STAs, but also the clear value of students being motivated to engage with STAs (Zimmerman, 1995).

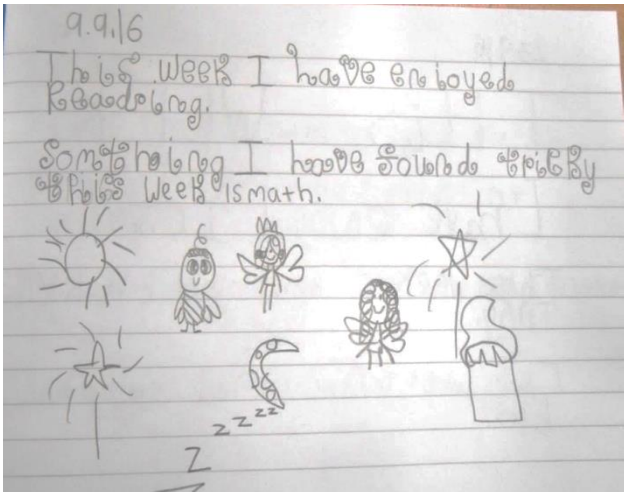


Figure 5.4. First entry in Laura’s learning log
Demonstrating engagement with the written STA

Despite discussion with Laura indicating a decrease in engagement with STAs throughout the school year, triangulation of sources revealed that Laura consistently provided ‘appropriate’ responses in her written work. The following example demonstrates the dissociation often observed between Laura’s written outputs and her verbal engagement with STAs:

> Researcher: So, what about next week, what are you going to put lots of effort into?
> Laura: Eating.

> Researcher: What about learning things?
> Laura: Oh, uh… [Peer says colouring in] yeah.
> Researcher: Colouring in? [Nods] Why do you think you need to put lots of effort into colouring in?
> Laura: Cause its fun, and you need to be good at it. If you don't know how to colour in you're going to be never be good at life. You may as well disappear into a rocky mountain forever if you can't colour in properly [giggles].
> Researcher: Right, so do you need to get better at colouring in?
> Laura: Yeah. If you don't learn how to colour in properly, then you are not going to survive … you go into a rocky cave, and then just in the last moment, when you are about to go to sleep, a bear comes and eats you and that will be the end to you. (discussion between Laura and researcher, 10th February 2017)

This excerpt is representative of the kind of funny answers that Laura provided in discussion with the researcher or peers. Indeed, several instances of Laura being funny whilst completing STAs were noted. Such a finding may be indicative of Laura perceiving the STAs to be somewhat 'silly' – in that they are not activities that require her full attention. Such a finding points towards an influence of student motivation in relation to engagement with STAs. Moreover, a clear finding of the present study is the clear influence of the content of the STA itself upon Laura's engagement with STAs. That is, Laura tended to provide relatively superficial responses to prompts – prompts that were themselves, relatively broad and procedural. Findings relating to the factors within the classroom environment that facilitate or restrict student metacognition through STAs will be discussed in more detail in the second part of the chapter, with the influence of student motivation being explored in greater detail in the chapter discussion.

Interestingly, despite Laura being funny throughout the discussion about the sentences for her learning log, in her actual learning log, she wrote ‘coding’ rather than colouring in (as shown in Figure 5.5). Laura’s written response of coding compared to her funny response of ‘colouring in’ stated in discussion, suggested that Laura provided a written response to align with expected written outputs for the STA, despite it not aligning with her verbal reflection.

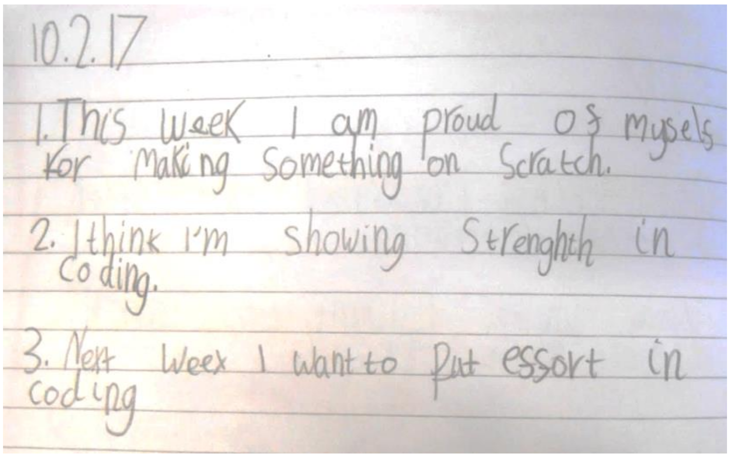


Figure 5.5. Laura’s learning log entry
Demonstrating responses at ‘topic’ level

5.5.2 *Amy’s experience of STAs*

5.5.2.1 Limited engagement with STAs

In contrast to Laura, Amy demonstrated limited engagement with STAs. Throughout the school year, Amy most often completed no entry in the learning log following the learning chat with Ms Abbot (as shown in Figure 5.6). In one observed STA session, field notes revealed Amy’s lack of engagement with the learning log:

> 2.30pm Amy is wandering around the class […].
> 2.31pm Amy crawling on knees. Goes to talk to peer who is looking at a book on the floor. She has a whiteboard on her knee and is reading the story book.
> 2.32pm Peer: Amy, you need to sit at your table [repeats]. Amy still sitting on floor looking at book. Peer comes to sit beside [Amy]. He turns the page on learning log and begins to write whilst looking over Amy’s shoulder at book.
> 2.33 All looking at book together.
> 2.33 Amy looks up at board and has page open on learning log […].

2.34 Amy crawls past me and sits directly in front of board […]. Stares up at board. (observed learning log session, 10th February 2017)

In discussion with Amy as she sat on the floor, Amy described her dislike of the STA:

Researcher: How are you getting on here?
Amy: Good!
Researcher: Good, do you like doing these questions?
Amy: [Shows thumbs down sign and does an exaggerated unhappy face].
Researcher: You don’t like it?
Amy: No.
Researcher: Why not?
Amy: I don’t know, but I don’t. (discussion between Amy and researcher, 10th February 2017)

This episode suggested that Amy avoided and did not enjoy completing the STA. Instead of completing the sentences that Ms Abbot had displayed on the board at the front of class, Amy avoided the task. Further, in discussion Amy did not articulate her reasoning behind her lack of enjoyment, but she was clear that she did not enjoy the tasks. This suggests some implicit feelings in relation to the task that Amy either could not (or did not want to) articulate. Therefore, evidence from observations, written excerpts and interview all suggest that Amy showed somewhat limited engagement with STAs.

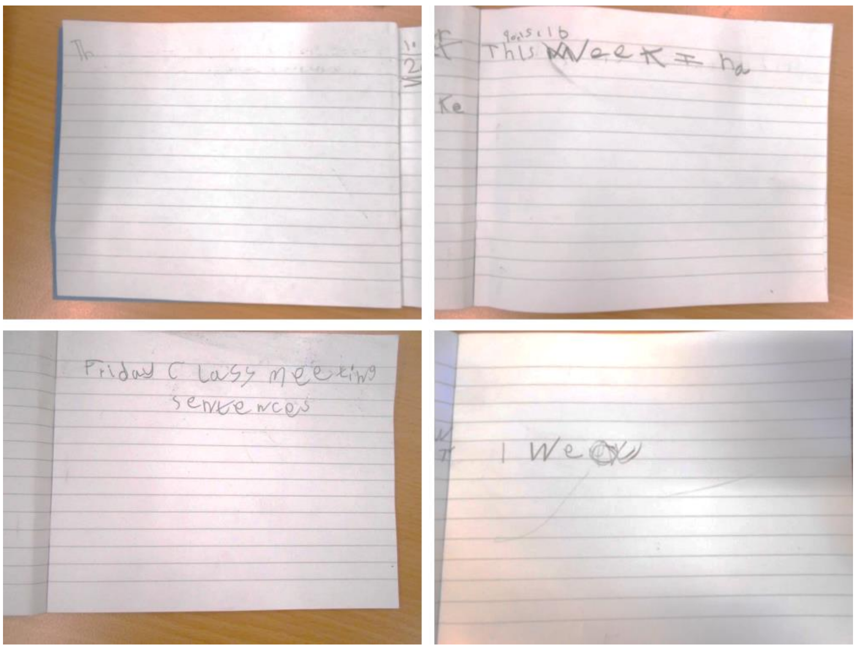


Figure 5.6. Excerpts from Amy’s learning log
Showing no or little written entries on 23rd September 2016 (top left), 9th December 2016 (top right), 3rd February 2017 (bottom left) and 10th March 2017 (bottom right).

5.5.2.2 Structured Thinking Activities and literacy

Early in the data collection process, a key emerging theme was the repetitive use of ‘stock’ short answers by Amy in STAs. In written work (illustrated in Figure 5.7) and throughout discussions with the teacher and researcher, Amy often provided the same response of ‘ICT’ (denoting Information and Communication Technologies), regardless of the eliciting question:

> Ms Abbot: What are your strengths, Amy? What do you think you are good at?
>
> Amy: ICT. (observed achievement log discussion, 21st April 2017)

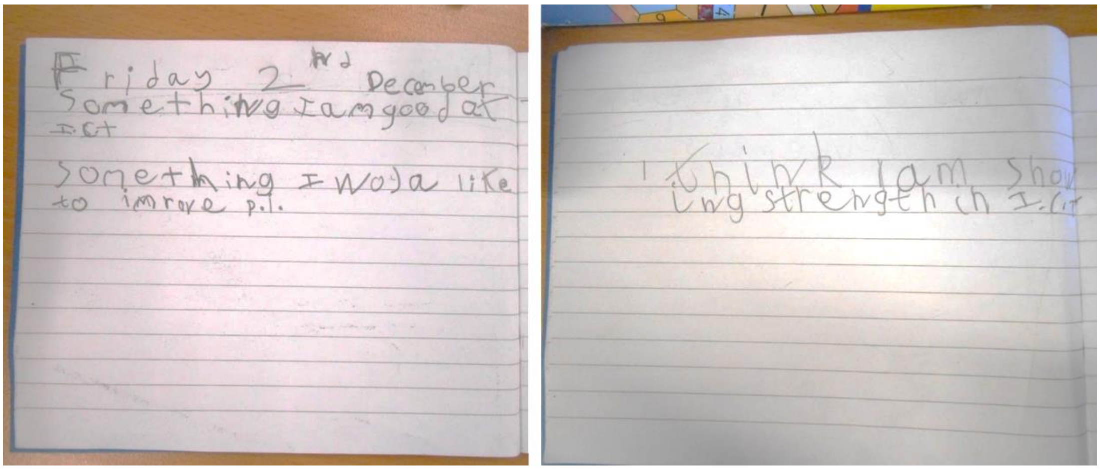


Figure 5.7. Amy’s use of ICT in her learning log
Demonstrating Amy’s repetitive use of ICT in responses in learning logs on 2nd December 2016 (left) and 10th February 2017 (right)

Throughout the course of data collection, Amy’s struggle with literacy in comparison to her peers became clear, and this struggle appeared to greatly impact upon Amy’s engagement with the STAs. That is, evidence clearly suggested that Amy’s repeated reference to ICT was a strategic negotiation of tasks, given her difficulties with literacy. Discussion with Amy during a learning log session supported this inference:

> Researcher: So, you’re doing, ‘I think I’m showing strength in’.
>
> Amy: ICT!
>
> Researcher: ICT?
>
> Amy: Yes.
>
> Researcher: Why are you picking ICT?
>
> Amy: Because I love it.
>
> Researcher: You love it?
>
> Amy: Yeah.

Researcher: And how do you think that you are showing strength in ICT?
Amy: Eh by eh, learning.
Researcher: Oh, by learning, and you like learning in ICT?
Amy: Yeah. But, I don't know how to spell learning, so I just write ICT.
(discussion between Amy and researcher, 10th February 2017)

Here, discussion demonstrated a limited capacity for Amy in relation to metacognitive knowledge. In contrast to Laura, Amy did not provide a justification for her response that indicated any knowledge about herself as a learner or the task characteristics or strategies associated with ICT. Rather, Amy demonstrated a lack of distinction between enjoyment and skill. When asked to elaborate, Amy provided a relatively superficial response of 'learning', which indicates a lack of metacognitive knowledge of herself as a learner (Flavell, 1979). Critically, however, whilst not providing an explicit reflection of the learning process in her STA, Amy did indicate metacognitive knowledge in her response of "I don't know how to write learning". Therefore, this response clearly suggests that Amy's engagement with the STAs is directly influenced by her awareness of her own cognition (rather than being documented in the STAs themselves).

At a wider level, the excerpt above strongly suggests that literacy was a barrier to Amy's engagement with the written learning logs. Anticipating that she would be asked to write her response into her learning log, Amy was often reluctant to elaborate or go beyond basic responses in conversation with the teacher. When Amy did not refer to ICT, her response was always short (i.e., responses of one or two words), as demonstrated in the following excerpt:

Researcher: What kinds of thing have you been learning about in primary 4?
Amy: BFG.
Researcher: Oh, the BFG! Have you been reading the book? [Amy nods] Has it been good?
Amy: [nods, starts to write] … oh I forgot how to spell BFG. (discussion between Amy and researcher, 22nd June 2017)

An observed discussion between Ms Abbot and Amy revealed yet more insight into the influence of literacy upon Amy's reflections:

> Ms Abbot: What do you want to improve on? What do you want to get better? Anything at all. What do you think, to make your learning …?
> Amy: ICT.
> Ms Abbot: Hmm, well I think you're actually quite good at ICT, and that was one of your strengths. What about in the classroom? Something you would like to get better at? What do you think?
> Amy: Em… topic.
> Ms Abbot: Topic? Tell me how you would get better at topic?
> Amy: Hmm…
> Ms Abbot: Maybe working with my team? Maybe that might be your target? Yeah?
> Amy: [Pauses and looks at the post-it]
> Ms Abbot: You would write 'target – work with my team'. Will I write that down up here for you? [Ms Abbot writes on board].
> Amy: You're so fast at writing.
> Ms Abbot: It's just practice, Amy. (observed discussion between Ms Abbot and Amy, 21st April 2017)

This excerpt demonstrates limited engagement with the STAs. Amy provided short and repetitive responses without elaboration, leading ultimately, to Ms Abbot providing a target *for* Amy. As this excerpt suggests, however, there is again a clear distinction between Amy's engagement with STA and more subtle indicators of metacognition evidenced through discussion. That is, on the surface, there was limited evidence of metacognition: if Amy was to reflect on her thinking, it might have been expected that she would say that to improve writing was a target. In this instance, rather than providing responses that aligned with her difficulties (an indicator of explicit metacognitive knowledge), Amy instead provided a response indicative of a sophisticated strategy to 'get through' the task set by the class teacher by using the strategy she knew she could rely on (i.e., the spelling of ICT). By contrast, Amy's comment about the ease with which Ms Abbot wrote provides clear evidence of Amy comparing her writing skills to others. This excerpt, then, again suggests that Amy did have awareness of her struggle with literacy, but this was evidenced in more subtle ways than can be captured by (written) STAs. Moreover, like with Laura, discussions provided clear evidence of the clear role of metacognition with affective responses such as motivation: Amy in this instance, perhaps, was disaffected in relation to literacy, and this may have influenced the responses provided in the STA.

5.5.2.3 Discussing learning

Despite the aforementioned influence of writing upon Amy's verbal responses, non-written STAs provided more evidence of Amy elaborating on her thinking and learning. Over the course of the school year, Amy discussed her thinking and learning; particularly when these discussions were not bound by a writing exercise. An example is provided in a learning chat, in which Ms Abbot asked the class what they would like to learn more about in the following week:

> Amy: I want to learn more about our times tables.
> Ms Abbot: Times tables. […] what things have we used to learn the times tables this week?
> Amy: Em, we have used the triangles and the [inaudible].
> Ms Abbot: What did the triangles help us to remember, which times table?
> Amy: Three.
> Ms Abbot: Three, and what about the five pence?
> Amy: Five.
> Ms Abbot: The five. And we made posters, and we did lots of different tricks, didn't we?
> Amy: Yep. (observed learning chat, 3rd February 2017)

Here, Amy described a taught strategy in discussion with the teacher; more detailed than the responses she had provided in writing. Such a discussion provides evidence that Amy could reflect on strategies associated with thinking and learning, providing evidence of metacognitive knowledge of strategies (Flavell, 1979). As such, this excerpt provides further evidence that discussions between the Ms Abbot and Amy revealed more about the ways that Amy could think about how she has been thinking and learning through STAs than written evidence alone.

The following extended example demonstrates the clear value of one-to-one interaction around subjects of interest for providing insight about Amy's thought process in relation to her own work. From the first observed STA, Amy stated that she enjoyed being creative through dancing, singing and acting, for example describing that she learns best "when I'm standing up and acting things out in drama" (observed learning chat, 2nd September 2016). Towards the end of the school year, students reflected on the year's learning in their achievement logs followed by another activity in which students could pick cards from a set that prompted them to verbally reflect on their learning. Initially, Amy referred to her 'stock' answer of ICT:

> Amy: My goals next year are… more ICT.
> Researcher: More ICT? If you didn't need to write it and we just talked about it, what kinds of thing would you like to learn? We don't need to write it, we can just chat about it.
> Amy: Hmm… ICT… [gets distracted by toy at the table].
> Researcher: So, what about next year, what do you think your goals are?
> Amy: Hmm, eh, eh, eh, ICT [writes]. (discussion between Amy and researcher, 22nd June 2017)

Throughout this interaction, Amy was reluctant to respond anything other than ICT, writing this as a response to several different questions. At a point in the discussion, Amy described that when she leaves school, she would like to be "a dancer or singer, or an accordionist". Amy then went on to use movements to describe her responses: "let's see if I can spell BFG with my arms [makes movements with arms]". Reacting to Amy, I shifted the exercise away from written responses:

> Researcher: What if you were to show me with movements, what your favourite moment was this year? Can you act it out?
> Amy: [Pretends to type on computer].
> Researcher: You're looking happy there, typing away on your computer.
> Amy: I'm actually doing a PowerPoint.
> Researcher: […] what are you making on your PowerPoint?
> Amy: Food.
> Researcher: Oh, is it a PowerPoint all about food? [Amy nods] What are you putting on it?
> Amy: Pizza, donuts.
> Researcher: They're quite tricky things to do on the PowerPoint as well, are you putting pictures on there?
> Amy: [Nods and continues to act] you em, go onto Google, type in what you want, I type in cake and then I go down and click on a picture. Then

> I click on the picture with this bit of the mouse [points to imaginary mouse on table] on this bit [points to right], then you copy the image. Then you go onto PowerPoint, and go onto the big picture, you click on it, and then there's the image! (discussion between Amy and researcher, 22nd June 2017)

In this one-to-one interaction, Amy provided a more in-depth description of the specific actions taken during the PowerPoint exercise than she had been observed to complete previously in any written or verbal reflection throughout the school year. Amy's very detailed description of how to insert a picture into a PowerPoint presentation during this session revealed Amy's ability to articulate *how* to perform activities. This finding demonstrates that whilst Amy tended to provide relatively superficial and repetitive responses, when the conditions were right, she could reflect on the process of thinking and learning, demonstrating some awareness of tasks and strategies, in line with Flavell (1979).

5.5.3 *Drawing together Laura and Amy's experiences of STAs*

Throughout data collection, clear differences were observed between the ways that Laura and Amy experienced STAs. On the surface, there was more evidence of Laura thinking about her own thinking than Amy, both in written activities as well as in the depth of responses provided in learning chats. In general, Laura tended to provide more in-depth responses about the process of learning, particularly in class discussions. For Amy, difficulties with literacy and the predominance of written activities through 'learning logs' were identified as barriers to engagement with STAs and led to a reliance upon 'stock' responses.

Despite clear differences, one similarity between Laura and Amy is that both students appeared to often provide responses in STAs that were achievable and that aligned with teacher expectations, rather than providing necessarily 'accurate' reflections of their own learning. Throughout the year, Laura displayed signs of being 'good' at STAs, and this was clearly reflected in Ms Abbot's perspectives from the beginning of the year and throughout. However, through observation and discussions over time, it became clear that Laura knew what to do to 'tick the boxes' and produce outputs desired by the teacher, without necessarily engaging in meaningful thinking about her own thinking or the learning process. Similarly, although verbal activities provided more evidence of Amy's abilities to elaborate on her thinking and learning than writing activities, Amy did tend to rely on the same responses, elaborating only when explicitly encouraged to by Ms Abbot (or the researcher). As such, evidence suggested that whilst these two students differed in their metacognitive knowledge (observed through investigations of their engagement with STAs), neither provided clear evidence of using STAs for their intended purpose (as platforms to think about and manage their own thinking or learning).

A key finding in the present study, therefore, is that that both Laura and Amy strategically negotiated their way through the STAs in accordance with their assessments of the activities themselves – suggesting they engaged with STAs in ways more similar than it appeared in written form. In a sense, both Amy and Laura knew what to do to ‘get through’ the STAs in some way, whether it was Amy making the task as simple as possible to avoid having to write more than ‘ICT’; or whether it was Laura being funny with friends before writing a response in the learning log that fitted with the teacher’s expectations. As such, students were more similar in their strategic approach to completing STAs than it appeared from written outputs alone. That is, both students regulated their cognition in line with their goals (Zimmerman, 2005): both Amy and Laura negotiated the ‘game’ of STAs, with Laura perhaps being more efficient at playing this game than Amy.

In exploring the potential reasons for students’ superficial metacognitive responses in the STAs, it is pertinent to consider the interaction between metacognitive practices and insights about the metacognitive process itself. Indeed, both students provided relatively ‘superficial’ reflections of their own thinking and learning, a finding that parallels previous research using concept maps to explore the increasing ‘sophistication’ of students’ metacognitive reflections as they progress from primary to secondary school (Ritchhart et al., 2009). The finding of the relatively superficial responses provided by primary four students in the current study is also indicative of reflections of relatively ‘surface’ rather than ‘deep’ learning (Biggs & Collis, 1982; Dart et al., 1999), suggesting that this distinction can also be made in the metacognitive domain. Moreover, whilst I observed fairly ‘surface’ reflections, it was arguably inevitable given the relative ‘surface’ questions being asked in the STAs. This finding speaks to the interaction between pedagogy and indicators of metacognition (Desoete, 2008), providing a rationale for considering factors that influence students’ engagement with STAs (as discussed in the following section).

5.6 Findings 2: Factors that Influence Metacognition through STAs

The third research question in the present study pertains to the factors that facilitate and/or inhibit students’ engagement with STAs and (ultimately) influence metacognition. This question is relevant given the lack of existing research that investigates the factors that facilitate and/or inhibit metacognition through STAs, particularly the role of the teacher in structuring the activities themselves. In the following section, findings focus on identified factors that influence students' engagement with STAs. Throughout the findings, I draw on excerpts from observations and interviews with students as they completed STAs. In contrast to the preceding section, the following section does not focus solely on Laura and Amy, allowing a broader consideration of metacognition in the classroom, including the role of Ms Abbot in facilitating metacognition through STAs. Throughout excerpts, responses provided by students are noted in squared parentheses.

5.6.1 *Classroom environment*

From the beginning of data collection, it was clear that Ms Abbot explicitly valued students being able to discuss their thinking and learning in a supportive environment. Ms Abbot repeatedly reiterated that students are individual and unique in how they learn, without singling out any one student in a manner that might cause embarrassment. For example, when a student stated that they prefer to learn in a quiet environment, Ms Abbot drew a comparison with another student in the class:

> It's interesting, because Laura liked it when she was up and doing the active things this morning […] do we all learn in the same way? [students shout no]. (observed learning chat, 2nd September 2016)

In this excerpt, Ms Abbot's focus on interesting differences encouraged students to openly explore differences between them, particularly in relation to thinking. Later in the year, Ms Abbot continued to refer to differences as being natural: "Some people like doing things in different ways […] it doesn't mean that one way is right and one's wrong. It just means that we like doing things in different ways" (observed learning chat, 16th June 2017). The culture created in the classroom was one that placed value upon students being able to openly think about their thinking (i.e., engage with metacognition).

Observations suggested that an environment that valued thinking and learning was supported by the Growth Mindsets approach in the classroom, encouraging and celebrating resilience and persistence. In one learning chat, Ms Abbot asked students to reflect on the statement 'this week I am proud of myself for…' In response to a students' response of times tables, Ms Abbot stated:

> You should all be proud of yourselves for the work you put in to learning your times tables. And you know what it was? Remember the Growth

Mindsets and we said that you're not just born knowing things, we have to work hard to learn them? (observed learning chat, 10th February 2017)

In this excerpt, Ms Abbot clearly praised students for their efforts in the subject and linked students' responses to the Growth Mindset approach. Ms Abbott also discussed the positive feelings that result from persistence:

> Do you ever get that feeling, when we are talking about being proud of ourselves? Do you ever get that feeling when something is hard, and you want to give up, and you don't give up? And after you've done it you just feel so good about yourself, like 'yes, I'm on fire, I just feel so good about this'. (observed learning chat, 10th February 2017)

Here, by drawing on the Growth Mindset approach, Ms Abbot explicitly described to students that to persist in the face of struggle is important. As such, a focus on Growth Mindsets and persistence was identified as positively influencing classroom culture (with culture being defined as "the context and general surround in which we operate", Ritchhart & Perkins, 2005, p793).

Relatedly, Ms Abbot consistently provided opportunities for students to lead their own thinking and learning, encouraging a sense of ownership. On introduction, Ms Abbot emphasised that learning logs were personal to each student and were not to be graded alongside other classroom work:

> It's a bit like keeping a diary – I'm not going to check them, it's for you. I'm not going to mark them, sometimes I might look through them, sometimes I might ask you what you have written, sometimes you might show what you have written to your friend, sometimes you can share it with the class. (observed learning chat, 7th September 2016)

This excerpt from students' introduction to learning logs emphasises that they are intended to be something personal for students with no 'right or wrong' answers – thus reinforcing their use as a tool for individuals to think about their own thinking. Clearly, therefore, an important factor in terms of facilitating reflections of thinking and learning is a classroom culture that supports students' dispositions towards thinking. Classroom culture is essential in relation to metacognition, as it is crucial for the development of meaning – connecting strategies and procedures to the process of learning itself (Ritchhart & Perkins, 2005).

5.6.2 *Student engagement*

Despite Ms Abbot's efforts in creating a nurturing, safe environment in which to explore thinking and learning, observations revealed that students were often unmotivated to engage with STAs. Students' lack of motivation was particularly evident at the beginning of the school year, however it continued to be a theme throughout data collection. When learning chats and logs were initially described to the class, evidence suggested that there was a degree of resistance from some students, with some commenting to the teacher that they did not want to take part. As the following observed discussion highlights, students were given no choice in the engagement with weekly STAs:

> John: I don't want to do this.
> Teacher: Well, we're all going to do it, and if you don't want to do it, then I can give you some extra work to do. (observed learning chat, 9th September 2016)

Here, when the STAs were introduced, students were openly reluctant to take part. Ms Abbot's response that the choice for students was either to complete STAs or 'extra work' suggests that the activities were compulsory, despite a focus on student-led learning and personalisation. Such an interaction highlights the inherent power dynamics that encapsulate classroom activities. That is, while STAs were described as individual and personal, they were still compulsory – a piece of work to be completed.

Students' lack of motivation towards STAs was also clear in comments described previously, for example Laura's comment that learning logs are tiring activities when "all we do is sit on chairs and write the boring stuff" (discussion between Laura and researcher, 21st April 2017), or Amy's comment that "I don't know [why], but I don't" when asked about her enjoyment of STA questions (discussion between Amy and researcher, 10th February 2017). Laura also described STAs as tiring: "I sometimes think that um, it's a wee bit, like, a wee bit tiring because we have to sit down and do work in silence, because the rest of the class are like 'aaarghh' [makes loud noise and gesticulates]" (discussion between Laura and researcher, 3rd February 2017).

At the beginning of the year, Ms Abbot herself acknowledged students' lack of motivation, describing her hopes for the role of the learning logs within the Friday routine:

> Today they were like I don't want to do this. But I know that if I make it like, you get back from star time, you do your sentences, and then you

> can relax, then they won't mind doing it, it will be more of a routine. Now, they are not used to doing any work after star time, so they're just like, "I'm not writing down" that's why I don't want it to be something that is marked. (discussion between Ms Abbot and researcher, 9th September 2016)

Here, Ms Abbot herself acknowledged students' lack of motivation towards STAs, describing a clear barrier to student engagement: the timing of the activities. Indeed, I found a clear influence of time – STAs were held at a time when students were most unmotivated, towards the end of the school day on Friday afternoons. This time slot directly followed star time of recreational activities to reward good behaviour, and was followed by relaxation time, in which students would take part in relaxing independent activities, such as playing quietly, reading or drawing. Ms Abbot's described rationale of holding STAs at the end of the week to aid weekly reflection suggests that despite limitations of time, she did not feel that there was a more suitable alternative time to hold the learning chats.

A further aspect of timing that was identified as a barrier to engagement was the situation of STAs alongside other classroom tasks. Friday afternoons were often described as a time to complete unfinished work from the week, "Can I ask you nicely if you have not finished your writing this week, can you finish this off?" (observed learning chat, 3rd February 2017). Ms Abbot, in the spring term, also described that STAs tended not to be completed during busy times, such as at the end of term: "We didn't do it over Christmas, as you know, Christmas is quite manic, so we haven't done it since the 9th" (discussion between teacher and researcher, 9th February 2017). Thus, the timing of the STAs themselves was identified as a clear factor inhibiting student engagement with STAs, with STAs being placed at times that devalue the importance of the activities themselves: the timing of activities acted to marginalise the STAs themselves, providing the implication that STAs were not important.

5.6.3 *Student focus on describing topics of interest*

As described above, evidence suggested that students sometimes lacked motivation to take part in STAs. Where students *did* reflect on their thinking as part of STAs, students most commonly provided broad descriptions of topics learnt, particularly those that they found particularly interesting or exciting. In response to questions and sentences initiated by Ms

Abbot, students repeatedly provided superficial responses that focused on topics rather than skills, and most commonly related to key areas of interest:

> Sienna: I learned in Assembly that girls are better spies than boys.
> Ms Abbot: Why are girls better spies than boys?
> Sienna: Because we can get changed faster.
> Ms Abbot: Something you have learned in class this week, Ella?
> Ella: The 7x tables, because I think the 7x tables are really fun. (observed learning chat, 3rd February 2017)

Later in the same discussion, students continued to refer to interesting topics, in this case the class project:

> Ms Abbot: What would we like to learn more about next week? Andy?
> Andy: Viking gods.
> Ms Abbot: You would like to learn more about Vikings. Daniel?
> David: Vikings in general. (observed learning chat, 3rd February 2017)

As the above example demonstrates, students tended to confound enjoyment with skill when talking part in discussions as part of STAs. A focus on topics was also particularly evident in Laura's engagement with STAs (see Section 5.5.1). Thus, in learning chats, students most commonly referred to topics or 'facts' rather than skills or aspects of the thinking process. This finding, therefore, emphasises that a clear influence upon students' engagement with STAs was the very content of the STA itself. This finding, therefore, may be unsurprising, given the close association between the tools used to measure metacognition and the insights into metacognition these provide (Desoete, 2008; Gascoine et al., 2017).

5.6.4 *Teacher-student interactions*

Thus far, I have described that despite reflections of thinking and learning being explicitly valued by Ms Abbot, students were often poorly motivated to take part in STAs, and when they did, often focused upon superficial aspects, such as describing topics of interest. As will be described below, a key finding is the critical role of teacher-student interactions in eliciting metacognition from students in STA discussions. Evidence revealed that consistently, Ms Abbot encouraged students to go beyond superficial reflections by scaffolding metacognition and asking elaborative questions.

5.6.4.1 Introducing the language of learning

Ms Abbot frequently used talk to encourage elaboration by providing additional information or examples about the ways that students might think about and manage their own thinking. Often, Ms Abbot elaborated in short, passing comments in response to students' broad reflections, such as "we learnt to code. So, we learnt little new things, but we also went deeper into things, like we went deeper into coding, didn't we?" (observed learning chat, 10th February 2017). In addition, Ms Abbot explicitly elaborated during STA discussions. In the first observed learning chat at the beginning of the school year, Ms Abbot supported students' goal-setting through description and elaborated discussion of the target-setting process:

> Think of a goal that you have for next week […] just something that you actually think you can get done in a week. So, it can't be something like, "next week my goal will be that I will learn to be an astronaut, and fly to Mars, and set up a colony on another planet" [laughs]. Will I manage that in one week? Maybe if I try really hard, then in ten years. Something that you would really, really like to either get better at, to improve on for next week? (observed learning chat, 2nd September 2016)

Here, Ms Abbot described what an unrealistic goal would look like. Using a humorous example, Ms Abbot encouraged students to set a realistically achievable goal for the next week. As such, Ms Abbot made the process of goal-setting explicit to students and used an example to demonstrate what a 'useful' goal might look like (or in this case, not look like). Later in the conversation, Ms Abbot again elaborated on the process of thinking about thinking, by describing for students how Laura's goal might be achieved:

> Laura: [My goal] is to speak at least three sentences in fluent French.
> Ms Abbot: Oh, now I think we can do one already, 'cause we have done one this week haven't we? You want to learn three? So next week, will we try to do maybe a sentence on Monday, and then a sentence on Thursday, and then by Friday, we could maybe try to fit them all together. (observed learning chat, 2nd September 2016)

Here, by elaborating on Laura's goal and linking to previous achievements, Ms Abbot provided an example for students of *how* they might plan to achieve a goal. Clearly at the beginning of the school year, therefore, Ms Abbot played a key role in supporting student metacognition through STA discussions; providing examples of the ways that students could themselves think about and manage their own thinking by herself making the internal process of metacognition explicit for students. Such talk suggested that Ms Abbot acted as a metacognitive role model (Wall & Hall, 2016).

5.6.4.2 Encouraging elaboration from students

A key finding of the present study is that the best examples of students thinking about their thinking (i.e., engaging in metacognition) throughout STAs was through interaction between teacher and students. At the beginning of the year, Ms Abbot introduced the idea of elaborating on responses in a non-threatening manner, by stating that students could choose whether they would like to elaborate on their responses:

> If you really want to, you can go, "I've enjoyed reading because…" You don't need to give the reason, but you can give the reason if you want to share it. The next sentence is: something I've found tricky this week has been. Now something you've found tricky – this can be something you have learned that's been tricky. So, you might say this week I have found maths tricky, and you might say I have found maths tricky because, or you can just leave it like that. (observed learning chat, 9th September 2016)

Here, Ms Abbot encouraged but did not insist upon students elaborating on their answers, by stating *why* they provided their response (i.e., providing justification for their response).

Ms Abbot also encouraged students to think about strategies during learning chats. An example is evident in discussion about times tables: "Have we worked hard at our times tables this week? [Students say yes] What helps you learn them Sarah, is it like a strategy or a technique?" (observed learning chat, 10th February 2017). Here, Ms Abbot used questioning to encourage students to reflect on the strategies used in numeracy, and to compare between different strategies for different times tables. As such, Ms Abbot brought students' thinking process to the surface by focusing on the strategies used and explicitly elaborating on students' initial (often relatively superficial) responses.

Whilst at the beginning of the year Ms Abbot often provided examples and elaborated on skills for students, as they year progressed Ms Abbot began to insist that students themselves reflect on the process of task and the skills involved in classroom topics:

> Ms Abbot: Does anyone want to tell me something that they have learned this week, anything they have learned this week?
> Laura: That the girls make better Vikings than the boys.
> Ms Abbot: So, why do the girls make better Vikings than the boys?
> Laura: Because when we were supposed to compose ourselves, the girls got together instantly, and the boys were like 'aahhhhh' [flaps arms around].
> Ms Abbot: So, what skills did the girls use that the boys didn't?
> Laura: Listening. (observed learning chat, 3rd February 2017)

This excerpt again demonstrates the tendency for students to refer to general skills and events that they found interesting. In response, Ms Abbot used questioning to steer the conversation back to the underlying skills. As such, the relatively structured approach to learning chats between teacher and students provided a basis for Ms Abbot to elicit metacognition from students through discussion and questioning.

As the school year progressed, Ms Abbot's role in persistently supporting students' metacognition throughout STAs was evident. In a review of learning over the term, Ms Abbot asked students to elaborate on the skills learnt in topic work, asking students, "What kinds of things have we been learning about in Vikings? Not about things, but about how to do things?" In response, students began to discuss skills more, however the following excerpt demonstrates that students still often tended to revert back to focusing on topics:

> Ali: How to research?
> Ms Abbot: How to research, what have we been learning about how to research things?
> Ali: Um, like primary and secondary […].
> Ms Abbot: What else have we been learning about with the Vikings, Laura?
> Laura: How to work in the Viking army.
> Ms Abbot: how to work, how they lived. We've been comparing how they lived to how we live, haven't we? Because we've been comparing, can anyone tell me any similarities or differences between the way they lived and the way we live? (observed achievement logs discussion, 21st April 2017)

Here, in response to Ms Abbot's question about how to do things, Ali responded by describing a skill (i.e., research) that had been explicitly described as part of the class project. As the conversation progressed, Laura reverted back to the recall of information, using the 'how' term in a way that allowed her to recall interesting information about the class project. In response, Ms Abbot again steered the conversation to focus on the underlying skill of comparison.

As another example, in a discussion around achievement logs, Ms Abbot explicitly made a differentiation between describing topics and describing skills when evaluating students' strengths in maths, asking:

> Ms Abbot: What specifically in maths? Working your best in maths? Trying hard in maths? Having a determined attitude in maths? Times tables? Problem-solving? Just maths in general? [Paul nods].
> Karl: I'm good at PE and maths.
> Maida: PE.
> David: PE, maths…
> Ms Abbot: Now you're all just naming me subjects, so what is it that you're good at, is it using the skills, is it working together as a team? Is it good spatial awareness, what is the skill that you're good at?
> Donald: Em… coding. (observed achievement logs discussion, 21st April 2017)

This is a typical example of Ms Abbot's use of questioning to attempt to 'dig deeper' than superficial naming of subjects. Students' tendency to provide superficial reflections is clear despite attempts to encourage elaboration. Furthermore, this excerpt highlights the critical role of the teacher in balancing between herself elaborating, and allowing freedom for students to themselves elaborate on student responses.

5.6.4.3 Closed Questions

Clearly, at a time when students show limited metacognitive reflections, Ms Abbot played a key role in describing what metacognition might look like. Importantly, however, instances were also observed where Ms Abbot used closed questions or would evaluate *for* students (often in an effort to praise). For example, when reflecting on targets in the spring term, Ms Abbot asked students to reflect using 'thumbs': "Thumbs up if you think you've achieved, thumbs to the side if you think that you kind of have achieved but you need to revisit it, or thumbs down if you think you've missed it" (observed achievement log discussion, 21st April 2017). In the discussion that followed, Ms Abbot continued to structure students' evaluations by reading aloud achievement log targets (to be evaluated using green, amber or red colours in the log) and asking students to evaluate by showing their thumbs:

> What about improving our creative writing skills? That should be a big thumbs up from everyone […]. Free writing. Do you enjoy free writing? [yeah]. And I think it's really helped us with our creative writing skills, because it's helped our imagination. So, I think we are a big green for that one. (observed achievement log discussion, 21st April 2017)

In this example, the method of evaluation used by Ms Abbot was to ask students to indicate with thumbs whether or not targets had been achieved. The refection elicited was in the form of a binary yes or no evaluation rather than a reflection on the quality or process of learning. Furthermore, Ms Abbot then proceeded to effectively evaluate *for* students. In another discussion when evaluating targets in the achievement logs, Ms Abbot again provided guidance about how students *should* evaluate their targets:

> The next bit is our key learning targets from term 3, from when we did the Vikings. We talked about them last week, I want you to go through them and traffic light the circles. I'll tell you right now that no-one should be red for any of them, because everyone has taken part in all of them. (observed achievement log discussion, 5th May 2017)

In this excerpt, Ms Abbot again directed students about their targets, stating that no one should have red evaluations as they all took part. This is somewhat in contrast to Ms Abbot's general focus on eliciting responses by students, and demonstrates the delicate balance that exists in providing structure and support for the class to reflect, whilst encouraging students to independently reflect on their own thinking. That is, where students were encouraged to respond to targets in a particular manner, this contrasts with the notion of individual reflection. Moreover, by the teacher suggesting how the class *should* evaluate, there is an associated implication that students are all the same.

5.6.5 *Summary*

Overall, findings highlighted the fundamental role of teacher-student interactions in encouraging students to develop skills in metacognition throughout STAs. Whilst several factors (time, focus on writing) were identified as barriers to students' use of STAs for expression of metacognition, Ms Abbot continuously used STAs as a basis for creating a culture that valued thinking and learning, as well as a platform to model metacognition and encourage students to provide deeper metacognitive responses through elaborative questioning and discussion. Clearly, throughout the school year, Ms Abbot responded to students' often superficial responses by encouraging more metacognitive reflections from students, supported by providing examples and questioning. Indeed, observations suggested that this 'dual role' was at times difficult to achieve, with some instances of teacher talk acting to restrict student metacognition by reflecting *for* students. In sum, investigation of STAs revealed the critical function of interaction, with observations revealing continual negotiation between the teacher and students to build from students' responses and encourage metacognition.

5.7 Discussion

The present chapter aimed to explore the use of STAs in relation to supporting metacognition. By focusing on two students who differed in terms of traditional academic skills, findings revealed clear differences in the ways both Laura and Amy engaged with STAs, with Laura providing clear responses in written STAs, and Amy providing little (if any) written response to STA prompts. Critically, triangulation of research methods revealed similarities between students in their STA use beyond those revealed through written responses alone. More specifically, discussions with students revealed that both Laura and Amy used their metacognitive knowledge of their own skills and task requirements to strategically negotiate STAs (Flavell, 1979); Amy by repeatedly referring to 'stock' responses that she knew she could spell, and Laura by writing responses that fitted what Ms Abbot expected, whilst entailing minimum effort. As such, evidence suggests that neither Amy or Laura took full advantage of the intended use of STAs (as metacognitive tools), however both exhibited regulatory skills indicative of metacognition (by controlling their behaviour based on strategic assessments of task requirements, as per Schraw & Moshman, 1995; Veenman & Spaans, 2005).

This study also aimed to investigate the aspects of the leaning and teaching environment that facilitate and/or inhibit metacognition through STAs. In the latter section of the present study, the main finding was the fundamental role of interaction between teacher and students in facilitating metacognition throughout STAs. Ms Abbot consistently used talk to emphasise the importance of effort and persistence: seeking students' perspectives about thinking and learning, as well as using these perspectives to plan tasks. However, despite Ms. Abbot's attempts to nurture an environment that was supportive of metacognition, students were often unmotivated to take part in STAs, and when they did, they most often provided superficial responses about their thinking and learning. The timing of STAs was highlighted as an aspect of STAs that acted as a barrier to metacognition; STAs were typically held at times when students were particularly tired or unmotivated, which acted to marginalise the activities themselves. Most importantly, there were nonetheless, clear instances where metacognition was observed, notably through interactions between the teacher and students. As such, findings highlight the critical importance of teacher-student interactions for encouraging metacognition through STAs.

5.7.1 *Characterising metacognition*

The findings presented in this study highlight the individual ways that students experienced STAs, providing clear insights for metacognition theory. One finding of particular interest is the difference between 'outputs' of STAs and indicators of metacognition as students discuss STAs. For instance, written evidence provided little evidence of Amy's metacognition, apparently confirmed in her somewhat 'superficial' responses in discussion. On deeper analysis, however, it was evident that Amy did have a clear sense of her own thinking and learning, however not necessarily evidenced in a conscious or declarative way required by STAs. Such a finding highlights a distinction between metacognitive knowledge and online metacognitive experiences. That is, the explicit, self-reflective nature of STAs may necessitate a level of conscious, stateable metacognitive knowledge, "stable, familiar constant, established long-term knowledge which involves self-knowledge, self-awareness and a sensitivity to and evaluation of this knowledge" (Tarricone, 2011, p156) that is distinct from metacognitive experiences (more implicit feelings that connect a person to a task, Efklides, 2006, 2008). Therefore, through negotiating STAs, both Laura and Amy demonstrated strategies that indicated that they had assessed the requirements of the activities (i.e., monitored their own cognition) and acted in line with their own perceived skills (i.e., controlled their cognition). As such, the present findings suggest that both students demonstrated 'on-line' monitoring and control by drawing on metacognitive experiences: they demonstrated metacognition.

Going beyond consideration of metacognition in isolation, the relationship between metacognition and motivation was clear throughout findings. The findings of the present study clearly demonstrated the influence of motivation in the metacognitive process. In focusing on Laura, for instance, it was clear that motivation played a significant role in engagement with STAs, with the repetitive nature of STAs leading to a clear sense of boredom as the year progressed. Motivation was also observable to a degree in Amy's engagement with STAs, insofar as discussions about the learning process were particularly productive when they built from Amy's own interests in drama and role-play. At a wider level, investigation of the facilitators and inhibitors to metacognition through STAs revealed that several students indicated a lack of motivation towards STAs, with responses mainly focusing upon general descriptions of topics that students were interested in.

Clearly an examination of the wider framework of self-regulation theory is appropriate in my present interpretation to understand the critical way that students' motivations influence metacognition and strategic behaviour throughout STAs. Zimmerman's (1990) theory of Self-Regulated Learning comprises three components; self-regulated learning strategies (behaviour), responsiveness to self-orientated feedback about learning (metacognition), and motivational processes (motivation). Through the inclusion of motivation in a model of self-regulation, we are compelled to look at learning from a more social cognitive viewpoint, allowing us to consider the varying influences of the social world (Zimmerman, 1995). The relationship between metacognition and motivation was clear throughout findings, highlighting that students must be motivated to take part in STAs, and must see them as supportive of learning. Critically, therefore, I did find that both Laura and Amy demonstrated self-regulation (Zimmerman, 2005), by controlling their cognition in line with their own goals. In STAs, however, students' goals (i.e., to 'get through' the task) did not necessarily align with the intended goals of STAs (to encourage metacognition by planning and reflecting on thinking). Thus, the present findings suggest that students were oriented towards performing, or reaching the end of tasks, rather than being oriented towards mastery, or understanding (Ames, 1992).

In explaining these findings, it is possible that alignment of STA goals between teacher and students necessitates a level of cognitive or self-regulatory maturity that was beyond the students included in the present study. Critically, however, analysis of student engagement with STAs reveals important differences between these activities and the everyday learning tasks analysed in the previous chapter. That is, whilst several different forms of STAs exist in education (see description in Section 5.2), what characterises an STA is the specific focus on exploring learning and thinking as a separate activity from the learning process itself. In the STAs investigated presently, students were primarily asked to reflect on their thinking and learning from the week, term or year, as well as to think ahead by planning and setting goals for the coming week, term or year. Therefore, due to the prospective and retrospective nature of STAs, the STA themselves had different goals – one step removed from the current activity. These ‘second order’ goals, and more widely the forward thinking and evaluative nature of STAs, require a somewhat different type of metacognition to that required in everyday tasks. Not only do STAs require students to reflect on their metacognitive experiences, but these entail students remembering, translating experiences into more conscious ‘statable’ metacognitive knowledge, as well as describing using the vocabulary available to them (Tarricone, 2011). Thus, these findings again highlight a difference between students’ explicit ‘statable’ metacognitive knowledge, and more ‘on-line’ metacognitive experiences that connect the person to the task during tasks (Efklides, 2006, 2008).

Whilst previous research has found metacognition to be relatively stable across learning domains (e.g., see Veenman, Elshoutt & Meijer, 1997; Scott & Verman, 2013), the present study found that a relatively clear distinction could be made between everyday tasks and the weekly or termly activities that focused on the thinking and learning process itself. Thus, the distinction between STAs and more everyday tasks is a point of reflection. That is, given the diverse STAs that exist within classrooms, it is difficult to transfer insights directly to other classrooms or in understanding different STA activities. Indeed, the distinction, in some cases, between everyday tasks and STAs may be more difficult (for instance, when considering an end-of-task reflective exercise such as a short peer-or self-assessment). Critically, the intention in the present study is not to suggest some over-arching arbitrary divide between tasks (specifically, between STAs and everyday tasks) that can be used across contexts, but rather as a broad distinction that can be used to explore the different ways that students (and teachers) experience metacognition in classrooms.

5.7.2 *STAs and teacher-student interactions*

The finding that both Amy and Laura strategically negotiated STAs in line with their assessments of the demands of the activities emphasises a focus upon students ‘getting through’ the STAs, rather than using them as tools to assist metacognition. One interpretation of the current findings is that in practice, ‘success’ in STAs relies upon students learning to act the correct way; to produce the right outputs that align with what the teacher expects of them. From this perspective, it might be argued that STAs in fact gauge students’ abilities to play the ‘game of school’ (and the game of *appearing* metacognitive) rather than gauging students' actual metacognition. Indeed, such a finding may not be unique to STAs, with a view of teaching as transferring notions of 'correctness' to learners being a key aspect of traditional 'direct' modes of teaching (Skinner, 2010).

Critically, I do not interpret findings as being evidence to support the diminishing of the purpose of STAs within the classroom. In fact, evidence suggested that students demonstrated metacognition through negotiating STAs, and in discussions with the teacher as part of STAs. Ms Abbot was skilled at working with students to dig deeper into reflections, providing the kind of explicit metacognitive probing that has been highlighted as a facilitator of metacognition by encouraging students to reflect on how thinking is generated (Hacker & Dunlosky, 2003). Where students struggled to metacognitively reflect on the process of thinking, clear examples were observed of Ms Abbot being responsive to students' struggles, providing additional support by using metacognitive vocabulary and making the language of thinking explicit. In some instances, Ms Abbot ultimately 'filled in the gaps' by elaborating on students' reflections herself and making the thinking process visible through modelling (a technique that has been demonstrated to be effective for the development of metacognition, see Schraw, 1998; Wall & Hall, 2016).

Thus, a focus on the role of interaction is important because it changes the way STAs are viewed – they should not be seen as a platform for students to document their metacognitive processes (something to 'get through' or get right') but as a set of activities that (when used within the social space of the classroom), act as catalysts to talking about, (and thinking about) thinking, reflecting tools "designed to make a particular activity different: faster, slower, richer, more focused, more efficient, more sustained" (Baumfield et al., 2009, p424). STAs therefore, provide an opportunity to explore a greater depth of meaning in relation to students' learning – STAs are not just an output, but a vital part of the metacognitive process itself.

5.7.3 *Implications*

Of course, there is an inherent interaction between the pedagogical tools that are STAs and findings relating to student metacognition. As such, findings have relevant implications for understanding how to facilitate students' understandings of their own thinking and learning – particularly in highlighting the important role of the teacher in scaffolding students' experiences with STAs. That is, I found that it is critical that STAs are diverse (to avoid boredom); it is important that STAs are appropriate in relation to other developing skills (such as literacy or vocabulary); and it is important that tools are embedded within (and instrumental for) a wider pedagogy (of dialogue, feedback, planning and instruction, Baumfield, 2006; Baumfield et al., 2009).

Findings emphasise the multiple roles of teacher talk in supporting metacognition: developing a classroom environment that values students' perspectives of their own thinking, assimilating STAs within the already demanding classroom routine, making the thinking process and the 'language of learning' explicit, and providing opportunities for students to independently think about and manage their own thinking (e.g., Paris & Paris, 2001; Hacker & Dunlosky, 2003; Dignath et al., 2008; Wall & Hall, 2016). Moreover, the findings highlight the importance of teachers being sensitive towards students as they complete STAs, altering tasks as appropriate in relation to students' developing skills. Unsurprisingly, the multiple roles of teachers in relation to supporting metacognition is not subject to a formula or 'quick fix'. As such, findings highlight the significant challenge in supporting metacognition in the classroom – whilst various STAs can be thought of as 'catalysts' for metacognition, it can be difficult to balance the competing demands of tasks, time, and more specifically, pedagogical approach towards metacognition.

5.7.4 *Summary*

Overall, this chapter found that rather than the existence of STAs being evidence in themselves of metacognition in the classroom, in fact STAs form only the basis for beginning to understand how metacognition can be encouraged within classrooms. Indeed, present findings highlight the complexity of encouraging metacognition, with factors such as the classroom culture and the timing of activities being observed to influence student engagement. Findings suggested the particular importance of the talk between teacher and students throughout STAs. As such, findings highlight the importance of STAs being embedded within (and instrumental for) wider pedagogies.

Given the critical role of the teacher described in this chapter, it is clear that research should take into account not only teaching practices, but also the knowledge, beliefs and perspectives of teachers about educational practices such as metacognition. Further rationale for this focus comes from the diverse initiatives that exist within classrooms. For example, the finding of the prominence of Growth Mindsets and student-led learning lead to questions regarding teachers' perceptions of metacognition in relation to their practices. Therefore, given the critical role of teachers in relation to facilitating metacognition in the classroom, teachers' perspectives about metacognition is the focus of the following chapter.

Summary point 1: Analysis of written STAs revealed clear differences in engagement, with discussion revealing that students strategically negotiated STAs in line with their metacognitive knowledge of self and tasks.

Summary point 2: Several factors within the classroom environment influenced engagement, including the structure and timings of STAs.

Summary point 3: Teachers played a critical role in facilitating student metacognition through interaction

Chapter 6: Teachers' Perspectives of Metacognition

"The restructuring of schools, the composition of national and provincial curricula, the development of bench-mark assessments – all these things are of little value if they do not take the teacher into account." (Hargreaves, 1992, p ix)

6.1 Where are we now?

Throughout both classroom-based research studies described in the preceding chapters, one thing is strikingly clear – the role of the teacher in the metacognitive process in classrooms. Indeed, the interactions between teacher and student were identified as critical for creating a supportive environment, for structuring tasks and for facilitating students' metacognitive reflections. Critically, however, whilst clearly important for understanding metacognition, there was limited exploration of teachers own perspectives about encouraging metacognition within classroom-based studies presented in Chapters 4 and 5. Thus, following the previous empirical chapters, talking to teachers about their experiences and perspectives of metacognition was identified as an important area to explore in relation to developing a clear sense of the impact of metacognition in primary schools.

6.2 Introduction

Previous chapters have explored metacognition throughout everyday classroom tasks as well as during more structured tasks that specifically encourage metacognition. Rich data were obtained in each case, characterising student metacognition but also highlighting the role of the teacher in facilitating metacognition. Although there were clear individual differences' in students' developing metacognition, the similarities were also striking (e.g., the finding of Amy and Laura's similar engagement, or children's general lack of independent planning in literacy). Such findings suggest that students in the middle primary school years often exhibited relatively superficial metacognitive skills, focused on reaching the end of a task rather than reaching understanding. Across studies, the role of teacher-student interactions for encouraging metacognition was emphasised. Given the teachers' role in the classroom activity, therefore, it is critical that the perspectives of teachers are taken into account. Considering the perspectives of teachers is particularly important given the wider literature described throughout this thesis – a focus in many studies of metacognition is upon developing knowledge for teachers about 'what works'. Consequently, the focus of the present chapter is on exploring the perspectives of teachers about encouraging metacognition in classrooms; an effective way to draw together findings of this thesis, and explore the impact of metacognition fully.

In the present chapter, the term 'teacher perspectives' is used to encapsulate teacher knowledge, beliefs and attitudes towards metacognition, which will be explained below. After describing previous literature relating to teachers' perspectives about metacognition as well as outlining the present study, this chapter will describe two key questions that were addressed in teacher interviews. As will become clear, the research detailed in this chapter explored not only teachers' knowledge of metacognition (considered in the first section of findings), but also teachers' perspectives about the facilitators and barriers to metacognition in classrooms (as explored in the second part of the findings).

6.2.1 *Defining teachers' perspectives*

Several terms have been adopted in literature exploring the perspectives of teachers, including knowledge, beliefs and attitudes. Teacher knowledge has been a main focus, with much discussion about the nature of teacher knowledge. Shulman (1986) describes several different types of content knowledge of teachers. One of the main distinctions is between curricular knowledge, subject matter knowledge and pedagogical content knowledge. Curricular knowledge refers to the knowledge of the programs and materials available at the curricular level. Whereas subject matter knowledge encapsulates knowledge of the 'what' and the 'why' of specific areas of teaching content, pedagogical content knowledge refers specifically to the knowledge in a subject *for teaching* (i.e., "the ways of representing and formulating the subject that make it comprehensible to others", Shulman, 1986, p9).

Pedagogical content knowledge has been identified as critical to the success of interventions in the educational setting (Boekaerts & Corno, 2005). Indeed, pedagogical content knowledge is clearly relevant for understanding how teachers teach particular subjects and skills. Such knowledge typically includes several devices, such as the use of examples, storytelling or props (Leat, 1999). In relation to the importance of pedagogical content knowledge, teachers must not only have knowledge about the subject matter (in this case, metacognition), but also have knowledge about pedagogies relating to the development of the subject. That is, knowledge about how to facilitate metacognition

(Wilson, Shulman & Richert, 1987). Relatedly, Leat (1999) describes teachers' situated knowledge; the context-specific knowledge that connects content to specific aspects of the context such as the classroom, time or nature of the task. Such knowledge explicitly takes into account the uniqueness of particular educational contexts.

Distinguishing between teacher knowledge and beliefs is in practice difficult in the fields of education and educational psychology (Southerland, Sinatra & Matthews, 2001; Ben-David & Orion, 2013), with some arguing that they are in fact the same (Pajares, 1992). Several criteria have been employed to distinguish between knowledge and beliefs. For instance, knowledge is something that is agreed with consensus across a group, whereas beliefs are generally more individual and variable between individuals within a group (Pajares, 1992). Knowledge contains an element of evidence and critical engagement, whereas beliefs do not always require evidence to be believed (and indeed can defy such critical examination, e.g., see Nespor, 1987). Knowledge and beliefs have also been distinguished by emphasising the episodic nature of beliefs, drawn from personal experiences and cultural discourses, with beliefs including an element of judgement or evaluation that knowledge does not hold (Nespor, 1987). Pajares (1992), however, raises the question as to whether knowledge can in fact be considered free of judgement or evaluation, with all knowledge to an extent including some sort of evaluation.

'Attitude' is another term often employed in relation to the perspectives of teachers. Indeed, attitude research is widespread, with research demonstrating that the attitudes of teachers about implementation of initiatives have an important influence on the success of initiatives themselves (Ghaith & Yaghi, 1997). Attitudes are also clearly closely associated with knowledge and beliefs. Whilst similarities exist, however, distinctions have also been made. For example, attitudes have been described as beliefs about particular constructs (Pajares, 1992). Attitudes have also been distinguished from knowledge and beliefs in that attitudes are associated with a particular *affect*. That is, attitudes are either positive or negative (Ben-David & Orion, 2013).

Given the clear inter-relations between knowledge, beliefs and attitudes, and the resultant difficulties in separating these constructs, researchers often adopt different terms that encompass terms. For instance, Ben-David and Orion (2013) use the term *teachers' thinking* to encompass teacher knowledge and beliefs. Indeed, Southerland et al. (2001) use the term teachers' thinking for the sole purpose of encompassing both knowledge and beliefs, given the theoretical and empirical overlap. Other researchers have used the term *teacher perspectives*. For instance, Clark and Petersonn (1986) defined teacher perspectives as "a reflective, socially defined interpretation of experience that serves as a basis for subsequent action [...] a combination of beliefs, intentions, interpretations, and behavior that interact continually" (p287). Perspectives relate to specific contexts and relate to action (Pajares, 1992).

The present study aimed to explore teachers' *perspectives* of metacognition. As contended by Pajares (1992), given the difficulty in reaching definitional consensus about definitions surrounding knowledge, beliefs, perspectives and attitudes in the educational sphere, it is useful to focus on an object. Thus, here, I was interested in teachers' perspectives *about* metacognition. Such a focus entails consideration of teachers' thoughts, beliefs, interpretations and behaviours in relation to metacognition in the classroom (Clark & Peterson, 1986). Investigating teachers' knowledge, beliefs and attitudes under the broad term 'perspectives' allows an exploration of the valuable insight that teachers can bring to discussions about facilitating metacognition in education, without imposing any notions of 'truth' from psychological research that dominates teachers' thinking. Therefore, I use the term 'teacher perspectives', with full consideration of the extent to which teachers' responses were knowledge, beliefs or attitudes being beyond the scope this study.

6.2.2 *Teachers' perspectives of metacognition*

Previous research has examined teachers' perspectives of metacognition in several different educational contexts and in relation to teaching different age groups. For example, Wilson and Bai (2010) explored elementary school teachers' knowledge of metacognition through an online questionnaire. Teachers were asked to define metacognition and this response was used as an exclusion criterion for the remaining questionnaire, gauging teachers' pedagogical knowledge about metacognition. Teachers described metacognition as an active process that requires teaching through methods such as talk to facilitate. Teachers emphasised the importance of teaching particular metacognitive strategies, and when, why and how to use them. Debriefing after an activity was described as an essential tool for identifying to students what strategies were used and how effective they were.

In contrast to Wilson and Bai (2010), who used knowledge of metacognition as a criterion for inclusion, other research has aimed to understand teachers' knowledge of the term in general. For example, Zohar (1999) examined the perspectives of junior high and high school science teachers in Israel before, during and after an in-service training course which aimed to improve teachers' knowledge about higher-order thinking skills including metacognition. Teachers mentioned that they had intuitively used some elements of metacognition in their classroom instruction, although they had not been aware that what they were teaching was termed 'metacognition'. Moreover, this intuitive knowledge was described as limited by Zohar (1999), and as such their teaching practices were 'unsatisfactory' for facilitating metacognition. During the course, teachers developed greater understanding of metacognition and as a result, reported feeling empowered to teach higher order thinking more effectively. Together with the research of Wilson and Bai (2010), these findings suggest that teachers' knowledge about metacognition may be a prerequisite for teaching practices relating to metacognition.

In a related study, Ben-David and Orion (2013) investigated the voices of primary school science teachers in the context of metacognition instruction. By focusing on teachers' views and attitudes towards metacognition before and after an in-service training programme, the researchers aimed to explore teachers' pedagogical thinking. Similar to Zohar (1999), Ben-David and Orion (2013) revealed that teachers in general had little knowledge of the term 'metacognition', with 40 out of 44 teachers being unable to accurately define the term. Again, following instruction about metacognition, teachers revealed that they engaged with metacognition intuitively, although only five teachers reported an intuitive engagement. Regarding attitudes towards metacognition, a substantial number of teachers (13 out of 44) expressed scepticism about metacognition before training, with one commenting on the disconnection of psychological research from the 'real classroom world'. Although attitudes became more positive following training, teachers still expressed concerns regarding changing roles between the teacher and learner, and the potential to threaten the teaching authority of the teacher.

6.2.3 *The present study*

This chapter describes an interview study that aims to explore teachers' perspectives (knowledge, beliefs and attitudes) of metacognition – including factors that act as barriers and/or facilitators of metacognitive approaches within the classroom. Indeed, importance of exploring teachers' perspectives is highlighted by evidence that teachers' perspectives may have important implications for their pedagogical knowledge and practice (Ghaith & Yaghi, 1997; Wilson & Bai, 2010). Moreover, the present research adds to existing understanding by providing an up-to-date account of the perspectives of primary school teachers in Scotland. Guided by the broad aim of exploring teachers' perspectives of metacognition and informed by the existing literature, the key research questions are as follows:

1. What are primary school teachers' perspectives about metacognition? That is, what knowledge do teachers have about the term 'metacognition' and what are teachers' perspectives about encouraging metacognition in classrooms?
2. What factors do teachers describe that influence the way metacognition is facilitated in primary school classrooms?

Findings are presented in two sections, paralleling the research questions outlined. Firstly, findings explore teachers' knowledge of metacognition as a term, including explicit (knowledge of the term 'metacognition') and implicit knowledge (of ways to encourage students to think about and manage their own thinking). Secondly, findings are presented in relation to teachers' perspectives about factors that facilitate but also inhibit their encouragement of metacognition in classrooms. Following the presentation and analysis of findings, implications in relation to the implementation of metacognition are discussed.

6.3 A Note on Methodology

This chapter reports finding from a semi-structured interview study with primary school teachers in Scotland from January to March 2018. In total, 20 teachers took part in this research, over ten interview sessions. Participants were primary school teachers from six Local Authorities in Scotland. Overall, 18 out of the total 20 teachers interviewed were female (90%), and the average experience reported was 13 years (range 0.5 to 29 years). Participating teachers included class teachers, learning support teachers, a supply teacher, depute and head teachers (as detailed in Figure 6.1). Interviews varied in length from 22 to 65 minutes, with a mean duration of 35 minutes. Full characteristics of each interview (including the teachers interviewed) are presented in Appendix D. Throughout findings, teachers are referred to by interview number.

It is relevant to note the relation between the participant sample and national averages. The proportion of females is consistent with the Scottish demographics, with 90% of primary school teachers being female (Scottish Government, 2017). The proportion of teaching roles differs from the national average: As per the most recent statistics, in Scottish primary schools 80% of teachers are class teachers, 7% are head teachers, 5% deputy head teachers and 7% principle teachers (Scottish Government, 2017). No national records are available in relation to years teaching experience.

A particularly noteworthy characteristic of the present study is the decision to interview teachers from LAs throughout Scotland. That is, despite the restriction of age in the classroom-based research described in Chapters 4 and 5, there was no exclusion criteria in terms of age group taught in this study (beyond being restricted to the primary school years). This was appropriate given the aim of gaining an overall insight about teachers' perspectives of metacognition, and importantly, the fact that primary teachers are not 'fixed' to particular age groups from one year to the next (meaning teachers are likely to draw on experiences across age groups). This does, however, mean that teacher responses may in part, be influenced by the local policies in which teachers work. For example, whilst there was a clear focus upon Growth Mindsets in the LA in which classroom-based research took place (as documented in Section 5.4 of Chapter 5), this cannot be assumed for all LAs. Relatedly, teacher participants have different experiences with teacher training as well as diverse professional experiences in classroom settings (see section 3.9). Thus, it is important to be cognizant of the fact that in interpreting teachers' experiences of teaching practices relating to metacognition, that these are indeed influenced by teachers' professional histories and contexts. This is indeed an interesting point of discussion which is considered throughout analysis.

Rather than knowledge of metacognition as a construct being a criterion for inclusion in the study (e.g., Wilson & Bai, 2010), the present research sought to gain a more rounded understanding of teachers' metacognitive practices by asking teachers about elements of metacognition without relying on knowledge of terminologies. The procedure (discussion points/questions) in both the one-to-one interviews and small focus groups was guided by an interview schedule (reported in Appendix D), with items including:

- In what ways do you support children to think about and manage their own thinking?
- What knowledge/awareness do you have about the term metacognition?
- Can you describe any other approaches or current initiatives that encourage children to think about or manage their own thinking?

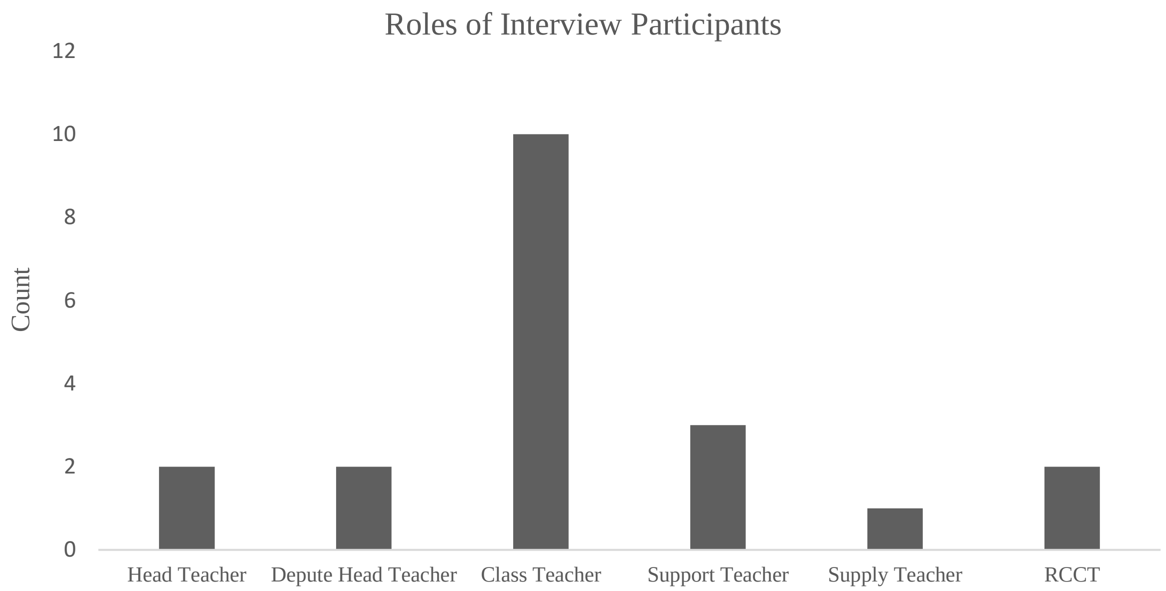


Figure 6.1. Roles of teacher participants.
As the graph shows, the largest group (half of participants) were class teachers, however participants adopted various teaching roles within primary school classrooms.

Interviews were conducted in person and via telephone, with in-person interviews being conducted individually as well as in pairs or small groups (up to five interviewees). Telephone interviews were employed to enable participation from teachers in more remote or logistically problematic areas and were employed for three out of the ten interview sessions. Half (five) of the face-to-face interview sessions were conducted in small groups of between two and five participants. Group interviews were held at the request of participants. The use of group interviews was particularly appropriate for research in the educational setting, to minimise disruption to the class routine. All interviews were audio-recorded and fully transcribed. As described in Chapter 3, data were analysed thematically, by interrogating data to assign codes, sorting codes with examples and generating themes (Miles et al., 2014). In analysing the responses provided by participating teachers, the goals was to stay ‘grounded’ in the words provided (Strauss & Corbin, 1991), to more truly reflect the voices of the teachers.

6.3.1 *A Reflection on Methodology*

As stated above, the present study used three different approaches to investigate teachers’ perspectives: one-to-one interviews, individual telephone interviews and group interviews. It is critical to reflect on the potential differences that might result from three types of interview, including potential associated biases with each approach. Firstly, one-to-one interviews are one of the most widely used interview techniques. Even with this common approach to data collection in qualitative designs, there are potential biases to be critically aware of. For instance, the potential for the positionality of the interviewer to influence the interaction between interviewer and interviewee (as discussed in Section 3.6 of the Methodology), or the tendency for the analyst to over-interpret the experiences of interviewees without awareness of the constructive nature of interviews (Hugh-Jones, 2010). It is, however, generally agreed that with a critical and reflexive approach to these potential biases, one-to-one interviews can provide a powerful route to explore the perspectives and experiences of individuals in a range of topics (Bryman, 2012).

With regards to group interviews, the advantages of this data collection method in comparison to individual interviews has been widely discussed in the qualitative research literature: "the group interview has the advantages of being inexpensive, data rich, flexible, stimulating to respondents, recall aiding, and cumulative and elaborative, over and above individual responses" (Fontana & Frey, 1998, p55). It is, however, acknowledged that there are potential limitations to consider when using group interviews, including the potential for particular interviews to dominate conversation, or the possibility of 'group-think' (Fontana & Frey, 1998). Indeed, an important aspect about focus groups is that they entail a different skillset compared to traditional one-to-one interviews. That is, focus groups entail the interviewer having interviewing skills, but in addition, a level of facilitation or *moderation* between participants (Braun & Clarke, 2013). In the present project, the potential biases associated with group interviews were negotiated – in part – through careful use of questioning by the researchers, with follow-up questions being used to encourage elaboration from less vocal participants. Moderation techniques were also discussed in depth prior to data collection amongst the supervisory team and were strengthened by postgraduate training in interviewing and facilitation skills[25].

In addition to group and individual face-to-face interviews, data were also collected through telephone interviews (as outlined in Section 6.3). There are potential limitations of telephone interviews to be cognizant of – both interviewer and interviewee cannot access the full means of communication such as body language, which may disrupt the dynamics of the interview (Cohen, Manion & Morrison, 2011, Bryman, 2012). Telephone interviews are also typically shorter in duration (Bryman, 2012), a finding that aligned with the

[25] In June 2016 I attended the Scottish Graduate School of Social Sciences (SGSSS) Summer School courses: (1) Advanced facilitation skills for small group research and engagement; (2) Advanced 1:1 interviewing skills for social research and engagement

present study (phone interviews had a mean duration of 24 minutes compared with a mean duration of 39 minutes for face-to-face interviews). Despite these potential limitations, previous research comparing face-to-face and telephone interviews found that responses did not differ in quantitative or qualitative content (Sturgess & Hanrahan, 2004). Telephone interviews have indeed been used for similar reasons in related research projects, for example those investigating the Learning to Learn project (Thomas, Tiplady & Wall, 2014). Thus, telephone interviews were identified as an appropriate method – particularly for allowing participants from more remote locations to participate.

Whilst telephone interviews are increasingly seen as a valid and inclusive alternative to face-to-face interviews, given the particularities of telephone communication, specific techniques were adopted to minimise any potential biases or variations from face-to-face interviews. Specifically, I used a hands-free loudspeaker telephone throughout all interviews, allowing me to move freely throughout discussion and therefore paralleling face-to-face interviews. I was also intentional in providing space for interviewees to think and respond, in order to avoid interrupting flow of thought in a manner that may be particularly damaging to interaction in the absence of body language (Bryman, 2012). Finally, I provided space at the end of the interview for participants to discuss anything pertinent that was not covered throughout the discussion – and provided my contact details for participants should they wish to discuss anything further.

In sum, whilst certain variations exist between interview methods, attention was given throughout all interviews (regardless of method) to explore teachers' perspectives in relation to the research aims. A reflexive and transparent approach throughout interviews, whilst being attuned to the dynamics of the interactions was a key approach to ensure equal voice across all contexts. Moreover, reflection throughout the analytic process acts as a proxy to gauge the equality of voices across contexts – with identified themes being drawn from across interviewees rather than as a reflection of the interview method.

One other important consideration to make in relation to the present study is that interviews are not a "neutral tool". Instead, they are an *interaction*, meaning that the interviewer plays a role in constructing the reality of the interview with the interviewee (Denzin & Lincoln, 1998, p36). Likewise, meanings are constructed amongst peers (for instance, in a focus group setting). Importantly, the interview situation itself is somewhat different from normal conversation, as the whole situation has a particular significance (in that it is recorded and used at a later point), the interviewer takes a leading role in questioning, and the interviewee is expected to have responses to each of the questions asked (Walford, 2009). One way that I attempted to minimise the influence that the 'unusual' set-up of the interviews had on the situation was by adhering to the principle of treating people as people (Fontana & Frey, 1998). That is, interviews were powerful (arguably more so than experimental or survey research) for enabling the interviewer and interviewee to interact as people together, each with valuable perspectives. As such, interviews (regardless of the form they took) were approached in a friendly manner, from a place of genuine interest in the perspectives of interviewees. Throughout interviews, the focus was upon flexibility (Bryman, 2012). As such, whilst I had a set of ideas or questions to focus upon, questions were open-ended and encouraged interviewees to provide an account that was based on their experiences.

Finally, it is relevant to reflect on the particularities of the interviews conducted in the present study, particularly in relation to the overall project design. That is, given the iterative process of recruitment across studies, it is important to acknowledge that some teachers interviewed may indeed have taken part in the pilot survey study conducted at the outset of this research project. The pilot survey asked participants explicit questions about their knowledge of metacognition as a construct, and the participant information form was clear about the goal of investigating teachers' perspectives of metacognition. Such characteristics of the recruitment process brings rise to considerations of possible priming of participants, in which the mention of specific concepts can 'activate' cognitive associations leading to an increased likelihood of concepts being discussed or indeed acted upon (Dawson, Hartwig & Brimba, 2015). In considering the possibility of priming, however, it is relevant to note the limited degree to which teachers described explicit knowledge of metacognition as a term (as discussed in Section 6.4 below), suggesting that explicit priming did not influence participants' responses. Moreover, it is important to consider that the goal of interviews was not to 'test' or score participants on their knowledge of metacognition, but rather to explore teachers' perceptions of metacognition, both through knowledge of the term, as well as pedagogies surrounding encouraging students to 'think about and manage their thinking'.

6.4 Findings 1: Teachers' Perspectives of Metacognition

The following section focuses on teachers' responses regarding their knowledge of the term 'metacognition' as well as their perspectives about how to support children to think about and manage their own thinking within the classroom environment.

6.4.1 *Explicit knowledge of the term 'metacognition'*

When asked, teachers did not generally describe explicit awareness of the term metacognition, with several varied and vague definitions being offered. Some teachers indicated that they had heard of the term without full understanding of its meaning: "I heard the word kind of thrown around but I can't really remember anything specifically about it, it was just it was there in the background really" (3). Others noted:

> It would be more learning and teaching, and how do children learn, rather than metacognition. It's not a buzz-word in education. (9)
> I've heard of it, but I wouldn't know much about it at all, not that I can remember. (14)
> I've never heard of it before. (19)

Above are some of the typical responses provided by teachers when asked about their knowledge of metacognition, demonstrating that overall, the majority of teachers indicated that they either had no knowledge of metacognition, or a vague understanding of the term.

Where teachers did indicate understanding of 'metacognition', they often indicated that specific terminologies were used with specific disciplines or for specific purposes. For example, a head teacher stated that the use of the term would be used in terms of psychological assessments rather than everyday discussion, stating:

> [Metacognition is] not something that we would necessarily use when we're talking about children, or even when we're talking about children's level of needs. It's not something that we would actually refer to in relation to when we're thinking about children. However, when we have children that are being seen by psychologists […] it may be that maybe we would get reports from them in relation to thinking about children's understanding of learning and what is and isn't working for them. But within actual school ourselves, it's not a term necessarily that we would use. (12)

In discussing metacognition, teachers often made a distinction between psychology and education, indicating that metacognition links more with psychology than education:

> I did psychology as my degree through the Open University so if you had asked me that question about metacognition like, ten years ago I'd have

> given you a whole spiel. I could have talked to you about it forever. But now, the buzz words that are used, and the ways I look at cognition now, it's more towards an education side rather than a psychology side. (13)
>
> We've been taught things like Bloom's Taxonomy but we've not really talked much about cognitive or things like that, I think that scares teachers off a bit. (20)

Cumulatively, the above excerpts demonstrate for many teachers, metacognition was not a term used in their practice, or in 'education circles' more widely. Where teachers described awareness of metacognition as a term, this was often directly in relation to psychology, for example when teachers studied psychology as their undergraduate degree before entering teaching, or when educational psychologists worked with teachers on specific initiatives or with specific children.

One head teacher described that there was some awareness of metacognition by staff, particularly younger staff who had received more recent training:

> There would be a reasonably good understanding. I think possibly amongst the younger teachers, more than the ancient ones like me, in that psychology is much better understood coming out of university, than we were very much practical based. (8)

This excerpt suggests a potential difference in experience between recently qualified teachers and more experienced teachers in terms of training received – an interesting point as it suggests an influence of time. Whilst change over time is considered more fully in Section 6.5 below, this change is relevant in relation not only to the training experienced (which, this head teacher suggests, has shifted to include more psychological content). Indeed, an important point to consider is the resultant impact that this might have on the interaction between new teachers and more experienced teachers, and the complex processes of socialisation that are undergone as a teacher enters the educational context (Leat, 1999).

Several teachers indicated that the term 'metacognition' is not used widely throughout the educational domain. By contrast, however, other related skills, terms and approaches were mentioned by teachers. Teachers discussed many approaches when asked how they generally encouraged children to think about and manage their when thinking (outlined in detail below), but terms were also highlighted specifically in relation to teachers' knowledge of metacognition. Some of the responses provided were vague and focused on broad descriptions of approaches to ‘thinking skills’:

> There was a programme in the school – I can’t remember the name of it – that we used to teach thinking skills, and how to approach a problem, and what you do. What’s the first step you would do with that you know? That kind of thing? Em, so we did a lot of that sort of thing as well, types of activities like that. (11)

This finding is critical for beginning to more deeply explore teachers’ own conceptualisations of metacognition, allowing consideration of the types of approaches encapsulated by the term – linking to thinking, thinking skills, differences in the ways children learn, and so on. Thus, whereas teachers generally did not describe explicit knowledge of the term metacognition, teachers did demonstrate perspectives about encouraging students to develop skills relating to thinking and learning. Of course, teachers may not necessarily require explicit knowledge of the term ‘metacognition’ to encourage students to develop metacognitive knowledge or skills. Therefore, another key aspect of the interviews was to explore teachers’ practices without relying on knowledge of this term. As such, the following section explores teachers’ perspectives of metacognition in more depth by describing responses provided when asked to consider how they support their students to ‘think about and manage their own thinking’.

6.4.2 *Pedagogies for metacognition*

When asked how they encourage students to think about and manage their own thinking (i.e., support metacognition) teachers described several initiatives or programmes. By far the most commonly described approach was Growth Mindsets:

> I think the implementation of Growth Mindset has been good as well, teaching children it's ok to make mistakes and identifying how you can improve and achieve goals that they should be setting themselves. (7)
> In general, we really want our children to be kind of resilient, so we’ve done a lot about the learning pit, so through the Growth Mindset stuff. So, we’ve done a lot of work about the pain of learning. You know you hit that learning pit and you know you can be really a struggle and it can be frustrating, and it can be annoying, ‘cause that’s the struggle of learning. (8)

Other approaches described by teachers included: Bloom's Taxonomy; activities through music; formative assessment strategies; Hattie's visible learning and feedback; mindfulness or meditations; Philosophy for Children; Kit Bag; Seasons for Growth; Maths Enhancement Programme; PATHs programme and Critical Skills Programme. One teacher stated that encouraging students to think about and manage their own thinking would be a separate lesson in itself:

> I think if I was working in the primary 7s we would always, we would do thinking skills, maybe show them a picture of something and then say 'what do you think is happening there?' […] But as far as thinking about *learning,* thinking about *thinking,* that would be – I would take that out and use it as sort of a separate thing, you know just – like problem solving skills that type of thing. (11)

This comment is in contrast with other teachers' talk about discussion throughout everyday classroom activities, suggesting that metacognitive instruction can be seen not only as 'infused' throughout everyday lessons, it can also be a separate lesson with a focus on metacognition. This perceived contrast to everyday activities is also evident in the following excerpt, in which a teacher mentioned that thinking skills discussions were distinct from traditional classroom tasks:

> It's what you think, so therefore, it's not like doing some numeracy where that is the answer, it's concrete. Whereas for something like thinking skills, it is so much an individual thing, and it's almost getting them to understand that – they are allowed to think like that, they are allowed to have an opinion. (2)

Here, thinking skills approaches were described as different from other lessons such as numeracy, because there are no notions of right and wrong, and children can be free to provide any answer. This highlights a large contrast between psychological literature on metacognition and classroom approaches. Whereas in the classroom the focus of metacognitive approaches is often on developing awareness of strengths and limitations as well as the use of strategies, in the laboratory there are often clear notions of accuracy and correctness in metacognitive assessments. This stark contrast between psychology theory and classroom practice is clearly a critical point in bringing together psychology and education in relation to metacognition, and therefore will be considered in more depth in the general discussion (Chapter 7).

Metacognitive approaches were often described as being 'tools' for teachers that can be used as required by the circumstances. For example, one teacher stated: "We talk about it as different tools that we would maybe have as teachers, and things that we would maybe have within our toolkit as we call it, that we would maybe draw on" (12). At a broader level, teachers demonstrated the way they use their knowledge and beliefs in relation to facilitating students' skills in thinking about and managing thinking. For example, teachers frequently described the importance of 'knowing your class' or taking into account the specific context and time in which to encourage students to think about their thinking. For example:

> It is kind of knowing your class, gauging what kind of mood they're in – because that comes into it as much as anything else. If they have done something that has had them so excited – bringing them back down again, they're not going to listen to me being like 'so what kind of skill are you developing?' they'll be like 'are you really asking me that now seriously?' (13)

Evidence suggests, therefore, that teachers interviewed had clear perspectives about how to encourage students to think about and manage their own thinking, and the particular considerations that need to be taken into account in relation to classroom practice.

6.4.3 *Discussion and questioning*

A key theme in the responses provided by teachers was the prominence of approaches that centred on questioning and discussion. For example:

> Children do a lot of that now, don't they? Talking through how they got to that result, what was your thought process? (2)
>
> It's giving them that time to have that time to talk a time to talk [sic] about their thought process and say, 'well this is how I did it'. And I have to say when we first did that children found it a bit difficult to say, well I just got it, or I just got that – well how did you get it? How did you come to that answer? (1)
>
> I *always* challenge them about where their views have come from, and why they think certain things, and how they come to that conclusion, yeah, and some kids are really engaged in that kind of thing. (14)

Approaches described by teachers frequently focused on using discussion to develop students' understanding of both the purpose and the process of learning, including the 'what, when, why and how' of strategies:

> In maths, there's a big huge thing at the moment about doing the conceptual understanding and it's getting the children to talk about 'how did you arrive at this answer? What did you do? Rather than them just going 'well I just did it' Well what's just did it, what did you do with it? […] everything we're doing nowadays within most of the lessons is getting them to look further into the learning, to think more deeply about 'well, what skill am I using, what is it that I'm doing here?'. (13)

One head teacher discussed the role of questioning and discussion within practices from the early years:

> we do a lot of learning through play […] so getting the children to actually identify what did they want to do, and then from that, have the opportunity to engage in the activity, but also to engage in discussion with the teacher or with their friends, to say is it not going as well as you want it to go, or is it going quite well, and teacher-questioning and actually posing those questions to actually help those children, even at the age of 5 to be able to think about well, it would maybe be better if… and we actually review, you know, when we do plenaries at the end of lessons. (12)

One teacher stated that in discussions, a key focus is on being explicit about the thinking process:

> the first thing I do is I actually teach them about what thinking is and what they think thinking is, and talk about our brain, and we talk about how – how, we'll maybe do something, and after it I'll say, 'who can describe what was happening in your brain?'. (1)

This excerpt highlights an important role of teachers in explicitly describing to students what it means to think, and the role of thinking in relation to activity in the brain. This teacher clearly described ideas from psychology in relation to her practice, through the inclusion of ideas relating to the brain and thinking, however this was not described in relation to cognition or metacognition. This excerpt, therefore, suggests that teachers can indeed teach complex psychological ideas without the use of psychological 'buzz words' (as described previously).

One key finding to emerge consistently throughout excerpts is the clear role of the teacher in scaffolding discussion. In some cases, teachers explicitly described the role of the teacher as being a facilitator or scaffolder of discussion:

> I think some children would just take the opportunity to let it become silly, whereas like you say with scaffolding, you are kind of leading the direction, or facilitating the direction would be better word to use – you know, then you do get some good discussion out of it. (2)

Teachers' roles in scaffolding students' metacognition was also highlighted in a discussion about developing students' vocabulary and abilities to go into more depth about their thinking and learning:

> (18): Open questioning.
> (19): Yeah open questioning, sometimes written questions in jotters, you know, how did you, what are your next steps, or how did you feel about this?
> (18): Yes, we do quite a lot of evaluative work here, so we really encourage children to think about what they've learned, and how they've learned, and the kinds of skills that they have developed.
> (19): And how they feel about their learning, we're trying to get them to articulate more, because initially, quite often they'll say, 'I feel good' and we're trying to develop their vocabulary so that we can be a bit more precise and dig down and be a bit more precise, so why do you think that, why do you…

In the above excerpts, therefore, teachers clearly articulated ways that they encouraged students to think about their thinking through discussion and questioning, particularly about the what, when, why and how of strategies. Furthermore, evaluations at the end of the learning process were particularly described as key aspects of classroom discussions. Discussion and questioning approaches have been identified as critical aspects of facilitating metacognition in the classroom (Paris & Paris 2001; Mercer & Howe, 2012; Hacker & Dunlosky, 2003). Such questioning approaches can, clearly, be linked with metacognition theory by encouraging students to develop more insight into their own thought processes, strategies, and tasks, facilitating their explicit metacognitive knowledge (Flavell, 1979). Teachers described their important role in these interactions, with several teachers describing the importance of structuring discussions to make the most out of opportunities for students to think about the purpose and the process of learning. Thus, there is a recursive component to teachers' talk about developing students' awareness of their own cognition, with teachers demonstrating awareness about their actions in the support of students' developing metacognitive awareness.

6.4.4 *Summary*

In the preceding section, findings revealed that metacognition is a term not widely adopted by the teachers interviewed, with several teachers indicating that they did not have explicit knowledge of metacognition. Nonetheless, by asking teachers about the ways they encourage students to think about and manage their own thinking, findings revealed that metacognition does play a role in teachers' pedagogies. That is, whilst teachers may not have used the vocabulary of metacognition, they did describe practices relating to encourage students to think about and manage their own thinking – with discussion playing a key role. As such, data from semi-structured interviews reveal that the teachers interviewed demonstrated situated knowledge in relation to metacognition (Leat, 1999). Overall, therefore, the present findings highlight an interesting tension. That is, on one hand teachers had clear perspectives about how to support metacognition, and on the other, teachers lacked explicit knowledge of the term metacognition. The observation of this apparent contradiction suggests the need for deeper consideration of the wider influences upon the implementation of research into practice. As such the following section explores teachers' perspectives about the factors that facilitate or act as barriers to metacognition in classrooms.

6.5 Findings 2: Implementation of Approaches in Classrooms

The following section explores teachers' perspectives in relation to the implementation of metacognitive approaches in schools, detailing two overall routes – 'ground up' implementation and 'top down' implementation. In doing so, consideration is given to particular factors that were described by teachers in relation to facilitators and barriers to the implementation of metacognitive approaches in the classroom. Following presentation of the findings, the chapter discussion draws on an ecological approach to conceptualise the multiple embedded influences upon teaching practice.

6.5.1 *'Ground up' implementation*

When discussing specific initiatives relating to metacognition, some teachers described implementation from the 'ground up'. Such descriptions saw initiatives as relating to a specific need in a class or group. For example, one teacher described the implementation of metacognitive initiatives based on an identified problem within a class:

> I was aware that there was this group of children, who – it was that transferral of skills, you know? […] and I came across about metacognition, and about the teaching, thinking about thinking, kind of thing. Em, and the class that I had, they loved stories and you know, they loved just, the spoken word. So, we looked at Robert Fisher's stories and we used these as the stimulus for things. (1)

In this particular example, the teacher described a piece of enquiry research conducted for her chartered teaching qualification, and this was something that was described as revealing in terms of children's cognition:

> What came out – a lot of it was about, 'I didn't think about that idea until I listened to somebody else' and it was about this – how it then sparked off different things in the brain and things like that. (1)

Clearly, teacher 1 found this 'ground up' approach to implementation to be successful, describing demonstrable effects on learning. This example demonstrates that where metacognitive approaches were selectively adopted by the teachers interviewed, this was usually for a specific problem or issue related to the class (in this case, a lack of transfer of learning). This selective use of approaches for specific purposes was a common theme throughout interviews, with approaches that drew from teachers' own contexts and experiences being identified as having particular success in the classroom.

In another example, a head teacher described how a 'ground up' approach to Growth Mindsets extended beyond a single class:

> We had this really worrying class of children for who, resilience was not there. And we'd been kind of wringing our hands about this. So, we really brought it in for that one class. And as we became more comfortable and realised that this was something that we needed to roll

> out to the whole school, as almost as you say an ethos – em so that class actually took charge of that – they rolled it out. (8)

In this example, the teacher described the implementation of approaches as beginning as small scale in relation to particular identified problems, and then extending throughout the school, as benefits were evidenced.

One teacher described the critical role of educational psychologists at the LA level in facilitating ‘bottom-up’ initiatives:

> We as a school did quite a bit of research with our educational psychologists in relation to self-regulation […] So, we were involved in a piece of research in inquiry learning for self-regulation, to try to understand how children think about their learning and to try to encourage them to be able to from a really early age, to have better ownership of their learning. (12)

This excerpt suggests the critical role of cohesion between the school and supporting structures (such as educational psychologists) in the success of initiatives. Indeed, in relation to contextual factors that facilitate implementation of approaches, teachers clearly described the importance of coherence between stakeholders at multiple successive levels in education. For example, when describing educational aims one teacher stated:

> We have our school quality improvement plan that our own school development is built around too […] So, you have the cluster[26], then you’ve got the school, then you’ve got your personal [aims], all hopefully working together, to make sure that you’re all working together. (9)

Teachers also described that success in initiatives was possible when they aligned with teachers’ professional understandings and existing practices. For example, in the following excerpt a teacher described when an external approach aligned with her professional understanding:

> some things are, you can think ‘no I’m actually not doing that’, so you can see how the children will benefit, and there’s other ones where you

[26] A cluster is a group of schools within a LA, often linked geographically.

> think, ‘actually no I am doing this’, and it’s actually that you’ve got where the new incentives are, where ‘that’s kind of what I am doing so that’s fine. This one – I don’t think I’ve got anything that kind of meets the expectation for this’. (13)

This example demonstrates that bottom-up initiatives were perceived as particularly useful when they aligned with teachers’ own perspectives about the subject area. Such a finding highlights the importance of teachers’ own metacognitive awareness – their declarative knowledge as being critical to the implementation of metacognitive initiatives themselves (Wilson & Bai, 2010).

In sum, teachers who described instances of successful implementation of educational initiatives around metacognition tended to be described as ‘ground-up’, and moreover, tended to involve coherence between different levels of the educational system (e.g., cohesion between the identified needs of the particular classroom and the initiatives promoted at local or national levels). Furthermore, the examples above suggest a degree of movement between levels (i.e., from the classroom level to the school level) when teachers perceived there to be benefits – when they had the opportunity to experiment with initiatives and to identify what works for them. As such (and perhaps unsurprisingly), ‘bottom-up’ approaches were identified as achieving cohesion between levels.

6.5.2 *‘Top down’ implementation*

Whilst instances of ‘bottom up’ implementation were described, teachers more often in the interviews described ‘top down’ implementation of initiatives. In discussing implementation of initiatives in the educational setting, teachers described forces at the local and national policy levels, with change over time also being a clear characteristic of the educational context.

In relation to local policy, teachers referred to initiatives at the Local Authority (LA) level as well as cluster level. At this local policy level, teachers often described initiatives or programmes that were a focus of the LA or cluster. For example, two teachers described a greater focus on Growth Mindsets than metacognitive approaches *per se*:

> (1): in terms of as an authority and things like that, there’s not a focus [on metacognition], but it is part of IDL [Interdisciplinary Learning], and how it’s meant to embed into everything.

> (2): I think about Growth Mindsets and fixed, there's been a big, big push. We've had quite a lot of CPD [Continuous Professional Development] on that, particularly last year or the year before we had that. That was a big thing.

As this excerpt demonstrates, local level initiatives were described as having a substantial impact on the initiatives supported by particular teachers in particular schools. Whereas some teachers did describe that LA initiatives relating to developing skills in metacognition and self-regulation (as described above), this was not always described as an explicit focus for LAs.

Moving away from local level policy, one of the largest contributors to teaching practice described by teachers was national level policy. For example, one head teacher described the increased focus upon student choice and awareness of learning:

> with the standards in education just now, the standards for teaching, and head teaching, and the whole leadership and these sorts of things that came out of the GTC [General Teaching Council], there is [sic] very structured and identified tasks if you like, for teachers to be able to engage children in their learning, as well as, Curriculum for Excellence has a huge big push on children having choice. […] So, I think just a whole shift in the whole way that we look at education and the way that we engage children in their learning, it has become much more prominent in the classrooms that children actually do understand what they are learning and why they are learning it. It's really, really important now. (12)

In this excerpt, the teacher clearly described external influences from several different national policy organisations, suggesting that national-level policy has a direct impact upon what happens in schools. Interestingly, this teacher talked about influences directly in relation to a shift, inferring change over time. This is a recurring theme that will be discussed in more detail in the following section.

In relation to teachers' perspectives of 'top-down' policy initiatives, it is pertinent to note that the external focus on specific approaches was described by some as a negative, for example:

> I think unfortunately sometimes in education there's always something that becomes something that we've got to focus on. So, for a while there was quite a focus on thinking skills, and it has gone down. And I'm quite an advocate of it. (1)

This teacher, who described herself as an 'advocate' of thinking skills approaches (and who indeed had discussed a previously successful 'bottom-up' approach to thinking skills), clearly emphasised a change in the initiatives being advocated by educational policy, with approaches coming in and out of favour. Later in the discussion, this teacher described the shift in emphasis from a policy level: "other things have become – in some views more of a priority" (1). Therefore, findings suggest that approaches were commonly perceived as being imposed on teachers, with teachers interviewed often describing external initiatives in unfavourable terms.

One of the directly negative influences described in relation to external policy being implemented in schools was the extreme workload placed on teachers:

> teachers have a vast amount of things that they have to tick off […] teachers have to do a formal letter, they have to do a poem, you have to do a creative story, and all these things need to be ticked off, and proved, and stuck in jotters to somebody else can tick it and go 'oh I'm doing great' … I think the expectations of Government, or whoever sets these goals of 'this is what children have to do and achieve' is actually, can put a box on children's creativity and thinking. (14)

As the above examples demonstrate, therefore, national-level policy initiatives were often viewed as external and unfavourable by teachers interviewed. Furthermore, one of the factors described by teachers as a barrier to metacognitive approaches within the classroom was the over-crowding of the curriculum, set externally by those out-with the educational setting. The teacher above described the negative consequences of the over-crowding of the curriculum as leading to a level of 'tick boxing'. Interestingly, this teacher also extended this criticism to structured thinking activities such as learning logs:

> I think they're a load of pants […] it's just piecemeal – I don't think there's anything wrong with asking the children about their learning, of course not, and discuss – but this need to document it all, and have it all in learning logs – I just feel it's another box-ticking exercise. (14)

Cumulatively, then, the above experts provide striking examples of a perception of external initiatives being bound within a framework of *performativity*, where teachers are compelled to generate specific achievements (Priestley, 2014; Priestley, Biesta & Robinson, 2015b). Here, the teacher clearly felt a need to perform, through ticking boxes and evidencing student work. This was described in clearly negative terms, in direct contrast with what the activities *should* be about. As such, the need to 'perform' had a restrictive force upon this teacher's practices in relation to metacognition.

6.5.3 *Change over time*

As mentioned previously, time was a clear theme throughout analysis. That is, teachers described changing 'fashions' in education, through the changing emphasis placed on different initiatives at local and national policy levels. This finding is exemplified in the following excerpt:

> Things change within education as well though, and they put more of an emphasis on this sort of skill, and then on this sort of skill. I think it depends on where in education we are as well, because it's really been in the last few years that they have started talking about conceptual maths rather than just maths. (13)

Teachers described that practices relating to metacognition (and teaching practices more generally) had changed over time; most commonly due to increased emphasis on students' involvement on their learning and student-led learning:

> The way that we teach now is totally different, because whereas in the past you might have been giving children lots of factual information, and sort of rote learning of facts, particularly in some of the topics that they were doing, that is no longer the case because of the internet. So, children can readily get access of information should they wish to have that information. And actually, teach themselves as they get older. Our teaching has actually had to shift to teach children how to learn. (12)

In the above excerpt, Teacher 12 described a massive shift in not only the content of teaching, but actually what it means to teach. Thus, change over time was described at a wider scale as well as more day-to-day changing of initiatives. At another point in the interview, Teacher 12 made an explicit link to this change in relation to encouraging metacognition:

> Our teaching has actually had to shift to teach children how to learn. It’s not the content any more, it’s the process of learning. And I think that’s why being able to reflect, and for the children being able to actually know things that work for them, strategies that work for them, and things that maybe don’t work for them is a much more advantageous way for us to teach. (12)

This is an important finding because it reveals that metacognition entails a rather different style of teaching than the more traditional models of teaching and learning that were prominent in education in the past. The changing nature of national-level policy initiatives coming into classrooms was described as challenging for teachers:

> it can be quite challenging when there are quite a few new things coming round, where you’ve got your BMT[27] coming in, then you’ve got this conceptual maths, em, you’ve got visible thinking, visible learning, so you’ve got all these different things that are kind of coming in, and they’re coming in from different directions, and sometimes you feel a bit like ‘wow, never mind children’s cognition, what about mine?’ [laughs] But yeah, so, it can be challenging, but you do – it’s what you’re expected to do, so you do incorporate it into your learning because that’s exactly what the expectation is. (13)

This challenge was elaborated upon by teacher 13 when she described the difficulty of inferring the extent to which new initiatives are in fact new, or whether they are the same or similar to existing approaches:

> I think the challenge is getting these targets set by external body, that yes education is part of who we are, but we are still other people [sic] are making decisions about what they want us to bring into classrooms […] Because even though we know that you are still teaching them basically the same stuff, but there is a different slant being put on it, and you are looking at that new slant thinking, well am I actually teaching them the same skill, or am I teaching them the same skill, but it’s being wrapped up in something different? (13)

[27] Better Movers Better Thinkers – an approach that seeks to improve students’ Executive Functioning through Physical Education. More information is available from Education Scotland (2019a).

This teacher described the external policy as coming in from all sides and changing constantly. Moreover, the above excerpt suggests that this teacher did not actually understand fully what was being implemented, she did not feel part of the implementation process. As such, clear negative effects were perceived in relation to changing ‘top-down’ initiatives.

6.5.4 *Teachers’ lack of agency*

A critical finding in the present study is that the ‘top-down’ implementation of initiatives in schools was interpreted as being negatively perceived by teachers interviewed. Although teachers did describe that initiatives aligned with their perspectives (particularly when implemented from the ‘ground up’), more often they were described as restrictive, changeable and in conflict with teachers’ perspectives. Interview data suggested that such a ‘top-down’ influence of educational practice, ultimately, led to a restriction of teachers’ perceived ability to make an ‘active contribution’ within the classroom – that is, teachers described a sense of restricted agency (Biesta et al., 2015). In terms of understanding the ‘impact’ of metacognition within the classroom, therefore, it is important to understand the tensions between teachers’ perspectives and external forces (i.e., externally-set ‘top down’ initiatives or curriculum).

Agency became a clear theme throughout data collection. In several interviews, teachers commented that initiatives were brought into the school without any input from teachers. For example:

> we’re now doing tables, and we’re now doing rote learning of tables, which has not been considered good in education for a long time, but our gut feeling has always been that they need to know them […] we’re now a bit more confident in saying ‘well actually we’re going to do it this way’ we know it. (19)

This excerpt clearly demonstrates a tension between what is perceived to be the ‘right’ thing in mathematics, and teachers’ intuitive understandings (constituting, in this case, a ‘gut feeling’). The temporal dimension of agency is also emphasised in this excerpt and was prevalent throughout teachers’ experiences, suggesting that change over time is not solely a characteristic of the context within which teachers practice, but also has direct influences upon teacher agency, by constraining and constantly changing what are deemed ‘good’ practices (Emirbayer & Mische, 1998; Priestley et al., 2015b).

Another teacher made a striking comment demonstrating her perceived lack of agency when describing initiatives brought into the school:

> there are these schemes, where they are kind of inflicted upon us, and we are expected to go along with it, and it's like we're putting all this effort in, and the children are putting all this effort in, and I really aren't sure [sic] that we are getting enough from it to see that it's making a difference. (13)

Interestingly, as this teacher spoke, she initially described her lacking knowledge about the purpose of initiatives, before focusing more on a perceived lack of voice regarding initiatives in the school:

> I feel that sometimes, we're either not quite given enough training to use those tools, or we're not quite given enough insight into where are we actually taking this. Where are we to go with this? I know what you're telling me to do, but I as an educator and I have an enquiring mind, why am I doing this, what's the benefit, where do you want me to take the child on this journey, and how is the child going to understand that it's getting taken on this journey, if we don't know what it is myself. (13)

As the above examples demonstrate, teacher 13 expressed a particular lack of agency. She talked at length about having a restricted level of choice over what she implemented in classrooms and that there was a level of lack of understanding about the content or purpose of initiatives.

Another teacher summarised the perceived tension between teacher professionalism and external initiatives when she stated:

> That's where your professionalism comes into it actually, it's trusting your teacher to make a judgement in that situation, you know? That needs to be reinforced again, to help teachers feel like they have an ability in the classroom to go off on a tangent, to use the skills that they've got to be able to read the needs of the children in front of them. Because there isn't a teaching package you can say 'this is how it's going to work in this classroom'. As I've said, one size does not fit all. (14)

This particular excerpt well captures a tension that was highlighted repeatedly in interviews between teachers' perspectives (here described in relation to teacher 'professionalism') and the culture and systems of education more widely. Through describing the importance of giving back a level of professionalism to teachers, enabling them to feel empowered to use situated knowledge and change the content of lessons in accordance, teacher 14 highlights the common desire for increased agency in classrooms.

6.5.5 *Summary*

In sum, findings suggest that teachers perceived there to be external forces that play a role in what happens in schools, both at a local and national policy level. Teachers described instances where implementation of metacognitive approaches worked, and when they did not. In terms of what works, teachers described the success of 'ground up' approaches designed to address specific problems. Success was also described in relation to supportive structures, particularly the role of educational psychologists as being a 'link' between the LA and the school. On the other hand, teachers described barriers to metacognition, particularly in relation to 'top-down' initiatives. Instances where implementation worked less well were predominantly characterised by tensions between different aspects of the educational environment, for example between teacher perspectives and 'top-down' policy initiatives. Through discussing these tensions, a clear theme identified was a perceived lack of agency in relation to enacting educational approaches.

6.6 Discussion

The present study aimed to explore teachers' perspectives about metacognition. The first question in this study related to the knowledge that teachers have about the term 'metacognition', and teachers' perspectives about encouraging metacognition in classrooms. Overall, very few teachers indicated that they had explicit knowledge about the meaning of metacognition as a term. Nevertheless, despite the lack of awareness of specific terminology, it was apparent that teachers did have clear perspectives about approaches to encourage children to think about and manage their own thinking. Namely, teachers described discussion as a key route to encouraging metacognition, in addition to more structured approaches linked with other initiatives such as Growth Mindsets.

The second research question presented at the beginning of this chapter related to the factors described by teachers that influence the way metacognition is facilitated in primary school classrooms. In discussing barriers, teachers described tensions between teachers' perspectives and external policies that often perceived as 'inflicted' upon them. Finally, analysis suggested that the difficult relationship between external policy and teacher perspectives had direct impacts upon the perceived agency of teachers interviewed.

6.6.1 *Teachers' perspectives about metacognition*

The present findings revealed that few teachers had explicit knowledge of the term 'metacognition'. Whilst teachers talked frequently about teaching thinking skills or teaching children to think about their thinking or learn to learn, the level of detail about what it means to encourage students to think about their thinking varied. Teachers' discussion of other related approaches (such as Growth Mindsets) also suggests that teachers may not necessarily see metacognitive approaches as having distinct properties. In some ways, therefore, teachers' knowledge of metacognition could be deemed incomplete – they did not demonstrate knowledge of the term and in some cases provided relatively vague accounts of metacognitive practices. This suggests that teachers may not have full explicit knowledge of what it means to facilitate metacognition in classrooms, a finding consistent with Biesta et al. (2015), who found that teachers often provided vague notions of the goals of education, without detailed analyses of what they mean. In relation to thinking skills approaches in particular, Leat (1999) commented that teachers' pedagogical content knowledge is often so bound within specific subject matter(s) that it can be difficult to also incorporate specific knowledge relating to wider thinking skills approaches.

Critically, however, despite not generally having explicit knowledge of metacognition, many teachers did have a sense about the ways that they encourage students to think about and manage their thinking within the classroom. Teachers frequently described questioning and discussion approaches, particularly encouraging students to discuss the process of their thinking and the strategies used. These interactions have been highlighted in wider literature as critical for the development of metacognition (Paris & Paris, 2001; Mercer & Howe, 2012). The current findings are also consistent with the findings presented in Chapters 4 and 5, which emphasised the clear role of interaction in supporting metacognition. Also in line with the observational data presented in this thesis, teachers described approaches to facilitate metacognition throughout everyday classrooms as well as more structured approaches. Such findings, therefore, suggest that teachers have a degree of pedagogical content knowledge of metacognition (Shulman, 1986), with this understanding being based on an 'intuitive' sense of how to encourage metacognition rather than being based on explicit understanding of metacognition from a psychological perspective (Zohar, 1999). The current findings thus raise questions about the extent to which explicit awareness of the term is advantageous in relation to the facilitation of metacognition. This is an important question for practice, and will be considered in the general discussion (Chapter 7).

6.6.2 *Metacognition: An ecological perspective*

In exploring perceived facilitators and barriers to metacognition, a somewhat unexpected finding was the extent that teachers talked about the process of implementation of approaches in schools, with clear tensions being highlighted. In interpreting these experiences, it was apparent that these influences upon student metacognition extended well beyond the interactions between teacher and student(s) – and into consideration of the contextual influences such as the policy environment at the local and national governance levels. Given this finding, a systems analysis has been adopted to investigate the implementation of approaches at multiple successive levels. Such an approach is necessary to fully understand the 'impact' (or lack thereof) of metacognition (or any other approach or initiative) within classrooms. As such, the following discussion explores teachers' perspectives of metacognition from an ecological perspective.

Within Bronfenbrenner's Ecological Systems Theory (EST, Bronfenbrenner, 1977, 1994), development is seen from multiple embedded levels:

> the understanding of human development demands going beyond the direct observation of behavior on the part of one or two persons in the same place; it requires examination of multiperson systems of interaction not limited to a single setting and must take into account aspects of the environment beyond the immediate situation containing the subject. (Bronfenbrenner, 1977, p514)

In relation to the present study, an ecological perspective provides a structure to understand the impact of metacognition within classrooms, with impact being dependent on barriers and facilitators at multiple successive levels within with educational context. Thus, there is a 'layering' of influences on teachers' use of metacognition in practice. Bronfenbrenner (1994) described the layered structure of the environment as "conceived as a set of nested structured, each inside the other like a set of Russian dolls" (p39). In EST, surrounding direct interactions are described as microsystems, mesosystems, exosystems, macrosystems and chronosystems.

Within an ecological framework, the micro-system is described as the immediate context, encapsulating the interactions that exist between an individual and their environment, such as school, home, community groups or sports clubs (Bronfenbrenner, 1977, 1994). Teacher-student interactions occur within the micro-system, in which “direct interactions with social agents take place” (Christensen, 2016, p23). According to this view, talk between teacher and students that facilitates metacognition reflects the importance of ‘proximal processes’ of interaction within the microsystem for the development of the child (Bronfenbrenner & Morris, 1998; Tudge, Mokrova, Hatfield & Karnik, 2009). Such proximal processes are defined as “enduring forms of interaction in the immediate environment” (Bronfenbrenner & Morris, 1998, p996). Moreover, the mesosystem is defined as a ‘system of microsystems (Bronfenbrenner, 1977, p515); the interaction between the different (micro-system) environments that an individual is in contact with, such as interactions between school, home, friendship groups or community groups (Bronfenbrenner, 1977; 1994; Christensen, 2016).

Of particular relevance in relation to the present findings is the influence of the exosystem on children’s development. The exosystem is defined as the interaction between environments or structures that the child is connected to, with those contexts that are beyond the immediate context of the child (Bronfenbrenner, 1994; Christensen, 2016). Such structures can be both formal and informal, and encapsulate several different structures, for example the interaction between the school and a peer group (Bronfenbrenner, 1977, 1994). In the present study, local and national level policy contexts were exosystem influences that were clearly identified by teachers. Whereas some teachers described external initiatives positively (often those aligned with their perspectives), others noted a clear reticence to external policy initiatives, perceiving them as faddy and criticising them for not allowing space for teacher perspectives. Indeed, one of the most fundamental barriers to the implementation of metacognition identified was a tension between teachers’ perspectives about what works, and the external forces applied upon them as teachers (particularly at the highest level of national policy). Therefore, findings highlight a particular focus of tension within the exosystem.

Whilst the tensions between teachers’ perspectives and external policy are a key finding of the present study, it is also relevant to consider another exosystem influence upon student’ experiences of metacognition. That is, the influence of university research and training. Psychology in particular was described as irrelevant to education by several teachers, with descriptions of metacognition as being a “buzz word” in education. Such a response suggests a perception of psychology as “other” or irrelevant. Equally, however, educational psychologists at the LA level were described (mostly by head teachers) as playing a crucial role in implementing initiatives such as metacognition, and in helping teachers to understand the psychological underpinnings of initiatives. Such a finding suggests that particular roles can have a powerful position in terms of negotiating between contexts.

The macrosystem is described as the societal culture in which the child lives (Christensen, 2016). The macrosystem is the widest level of influence on the child, encapsulating social norms, cultures and systems in general that manifest in the microsystem, mesosystem and exosystem (Bronfenbrenner, 1977, 1994). Whilst the present study did not explicitly focus on the influence of the macro-level societal and cultural influences (e.g., that children go to school, that there is a level of accountability in schooling), these wider influences do clearly have influence over the other systems addressed. Such a view of the societal norms is difficult to parse from the exosystem influences, due to their (often not transparent) influence they have on the more concrete exosystem manifestations.

Finally, within the EST, the chronosystem describes another important dimension of the context surrounding a child. That is, the influence of time (Bronfenbrenner, 1994). Such a view of time extends beyond conceptualisations of the developmental profile of children, to consider time as a key property of the environment that extends historically (Bronfenbrenner, 1994, Bronfenbrenner & Morris, 1998; Tudge et al., 2009). This key function of temporal change is supported by the present findings. Indeed, a theme that was evident throughout all of the discussion points presented in the findings was a perceived sense of constant change; in society, in education, in initiatives implemented. Teachers emphasised the changing nature of initiatives as detrimental, not knowing how or why initiatives change. In relation to the impact of any educational approach, it is not surprising that the perceived transient nature of approaches is a limiting factor in relation to their implementation.

In sum, adopting an ecological approach to analysis provided a useful structure to understand the tensions described by teachers in relation to the facilitation of metacognition in classrooms. From this perspective, the current findings reveal tensions between exosystem processes and microsystem processes (between policy and teacher perspectives, but also, to an extent, between university research and teacher perspectives). With reference to the tension between teacher perspectives and local and national policy, findings suggested particularly negative effects on teachers' perceptions of agency.

6.6.3 *Teacher agency*

As a result of the tension between teacher perspectives and external policy, teachers described limitations to their perceptions of *agency*. Biesta et al. (2015) define agency as teachers' "active contribution to shaping their work and its conditions" (p624). Whilst such a definition clearly points towards the importance of teacher beliefs and attitudes, findings suggest that the influences are broader; with teachers' perceived agency being embedded within an ecological framework. Teacher agency has been described in the context of an ecological construct, namely: "Teacher professional discourses are to a large extent as they are because of the teachers' positioning within their professional environments, and their agency (or lack of) is heavily influenced by factors which are often beyond their immediate control." (Biesta et al., 2015, p629).

Ecological systems at school, community and policy levels all play important roles in relation to teachers' perceptions of and enactment of agency (Bronfenbrenner, 1996; Wilcox & Lawson, 2018). These ecologies have influence over several aspects of teachers' careers including roles, responsibilities, routines and measures of accountability (Priestley et al., 2015b). Biesta and Teddler (2007) used the term 'ecological agency' to describe the role of context in shaping teachers' experiences of agency, highlighting influences including feelings of purpose, judgement and routine. With such a view, context is seen as integral to agency, and rather than agency being perceived as something that is an inherent characteristic of the individual, it is instead seen as something that is achieved or constrained by an interaction with context (Biesta & Teddler, 2007; Leat, Reid & Lofthouse, 2015). Priestley et al. (2015b) provide an ecological model of teacher agency that is relevant here. In their model, agency is seen as a process bound within the past and projecting into the future. In the present, agency is understood as being influenced by three components of the environment in the 'practical-evaluative' dimension; cultural (thoughts and talk, values and beliefs); material (resources in the physical environment) and structural (social structures and interpersonal relations, power, trust) components.

A clear finding in the present research is a perception, by teachers, of a tension between teacher perspectives and 'top-down' policy initiatives. Such a finding brings to the fore, notions of performativity and professionalism. Priestley et al. (2015b) define performativity as "the demand on schools and teachers to 'perform'; that is, to generate achievements in a clearly specified range of outcomes (p105). Clearly, teachers in this research described a sense of performativity, a need to 'tick boxes' and *do* certain things, whether that constitutes completing a learning log, implementing a Growth Mindset approach, include more active learning in lessons, and so on. Critically, such a need to 'perform' acted to restrict teachers' agency by restricting teacher professionalism, defined as "the control of work by professional workers themselves, rather than control by consumers in an open market or by the functionaries of a centrally planned and administered firm or state" (Friedson, 1994, p32 in Priestley et al., 2015).

In the present study, the temporal dimension of teacher agency was emphasised, based on a perceived 'changing tide' of educational reforms based on ideas of performativity (Priestley et al., 2015b). Where teachers described 'top down' implementation of initiatives, this was associated with a lack of 'voice' in relation to the appropriateness of initiatives for particular contexts. Moreover, teachers indicated a lack of explicit knowledge of metacognition, with an associated lack of clarity about how metacognitive approaches related to other related initiatives that have been implemented. Such a view emphasises the inter-relation between 'material' resources of the present (i.e., knowledge) with structural processes embedded over time (Priestley et al., 2015b). In sum, a view of wider influences beyond the classroom, and particularly in relation to teacher agency, is identified as critical for understanding the impact of metacognition.

Whilst a main theme is the perceived predominance of 'top-down' policy initiatives by teachers, it is critical to consider that teachers did also talk in detail about instances where initiatives were implemented from the 'ground-up'. Such instances often described initiatives as relating to a specific need in a class or group, for example, based on an identified problem within a class. Teachers particularly described that success in initiatives was possible when they aligned with teachers' professional understandings and existing practices and were supported by cohesive relationships between stakeholders at multiple successive levels in education. Moreover, teachers often described 'ground-up' implementation of initiatives as transformative, in that they often led to wider scale changes in practice. Such a description suggests a degree of movement between levels (i.e., from the classroom level to the school level) when teachers perceived there to be benefits – when they had the opportunity to experiment with initiatives and to identify what works for them. Thus, an ecological framework provides a basis for understanding not only when teacher agency is constrained, but also in building understanding about successful implementation of educational approaches by supporting teachers and enhancing agency.

It is necessary to engage in critical reflection of teachers' responses with regards to the prominence of 'top-down' policy initiatives and the resultant restrictions upon their sense of agency. Indeed, an explicit goal of the Scottish Curriculum for Excellence is to allow flexibility, with the intention of 'liberating' teachers (Swinney, 2016). As such, at the widest level, Scottish educational policy may be argued to support teacher agency. Moreover, it is apparent in the analysis described in section 6.5.1 that teachers did not only describe 'top-down' policy but indeed also described instances of 'bottom-up' initiatives, in which they acted on the needs of particular students. Thus, an important point of consideration of whether teachers are restricted in their metacognitive practice due to ecological constraints, or whether this may in fact be a 'stock' response provided.

Of course, interviews as a research method provide insight into only the described perspectives of individuals, and in this project, participants' described words were understood as reflective of their experiences (a reflective account of this approach is provided in Section 6.3.1). However, an important aspect of the present study is that it explored teachers' perspectives in the context of the observed behaviour of teachers (as described in Chapters 4 and 5). That is, instances in which teachers were observed to facilitate metacognition were most often subtle (for instance, through talk and interaction) rather than overt, with such practices often being in the context of popular initiatives in the educational context (such as Growth Mindsets). Of course, individuals may be influenced by beliefs that restrict their own perceptions of resources for agency, paralleling evidence of an association between teacher beliefs and teaching practices in a range of domains (Nespor, 1987; as discussed in Section 6.2 of this chapter). Critically, it is important to consider that within an ecological framework, teacher agency is not seen solely as an individual capacity that teachers 'own' (and are therefore responsible for), but instead agency as understood as being supported and constrained by environmental factors outside of the individual's control (Biesta et al., 2015). As such, an ecological perspective allows us to consider teacher perspectives (encompassing knowledge, beliefs, attitudes) as connected to, opposed to separate from, notions of agency.

6.6.4 *Implications*

The present findings have clear implications for understanding the impact of psychological approaches such as metacognition within the classroom environment. One direct implication of the present study relates to teacher knowledge of the theory and rationale behind metacognition. Thus, teachers' agency in relation to approaches could be strengthened by greater communication with teachers about the rationale behind initiatives, increasing explicit knowledge. Moreover, the present findings clearly have wider implications in relation to teacher agency. Indeed, by understanding teacher agency as inherently routed in context (Biesta & Teddler, 2007; Biesta, Priestley & Robinson, 2017) agency is not seen as a fixed entity, and is expected to change in different contexts. Such a view of agency provides clear opportunities for change; to influence agency by improving the teachers' sense that they have the ability to make change and take action in their professional lives (Leat et al., 2015). Clearly, this is an important point and the implications of the present research for implementation of initiatives will be discussed in more detail in Chapter 7.

6.6.5 *Summary*

The aim of this study was to explore teachers' perspectives about metacognition. A clear finding throughout interviews was that beyond the micro-level (i.e., interactions between teacher and student), there were aspects of the educational context that teachers described as strongly influencing children's experience of metacognition, despite the child not encountering them directly. Namely, not only did teachers describe limited explicit knowledge of metacognition as a construct, but tensions were also highlighted between teachers' perspectives and local – and national – level policy initiatives. The findings of the present chapter suggest that despite the goals of the Scottish CfE being to encourage flexibility for teachers, the participating teachers still described school initiatives as overly 'top down' and prescriptive. Moreover, such 'top-down' approaches to implementation of educational initiatives were associated with a restriction upon teacher agency.

Summary point 1: Teachers described intuitive rather than explicit knowledge of metacognition.

Summary point 2: Exploration of the impact of metacognition within education is supported by an ecological approach, with teachers describing influences upon student metacognition beyond direct 'micro-system' interactions between teacher and student.

Summary point 3: Teachers perceived a lack of agency in relation to supporting student metacognition, with their perspectives as teachers being undermined by the continual revision of educational policy initiatives.

Chapter 7: General Discussion

Recalling the project description presented in Chapter 2, this thesis aimed to investigate the construct of metacognition in the classroom environment, examining how metacognition can be characterised throughout everyday tasks and in Structured Thinking Activities (STAs). In addition, this project sought to explore the roles that teachers play in relation to facilitating metacognition in the classroom environment, through classroom-based observations as well as interviews with teachers about their perspectives of metacognition. Ultimately, this thesis aimed to explore the 'impact' of metacognition research in the classroom. This study adopted an interpretive design, with analysis drawing on insights from psychological theory whilst being firmly grounded in practice. The results produced by this project are highly original in the extent that they bridge the fields of education and psychology. Indeed, this novel approach is powerful, not only for exploring metacognitive pedagogies, but also for developing theoretical understanding of the metacognitive process in classrooms.

Chapter 4 characterised metacognition throughout everyday classroom tasks, identifying clear opportunities to explore metacognition throughout the learning process. By focusing specifically on planning and the experience of struggle, findings highlighted the clear role of teachers in facilitating student metacognition, with teachers often monitoring and controlling cognition for students. Chapter 5 explored the interactions between teacher and students in greater detail and across time, focusing specifically on classroom practices designed to facilitate metacognition, STAs. Whilst limited evidence was observed for explicit metacognitive responses in written STAs, observations revealed the employment of metacognition in students' negotiation of tasks, with interaction between teacher and students being of critical importance for the elicitation of explicit metacognitive reflections. Chapter 6 then considered teachers' perspectives of metacognition, revealing implicit rather than explicit knowledge of metacognition by teachers, and critically, revealing the restrictive nature of external policy upon teacher agency in relation to the promotion of metacognition.

As will be discussed in more detail, the present findings make a significant contribution to the field by emphasising the iterative and interactive nature of metacognition throughout the learning process. Such a finding suggests that metacognition is practiced in primary school classrooms, however not in the ways that psychological theories suggest. Moreover, this project develops insights about the impact of metacognition in classrooms by conceptualising metacognition as an interactive process embedded within a system that exerts influence over the metacognitive process by restricting the agency of the teacher – a critical person in the educational process.

7.1 Characterising Metacognition in Primary School Classrooms

We are not going in circles, we are going upwards. The path is a spiral; we have already climbed many steps – Hermann Hesse

In exploring metacognition throughout everyday tasks as well as through specific STAs employed as pedagogical tools to support metacognition, there were important insights for understanding the metacognitive process within the classroom setting. These insights, which are inherently grounded in practice, are critical for developing understanding about metacognition as a construct. As such, exploration of practice has a critical role in informing psychological theory. More specifically, here I draw on findings from Chapters 4 and 5 to briefly summarise key reflections on metacognition theory.

The present evidence suggests that during tasks, monitoring and control form central 'on-line' aspects of metacognition that interact cyclically; the process of controlling develops task-specific knowledge that informs monitoring, and so on (Nelson, 1996). Monitoring is 'experienced' through on-line feelings and knowledge, and on-line control includes the selection, coordination and revision of strategies (Efklides et al., 1999; Efklides 2006). Control is influenced by, and influences on-line feelings and task-specific knowledge (monitoring). As such, on-line monitoring and control 'during' the learning process repeat cyclically as a task is completed.

The experience of struggle provided clear evidence of monitoring and control during tasks. Students frequently expressed difficulty, eliciting help from a peer or adult. In exploring on-line monitoring and control, the present research suggests that important distinctions can be made between implicit task-related experiences and more explicit declarative and procedural knowledge of cognition. The interaction between monitoring and control was also observable through students' own self-speech, for example when erasing work and/or commenting on changes to be made. Chapter 5 found that students can lack explicit metacognitive knowledge (demonstrated, for example, by the absence of literacy in Amy's reflections), whilst still 'experiencing' their cognition, transpiring as monitoring and ultimately, controlling cognition during tasks (demonstrated by students' strategic negotiation of tasks in accordance with their understandings of themselves and task requirements, such as Amy's repetitive use of 'ICT'). Although students monitored and controlled their cognition in very distinct ways (Laura by doing the 'bare minimum' for teacher expectations and Amy by producing 'stock' responses), the findings from both students suggest an 'online' monitoring and control of cognition throughout STA tasks, with metacognitive experiences paying a key role in this process.

Debate exists as to whether metacognitive experiences are distinct, or part of either metacognitive knowledge or metacognitive regulation (Tarricone, 2011). There is evidence that certainly to a degree, metacognitive experiences can be considered a distinct form of metacognitive knowledge, insofar as they are the mechanism through which the individual engages in monitoring during a task. In this way, metacognitive experiences may be understood as forming the "interface between the task and the person" during tasks (Efklides, 2006, p7). Therefore, whilst monitoring is 'experienced' as on-line task-specific knowledge and feelings, metacognitive knowledge encompasses more than solely on-line processes during tasks. Thus, in addition to metacognitive knowledge and regulation being 'manifestations' of monitoring and control processes (Efklides, 2006), they can also act as drivers of on-line monitoring and control.

More widely, conceptualising metacognition throughout the learning process within applied classroom contexts highlights the before, during and after functions of both metacognitive regulation and metacognitive knowledge, beyond a 'micro' focus on on-line monitoring and control. Whilst evidence suggested a surprisingly limited focus upon evaluation in the tasks observed, a clear example of student metacognition was the act of planning (Chapter 4). Chapter 4 revealed that students differed in the extent that they used planning as a metacognitive tool (i.e., to support cognition in relation to the forthcoming task), with many students using planning in a procedural, prescriptive manner. Critically, exploration of planning highlighted the relationship between metacognitive skills before the task and the resultant monitoring and control during tasks, with students often experiencing struggle when they used prescriptive planning structures without any metacognitive awareness about their use. Moreover, Chapter 5 found clear differences in the extent that Laura and Amy engaged with written STAs, with Laura providing clear plans and evaluations of her learning, and Amy providing little if any written response. In fact, the very function of such STAs was to make prospective or retrospective assessments of thinking and learning, thus encouraging metacognition in a way that is one-step removed from the 'on-line' learning process.

A clear finding in this research has been that metacognition can be understood as iterative, extending beyond singular tasks. In characterising metacognition throughout everyday tasks as well as exploring STAs, findings suggested that a key aspect of metacognition is drawing on previous experiences with tasks and using this knowledge in relation to the current task. When planning in creative writing tasks, for example, students clearly employed strategies that they had learnt in previous tasks, with teachers often linking to previous strategies and skills developed (Chapter 4). In addition, observational data suggests that a key function of evaluation is in planning to the future, with the relationship between planning and reflection being inherently connected, particularly in STAs (Chapter 5). Through talk, Ms Abbot clearly encouraged students to build on previous reflections in their STAs as time progressed, encouraging increasingly detailed and process-driven metacognitive reflections in relation to future learning (i.e., declarative knowledge, Brown, 1987; Schraw & Moshman, 1995). Thus, evidence suggests that metacognitive knowledge plays a key role in the iterative process, linking between tasks. This iterative nature is implicit in conceptualisations of metacognition but it is not subject to explicit consideration in traditional metacognitive theories (Flavell, 1979; Nelson, 1996; Kuhn, 2000). Thus, one significant outcome of this present thesis is to bring iteration into focus, as a fundamental feature of metacognition in practice.

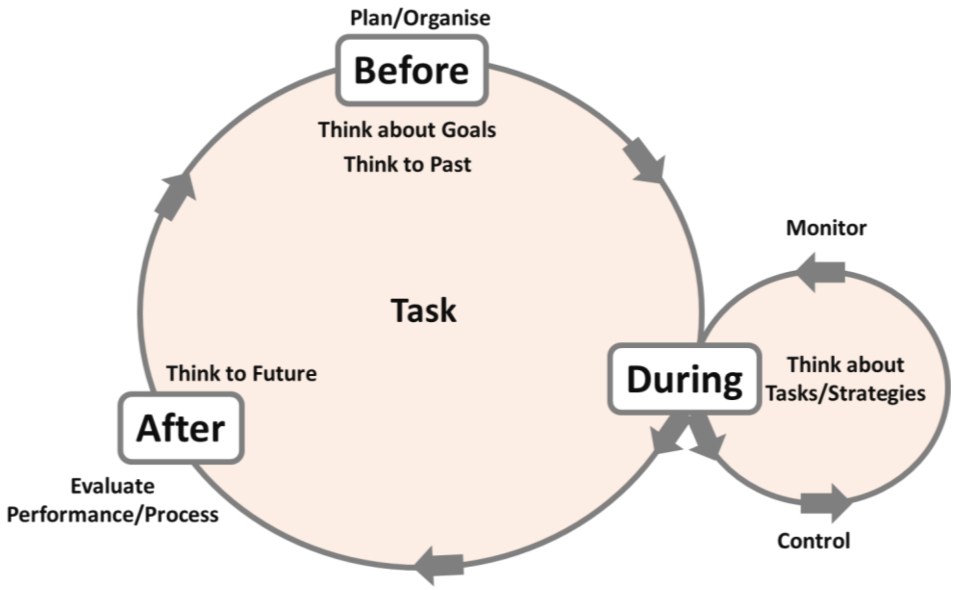


Figure 7.1. Conceptualisation of metacognition
This conceptualisation draws on findings from Chapters 4 and 5. As the figure shows, this conceptualisation incorporates two iterative loops, reflecting both the transition from one task to another; and the iterative transition between monitoring and control during tasks, with both cycles involving the development and use of metacognitive knowledge

To summarise, by drawing together insights from existing psychological theory with observational data grounded in practice, the findings of classroom-based research have clear implications for metacognition theory. As shown in Figure 7.1, metacognition in the classroom setting is understood presently as a suite of components that interact iteratively throughout the learning process. A key feature is the shifting focus away from metacognition as an isolated event: Metacognition is inherently connected to the learning process, and as with learning, metacognition is an iterative process between tasks, with metacognitive knowledge being both used and developed across successive tasks. Figure 7.1 captures two separate kinds of iteration. Firstly, on-line monitoring and control 'during' the learning process repeat cyclically as a task is completed, with metacognitive experiences playing a unique role in connecting the person to the task through on-line monitoring. Secondly, the 'on-line' process is situated within a wider process of metacognitive knowledge and regulation interacting across tasks. This cyclical nature is intended to emphasise the transition from one task to another – akin to a corkscrew – reflecting the continuous transition between activities in classroom settings.

7.1.1 *Teacher – student interactions*

The characterisation of metacognition as an iterative process within the applied context lays the foundations to explore not only the inter-relation between components of metacognition, but also the relationship between metacognition and other elements of learning, including contextual and inter-personal factors. Indeed, throughout observational research there was clear evidence of students thinking about and managing their thinking through interaction with peers and teachers as they completed tasks. The essential role of teachers in developing students' metacognitive processes is of fundamental importance in understanding metacognition in the educational setting. Despite this clear importance, psychological research has often focused less on the interaction between teachers and students, with efforts to improve metacognition often focusing on the evaluation of specific (often researcher-led) interventions (e.g., see Dignath et al., 2008).

Given the prominent role of teachers in the metacognitive process outlined throughout this thesis, it is pertinent to reflect on how teachers are situated in the metacognitive process as displayed in Figure 7.1. Across the research described in this thesis, a key finding was the importance of the talk used by teachers in facilitating metacognition. In Chapter 4, the critical role of the teacher was emphasised, particularly before and after tasks. Indeed, during observed tasks, teachers often monitored and controlled cognition for students rather than supporting students to monitor and control their own cognitions. At the end of the learning process, very little teacher talk or evaluation was observed – a finding that is perhaps surprising given the key function of evaluation in being to develop knowledge to take forward into future tasks (a point that is considered in greater depth in Section 7.4 below). Thus, it is clear when viewing Figure 7.1, that teachers are integral to the metacognitive process. Indeed, where metacognition was observed in classrooms, it was most commonly in *interaction* with the teacher, as exemplified by the learning chats observed as part of the STAs described in Chapter 5. Furthermore, teachers emphasised the crucial role of talk and discussion in relation to promoting metacognition throughout the primary school years (Chapter 6).

Findings, overall, suggest that metacognition exists in the space between students and the teacher, and as such, teachers play a critical role in facilitating student metacognition. Whilst in the present research there was a broad focus on the functions of ‘teacher talk’ and interaction in broad terms, it is pertinent to consider the types of talk in relation to the facilitation of metacognition. As shown in Figure 7.2, Fisher (2007) provided a useful distinction between different types of talk, ranging from direct instruction, through superficial conversation, to exploratory and challenging dialogue. In this research, several different types of talk were observed. In Chapter 4, for example, there was clear evidence of several types of talk, including instruction, monologue, discussion and dialogue. Indeed, this is unsurprising when observing the everyday workings of a primary school classroom. Comparisons can be made here, to more dialogic functions of teacher talk in relation to ‘learning chats’ that surrounded STAs in Chapter 5. It is through constantly encouraging students to go beyond superficial reflections that students begin to really think about their thinking process. For example, the findings of Chapter 5 demonstrated the critical role of dialogic interaction between the teacher and students, emphasising the sociocultural dimensions of metacognition in ‘constructing’ metacognition through talk (Vygotsky, 1978). Indeed, through dialogue, teacher talk is important for continuously negotiating students’ engagement of metacognition, by providing scaffolding sensitive to the needs of the individual child (Wood et al., 1976; Vygotsky, 1978). Of course, the different functions of teacher talk were an emergent finding of the present research rather than the sole focus, and so future research will provide further insight into the dialogic functions of teacher talk in the development of metacognition across time.

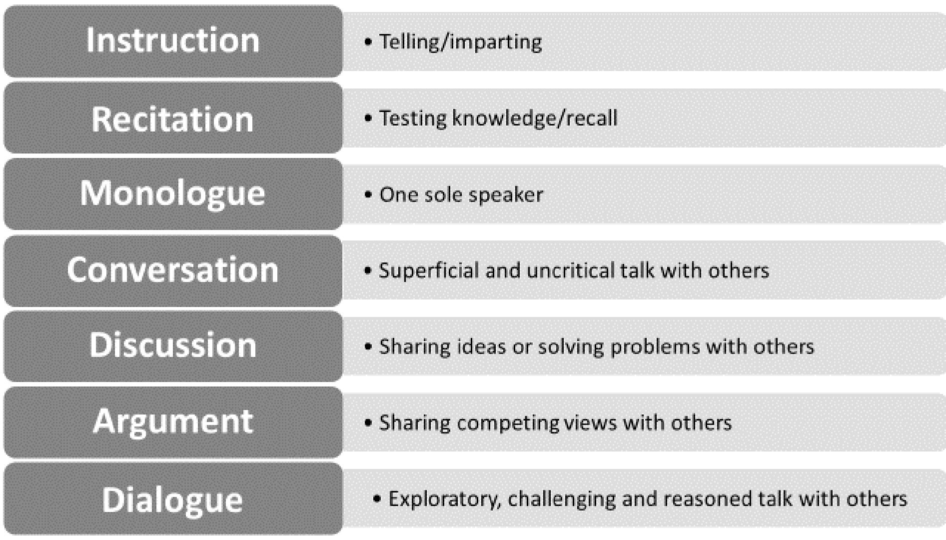


Figure 7.2. Types of talk, adapted from Fisher (2007)
This figure demonstrates the different types of talk used in classrooms. As shown, talk plays several different functions, from description to construction of meaning.

7.1.2 *Exploring the boundaries of metacognition*

The previous discussion considered conceptualisations of metacognition by drawing on insights from classroom practice to inform psychological theory – emphasising the iterative and interactional nature of metacognition. Before considering within influences upon the metacognitive process in the educational context, it is relevant to address some considerations that this project has raised in relation to the developing understanding about metacognition. More specifically, the 'boundaries' of metacognition can be considered in relation to several key points that arise when adopting an inter-disciplinary view of metacognition in this project; (1) the distinctness of metacognition in relation to educational approaches, and (2) the 'accuracy' or 'sophistication' of metacognition. In the following discussion, these points will be explored in turn, with the broad aim of exploring the idea of what it means to be a metacognitive learner in the educational environment.

7.1.2.1 Thinking, learning and metacognition

With the broad intention of exploring teachers' explicit knowledge of metacognition as well as exploring teachers' perspectives about encouraging students to 'think and manage their own thinking', Chapter 6 revealed that teachers interviewed discussed metacognition in relation to several pedagogies and initiatives, such as Growth Mindsets, Philosophy for Children, and general 'thinking skills' approaches. Such descriptions suggest that metacognition is perceived as rather diffuse, related to several different educational initiatives. This finding causes consideration about the 'boundaries' of metacognition, what aspects of metacognition specific approaches encapsulate, and in what ways do they differ. Clearly, several approaches aim to encourage students to more actively engage with their thinking and learning, however it is important to consider the specificity of individual approaches. For example, Growth Mindsets is an approach that encourages students to move to a 'mastery-oriented' view that emphasises growth and malleability, rather than a 'fixed' view of cognition (Dweck & Leggett, 1988). Clearly, such a view is conducive to metacognition (and could perhaps even be seen as a pre-requisite to metacognition) throughout its focus on students' developing awareness of the roles of effort and persistence. In itself, however, Growth Mindsets is not a purely 'metacognitive' approach as it does not entail thought about (or regulation of) one's own cognitive state. Whilst a comprehensive comparison of educational approaches to metacognition is clearly beyond the scope of this thesis, a clear finding that this issue raises is the implications of the 'conceptual fuzziness' upon teachers' perspectives and practice.

At a wider level, consideration of the 'fuzziness' of metacognition prompts consideration of the relevance of psychological theory to practice. Like in psychology research, educational research commonly refers to traditional conceptualisations of metacognition, drawing from the research and theory of Flavell, Schraw and Veenman (to name but a few). In practice, however, a much looser definition of metacognition is used within the educational context (research and practice) – to include not only 'cognition about cognition', but more widely, thinking skills, thinking about learning and learning to learn (e.g., Ritchhart et al., 2009; Higgins et al., 2004, 2005, 2007). Such a flexibility of meaning is perhaps most useful in the educational setting, supporting teachers to construct their own personal meaning and therefore, to structure pedagogy with more agency (Wall & Hall, 2016). Within the psychological field however, metacognition research is still predominantly focused on more cognitive accounts of 'online' processes of monitoring and control – and this indeed may in part contribute to some of the existing barriers in achieving cohesion between psychology and educational fields. Clearly, therefore, theoretical accounts will be most useful from an inter-disciplinary perspective when they allow the researcher and/or practitioner to observe the metacognitive processes with differing levels of 'granularity'.

7.1.2.2 The ‘quality’ or ‘accuracy’ of metacognition

Clear points of consideration when characterising metacognition within the classroom environment are notions of quality or accuracy. Cognitive paradigms entail measurement of the accuracy of students’ estimations of their own performance (for example, the popular JOL paradigm). In these measures, the accuracy *is* the metacognition, with their being a ‘correct’ response that individuals must judge against (e.g., Flavell et al., 1970; Coughlin et al., 2015). A similar issue to accuracy, relates to the quality of strategies employed to control cognition. Cognitive research paradigms have traditionally conceptualised ‘good’ metacognitive regulation as the appropriate adoption of distinct strategies, such as selectively withdrawing answers that are incorrect (Roebers et al., 2009) or studying longer for items not yet committed to memory (Destan et al., 2014). Again, such experimental paradigms allow a measurement of the ‘correctness’ of metacognition. For example, Bjork, Dunlosky and Kornell (2013) argue that many students use both ineffective strategies but also erroneously believe these to be effective.

Rather than exploring the ‘accuracy’ of metacognition, or how ‘good’ strategies were, the present research has focused on broadly characterising metacognition within the applied educational context. Such a characterisation has at times, entailed consideration of the usefulness, or ‘sophistication’ of metacognition. A difference in metacognitive ‘sophistication’ can be seen through the investigation of discussions with students as they complete classroom tasks (for example, in the different degrees of ‘internalisation’ of planning strategies suggested by the teacher, or the difference in strategies used to respond to struggle in Chapter 4). As discussed throughout, however, there is an inherent difficulty in judging the ‘accuracy’, ‘sophistication’ or ‘quality’ of metacognition throughout classrooms tasks (i.e., out-with the controlled laboratory setting).

Findings, therefore, raise critical questions when exploring the boundaries of metacognition. That is, how can we (and should we) assess the accuracy of metacognition in the classroom, and on what basis can one deem strategies effective or ineffective? Clearly, there are important considerations to be made in terms who should be attributing quality or accuracy to a process that is itself internal and personal – issues that inevitably raise questions of not only method, but also student voice and power (Arnot & Reay, 2007). Unfortunately, there is no easy solution to the issue of accuracy or quality of metacognition, which in part, reflects the epistemological differences between research approaches. Another way to phrase the question about the ‘accuracy’ of metacognitive judgements, is to question whether there is such a thing as a ‘true’ or ‘accurate’ assessment, and if so, then whether it is possible (or indeed, desirable) to gauge this. As research consistently suggests the critical interplay between the task, person and context, it is possible that there is no one ‘truth’; no one ‘accurate’ monitoring of cognition, nor one ‘best’ metacognitive strategy to employ uniformly between individuals. This is a question that would of course benefit from further research, particularly through the use of mixed methodologies to on one hand explore the characteristics of metacognition used throughout classroom tasks and on the other, explore their efficacy in more experimental paradigms.

7.1.3 *Summary: What is the impact of metacognition?*

In bringing together findings relating to the characterising of metacognition in the applied classroom setting, it is possible to consider the impact of metacognition research in Scottish primary school classrooms. Overall, evidence from classroom observations as well as interviews with students and teachers suggests that within the bounds of this research study, there was limited impact of metacognition in schools in relation to what may be expected from psychological theory and research. That is, this research found evidence of metacognition in schools, however not as psychological theory might expect. This research suggested that metacognition is a complex interplay between experiences, knowledge and regulation throughout the learning process, bound within affective and emotional processes and critically, deeply interactive in nature. That is, metacognition was present in classrooms, particularly in the space between teachers and students and in the interactions that take place throughout classroom tasks. Critically, this promotion of metacognition occurred in spite of many teachers not having explicit knowledge about metacognition as a construct.

7.2 Impact: Addressing the ‘*Why*’ Question

The primary aim of this research project was to characterise metacognition in the primary school classroom environment, providing insight into the impact of metacognition research in practice. By conceptualising metacognition as an interactive and iterative process embedded within an ecological system, a significant contribution of the findings is in providing an explanation for not only what the impact of metacognition is, but also why there might be limited impact of research in classrooms. Figure 7.3 shows the embedded systems in which a child exists. Rather than providing an exhaustive account of system factors, the figure demonstrates the layering of influences that surround a child, demonstrating that to truly understand educational approaches (and to grasp notions of research impact), it is necessary to go beyond the individual, and to investigate the systems that surround a developing child.

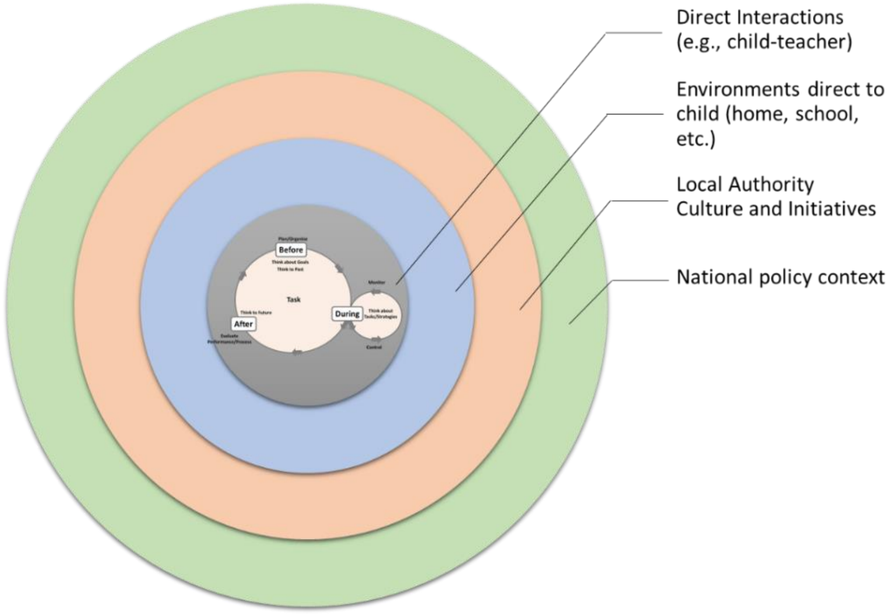


Figure 7.3. An ecological perspective of metacognition
Representing the concentric layers of influence which surround a child. As shown in the figure, the internal process of metacognition is only one aspect of metacognition, with systems of influence surrounding the child at successive levels of proximity.

Previously, I have examined the role of metacognition at the ‘micro’ level (Azevedo, 2009), considering the role of metacognition in classrooms and particularly the importance of ‘proximal processes’ of teacher-student interactions within the microsystem (Bronfenbrenner, 1977; Bronfenbrenner & Morris, 1998; Tudge et al., 2009). Now, attention is turned beyond proximal processes, summarising key system-wide influences upon student metacognition. As stipulated by the ecological systems theory, the interactions that a child encounters are immediately influenced by the environmental context (Bronfenbrenner, 1994). In focusing on STAs, for example, factors that influenced students’ engagement included the method of expressing metacognitive reflections, the timings of activities, the justifications of suggested strategies by teachers, and the culture in which the activities took place.

Of particular relevance in relation to the findings of this project is the influence of the exosystem; the interaction between environments or structures that the child is connected to, with those contexts that are beyond the immediate context of the child (Bronfenbrenner, 1994; Christensen, 2016). Such structures can be both formal and informal, and encapsulate several different structures, for example the interaction between the school and a peer group (Bronfenbrenner, 1977; 1994). In the present study, local and national level policy contexts were examples of exosystem influences that were clearly identified by teachers, with another being the university research context. Indeed, one of the most fundamental barriers to the implementation of metacognition identified in Chapter 6 was a tension between teachers' perspectives about what works, and the external forces applied upon them as teachers (particularly at the highest level of national policy). That is, whereas some teachers (often whose approaches aligned with the external pushes) described the initiatives positively, others noted a clear reticence to externally-implemented approaches, describing them as undermining teacher professionalism. Thus, this project reveals restriction of agency at two levels: from the national level curriculum, but also from the academic field, the 'what works' agenda.

Figure 7.3 provides a simple diagrammatic representation of a clearly multi-dimensional ecological construct of metacognition. As discussed in the preceding paragraphs, the findings of the present project highlight that teachers describe a perceived restriction of agency, particularly through 'exosystem' environmental influences stemming from external policy initiatives as well as psychological theory. Looking at Figure 7.3, it is clear that other influences exist beyond those that have acted as a focus in the present investigation. Examples of some of the particularly prominent factors that were beyond the scope of this study include individual differences (as described in Section 2.5 of Chapter 2), interactions with peers and caregivers (e.g., see Cho, Land, Alfred & Turgeon, 2005; Pino-Pasternak, Whitebread & Tolmie, 2010), or the influence of teacher training and support (for example, see McNamara, 1995; see also Section 3.9 of Chapter 3). Of note, instead of providing an exhaustive account, the purpose of Figure 7.3 is to demonstrate the layering of influences surrounding a child. As demonstrated by the findings of the present project, to truly understand educational approaches (and to grasp notions of research impact), it is necessary to go beyond the individual, and to investigate the systems that surround a developing child.

7.2.1 *Policy influences on agency*

A clear finding in the present research was a perception, by teachers interviewed, of a tension between teacher perspectives and 'top-down' policy initiatives. Such a finding brings to the fore notions of performativity and professionalism in Scottish Education. With the introduction of the Scottish Curriculum for Excellence, a stated aim was to provide an increased flexibility for teachers. Such a policy change should ostensibly be related to an increased sense of professionalism by teachers, and associated impacts upon teacher agency, “Curriculum for Excellence can be seen as an example of modern curricular reform in which teachers are explicitly positioned as agents of change” (Biesta et al., 2015, p625). However, the present findings provide stark evidence to the contrary, suggesting that teachers still experience a clear need to perform, to evidence, to ‘tick boxes’, and to move with the shifting tide of educational resources. Therefore, the present findings emphasise a clear tension between intended purposes and teachers’ perceptions of reality, stating that teachers should be agentic whilst restricting their capacity to be so (Leat, Livingston & Priestley, 2013; Priestley, Biesta & Robinson, 2015a).

One direct implication of ‘top-down’ initiatives identified in this project was teachers’ restricted pedagogical content knowledge in relation to metacognition, teachers’ perspectives about how to facilitate metacognition being based almost entirely upon intuitive knowledge. Knowledge is a key component of teacher agency, being a material resource that is also critically bound across time (Priestley et al., 2015b). That is, there is a clear influence of past training and professional development upon the knowledge, values and beliefs (and thus experience of agency) in the present. In interviews, the influence of time was particularly pertinent in relation to teachers’ perspectives of initiatives, with teachers describing a constant shift in educational policy, resulting in a lack of clarity about what is actually desired by external initiatives. Thus, teacher knowledge was identified as one material resource that acted to restrict teachers’ perceptions of agency. Such a consideration clearly relates to teachers’ perceptions of psychology in developing insights about ‘what works’.

Moreover, an ecological framework offers a nuanced perspective about teacher agency that can account not only for prominence of ‘top-down’ policy initiatives, but also more agentic, ‘ground-up’ approaches. That is, instances of successful implementation of educational initiatives tended to involve coherence between different levels of the educational system (e.g., cohesion between the identified needs of the particular classroom and the initiatives promoted at local or national levels). Furthermore, successful implementation of metacognitive initiatives tended to be described in relation to a degree of movement between levels (i.e., from the classroom level to the school level) when teachers perceived there to be benefits – when they had the opportunity to experiment with initiatives and to identify what works for them. As such, ‘ground-up’ approaches were identified as achieving cohesion between levels in an ecological system, particularly when aligning with teachers’ professional understandings. Thus, an ecological framework supports understanding of both ‘top-down’ and ‘ground-up’ initiatives through considering the influences beyond the individual in isolation, towards the interaction between the individual and context (Biesta et al., 2015).

7.2.2 *Psychology influences on agency*

Teachers clearly talked about what they *should* do, but when discussing psychological research, teachers also described a lack of relevance of psychological 'buzz words' such as metacognition to the classroom. Moreover, teachers demonstrated a lack of explicit knowledge of metacognition as a construct. Reflection upon the 'impact' of metacognition research into the classroom indeed causes consideration of the very systems in place to support and measure impact. The 'impact' agenda brings notions of impact in line with research funding (and therefore accountability), introducing a level of 'competitiveness' in relation to impact (Watermeyer, 2016). Therefore, it may be no surprise that there is limited impact of research in the classroom – there is a historical and current lack of communication, and notions of 'giving' to teachers without taking into account the nuance of complexities of particular educational environments, or teachers' professionalism (Biesta, 2010; Wrigley, 2018). As such, the evidence presented in the current project in relation to teachers' perceptions of metacognition emphasise some of the barriers that may result from the dominant methods of producing and communicating research and the wider 'what works' agenda.

7.2.3 *Time*

Another important dimension to the ecological model of teacher agency (as described in Section 6.6.3 of Chapter 6) is time. Indeed, within the context of ecological systems theory, time (i.e., the chronosystem) provides a useful lens to investigate time as a feature of the environment that not only considers the past, but also extends into the future (Bronfenbrenner, 1994, Bronfenbrenner & Morris, 1998; Tudge et al., 2009). In the present study, the impact of metacognition can certainly be considered in the context of time. Teachers clearly indicated a perception of constant change; in society, in education, and particularly in the initiatives implemented at the policy level. The chronosystem was indeed an important component of teacher's perceived lack of agency, with teachers describing the changing nature of initiatives as detrimental, not knowing how or why initiatives change. A final note to make about the influence of time within an ecological model is the influence of time in relation to change in the future. That is, time is a major component of the development of teacher knowledge as well as macrolevel culture, and therefore, future change entails time (Tudge et a., 2009; Priestley et al., 2015b). An ecological model, therefore, provides important implications for supporting future impact (as explored in more depth below.

7.2.4 *Agency and metacognition*

In exploring the role of teacher agency in relation to classroom metacognition, an interesting point to consider is the inherent parallels in discussion about agency and metacognition from the perspectives of both students and teachers. To elaborate, the characterisation of metacognition as an iterative process of interaction between student and teacher parallels theory relating to teacher agency, also emphasising the iterative and relational interaction between an individual (in this case, a teacher) and their environment (Emirbayer & Mische, 1998; Priestley et al., 2015a). Such a parallel between teacher agency and student metacognition causes a consideration of the role of *student agency* in the metacognitive process, drawing on notions of student voice (Wall et al., 2017). Further, in addition to teacher agency, a clear area for consideration is the need for teachers to be reflective and strategic in relation to their practices. That is, there is a clear need for understanding about how teachers' own metacognition relates to pedagogy (e.g., Artzt & Armour-Thomas, 1998).

The present findings suggest that metacognition was achieved when teachers and students were agents of their own teaching and learning, within contexts conducive for this. For students, this meant environments that placed explicit value on metacognitive skills and offered activities that are diverse in timing and expression. For teachers, supportive structures for teacher agency were characterised as 'ground-up' initiatives closely connected to teachers' professionalism and the needs of particular contexts. The parallels between teacher agency and student agency underlie debates about the very purpose of education. For instance, in his critique of the increasing medicalisation of education through the 'what works' agenda, Wrigley (2018) points towards the power for education to develop agency of learners, arguing that "The concept of emergence and the importance of human intention point to the emancipatory capacity of education, rather than a focus on efficient 'delivery' of fixed knowledge." (p373). Ultimately, future research is required to explore the notions of agency, voice and metacognition in more detail.

7.2.5 *Summary*

As demonstrated in the literature review (Chapter 2) a lot is known about how metacognition 'should' be able to be promoted – including the tasks, the environment and the types of instruction given to students. Indeed, insights for practice were produced in the present research, particularly the critical function of interaction. Going beyond direct influences, however, there are clearly wider influences upon students' metacognition – deeper questions that need to be addressed to fully understand the impact of metacognition in the classroom. The systems approach adopted here extends beyond understanding what the impact of metacognition is in classrooms, also developing understanding about *why* there may at times, be limited impact of metacognition in schools. The present findings indeed suggest that for the teachers interviewed, agency was restricted from two angles – the policy context, and the research context, both restricting material resources such as knowledge and understanding.

7.3 Implications

The findings presented throughout this thesis have clear implications for theory as well as educational policy and practice. Implications of this work on psychological theory have been detailed previously. The following section turns to implications for education, drawing on findings from studies presented throughout Chapters 4-6.

7.3.1 *Implications for educational policy and practice*

One clear implication for the present research is that 'teachers matter' for metacognition, particularly through the identified importance of teacher-student interactions. The importance of teachers is supported by Bronfenbrenner (1994), who states that proximal processes have a more powerful influence upon child development than influences from the environmental context. Such a view implies that the direct interactions between teacher and student constitute one of the most powerful influences upon children's developing metacognition. Thus, direct implications for teacher practice can be identified in this thesis. For example, Chapter 4 demonstrated that many tasks followed a traditional pattern of initiate – response – evaluation (Sinclair & Coulthard, 1975). Whilst common, this pattern has been suggested to be ineffective pedagogy for metacognition or thinking skills more widely (Baumfield et al., 2009), with a suggestion being to change the structure to make the tasks much more child-initiated (Leat, 1999).

The current findings highlight the importance of pedagogical approaches to support metacognition, whereby teachers repeatedly provide opportunities within the classroom for students to think about and manage their own thinking as they complete tasks. The present findings emphasise the importance of developing students' *understanding* about the purpose of metacognitive strategies throughout tasks (for example, in relation to planning or in response to struggle). As demonstrated by Ms Abbot's use of talk in Chapter 5, to develop metacognitive knowledge of strategies in the classroom, teachers can discuss the 'when and why' as well as the 'how' of strategies, and critically, explicitly discuss strategies as well as act as a metacognitive 'role model' (Wall & Hall, 2016). As Chapters 4 and 5 highlighted that facilitating metacognitive skills (such as planning) whilst supporting students to develop a sense of 'ownership' of these skills is a significant challenge – particularly in earlier stages of literacy when the focus on planning can encompass the entire lesson, or when students repeatedly tend to focus on broad topics of interest in relation to future learning. Such findings, therefore, highlight a significant challenge for teachers, requiring a high level of pedagogic knowledge about metacognition.

Ultimately, the diverse focus of existing studies as well as the diverse approaches observed in this thesis emphasises that there is not a neat 'one-size-fits-all' solution to develop metacognitive learners. Rather, it is argued that the idea of a universal solution is perpetuated by educational systems that continually implement packaged ideas about 'what works', without scope for taking into account the uniqueness of particular contexts or teacher professional knowledge (Biesta et al., 2017; Wrigley, 2018). In fact, interviews suggested that often, teachers did not know the central tenants of approaches implemented in classrooms (including metacognition). Moreover, the overwhelming abundance of different approaches to encourage visible learning, thinking skills, resilience and so on was clear through the extent to which teachers grouped ideas together (as discussed in Chapter 6).

By considering teacher agency as a process over time, it is clear that teachers' knowledge (and ultimately, agency) in the future is dependent upon the support provided to teachers in the present (Priestley et al., 2015b). Although metacognition is clearly related to other classroom approaches, there are some unique characteristics of metacognition that are more than other approaches such as 'thinking' or having a 'Growth Mindset'. From this perspective, perhaps the present research study as a whole raises an interesting question about the power of allowing a level of 'conceptual fuzziness' (and therefore, facilitating teacher agency and more context-relevant approaches), whilst maintaining a clear understanding about facilitating metacognition in particular. This possibility is something that requires further investigation – by exploring teachers' developing understanding of metacognition and observing the effects upon pedagogy (and ultimately, student metacognition). In the meantime, however, a feasible implication of the present findings is to highlight that metacognition theory is not explicit for teachers, and therefore, opportunity exists to provide more information to teachers about metacognition – particularly as this facilitates discussion about the interplay between psychology and education[28]. Improving teacher knowledge of metacognition is something that is likely to improve teacher agency by increasing the resources that enable teachers to act (Zohar, 1999; Priestley et al., 2015b).

This discussion started with the idea that 'teachers matter' for metacognition, and this is clearly a logical conclusion from the findings presented in this thesis. Ultimately, however, to achieve 'impact' of metacognition within the classroom, the present research highlights that more is needed than a focus on teacher practices. Clearly, proximal processes (Bronfenbrenner, 1994) such as teacher-student interactions are limited by the wider educational context and their influences upon teachers' pedagogical content knowledge and agency. At the time of this research project, Growth Mindsets appears to have super-seeded other initiatives, with previous pervasive initiatives including formative assessment and learning styles. Whilst many of these approaches are based upon psychological or educational theory, the continual change in the initiatives being promoted results in a diminishing of understanding about what these initiatives entail – what research or theory they are based upon, and in what way are they related to student outcomes (academic or otherwise). As such, it would be erroneous to take the present findings as a simple message of 'teachers matter' or 'teachers can do better' – instead, consideration should be given to how the systems can be improved to enhance the educational experience that children engage with, for example the critical influences of community in relation to professional learning (Thomas et al., 2014).

Clearly, more teacher involvement with research in schools is one approach to facilitate teacher agency. Teacher-led research supports teachers to target investigations in relation to their particular contexts and therefore directly relate change in practice to identified issues or needs of the classroom. Indeed, the benefits of teacher-led research have become increasingly clear in the wider literature. For example, a unique characteristic of the Learning to Learn in schools (L2L) project is the move away from seeking to implement

[28] One output from this project has been in the creation of classroom resources about metacognition, namely a teacher resource pack, a story book for children, and an educational video. These resources were created with the broad aim of describing the theoretical underpinnings of metacognition for teachers and students in a fun, accessible format. These resources can be accessed at: https://sites.google.com/view/classroommetacognition/home

initiatives, towards being a continual process, owned by teachers rather than being imposed upon them by external forces (Hall, Leat, Wall, Higgins & Edwards, 2006). In the action-research focused L2L project, tools such as Pupil Views Templates were successfully implemented when the teacher researchers felt supported and free to innovate (Baumfield et al., 2009). An interesting characteristic of the L2L project is the extent to which it involves teachers in the whole process of discovery in relation to L2L – through action research teachers are agents of change and researchers. In their research, Hall et al. (2006) found that teachers in the L2L project discussed connection and interaction with others as being an integral part of the L2L projects. These interactions extended beyond the classroom to the school and the LA and the university team supporting the project. Such relationships provide scaffolds for teachers' development (Hall et al., 2006).

In the UK, where class sizes reach up to 33 students, teachers are facing increasing demands on their time. Given the critical role of the teacher, then, it is important that curriculum is supportive of teacher agency, being careful not to over-burden teachers with demands: "For schools to become ecologically supportive of teacher agency, in order to foster deep engagement in research, requires a shift away from insistent policy imperatives which demand so much of the time, energy and souls of classroom teachers" (Leat et al., 2015, p283). Importantly, these demands not only include specific approaches such as metacognition, but also wider scale demands in relation to (for example) professional enquiry. Rather, educational change ultimately centres on collaboration and dialogue – teachers must be supported not only in consolidating the content of areas of pedagogy, but also in exploring concerns (Leat, Crawley, Wall, Dolan & Mitra, 2011).

Ultimately, more work is needed to ensure lasting and relevant educational change. Of course, this in part entails ensuring teachers are equipped with the knowledge (through initial teacher education and CPD) to use metacognitive strategies in their classroom as appropriate. However, exploration of teacher agency has revealed that the solution cannot be solely focused on characteristics of teachers. Rather, an ecological view of teacher agency promotes a view of educational change from multiple embedded structures and in relation to change across time. Facilitating metacognition in the classroom requires all involved to be metacognitive about how best to achieve this (including teachers and researchers). Thus, sustainable educational change requires a move against short-termalism and more efforts to work collaboratively. This may be seen, for example, in the inclusion of teachers in the decision-making process in relation to educational policy, as well as greater inclusion of teachers in the research process (for examples, see Hall et al., 2006;

Higgins et al., 2007; Drew, Priestley & Michael, 2016). University researchers have also an important role to play, in working with a range of practitioners to strengthen the theory, relevance and applicability of research.

7.3.2 *Implications for the measurement of metacognition*

Findings have important implications for the study of metacognition within the classroom, both for researchers and educational practitioners. The internal nature of metacognitive processing makes measurement throughout classroom tasks difficult (Ward & Traweek, 1993; Baker & Cerro, 2012). The present findings suggest that talk plays a powerful role in not only the construction of metacognition, but also in how it can be measured (evidenced, for example, in the finding from Chapter 4 that written plans often constituted poor indicators of metacognition, bearing little resemblance to the ways students thought about or managed their own thinking in discussion). As such, this research highlights the importance of teachers (as well as researchers) not only observing, but also talking to students. Additionally, the frequency of peer interactions within the classroom provides an opportunity to observe metacognition, by listening to the conversations students have with their peers, and the diverse ways that students use these discussions to plan, monitor and control their own and others' thinking.

In relation to classroom contexts, when approaching the measurement of metacognition (or any behaviour that is being measured), it is important to be clear about the intention of the measure. Indeed, for the purposes of experimentation, the aim is often to create precise measurements that can be used in statistical analyses and averaged between individuals. By contrast, the purpose of measurements within the classroom can be more diverse. That is, measures can provide a yardstick measure for teachers to track progress and influence pedagogy, however measures can also be used for accountability; to 'score' students and demonstrate 'what works'. Thus, the classroom-based observational measures used in this thesis may be more aligned with measures that teachers may use to develop broad insights into their students' metacognition, through looking at written evidence, observing and talking to students as they complete classroom tasks such as planning in creative writing or completing STAs.

As outlined in Chapter 4, the first aim of classroom-based observational research was to characterise metacognition in the classroom. As such, indicators of metacognition were outlined in a descriptive, listing fashion. Subsequent to this characterisation, it was decided that deeper insight about the metacognitive process in classrooms was achieved when focusing on specific aspects of classroom activity (such as planning and struggle), and informing the more in-depth study of metacognition in STAs (Chapter 5). Clearly, the findings of the present study emphasise the context-dependent relational nature of metacognition, which is undoubtedly bound within the measurements employed. Whilst the close relation between a measure and its findings is well documented (e.g., Desoete, 2008; Gascoine et al., 2017), it is argued that does not necessarily diminish the insights about metacognition produced. Rather, this emphasises the importance of seeking to employ diverse methods where possible, as well as in seeking to piece together different insights from different studies using different methods to develop rounded and relevant insights.

7.3.3 *Implications for the development of metacognition*

Whilst a comprehensive consideration of development throughout childhood is beyond the scope of this project, the present research does clearly have implications for the development of metacognition. Conceptualising metacognition as an iterative process certainly has an inherent focus on the development of metacognition across time. The findings in classroom-based research described in Chapters 4 and 5 suggest that the middle primary school years are indeed a critical point to investigate students' developing metacognition. Indeed, evidence suggested that between primary three and five (seven to ten years old), students certainly experienced their own cognition and could talk about it as they completed tasks. They are also developing the explicit, declarative knowledge necessary to talk about their thinking and learning in more abstract ways. For example, the findings from Chapter 5 suggest a distinct developmental trajectory between implicit metacognitive experiences and more explicit metacognitive knowledge. Indeed, the explicit, self-reflective nature of STAs may necessitate a level of conscious, stateable metacognitive knowledge, "stable, familiar constant, established long-term knowledge which involves self-knowledge, self-awareness and a sensitivity to and evaluation of this knowledge" (Tarricone, 2011, p156) that has not yet sufficiently developed:

> Metacognition […] follows an extended developmental course during which it becomes more explicit, more powerful, and hence more effective, as it comes to operate increasingly under the individual's conscious control (Kuhn, 2000, p178).

Thus, findings support the view of metacognitive development as constituting a gradual change in the form of metacognitive components, becoming more individualised and sophisticated over time (Kuhn, 2000; Roebers, 2014). Whilst future work would be necessary to situate the present findings within a wider developmental trajectory (e.g., to observe metacognition longitudinally), a point to emphasise is that with a view of metacognition as developing over time (i.e., over successive iterations), the critical importance of interaction between teacher and student in the development of metacognition is again highlighted. It would suggest that the role of the teacher is particularly important when looking beyond single isolated tasks. The findings presented in Chapter 5 began to suggest a development of more dialogic interactions associated with metacognition across time, however this is clearly an area that would benefit from future study.

7.4 Limitations and Future Research

7.4.1 *Reflections and Limitations*

Clearly, the implications of the research are confined by the design of this study. The research conducted as part of this project is small-scale qualitative research, meaning criticisms may be proffered in relation to the generalisability of findings. Indeed, observational studies took place within (in total) five classrooms within three schools, with a large analytic focus in Chapter 5 being upon two students and their class teacher. Furthermore, participating teachers cannot be described as representative of the general teaching population in particular, in part by their voluntary participation in this research. Generalisability, when considered in qualitative research, is not as straightforward a consideration as apparent in direct comparison to quantitative research designs. Qualitative research is often criticised for its lack of generalisability, and the context-based small-scale approach described in this thesis make such criticisms particularly pertinent. Indeed, the specific findings presented throughout this project are not generalisable in the sense that observed behaviours and talk can be applied to the wider population of teachers and students. Instead, the goal with qualitative research is to produce more analytic, theoretical insights that can be generalised to other contexts (Yin, 1994).

Going beyond general reflections of generalisability, there is also important reflection points in relation to the specific observational approach adopted. The task-focused nature of observations in Chapter 4 was adopted to characterise metacognition within the classroom environment. This has the potential implication that insights resulting from such a characterisation are restricted to fairly structured (teacher-initiated) classroom tasks, rather than embracing the varying learning opportunities that children encounter throughout their everyday lives. This also has direct implications, for example the lack of observed evaluation in Chapter 4 may be influenced by the nature of the student-teacher interactions in the wider task structure. That is, student-led activity during tasks was often ended when the teacher would call the students together, signifying the end of the task (and therefore perhaps not allowing an opportunity for the students to evaluate their work). Furthermore, teachers often stated an intention to revisit/share work at a later point, potentially influencing low rates of evaluation.

A wider consideration underpinning these reflections is the ‘granularity’ of the research conducted in this thesis, and the influence that the decisions regarding the studies have upon understanding of this area. Of course, the inclusion of three rather distinct studies means that space constrains the depth with which each can be explored in detail in the present study. A more focused approach may have allowed analysis with more nuance and consideration of the specific contexts, including (for example) the life histories of participants, that may be relevant in relation to understanding both students’ engagement with tasks, or teachers experiences of agency (Priestley et al., 2015b). Overall, however, to provide a rounded understanding of metacognition in the classroom setting, it was appropriate to use multiple methods, to explore metacognition from different angles, and critically, to explore the experiences of both students and teachers. Moreover, the multiple methods employed allow a level of triangulation of findings, supporting the robustness of this project (Robson, 2011; Fontana & Frey, 1998).

It is critical to be reflective of the fact that in contrast to much of the literature that is drawn on throughout this thesis, this project has not in any way compared metacognition to performance or to ‘success at school’ in any way. The adversaries of strictly cognitive psychological research may indeed argue that the metacognitive indicators described in this analysis (and several of the studies drawn upon) do not in fact constitute metacognition. Given the discussion of the boundaries of metacognition drawn upon thus far, this is far from surprising, but instead, an opportunity to truly assess what it means to be metacognitive and thus, what it means to have impact of metacognition research in the classroom. In the traditional cognitive sense, findings suggest that there has been limited impact of psychology research on metacognition, and that interventions have not been successful in encouraging metacognition as psychology would suggest. However, such a view, this thesis argues, diminishes the essence of what it means to be metacognitive, and the important pedagogies surrounding metacognition that teachers engage with.

A particular challenge in this project has undoubtedly been in balancing the diverse disciplines of psychology and education. Thus, it is important to reflect briefly on the particularities of this inter-disciplinary research project and the challenges associated with such an approach. Conducting an inter-disciplinary project means negotiating a path between psychology and education, and there are clear challenges associated with this. For example, there is the risk that you have to identify paradigmatically with one or the other approach – you have to be a positivist, or a constructivist – qualitative or quantitative, focus on the individual or the social (Heberlein, 1988). In negotiating between both approaches, however, I found that there are rarely any absolutes. Metacognition exists at a fundamentally cognitive basis, through the selective activation of neural processes (Skavhaug et al., 2010, 2013). At the same time, the current findings highlight that metacognition is inherently related to the environment of the classroom. As such, there is an internal cognitive process of metacognition, but this exists within a social reality. We are cognitive beings that exist in relation to others, and particularly in the classroom (and in relation to learning), we have the capacity to extend our thinking beyond ourselves and build meaning with others. This kind of conceptualisation means that metacognition must be understood as more than a suite of internal cognitive processes. Metacognition transcends the individual, and accounts of metacognition must take into account the space in the classroom in which metacognition is negotiated between students and with the teacher. Thus, whilst this thesis does not explicitly compare or experimentally assess the metacognitive processing of individuals in absolute terms, it does provide valuable avenues for future research.

The challenge of inter-disciplinary research in relation to accumulation of expert knowledge in the field as well as specifics of each methodological paradigm are not unique to this thesis (Golde & Gallagher, 1999). However, it is appropriate to acknowledge some of the challenges confronted throughout this project. One important (yet interesting) tension has been in the very foundations of understanding in relation to ideas of knowledge and truth. A large aspect of this learning process for me, has been in negotiating the distinct paradigms employed. As described above, the results of this endeavour are clear in the description of metacognition as bridging cognitive psychology and socio-cultural accounts of learning. Such difficulties clearly translate into critiques of research methods. Whilst I defend that small-scale, qualitative methods were most appropriate to address the research questions posed, there is undoubtedly debate about the value of such evidence for providing generalisable insights and indeed, for having demonstrable impact outside of academia.

It is hoped that the theoretical insights from the present research can be considered in relation to other classrooms and wider learning contexts, sparking further inter-disciplinary research to develop insights about metacognition in the applied setting. Moreover, given the framing of agency within an ecological framework in the present analysis, it is pertinent to note the implications this may have for understanding research impact. That is, successful initiatives were characterised as often arising from the 'ground-up' – aligning with practitioners' professional understandings and involving supportive relationships between individuals at multiple successive levels. An interesting point of reflection is whether this process is in parallel with the ecological structures necessary for successful research impact. This reflective point would be an interesting avenue for future research.

7.4.2 *Recommendations for future research*

The findings presented in this thesis provide clear avenues for future investigations that will further extend metacognition theory and practice in the classroom. One clear avenue for future investigation is the evaluation of resources produced throughout this project (detailed in Section 7.3). For instance, future research may explore teachers' perspectives of such resources, as well as the influence of classroom-based resources upon teachers' knowledge of metacognition and their metacognitive pedagogies. Moreover, given the important role of interaction in 'constructing' metacognitive reflections in the classroom environment, an interesting area for future research is the exploration of the discourses around metacognition in the classroom. For example, an interesting question for future research is the ways that metacognition is constructed between a teacher and a student and the differences this might have with, for example, interactions between peers (e.g., see King, 1998; Yarrow & Topping, 2001). Clearly, there is an unequal power dynamic between student and teacher, and this influences the ways that a student might reflect on their own thinking (recall back, for example, to the ways that Amy and Laura appeared to give the teacher 'what she wants' in Chapter 5 – or the use of repetitive planning strategies that aligned with teacher expectations in Chapter 4). Future research could explore the interactive 'constructive' work that is going on in these interactions in more depth, for example by using insights from Discourse Analysis and Conversation Analysis to investigate in fine detail *how* metacognitive reflections are constructed in interaction.

The focus of future research upon teacher-student interactions will be important for building theoretical understanding around the development of student metacognition. Such an approach could in more depth investigate the ways that students are encouraged to think about and manage their thinking iteratively across time, and indeed, the functions that teacher talk has in scaffolding students' developing metacognition. Such investigations could be supported by a range of research methods that seek to explore metacognition from the early years and across time, for example through the use of Pupil Views Templates (Wall, 2008; Wall et al., 2012), or the analysis of video footage (Whitebread et al., 2009), in addition to novel experimental methods such as log file events (Malmberg et al., 2014). One particularly interesting avenue for research would be to explore the development of metacognition throughout several consecutive tasks, for example by videotaping excerpts of lessons and using these as a basis for reflective discussions between teacher and researcher (Marsh & Mitchell, 2014). Such an approach may be powerful for enabling the co-construction of context-relevant insight between practitioner and researcher, in an iterative fashion.

One last point important to state, is that consideration should be made about *how* future research should be conducted (not just '*what*'). Findings highlight restrictions on teachers agency, influenced in part, by the prominent discourses around 'what works' and associated psychological interventions seeking to provide quick fixes for metacognition in schools. Moreover, the present findings suggest that the diversity of theoretical approaches and measurements within the field of psychology mean that the 'conceptual fuzziness' of metacognition can be unsurprisingly blinding for teachers. Thus, interview findings suggest that what is needed is more connection, more communication, and more cohesion between different research approaches, taking into account a wider diversity of voices. If ultimately, the goal is to investigate how best to facilitate metacognition in the classroom, this can only be achieved by working with teachers to build understanding about what this means, and how this can be achieved.

7.5 Metacognition in psychology and education: A reflexive journey

This research has epitomised my reflexive journey from a goal to understand the 'reality' of metacognition within the classroom, to a questioning of the notion of metacognition itself. Rather than a clearly-defined construct 'out-there' to be measured, I have come to see metacognition as a suite of experiences, thoughts, understandings and skills that are constructed through interaction. Thought itself, in this regard, is built in interaction and therefore, is a constantly changing entity. Although this idea of constructivism is not by any way new to the field of psychology (Vygotsky, 1978), I would argue that it is noticeably absent from dominant metacognitive theories perpetuated throughout research studies (e.g., Nelson & Narens, 1990; Flavell, 1979). Furthermore, it is my perspective that this (often un-reflexive) position within psychology in fact underpins the lack of observed 'impact' – experimental studies promote specific interventions and packaged techniques without a true understanding of the complex interactional business that metacognition entails.

Given the somewhat exploratory nature of the present project, it is appropriate to reflect on what has been learnt and whether my perspective as a researcher has changed as a result of this project. Recalling back to Figure 1.1, the intention throughout this project was to maintain a degree of flexibility in design, with iteration being an important element of the empirical studies. From pilot research conducted at the beginning of the project, it was clear that teachers are an essential part of the metacognitive process in classrooms – a point which influenced the focus of observations conducted in Chapter 4, the case study design in Study 5 and indeed, the ultimate investigation of teacher perspectives in Chapter 6. Furthermore, whilst teachers described encouraging metacognition through everyday tasks as well as more structured activities in pilot surveys, it was the process of collecting data in the first empirical study (Chapter 4) that guided my approach to data collection when investigating STAs in Chapter 5 – with a particular focus on one classroom to allow deeper exploration of the role of interaction in the metacognitive process. Finally, Chapter 6 is reflective of a sense of 'incompleteness' that came from classroom-based studies alone – given the prominent role of teachers in the metacognitive process, the findings of Chapters 4 and 5 highlighted the need to explore teachers' own perspectives about metacognition – and interviews offered a method of investigating this in much more depth than the pilot surveys conducted at the outset of the project.

If I was to start afresh knowing what I do now, there are some ways I might have approached the project differently. One unanticipated finding is the clear theme relating to teacher agency, focusing investigation of metacognition beyond the interactions between teacher and student. Given these embedded systems of influence described by teachers, one clear implication is upon the focus of study, with findings pointing towards the appropriateness of (for example) an embedded case study approach. Such an investigation would provide more insight into the influences upon practice at multiple successive levels (for example by interviewing and observing individuals at classroom, school, and Local Authority levels). In addition to focus, another pertinent reflection is the relationship with teachers throughout my project. That is, my research provides clear insights about the role of teachers in creating understanding of metacognition. If I was to repeat this study again, I would work more closely with educational practitioners throughout the process of data collection (for instance, working within a framework of professional enquiry). These reflections, rather than being seen as limitations of the present study, instead provide clear avenues for future study.

Chapter 8: Conclusions

"The end is where we start from" – T.S. Eliot, Little Gidding

With an increasing focus upon developing uniquely 'human' skills beyond the sole retention of knowledge, there has been a growing awareness of the importance of nurturing the development of skills such as metacognition. Critically, metacognition of is of interest from an inter-disciplinary perspective, providing insights into the processes associated with 'higher level' cognitive skills, as well as providing important insights for educational practice. The central tenants of metacognition in creating learners that can independently think about and manage their own thinking means that it makes intuitive sense that metacognition would be of clear value in education. As Chapter 2 outlined, however, there are many unanswered questions regarding the 'impact' of metacognition out-with academia, and fundamentally, how the construct of metacognition relates to the way children do (and can be encouraged to) think about and manage their own thinking throughout everyday classroom tasks.

The overarching aim of this thesis was to explore the 'impact' of metacognition in Scottish primary school classrooms. To achieve this broad aim, the thesis posed the questions:

1. How do children think about and manage their own thinking primary school classrooms, and what roles do teachers play in this process? That is, how can metacognition be characterised throughout (a) everyday classroom tasks, and (b) specific 'metacognitive' tasks (Structured Thinking Activities, or STAs)?
2. What are teachers' perspectives about metacognition in the primary school classroom? That is, what knowledge and beliefs do teachers hold about the metacognition?

This research was qualitative in nature, seeking to use examples to illustrate meaningful aspects of metacognition within the educational setting through classroom observations, providing "sightings in the field" (Wall & Hall, 2016, p407). Interviews were also conducted to explore students and teachers' perspectives of metacognition. Psychological theory provided a basis for analysis of qualitative data grounded in the classroom.

In answer to each research question (and drawing on the summary points provided throughout), the findings revealed that:

1. (a) Indicators of metacognition were observed throughout the learning process, particularly during task completion, with less evidence observed for indicators before or after tasks. The 'talk' of teachers played a dominant role throughout the learning process, particularly in providing description and instruction before tasks. Planning and struggle were critical points to investigate students' experiences of metacognition, including teachers' roles in supporting students' metacognition.
   (b) Analysis of written STAs revealed clear differences in engagement between two students identified as differing in terms of traditional academic skills. Discussion revealed that, in fact, both students strategically negotiated STAs in line with their metacognitive knowledge of self and tasks. Several factors within the classroom environment influenced engagement, including the structure and timing of STAs. Teachers played a critical role in facilitating student metacognition through interaction.
2. Teachers described intuitive rather than explicit knowledge of metacognition. Teachers described factors that influence their practices in relation to facilitating student metacognition beyond direct 'micro-system' interactions between teacher and student. Teachers lack agency in relation to supporting student metacognition, with their perspectives as teachers being undermined by the changing tide of macro-level educational policy initiatives.

By providing rich examples of metacognition beyond a pure focus on on-line monitoring and control, the present findings characterise metacognition as an *iterative* and *interactive* process. This thesis has deconstructed the psychological underpinnings of metacognition, and reconstructed metacognition as a term that has new meaning – meaning not only for researchers, but meaning also for learners and for teachers. The finding that observed instances of metacognition in classrooms differ in important ways to dominant models of metacognition calls into question the applicability of psychological insights in the classroom setting, particularly micro-analytical, paradigm-based, often taxonomic conceptualisations (Tarricone, 2011). Direct recommendations for enhanced teaching practice may be one implication from the present findings, suggesting that focus should be placed upon the content and form of interaction between teachers and students, in comparison to mere implementation of 'packaged' resources such as STAs.

This research project suggests that to fully understand metacognition within the classroom setting, it is critical to go beyond proximal processes such as teacher-student interactions that exist within the 'micro-system' of the classroom (Bronfenbrenner, 1977; Bronfenbrenner & Morris, 1998; Tudge et al., 2009). Teachers are key for metacognition, however teachers do not have explicit knowledge of metacognition, and environmental factors influence teachers' perceptions of agency (Biesta et al., 2015; Biesta & Teddler, 2007; Priestley et al., 2015b). In fact, the current findings extend the existing body of literature on teacher agency by arguing that in a similar way that policy acts to restrict teacher agency, so too can insights from research, perpetuated by wider accountability systems such as the Research Excellence Framework (Watermeyer, 2016; Wrigley, 2018).

These findings should be of interest to policy makers who are interested in evidence-informed education reform. Findings suggest that teachers matter for metacognition, but moreover, teachers' perspectives matter for metacognition, and ecological structures also matter for metacognition. One key implication for policy and research is the acknowledgement that impact cannot be achieved by merely telling teachers 'what works'. Rather, findings point towards a need for greater focus on professional development, as well as teacher involvement in the research process. Moreover, insights for policy parallel implications for university research – suggesting that metacognition as a construct would be better understood and (therefore) applied, if there was greater communication and collaboration between research and practice.

From an inter-disciplinary perspective, what is perhaps most distinctive about the present project is the bringing together of these findings in a way that emphasises the rich, layered and 'fuzzy' nature of metacognition, and the impact of psychological ideas more widely. Several of the findings may, to a degree, reflect transferrable insights about the divergences between theory and practice, or psychology and education, emphasising the importance of an ecological approach and examination of the relationship between theory and practice. In the present thesis, I examined these broad questions through exploration of an issue that is particularly relevant in terms of the overarching goals of education in the 21st century – metacognition.

In conclusion, metacognition is present in classrooms, but perhaps not in the ways that might be expected based on psychological theory. The present findings suggest that metacognition is a complex interplay of thoughts and skills that are enacted throughout the learning process. Moreover, metacognition exists in the talk between teachers and students, particularly through open-ended, exploratory interaction. Rather than assuming that metacognition is something that develops naturally across time, such a view of metacognition places the teacher at the centre of the metacognitive process in schools. This work is novel in the extent to which it spans psychology and education, bringing together insights from cognitive psychology and education theory. Such an inter-disciplinary approach, whilst challenging, has been useful for beginning to consider not only questions relating to the impact of research in schools, but also, considerations of *why* there may (or may not) be impact as expected. Given the critical role of the teacher, the findings presented here emphasise the fundamental importance of exploring educational issues by taking teachers' perspectives into account, and considering the multiple systems that ultimately, influence impact that psychological theories and ideas have in classrooms.

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Appendices

Appendix A – Ethics

<u>Student information form provided for classroom-based research.</u>

A Research Project about Classroom Learning

Exploring the different ways children think about and guide their own thinking

Who am I?

My name is Heather

I am a PhD researcher at the University of Stirling

We want to make sure you have a really good learning experience at primary school.

This project is trying to understand the different ways children think about their thinking, and how children guide thinking, for example what to do when you are 'stuck'.

I hope this project will help us understand some ways we might make your learning experience at school better.

Taking Part

During my visits, I will be:

- Visiting the class to watch some lessons
- Talking about learning with some children

We all learn in in lots of different ways – <u>there are no right or wrong answers.</u>

It is up to you if you want to take part or not. If you decide you don't want to take part, just let me or the teacher know.

If you have any questions, speak to your teacher who can help you get in touch.

Appendix B – Characterising Student Metacognition

Characteristics of observed tasks *(*indicates part-task observation)*

Task	Subject	Teacher	Description
1	ICT	Ms Smith	Small group activity, creating questions about hot and cold climates and then to looking up answers and creating a PowerPoint presentation with the answers.
2	PE	Ms Smith	Several activities (including sequences of actions and a group ball game). Throughout, teacher intersperses activity with discussions with the whole class.
3	Spelling	Ms Smith	Several stations with a range of activities to practice spelling words. Activities included spelling words out of Play Dough, making 'interesting' sentences from the spelling words, and look-cover-write-check.
4	ICT	Ms Smith	Creation of PowerPoint Presentation "All About Me", encouraged to include edits such as animations and different fonts. Teacher provided a template that the students could use if they wished.
5	Numeracy	Mr White	Text book activity involving calculating time differences. Teacher regularly stopped the class to discuss progress and working towards the answers.
6	PE	Ms Smith	Several activities, including; a sequencing game; stamina activity (running continuously for 2 minutes); a class ball game. Teacher interspersed activity with discussions with the whole class.
7	Compre-hension	Ms Smith	Comprehension task focusing on class novel. Students worked in pairs to identify adjectives in the text, and then answered comprehension questions about items in the text.
8	Problem Solving	Mr White	'Treasure map' activity, working out how to reach treasure on a worksheet without repeating steps already taken. The task was interspersed with regular whole class discussions with teacher.
9	Numeracy ICT	Ms Smith	Two tasks; (i) completing a quiz on a computerised numeracy programme, and (ii) designing a PowerPoint presentation about their favourite animal.
10	Numeracy	Mr White	Introduction to new topic; money. Discussion with teacher about everything they knew about money, before completing revision questions from a textbook.
11	Compre-hension	Mr White	Reading a section from a non-fiction book and identifying (by listing) all the facts and opinions from the book.
12	Spelling	Ms Alexander	Teacher discussed the spelling words with students. Students then copied their individual spelling words into their jotters.

Task	Subject	Teacher	Description
13	Literacy	Ms Alexander	Teacher discussed ways to make stories and sentences more interesting. Students then completed a literacy activity sheet that included making sentences more 'interesting' using adjectives, verbs and adverbs.
14	Creative Writing	Ms Bruce	Creating a poster about a made up character and then creating a 'storyboard' about what would happen in the beginning, middle and end of their stories.
15	ICT	Ms Smith	Introduction to Excel. Surveying peers on a topic of choice (e.g., favourite animal or favourite sport). Students then created a chart in Excel with their data.
16	Creative Writing	Mr White	'Writer's Craft' activity, creating story following from the first sentence provided by teacher.
17	Creative Writing	Ms Alexander	Short writing piece about the teacher they would like to have in the next year.
18	Creative Writing	Ms Alexander	Students watched a video and then shared ideas about what to include in a story about a superhero. Written plan of superhero stories using a template provided.
19	Literacy	Ms Smith	Introduction to and practice of alliteration, then created posters with illustrated examples of alliteration.
20	ICT	Ms Smith	Excel to create graphs and tables. They worked in pairs to survey their peers on a topic of their choice, and then input the data into excel, making a chart.
21	Creative Writing	Mr White	'Writer's Craft' activity, writing story continuing from the latest point in class novel.
22	Numeracy	Ms Alexander	Activity sheet of maths problems. Students given option of four activity sheets of varying difficulties.
23	Spelling	Ms Alexander	Activity sheet, several activities based on spelling words (e.g., definitions of words using dictionary).
24	Literacy	Ms Bruce	Creating a 'wanted' poster about one of the characters in their personal reading novel.
25*	Numeracy	Ms Smith	Students paired with a 'buddy' from the upper school, who challenged them with fractions puzzles.
26*	Compre-hension	Mr White	'Close reading', answering questions from text.
27*	Numeracy	Ms Bruce	Mental maths questions on whiteboard at the front of the class.

Indicators of student metacognition throughout the learning process.

Demonstrating a particular prominence of indicators of monitoring and control.

Indictor	Description	Example
Goal	Refers to/mentions a goal	"I gave myself a challenge to run around 20 times and I ran around 19 times almost 20". (6)
Plan	States plan or discusses with friend	"What do you want to do?". (1)
Share ideas	Shares ideas with peers or adult	"Snowman, Snowman" [walking around table]. (1) "What colour are you going to do yours?". (14)
Discuss task	Discusses task characteristics and/or expectations	[Argument about which page to start]. (10) [Discussion of how many pages can be done in the time] "Six". (10) "We've just to do the first page… [Discussion between M and B about whether to do the first page only]" J: it says there, do 5 pages M: yeah I know, but he said do one J: it doesn't matter. You won't get in trouble even if that's what he said". (11) "He said we had to do page 82-87 but now he says we just have to do the first bit". (11) "[To teacher] do you leave a line when you write a sentence? T: yes". (12)
Organise	Organises/ collects resources and/ or allocates roles	"Who wants to write?". (1) [Organising pens]. (1) [Goes to collect ruler]. (1) [Designating portions to read, taking turns]. (6) "Wait – you can do that bit". (6) "You can use my pen". (14)
On-line Monitoring – Intra-personal	Monitors progress/ cognition to self	"Ah, why this not work" [clicking the mouse repeatedly]. (4) "I've went past where I'm supposed to read". (6) "There was only one on that page". (6) "The reason I underlined is so that we can see what part of the writing answers the question". (6) "We've got all four". (7) "Easy" [selects take away]. (9) "I'm thinking you can split 15 into 2? [To self]". (9) "No it couldn't be 16, what about … I can't do this [moves on]". (9) "Oh, this is easy, find four ways of making 20, it's easy, I can do this". (9) "I can't do this so… I'm just going to press all of them" [repeats] "I don't care" [moves on]. (9) "I need to do this bell a bit bigger, a bit taller" [continues to draw]. (18)

Indictor	Description	Example
On-line monitoring - interpersonal	Monitors progress through discussion with peer(s)	"Guys listen we have 2 questions". (1) "Ooh did you change it, that's nice" [to peer]. (1) [Draws shape but lifts the pencil, shows B]. B:"you lifted the pencil" [draws again but misses a line. B points at missed line with pencil]. (7) [H and W are talking about where they are at]. (10) "You've only got 3 facts? 3 facts and 2 opinions?" . (11) "How many facts have you got? [shows jotter to B] B: oh wow [looking at jotter]". (11) "What page are you on?". (11)
Intrapersonal Control	Controls/regulates own behaviour in a task	[Uses rubber]. (3) [Rubs out]. (5) [Asks me for a rubber]. (6) "[Rubs out] I did 'dig' instead of 'dire". (6) "[Uses rubber] I did 'car' instead of 'calm'". (6) [Draws and then rubs out, draws again]. (7) [G rubs out, looks at B]. (7) "What's multiply again? [to self, looks at wall display] ah, multiplication" FN: "'Z' moves through the questions very quickly – he uses resources in the classroom to help him, and makes the task easier for himself when he can". (9) "96 divided by 2 [looks behind me at the wall] I could cheat, it's 36" FN: "his strategy was to use the multiplication tables on the wall, which he referred to as 'cheating'". (9) "How do you write Brazil?" [To self]. (9) [Crosses out, continues writing]. (10) [Copies 'clever' from the adjective board, resource on the wall]. (13) [Pauses, uses rubber]. (18) [Rubs out]. (21) [Uses rubber]. (22) [Uses rubber]. (22)
Intrapersonal control - Uses Strategy	Uses a strategy to control behaviour in a task	[RH uses finger to follow. Reads out loud]. (6) [Plays around a lot in the programme – trial and error]. (15) [Using pencil to point, whispers to self while reading]. (22) [Counts on fingers]. (22) [Uses fingers to count]. (22) [Uses pencil to follow writing]. (23)

Indictor	Description	Example
Interpersonal control - Seeks help from peer	Seeks help or checks with a peer	“So we just leave it like this?”. (1) A: How do you get the capital letter? H: [goes over, presses shift and points]. (4) “What did you put?”. (5) “Do you have to write what it’s asking you?”. (5) “R: So, I can’t remember what adjectives are again. Are adjectives describing words?” B: Yeah”. (6) “B: Would clapping be one? G: no. B: Excitement? G: I think so. B: Would wiggle be? G: yep”. (6) [B reads G’s work, then checks own]. (6) “E, can you help me find the bit where they find the shop?” E: you have to do it”. (6) [B goes to group of boys across the room to discuss the task, looking as another boy writes. Walks round to another boy, leans over and writes]. (7) “How do you spell education?”. (9) “R: What is the sign for a shilling? G: it’s the old currency R: no, the sign for it”. (10) “How do you spell Euro?”. (10) “I don’t know what to do for the end”. (18) “A: How do you write illustrations? B: what do you mean? A: like, how do you write illustrations?” (19)
Interpersonal control – Provides peer control	Spontaneously controls/regulates behaviour of a peer in a task	“Can we change full stop to a question mark?”. (1) For the first one you don’t just write 34 minutes, you need to write how you did it”. (5) “‘Henry, keep going, Henry there’s a giant gap”. (6) “Hey hey, you’re reading my bit”. (6) “Come on ‘Emma’ – look what I’ve done”. (6) “G: it would be sixty four hundred, Z: no, it would be 64 thousand, look – I’ll show you [types it in and moves on] G: [to me] that’s wrong, it’s too big. It’s moved three places”. (9) “You only have one fact for that. Read that page again [points at B’s book]”. (11)

Indictor	Description	Example
Interpersonal control - Sharing work with peer	Shares work or progress with a peer during a task	"I put 34 minutes". (5) [G hands up in the air, stands up. Draws on page, shows G and B". (7) [E talks to the group, shows plan of who, where, why etc.]. (21) "[Points at B's work] its 9". (22)
Interpersonal control - Seeks help from adult	Seeks help from an adult (teacher or researcher)	[Goes to ask teacher what to do for question 1]. (5) "G: Is beaming a describing word? T: what do you think? G: yeah T: what does it mean?". (6) "[Pupil goes to queue with the teacher who is working with another group]. (6) "[Turns to me] "would that be 64,000?". (9) "How do I do the animations?". (9) "Mr White how do you spell terrified? T: guess where you find that out? P: dictionary". (16) "Ms Alexander, I don't know how you spell 'Wood' T: it's on the board, all names are on the board. If it's a teacher it's like wood. If it's like would you like a drink, it's w o u l d". (17) "Ms Alexander, I've forgotten what I've written T: boys and girls, if you have forgotten about your villain, you can look in your jotter". (18) [Natalie called me over to spell 'illustration']. (19) "Ms Alexander, I'm on Bi and I can't find it t: boys and girls they don't have bike in the dictionary, they only have bicycle". (23) "Ms Alexander, I can't find lie and I'm on li T: well, have another look […] did you find it? [P shakes head] T: what is the first letter? P:'L' T: What is the second letter? P: 'I' [pauses, then goes to 'I' in the dictionary, looks at wrong page] P: I can't find it". (23) "I'm stuck on number 2 T: have a look through all the words. Water the plant or it will…thirteen? That doesn't make sense, does it? P: [pauses] die? T: well, what happens when you don't water plants? M: they die!". (23)
Avoidance	Terminates, avoids or alters task	[Teacher comes over to him and sets up the text – she picks the hardest of the red set, ***] T: "try a challenge for me" … [looks at screen, shrugs shoulders – selects answer and gets wrong but moves on to show answer] … "this one's quite hard" [goes back to tests and selects first *, selects play]. (9) "No it couldn't be 16, what about … I can't do this [moves on]". (9) "I can't do this so… I'm just going to press all of them" [repeats] "I don't care" [moves on]. (9)
Justified termination	Ends task upon finishing	"Done [puts pencil down and folds arms, looks towards board]". (17) "I'm finished, I can't do any more". (17)

Indictor	Description	Example
Share	Student shares completed work	“[Showing teacher her work] T: the mask fell off- what would happen? P: I can’t even see! T: what would happen if you couldn’t see? P: I might fall over”. (18) “[To me] look what I’ve done” [reads story] Happy Henry says hello to the tall tree. I’ll tell you why he says hello to the tall tree. I’m going to draw my illustration, look [draws]”. (19) [Henry goes to show the teacher] T: That’s great, see if you can do another one. I’m trying to do spelling with my group”. (19)
Review	Reviews own work	FN: I went to sit next to ‘Henry’ to watch he started speaking aloud as he worked…he went back to the start and read it aloud. As a result, he noticed he had missed an ‘and’ and went back to correct it. (4)
Evaluate	Evaluates work in relation to a goal	“I gave myself a challenge to run around 20 times and I ran around 19 times almost 20”. (6)

Indicators of teacher talk throughout the learning process.

Demonstrating prominence of talk, particularly before tasks.

Indicator	Description	Example
Describe Learning/ skills	Describes learning or skills in relation to the current task, including learning intention	"We're learning to move and put all of these actions together" (2) "Who can tell me what skills you are using? ...what else…what other skills that we are going to use later in our games? … What other skills are we learning?" (2) "When we do this we are developing our skills and warming up and learning French colours – we are developing a lot of skills" (2) "What we're going to do is I'm going to put you in partners and we're going to practice our passing skills before we put it into a game" (2) "We are learning how to recognise and learn different spelling groups" (3) "Your learning intention is to use Microsoft Word to create a document all about me" (4) "What do we learn in PE?" (6) "Today we're going to work on our stamina, then we're going to do a team game" (6) "Remember when we're doing our warm up we're learning how to move and do actions at the same time" (6) "We're going to learn how to move text in a PowerPoint" (9,) [On board: WALT: to make a sentence more interesting] "Today. We've done all this hard work, and today we're going to use all these things to make our sentences more interesting. Your learning intention is to learn how to make our sentences more interesting." (13) [WALT character on board: use our reading books to complete our literacy circle tasks] (14) "Today we are going to use a different software to create a chart" [writes 'To create a chart using a spreadsheet' in Learning Intention] (15) [LI on board: I can use vocabulary and style in a way that engages the reader] (16) "Today our learning intention is that we can all understand and make our own alliteration using illustrations" (19) " So, you are learning how to get information from the graphs" (20) [on board: LI I can recognise how an author uses language and style] (21) "I have a job for you to do, based on or class novel. We're going to gather some ideas first. In literacy today, what are we learning to do? We are learning to use our knowledge about a character to create a poster." (24)

Indicator	Description	Example
Describe task	Describes the current task	“In your group you have to come up with 3-4 questions about an animal that lives in a hot or cold climate” (1) “What we are going to do is a quick game of colours” (2) “What we’re going to do is pass chest press. If you drop the ball you have to start at zero” (2) “You’re going to create a document with all of this” (4) “Can you do the first 3 on page 8” (5) “Two tasks, half and half … half will be completing all about me from last time, and half will do comprehension” (7) What I’d like you to do is to make a start at the comprehension task in your jotter” (7) “Draw this shape without taking your pencil off the paper” (8) [points to board] “Draw this without going back over a line” (8) “What are our 5 steps of success? ...what are we doing? How are we going to find out what we are doing? … With your partner, discuss what you see…Normally we look for a question mark, don’t we? But there isn’t one… You have to collect all 9 without going over the same road twice. You have 5 minutes” (8) “One of the maps isn’t quite right. You have to work out which is impossible” (8) “What I would like you to practice here today is how to move text. One or two screens about ‘my favourite animal’ and yes, you can use pictures. You can get your text to appear – to pop in or fly in… what I want you to do today is to explore how to make the text fade in so the success criteria is to get your PowerPoint to have text and to get it to fly in… have a go at the animations tool bar” (9) [Writes money text book work on the board] “We are going to do a bit of revision work. Some of you might have seen it. Work your way through the purple pages, hopefully you can zip through it and then go on to something a bit more difficult” (10) “In our ongoing quest of finding the difference between facts and opinions, make a list of facts you can find” (11) “You and your partner are going to finish off your sentence with an adverb to tell us how the cat ran” (13) “Today. Using whiteboards to collect data with tally marks, for example favourite sport, favourite telly programme” (15) “What do you think this programme is good for?” (15) “We are going to start our daily writing [picks child to read board: which teacher would you like next year and why?] (17) [Shows video]. We are going to write our own superhero stories. Today we are going to write our plans. (18) “Today we are going to plan or superhero story.”(18) “You are going to create one, there can be just one or more, in a poster. These will go on the wall. Only the best ones will go on the wall because there is not much room” (19) “This week we are going to continue with spreadsheets” (20) “You are going to work with a partner to make a table to record your information. And then you can put it on the computer. The first thing I’m looking for is for you to be able to design a table to present your information [shows Excel] Once you have made your table, you can recreate it on here, and then we will gather together to discuss the next step” (20)

Indicator	Description	Example
Describe task (cont.)		"Once you have put in your information, I want you to make your chart. What I want you to do is come up with 2 questions that your partner can answer from the graph." (20) "We are going to do a bit on writer's craft. … We're going to use your books. We're on chapter 9. Remember someone grabbed Terry. You are going to write it with your own ending. You're going to look at how the author uses language and style." (21) "Today we are going to do a maths challenge, 'spicy maths challenge' (22) "The first thing we are going to do, the first one is very simple. Adding of cubes. What do you think you have to do? This is our mild challenge. The second one is our medium challenge. It looks hard, but actually it's quite easy. Our spicy challenge, its two digit sums, like 25 add 21. Who can do that? (46)" (22) "Today we are going to do our spelling. The sound today that we are thinking about is out 'I' sound" (23) "I am going to write our spelling word on the board and I want everyone to try to have a try out reading them. So, don't shout out [writes] think about what these words mean again? Maybe you don't know" (23) "Ok, these are our spelling words for this week. As usual we have our spelling challenge sheet for this week." (23) "Wanted for, I'm going to leave this up to you. It's not that they're missing. Last seen, that's a little bit like our missing posters. At the bottom, there's a reward. The character I want you to write about is the master, or the beast." (24)
Describe Expectation - aim	Provides expectation in relation to the task, describing what is expected	"The aim is not to drop the ball" (2) "What I want you to do is use the whole hall and move around passing the ball to each other – you will need to think about how far away your partner is" (2) "I want you to write in sentences how you get the answer" (5) "Challenge 2 with your partner. Read it with your partner and then I want to hear what you're supposed to do…someone explain what you are supposed to do" (8) "I would like you to do a quick success criteria. When we come to the end, what might we need to be able to do/have by the end? Once you have done that, you can read through and get the facts and opinions" (11) "You need to highlight first. You can explore using the 'insert chart'. Make sure you have made a column or a pie chart and then you can explore. I want you to be able to give me some information about your chart." (15) "But what I want you to do is to make your poster and example. Once you have finished your poster, you can put it into a poem" (19) [Shows sheet] which one do you think is right? Underline which you think is right and then check it in the dictionary and tick the correct word" (23) "There are certain things I will be looking for [writes on the board under WILF]: WOW words, describing words, a picture, use ideas from the book, imagination. I've made a wanted poster. There are 4 sections I want you to think about" (24)

Indicator	Description	Example
Describe Expectation - quality	Provides expectation in relation to the task, discussing how (quality)	"You are going to try to come up with some really good questions" (1) "Your answer should be quite detailed, make sure your answers are really detailed" (6) "Practice handwriting. Copy as neatly as you can. Remember your tall letters, finger spaces, capital letters and full stops. What do we also need to do also? (Neatly?) What about spelling? (spell correctly) (12) "What do we always need? (Capital letter) when? (start) (Sometimes for names) what else? Anya? (Capital letter at the start of the name and the sentence) what else? Have I put you on the spot? You know this – what goes at the end? (Full stop) great, what else? (Finger spaces). [writes 'the cat ran'] (Boring!) Who can tell me what the noun is? (Ran) is it? (Cat) why is it the cat? What is a noun? [discussion of verbs] (13) "What does WILF tell us about? (What I'm looking for) what else do we call that? (success criteria) Can you tell me one thing I'm going to want, for you to be successful [teacher writes on the board under WILF] (not rushed) taking your time, (neatly) ok, neat presentation. What do we need to use? (our imagination) [Writes on boar: use your reading book, use your word book] … (neat pictures) no bish bash bosh [use wow words is written] so we have lots of success criteria [reads them out again] … would you just describe what the character looks like? (no) what else? (personality) (14) Field notes indicate: "pupils seem very able to give these responses – I get the strong impression that they have discussed this task already – the teacher didn't do much explaining of the actual task" (FN 14) "It's not just the words you use; it's the style you use. If the reader isn't interested, they probably won't even get to the end."(16) "Remember when we're writing we need to remember our full stops. Where do full stops go, shout it out (end). Where do capital letters go? (Start) stop and put your pencils down. Start of what? (sentence). Where else would a capital letter go? (Name?) Yes. [discusses finger spaces, interesting sentences, words the right way round]" (17) "This is a superhero story, so it has to be very interesting." (18) "Lots of short sentences, lots of exciting language" (21)
Describe Expectation - logistics	Provides expectation in relation to the task, discussing logistics	"you have between 5 and 10 minutes" (1) "You're going to think of 3-4 questions" (1) "Take your time, there is no rush. Do this individually first and then we'll come back and discuss it" (11) "Points to be had for quiet working" (14) "You have about an hour for it. Again, I don't expect you to finish it all" (21) "at least one page" (21) "I'm going to give you 10 minutes to make a start" (23) "Take your time; we will put them on the literacy wall. Don't worry about them being different from the person next to you" (24) "You shouldn't finish this before lunch, but if you do, comics, challenge or a reading book. But this is only if you do a really good poster" (24) "What kind of tables do you think I'm looking for? (quiet), (sensible), (hard-working)" (24)

Indicator	Description	Example
Current Knowledge: Task	Discusses/ questions students' knowledge of task elements	[Abbie describes the task to me, prompted by the teacher] (6) "Why do we double to consonant for this word pattern?" (3) "Who can tell me the spelling pattern in the red group?" (3) "Can anyone tell me the special pattern in Jack?" (3) "Who can tell me the pattern in the purple group?" (3) "[discussion of how to open excel] if it's not full screen, what can I do? (click the box next to the screen)" (15) "What do you think you need to do once you have your data?" (15) "Who can tell me what the name of the bar at the top? It is important that we know this because it will help us use the programme (tool bar). Does anyone know what each box is called? It's ok if you don't, you can have a guess. (A1?) no, it's called a cell" (20) "How do I find PowerPoint if it isn't there? … To open up PowerPoint, what do I need to do? What do I need to press?" (9)
Current Knowledge: Content	Discusses/ questions students' knowledge relating to task content	"How do we tell if something is an opinion?" (11) "Who knows some ways we can make the 'I' sound? [only one hand up] everyone in class should know this. Ok, let's think of some words that have the 'I' sound (night, right [discussion with pupils bout various 'I' words, and how they are spelt] (you get two sorts of 'right') you are right. What is the other way? … (shine) how are we making the 'I' sound there? … (tie) … how are we making the sound this time?" (23) "What do I mean by characteristics? (like, their personality). Things that make them them." (24) "Who can tell me what an adjective is?" (6) "Who can tell me what else this word does?" (6) "What is an adverb? Describe with partners … show me with your fingers how a cat might run quietly" (13) "discuss with your partner what you think alliteration is" (19) "What do you think I mean by alliteration?" (it's the word where the letter starts the same as the next word" (19)
Provide Example	Provides example in relation to current task	[Goes around tables showing each activity] (3) "And remember, this is the movement I want you to do, try to count [shows movement]" (2) [Shows two examples] (4) "For example, question 1, let's discuss how to put it into a better sentence… if you put the answers together, that is what I'm looking for" (7) [Examples with class. Very quick] (9) "I'm wondering if I should do some examples. Who is planning on reading the whole thing and then going back to find facts and opinions? [pupils put hands up] ok, I won't do any examples just now then" (11) "This is how you type in the data. This is called the data [types in]" (15) [Teacher gives some examples] (16) [Teacher has written some words on the board: beady/menacing/red/threatening] (16)

		"Jumping Jason come in (that's alliteration)" (19)
		[Teacher encourages pupils to share examples of alliteration, e.g. 'super Sandra, Nice Natalie'] (19)
		[Shows PowerPoint with examples of alliteration] (19)

Indicator	**Description**	**Example**
Model	Discusses or 'thinks aloud' in relation to current task	"Can you tell me; are there any difficult words there? (Different) Is there anything we can do to break this word up? (Syllables)" (3)
		"Fractions question, how many does she eat? (three) Oh do you think 3? (pauses) Let's see [tries to input 3] (Oh no, 2!)" (9)
		"Let's have a look before we write them down. Where are our tall letters? … Who can read the first sentence? (The brown fox jumped quickly over the river) who can spot the noun? What is a noun? Any nouns? … What is the fox? (A thing) … Who can find an adjective? … What is an adjective? … Verb? (doing word) […] Who can spot the nouns? … I've got two adjectives. Who can spot them? What is an adjective again? (Describe word) … Who can find an adjective? (Lazy) … Who can find another one? … We've had nouns, adjectives, what's next? (Noun?) … What's before? (Verb) great. … What's a verb? (a doing?) … What is a verb there? …(crawling) (12)
		"'The rat sat staring at me. Caught in its beady gaze, I froze…' what are we doing with this?"(16)
		[Shows sheet on projector, Sally reads] Expanding, oh that's a tricky word, spell it out? [Teacher elaborates on 'expanding', explains what it means] … which is my noun? (Dog) verb in yellow, what is a verb? (describing word) [goes on to describe and give examples from sheet]" (13)
		"['Our favourite sports' typed on board] what is our first sport? (Swimming, football, horseracing, gymnastics) if you've noticed, the boxes aren't quite fitting, so what can we do? (Make them bigger) … [pupils vote for favourite sports]" (15)
		"[Shows from the example made previously] What is the name of that diagram. Do you know? (No/a diagram//a bar graph) yes, good. What is this [points at a pie chart] (it's called a chart title?) yes, but does anyone know how it's named? (a pie chart)" (15)
		"How did it start? (The planet exploded) why did the planet explode? What happened at the start? It told us how he got his superhero powers ... (18)
		"I think we could start our heroes by describing who we are and how he got his super powers. What could I write for the start of my plan? [Pupils give ideas] No, remember this is my story. Maybe I could draw a picture. Remember I am not writing the whole story. Miss Alexander is just doing this quickly but you can spend a lot more time over your picture. Then I'm going to write a little bit underneath so I can remember what I'm, writing about … remember I am not writing the whole thing … what's going to happen in my story that's going to be exciting? … What idea will I use because there are lots of good ideas! [draws picture on whiteboard] Miss Alexander is going to do a better job, you are going to do a much better job in your plans" (18)
		"Let's look at the words, and let's read them together. What does flex mean? Who is going to be brave enough to have a guess? (Like stretchy?) [discussion of flex and flexible] (23)
		"Are there any words that anyone isn't sure what they say? (Points at thirteen, encourages to spell out]. What does thirteen mean? (It's a number)." (23)

Indicator	Description	Example
Ideas	Engages students in the generating and/or sharing of ideas, through discussion/ questioning	"Questions that would help you find out about this animal?" (1) "Close your eyes and think about the types of questions you might ask" (1) "Close your eyes. Think about what kind of information you would like to include in a document all about me" (4) "What you would need to put on [sharing Ideas] … what you like and what your favourite sport is …. Likes and dislikes ok … name and age – that is important, we'll put it at the top! [etc.]" (4) "I want you to find a partner and sit with your partner, share a whiteboard between your partner … I want you to come up with an adjective to describe the cat, so the sentence might be 'the spotty cat ran'" (13) "(The cat ran to the park to play) you don't have an adjective! [adds 'brown'] … hold up boards so I can see (13) "Megan, describe why it's staring at you and why you froze" (16) "If anyone can think of any good verbs, write them on the board" (16) "Find yourself a partner. Tell your partner which teacher you'd like next year and why … tell me either who you would like or your partner, and why" [discussion] (17) "How do superheroes get their powers? [sharing ideas – discussion referring to previous work they have done on this] (Victor Van Doom Super Villain, he fell into lava and got burnt and hot bricks all over him (18) "[discussion in pairs, sharing ideas as a class] … I wonder if anyone else has come up with something else of their own?" (18) "What I would like you to do first, on paper or on whiteboard, is think about what you might want to find out about your class. You might want to find out about favourite food, favourite book. You can work with a partner" (20) "Talk with the person next to you or think in your head about what you think he look like and what he might be like … we're going to think of some words together. We're going to have a little think about the characteristics. It can be a describing word (half bull, half human), (horns) would we just use the word horns? I don't want to see any single words. (Big large red eyes) [More ideas shared]. I'm not going to gather any more ideas because I want you to think of your own WOW words." (24)
Discuss Strategies	Discusses/ questions/ states strategies	"What are our 5 steps of success? ...what are we doing? How are we going to find out what we are doing? … With your partner, discuss what you see…Normally we look for a question mark, don't we? But there isn't one… "You have to collect all 9 without going over the same road twice. You have 5 minutes" (8) "Who can tell me what sort of throw is good if I'm quite close to someone? ... if 'Susan' is far away should I still do chest pass…why…what type of throw could I do instead? …. what else?" (2) "What other things are important when you're catching and throwing?" (2) "It's up to you what strategy you use" (5) "You have to explain how you got the answer. Or did the answer just come to you like a ray of sunshine?" (5) [teacher discussion (interspersed with short drawing activities by pupils) of how they did it, where started] (8)

Indicator	Description	Example
Discuss Strategies (cont.)		"Why do people normally start in the top left corner?" (8) "[Example] who agrees with 'Jack'? Remember that repeated addition is just what multiplying is" (9) "Can you tell me how you worked that out?" (9) "And a good way to do this is the 5Ws [written on the board]" (10) "Why would you use your word book? (in case you forget some words)" (14) "Before we even start, what do we need to do? (Plan) we need to do a bit of planning. Make sure you have the right tense. It's happening… it's in the present. So, a little bit of planning, and then get straight into the writing … take a bit at the top of your page to plan it. Anyone not going to do any planning? (some hands up) OK, if you haven't done any planning, I want you to write 'no plan done'. I'm all for freedom of choice, I do think some sort of planning is a good idea" (16) "Remember we can borrow ideas from each other. So if you hear about a superhero story that is really exciting, you can borrow it … I might borrow Karen's idea for my story, because we're allowed to do that" (18) "You need to answer these questions before we begin [points to the 'when/where/who/how/why' on the board] (21) "(Do you have to do a plan?) Those who don't do plans, tend to run out of steam. The least I would expect is for you to have an idea in your head" (21)
Link to Past	Discusses previous task or experiences- including reference to current task	"(Oh, we've done this before) Yes, we have practiced this before" (2) "This links to clapping and moving earlier – that's why we were practicing these things earlier" (2) "You have practiced these all before" (4) "Robert when did you last do money?" (10) "In the first column, you are going to put everything you can think of about money. Whether that's the symbols, anything you can remember from the last time you did money… what's the biggest note you can think of? Anything … do you have to use decimals and fractions for money? What is the difference between British and Europe money? Anything you can think of" (10) "Any interesting things? (Dollars) what about? (Well you get one dollar, two dollars) yep, well, we don't use dollars, you get lots of currencies. Anything else? (You get 1000 notes) well we can look it up later. I'm pretty sure you do. (Pound is like the hundreds column. Pennies is like the 10s and 20s would be your tens column and pence would be your units column, and ½ pence…). [teacher corrects ½ pence and discusses] 'C' anything interesting about money? (…you can get cheques?) yes we've discussed them [discussion continues] … every time we do this, we start a new topic and you say you don't know anything, but now you are, you have written loads of things, and we're talking about credit cards" … in about a week's time we will fill in the middle column with everything you have found out" (10) "Yesterday we learnt something new. What did we learn? Who can remember?" (12) "Last week in ICT we were looking at our charts" (20) "Normally I put the first line on the board. This time we're going to do something slightly different." (21) "What were we doing in maths yesterday? (looking at information, tallies) what word begins with an 's' (survey)" (22)

		"Who can remember what our tricky words were last week? (Teenager and rainstorm) they were not our tricky words, they were our longer words, weren't they? (eleven and twelve)" (23)

Indicator	Description	Example
Check Under-standing	Assesses student understanding of what teacher has said	"Does everybody understand?" (1) "Can you show me thumbs if you know what your tasks are?" (14) "Does everyone understand? Does anyone have any questions? (H: you could do a hot and a cold animal) T: you could" that is another level of complexity!" (15) "Can now someone explain to me what alliteration is now?" (19)
Organise	Organises resources/ allocates roles	[Sorting into groups based on letters of names in alphabet] (2) [Puts into pairs …. Giving out balls] (2) "You need a pencil for this. That is pretty much all you need" (8) "For this, you will need [hands out jotters]" (11) "You will need your reading book and your jotter" (21)
Monitor Progress	Monitors/ checks progress of students through discussion/ questioning	"Thumbs up if you have chosen your climate… your animal…?" (1) "What I'm noticing is that some people are forgetting their rhythm, what was missing?" (2) "Has anyone finished 3?" (5) "That's two ways I have seen now" (8) "Who is struggling? Who's finished page 13?" (task 10, p114) "Has everyone read the first paragraph? [teacher reads out]"(task 11, p119) "the teacher comes to me and mentions that some of the pupils aren't using sensible methods for the tallies, for example Sean is not leaving enough room to keep the tallies next to the categories" (FN 15)
Teacher-led control – procedural instruction	Explains how or does the action for student	"Can you write, what a polar bear eats" (1) "And freeze! There's a massive empty space and you don't need to go in the same direction" (2) [Teacher writes for him as he discusses how his goldfish died, she then shows how to do an animation] (9) "You need to highlight the data and then go to 'insert recommended charts' [bends over and does it for the child]" (15)
Teacher-led control – scaffolding	Uses questioning/discussion to provide further scaffolding	"Come and sit down. A few people are getting quite confused about what we need to do. 'Expand these sentences' – what does expand mean? If something expands it gets …. (Wider) wider, or bigger. How can we describe this boy? Two words to describe the boy? (Smart, loud) … how does someone laugh? [discussion of laughing] (13) "Jack, do you think a snowman is an animal?" (1) "[teacher goes to speak to a pupil who looks sad] what's wrong? (I don't get it) you do get it. You just get upset when you don't do something super quickly. You are on the adjectives. Think of two adjectives to describe how he laughs [leaves for a minute and come back, looks at adjectives and reads, watches and reads out loud as he writes out] great, see. I told you that you could do it... I knew you could do it. Now you just do the same for rabbit" (13) "P: Lovely Ms Smith. T: Now that's a nice compliment. But it's not alliteration because it's not starting with the same letter. Can someone give an example for Andrew? [example] Do you see Andrew? [More examples] … P2: Awesome Jason T: Is that the same letter. Do you see what I mean? It could be awesome Amy … [shows examples] … do you see P, P2? It's the same letter at the beginning" (19)

Indicator	Description	Example
Teacher-led control - Modelling	Models thinking to students	[Teacher stops and asks pupils to gather around the table. Some had started to 'tally' rather than create a table of responses] "a table is another word for writing down information. It is handy because it helps us organise it. [Draws example of 'hobbies' table]. First I need to decide what I'm going to ask. How many categories. I'm going to do 3 [draws]. I might have swimming, gymnastics, karate, judo. If I want to find out boys and girls I can add it here. The first thing I need to do for information handling is to find the best way to record the information. For example, last week Sam didn't leave enough room for his tallies so we had to organise it so we could record the information." (20) "Right folks, you are making it more difficult than it needs to be. The whole point of writer's craft is that you continue the character and you continue the setting… ok everyone, bring your book to the front of the class. … Right, when we do writer's craft. And I am continuing a story about Hamish. Who am I going to be writing about? (Hamish). [Goes through what/where etc. with the example of Hamish]. So, I have all this information [questions pupils using the details of the fictional example]. You are using the information I give you to fill in the information about what happens in the story. What happens when he mixes the blue liquid and the red liquid? (he succeeds). How does he succeed? (He mixes the two liquids and it makes a glue). And what happens when they are mixed? (There's an explosion). So, what information have we got in this book? Who is the main character in this book? (Terry)… so when we write our story, how are we going to write about Terry? [no answers, repeats] (Second person). Yes, it's not first person. You are not Terry, you write about Terry. So the people who wrote 'I ran away'. Clare - is there any other issues that we're having. You haven't done very much … how would you describe my mood just now (annoyed) annoyed, no. frustrated, yes. This is pretty much how we have been approaching our work this week. I put it in front of you and it's just another price of work to get through. We are focusing on a lot of things that we haven't covered much this year, and trying to tick all the boxes before you get into P6, where you'll do it again, but a bit harder." (21)
Additional Expectations	Adds expectations different from those outlined at outset	"Make sure on your bit of paper, you write down your group name" (1) "I'm also looking to see what group works well together" (1) "Don't spend too long on presentation" (1) "Ok, we get the idea. Even if we just aim for the first page" (11) "Some people have finished already. If you have finished all of that, go on to the bit at the bottom" (13) "Check your work before bringing it out please" (13) "Boys and girls, two minutes left to finish this off" (17) "Now it's time to check through your writing. Check to see whether you have done full stops, capital letters, if it makes sense. Take one minute and then we will share" (17) "Remember to add lots of details to your pictures so I know what's going on" (18)

Indicator	Description	Example
Additional Expectations (cont.)		"Right, 25 minutes. We need to get something down on paper so tomorrow we have something to discuss" (21) "Right you, I would like you to do the medium one, but I am only going to give you 2 minutes. I want you to see how much you can do in 2 minutes" (22)
Share	Encourages students to share work	[Teacher reads out work to the class] (1) "Volunteer to show me their skills? I'm going to have four partners out" (2) [Teacher shares work – reads all about me documents] …"he[Henry] has been quite creative in showing his document… you have seen some examples, you know what I'm looking for"] (task 4, p30/31) [Teacher reads out one pupil's explanation for question 1] (5) "Kelly can you give me the first adjective you got… can you read the sentence it was in" (7) "Swap your sheets and see If you can see some other ones" (7) [Children showing different ways on the board] (8) [Teacher goes to show examples] (9) "Ok, so facts and opinions from that one paragraph. So things that are facts and things that are just opinions. Can anyone give me a fact? ... Another fact… are there any opinions? ...fast, furious and frightening. Because not everyone might not have found it frightening, yes" (11) "Can anyone give me the next fact from the next paragraph [example from pupil] No you've gone way too far, the next paragraph? Shall I just let you get on with it? Have you got your nose buried in the book?" (11) "Who can tell me by looking at the graph, what is our favourite teddy in our class? (Emu) I was quite surprised! (15) [Teacher discussion with examples from pupils, some pupils read out their work, teacher elaborates] (16) "If you don't want to share, say pass. If you would like to read it, be brave [some pupils read story]" (17) "Who can give me an example of the alliteration they did? (giant George) [some more examples] I'll hear some more later" (19) [Reads examples] "one farting frog forever, we definitely have some toilet humour going on" (19)
Feedback	Provides feedback about the task or strategy	"Oh, you did a PowerPoint, very impressive" (1) "I like these… what are these lines here? ….] (4) "What do you need for a proper noun? ... Do you know how to do a capital on a computer?" (4) "So that is exactly what we are talking about – absolutely perfect, but you haven't done Q2, too slow" (5) "Seeing how you said you didn't know how to explain it, that was an excellent explanation" (5) "What you have done, is you have you have gone the wrong way" (5) "As I always say, as long as you can explain it, I am not worried if you get the wrong answer" (5) "Stage 4 – the stage no one really wants to do because they want to go on to the next question" (5) "You're working well as a team, well done" (7) "What we notice is, there are quite a lot of adjectives and we might have missed some" (7)

Indicator	Description	Example
Feedback (cont.)		"This has clearly not been enough of a challenge" (8) "You've done that really quickly which is great" (8) "As usual, we have got a big variation in the way people are setting things out. But it seems people have a good understanding of how the notes are related" (10) "Look how much your handwriting has come on since yesterday" (12) "You didn't even sit down to fix that – now let's see if you can come up with your own sentence. Try to make it as exciting as you can" (12) "I'm so impressed with the fantastic ideas." (18) "There's not very much on there. It should have been finished. Make sure you are trying your best all the time" (19) "I'm so happy that you gave it a go [reading the spelling of 'alliteration' that is spelled wrong but used spelling out strategy] Remember 'Shaun' is spelt 'tion' but I am really happy that you gave it a go" (19) "Check that one, fantastic. Not paying attention, sometimes you make little mistakes when you do that many sums, don't you? Just one, and that was very quick too, fantastic" (22)
Evaluate confidence	Evaluates confidence in the task/subject	"Put your thumbs up if you think you are confident putting information into excel [many thumbs up] if you're confident in collecting information in a table [many thumbs up] creating a chart [less thumbs up]" (20)
Evaluate difficulty	Evaluates difficulty of the task	"Hands up if you're finding it hard?" (1) "Anyone really struggling today? Anyone want to admit it?" (5) "What did you find tricky about using PowerPoint? (Getting a picture) Still quite tricky, did you manage?"(9) "How did you find that? Use your thumbs (easy) Well, not necessarily easy, but ok!" (13) [Teacher asks pupils to put thumbs up/down/middle to assess difficulty] (15)
Evaluate knowledge	Evaluates knowledge of task/subject	"How does everyone feel about knowing what alliteration is?" [pupils show thumbs] (19)
Evaluate Strategies	Evaluates strategies used throughout task	"Who can tell me how they're finding out information?" (1) "You have a start time and an end time and you need to work out how to do it. How do you do it?" (5) [discussion of strategies, rounding up] (5) "So Daniel – which bit did you fall down on? Stage 1? I don't think so, stage 2? Stage 3? Stage 4? Probably" (5) "Rebecca, explain to me what you need to do" (5) "Now you have to come out and explain" [pupil comes out and explains strategy] (8) "Some people forget to put the answer, or some forget to put the working. Both are important" (8) "To my mind, it was so easy. 'Megan', completely unique way of doing it" [praise] (8) "We are doing money, but what are we supposed to be doing? It comes back to what? [discussion of addition] (10) "Megan, what mistake did you make [pause] what do you need to make sure – everything is in the right…? (column)" (10) "(I didn't do chimney sums) You did it like a mental maths sum?" (10)

		"And the trick to these are [discusses strategy of grouping the numbers together] … most of you are capable of doing these in your head" (10)

Indicator	Description	Example
Link to future	Discusses future task in relation to current	"On Thursday we are going to have a game of free ball steal. We don't have time today" (2)
		"We will come back tomorrow" (5)
		"Next time we need to work on a strategy to make sure everyone keeps moving" [Discussing options of how to tweak/change the game next time, to include throwing the ball etc.] (6)
		"I notice that everyone is also finding saving quite tricky, so we're going to keep working on saving" (task 9, p104)
		"Next time we write I want you to put alliteration into a poem or story."(19)
		"Next time you are going to have to have a race to see who can do better than they did this time. So Megan you will have to try and beat 11 and Lewis, you will have to beat 15" (22)
Linking to wider skills/world	Discusses task in relation to skills/tasks out-with current task	"Who can tell me why we should take part in exercise…how does exercise help us to keep healthy? … How can you tell your heart is beating fast…?" (2)
		"Why do we learn spelling?" (3)
		[Links to real world, e.g. football] (6)
		"Why does the author use adjectives? ... What do adjectives do?" (7)
		[Links to later life] (8)
		[Discussion of the importance of money and using it wisely] (10)
		"If you went into a shop, you wouldn't do a chimney sum" (10)
		[Teacher talks about budgeting, linking to spreadsheets] (15)
		"Why would we use alliteration? There is no wrong answer here (to make our stories more interesting). So, who would use alliteration? (an author) What does an author do? (write a story)" (19)
		"As much as alliteration is fun, it's also important that we can use alliteration. So it's important that you can spot alliteration" (19)
		"People collect information all the time. For example, Governments. Survey is a part of everyday life, so it's important we learn how to do it" (20)

Appendix C – Structured Thinking Activities

Descriptions of data collection episodes

Episode	Description
Friday 2nd September 2016 (14.15 – 15:00)	Class Meet: Observed discussion between pupils and teacher about learning (prior to students being introduced to learning diaries). The discussion started after Star Time on a Friday afternoon. Questions/topics covered in class discussion: • Favourite part of the week • How do you learn best? • What is Growth Mindset? • Goal for next week
Friday 9th September 2016 (14.15 – 15:00)	Class Meet: Teacher discussed learning with pupils and introduced the concept of the learning diaries. Teacher handed out the learning diaries and pupils wrote in them for the first time. Provided Ms. Abbot with a log book to note down any related activities or discussions with students. Questions/topics covered: • This week I have enjoyed… • Something I have found tricky this week has been… • It will help me next week if I…
Friday 3rd February 2017 (14:00-15:00)	Class Meet: Students discussed their learning with the teacher and then completed their learning diaries. Questions/topics covered: • One thing I have learned this week was • Next week I would like to learn more about
10th February 2017 (14.15 – 15:00)	Class Meet: Observed discussion and learning diaries after star time. Questions/topics covered: • This week I am proud of myself for… • I think I am showing strength in… • Next week I want to put lots of effort into…
24th February 2017 (14.15 – 15:00)	Class Meet: Observed discussion about learning between teacher and pupils, no written sentences.
Friday 21st April 2017 (9:00 – 10:45)	Achievement Log: Observed class set targets for term 4 in their achievement logs. They wrote two strengths and two targets on post-it notes, to stick into their achievement logs. A substantial proportion of the time was spent in discussion between teacher and students about targets and reviewing what the students learned last term. After this, students self-assessed their literacy using a self-assessment form.

Episode	Description
Friday 5th May (9:00 – 10:45)	Achievement Log: Observation of achievement logs being completed. Students traffic lighted the targets discussed in the last observed lesson. They also discussed the topic for the current topic (using a project grid)
Friday 16th June 2017 (14.15 – 15:00)	Class Meet: Visit to observe class meeting discussion following Star time. Learning conversation focused on problem solving task from earlier in the day.
22nd June 2017 (14.15 – 15:00)	Achievement Log: Observed shared lesson with parents. Students completed a sheet with 6 boxes to reflect on the past year. There were also cards for discussion once finished. Boxes in the sheet included: • This year I learned about… • My goals for next year are… • My proudest moment was… • My favourite thing I learnt this year was • My strengths are • My favourite subject has been … • My favourite memories this year…

Appendix D – Teacher Perspectives

List of Participating Teachers *(participant number referred to in text)*

Participant number	**Interview number**	**Gender**	**Years' Experience**
1	1	Female	>10
2	1	Female	>10
3	2	Male	3.5
4	2	Female	25
5	2	Female	25
6	2	Female	0.5
7	2	Male	9
8	3	Female	>10
9	4	Female	10
10	4	Female	13
11	5	Female	14
12	6	Female	29
13	7	Female	10
14	8	Female	16
15	9	Female	5
16	9	Female	3
17	9	Female	10
18	9	Female	7-8
19	10	Female	20
20	10	Female	20

Semi-structured Interview Schedule

- What do you feel are some of the biggest challenges that you currently face as a teacher?
- In what ways do you support children to think about and manage their own thinking?
- What knowledge/awareness do you have about the term metacognition?
- How would you define metacognition?
- What do you think metacognition looks like in the classroom?
- Do you encourage metacognition in the classroom, and if so, how?
- Can you describe any other approaches or current initiatives that encourage children to think about or manage their own thinking?
- How do you feel initiatives such as metacognition or [any stated] link to statutory requirements such as the curriculum?
- What kind of resource is most useful within the classroom?
- Is there any other information or support that you feel would be useful?