"I'll need my magnifying glass": Facilitating young children's critical thinking skills and dispositions in the context of (designed) detective mystery play

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Abstract

This thesis explores young children's critical thinking (skills and dispositions) in the context of detective role play and investigates ways to facilitate it.

A review of the literature showed that extensive work has been done in relation to the conceptualisation of critical thinking and instruction; however, the majority of this is focused on adults and young people. Despite acknowledging the importance of developing critical thinking in education, little research has been done in the context of the early years. This thesis, therefore, examines what 5-6-year-old children's critical thinking looks like and the benefits and constraints of four specifically designed detective play experiences, adopting an ethical and rights-based approach to research with young children.

This qualitative multiple-case study is grounded in play-based pedagogy and learning within a social constructivist theory. It is influenced by Dewey's theory of experiential education and maintains an early years teacher–researcher perspective throughout. The study consists of four exploratory cases focusing on semi-structured mystery play experiences. A total of 24 children aged 5 to 6 years participated. Child-centred and pedagogically appropriate methods and tools were used to facilitate the voice and visualisation of young children's critical thinking across these four scenarios.

Conducting observations (direct and video recorded) was found to be effective in capturing the different ways young children expressed their thinking. These observations were analysed using a thematic analysis approach targeting Critical Thinking Moments. The findings show that engaging in investigative collaborative enquiry, dazzling children's curiosity and interest, empowering children, listening to and acknowledging children's thinking, and guiding and scaffolding were useful for facilitating critical thinking skills and dispositions. In addition, the consideration of design elements, such as the degree of structure, open-endedness, and content knowledge dependency, was found to be important for creating productive spaces for facilitating the thinking of young children. For example, an open approach to a task might be beneficial for an open-natured exploration of critical thinking, while a more structured and

adult-controlled design might be more effective for facilitating and developing specific skills or dispositions. This study provides recommendations and implications for early years teachers, researchers, and policy makers.

Chapter 1 Introduction

This study will investigate critical thinking in the context of young children and explore ways to facilitate it in early years settings. Critical thinking is necessary to face current social, economic, and political challenges. It assists in the construction of knowledge, including deciding what to believe or accept as valid information, making sensible choices, making more reasonable decision making, problem solving, and making fair judgements. Critical thinking arguably supports a more thoughtful and, therefore, possibly enhanced-in-quality life (Paul et al., 1995). Despite its importance, there is growing concern about the lack of critical thinking in children and adults (Lai, 2011). Researchers state that most humans could be competent to think critically; however, this competence is not developed to its fullest potential (Cottrell, 2011; Lai, 2011; Fisher, 2001). Some researchers argue that critical thinking needs to be intentionally taught, yet this is mostly targeted in later stages of educational settings, such as higher education (Coles & Robinson, 1991; Cottrell, 2011; Ku, 2009). Evidently, concentrating all efforts to pursue the development of critical thinking in such late stages does not seem sufficient (Facione, 1990).

Early educational settings, such as nurseries and schools, are a place for the individual and collective to learn and develop holistically. However, if "learning is more than the acquisition of the ability to think; it is the acquisition of many specialised abilities for thinking about a variety of things" (Vygotsky, 1978, p.83), it is necessary to challenge the lack of presence explicit teaching and learning for thinking has, in this case, critical thinking (skills and dispositions) within the early educational provision.

If the aim of early education is the holistic development of the child, then this should include thinking. Furthermore, *'thinking is the method of an educative experience'* (Dewey, 1916, p. 119). Therefore, there is a need to stimulate and provide young children with valuable experiences and tools early on to develop thinking, including the tools, opportunities, and experiences for facilitating, exercising, and developing critical thinking for their present and future. However, since research in this area is limited in relation to what should be taught and

how (Nieto & Saiz, 2011), it is necessary to study how to facilitate critical thinking in children to ultimately enable its inclusion in early educational practice. Consequently, this thesis will explore young children's critical thinking in the context of specifically designed detective play and examine ways to facilitate it 'best' in early years practice. For the purpose of this research, I will only concentrate on 5-6-year-old children in Primary 1. Since this study is situated in Scotland, it is important to give you an overview of the Scottish Early Years provision to get a better understanding of the present study.

1.1 Scottish early years

Early years in Scotland include children aged zero to eight years old, which means that the first stage in primary school is also considered early years (Scottish Government, 2008). The Scottish system offers a wide and diverse range of provision before reaching school age. Such a provision before school age is referred to as Early Learning and Childcare (ELC). According to Education Scotland, ELC includes nursery settings, playgroups, family centres, day centres, independent nursery schools, school-annexed nursery settings and childminders. The funding for free early years provision in Scotland varies according to age. Formal education is compulsory from the age of five; however, despite not being the norm, homeschooling is accepted as an alternative regulated option. According to the Scottish Government, children in Scotland typically start school at an average age of 4.5–5.5 years old (2008), and many will have previous experience with or would be transitioning from an ELC setting before commencing school.

Scottish early years education is working towards a child-centred play-based pedagogy (Scottish Government, 2013; Crichton et al., 2020), which aligns well with the pedagogical mindset and methods adopted throughout this thesis. Due to the open nature and opportunities that play-based child-centred approaches may provide, I believe there is considerable room and potential for the development of critical thinking. Having said this, it is important to acknowledge that in practice, child-centredness and play-based pedagogy are interpreted and may look different across different Scottish ELCs and school settings. Documents such as the '*Early Years Framework*' (Scottish Government, 2008), *Curriculum for*

Excellence (CfE: Scottish Government, 2019) and '*Realising the Ambition: Being Me*' (2020) offer a range of guidance for practice in Scottish early childhood education (Crichton et al., 2020), but how they are interpreted and enacted varies. The above documents demonstrate the intention for linkage, transitioning, and cohesion across stages, which is potentially key for continuity and the inclusion of critical thinking throughout the various educational stages.

In this introduction, I have included some commonly used terms related to early years in Scotland, since I want to recognise them and acknowledge that the different terminology related to early years settings and the profession itself can potentially provide interesting insights into the country's educational history, ideology, culture, and how the profession may be viewed in society, among others. However, due to the widely divergent terminology available to address the different professionals working in early years, both locally and internationally (for example, practitioners, nursery nurses, teachers, and pedagogues), I will be referring to all early years professionals as 'early year teachers' in this thesis. I will also use the term 'adult' when generalising it for practical purposes. In addition, the term 'early years setting' will be used when referring to educational institutions that offer provision for children aged 0-8, rather than referring to it as a nursery, Early Childhood Education and Care setting (ECEC), ECE centre, daycare, infant school, child education, preschool, kindergarten, or ELC, among many other terms. I will also use the term 'school' when referring to the early years provision provided within the school setting.

1.2 Rationale

Critical thinking involves complex and effortful thinking and requires experience through practice (Halpern, 1997, 2006). Few positive results can be achieved in students' development of thinking at the university level if school and preschool are not involved in the intentional teaching and learning of it (Clarke, 1990; Facione, 1990). Learning to engage in quality thinking is a lifelong learning goal that requires a lifetime of practice (Clarke, 1990; Leicester, 2010). Therefore, it is reasonable to argue that critical thinking should be stimulated early in life (Facione, 1990).

Personal experience tells me that young children can be capable of critical thought and are able to exercise such skills and dispositions in stimulating environments. As an experienced early years teacher, I have dedicated time to speaking with young children, listening, observing, assessing, planning for and with children, and both teaching and learning from young children, providing me with a particular lens and set of goggles. However, the key question is how early childhood settings can meet such expectations and goals. The Scottish Government has been gradually reforming the education system to meet quality standards and to aim towards an optimum environment for growth (Scottish Government, 2008, 2019). In the last decade, the government has implemented important changes, such as play-based pedagogy, in the early years classroom within primary settings (Crichton et al., 2020). I have also experienced that children learn best when exposed to meaningful, playful, and motivating learning. I hypothesise that playful pedagogy might provide a rich environment in which children can become immersed in opportunities to develop critical thinking skills within teacher–children and child–child interactions. But how can we aim for a change towards pedagogy supporting critical thinking without the fundamentals of rigorous research evidence?

Research in critical thinking practice has rapidly grown since its origins in Dewey's progressive ideas of education towards reflective thinking (Dewey, 1910, 1933, 1938, 1916). Significant research has focused on the conceptualisation of critical thinking (Facione, 1990; Paul & Elder, 2007; Davies & Barnett, 2015; Siegel, 2010; Ennis, 1991). But where do early years stand in critical thinking practice research? Pollarolo et al. (2023) and Schulz and FitzPatrick (2016) conducted studies to seek teachers' (including the early years) understanding of critical thinking. Both studies showed that despite valuing critical thinking among the teachers, there was no clear understanding of what this was. In Schulz and FitzPatrick's (2016) study, the teachers did not feel they had the knowledge and skills for either facilitating or assessing critical thinking. Currently, there is insufficient research in this area. Young children's development of critical thinking in early-year settings needs to be further explored. To address this research gap in the early years context, the purpose of this study is to better understand what critical thinking looks like in the context of young children and how it can be stimulated and developed within the context of early years playful pedagogies. Ultimately,

the intention is to inform theory and practice by complementing what we currently know and offering new paths for teachers, researchers, and policy makers.

1.3 Positioning self

It is relevant to this research and important at this stage of the thesis to emphasise the role of identity in developing the study. Who we are, our lived experiences, political beliefs, and professional vision of self contribute to constructing a set of beliefs and philosophical assumptions that we carry into our research (Creswell & Poth, 2018). Even though it seems rational to state one's positioning due to its influence on research, this is often overlooked (Creswell & Poth, 2018, pp. 16–18). I acknowledge that my identity, role, and positioning (in both a personal and professional sense) have consciously and, at some level, most probably unconsciously influenced how I have constructed this research through the choices I have made. I, therefore, follow Creswell and Poth's (2018) advice of making this explicit at this stage of the thesis by collecting these thoughts derived from self-reflection and the practice of reflexivity.

It is, therefore, important to foreground my early years professional background and understand how this has influenced this study. I have two bachelor's degrees, one in early childhood education and one in primary school education specialising in second language teaching and learning. I additionally obtained an International Master's Degree in Early Childhood Education and Care (IMEC), which was taught in Norway, Sweden, Malta, and Ireland. In this international master's programme, I worked with 15 other early years teachers from across 14 different countries, which enabled me to learn from and understand education from a much broader international level. This has strongly influenced how I see education and the world in general. I obtained most of my early years of work experience as a teacher of 3-6-year-old children in the Basque Country (Spain) and in Sweden. Predominantly, *becoming, and being* a teacher, as well as practising my profession with young children across cultures before *becoming* a researcher, has given me a particular set of goggles for looking at research with children.

My identity and experiences have shaped how I see the world, how I understand learning, children, and childhood, and the diverse roles within early childhood education and care. In addition, my views and expectations as an early years professional have developed within and across countries and cultures. My personal and professional identity, as well as my daily work with young children, have influenced me by arousing my curiosity about the present study, which has led to the refinement of this study's research questions and the orchestration and design of the methodology and its implementation. My positioning in an active participatory role during data collection, analysis, presentation, and especially in my ethical considerations is also evidence of this.

My philosophical assumptions concerning ontology (my vision of how I see reality), epistemology (how I know reality and my relation to knowledge), and axiology (my value-stance and methodology or my collection of used procedures) (Creswell & Poth, 2018, p. 18) are briefly summarised below. The overarching vision, however, is commonly shared with interpretivist research (Creswell & Poth, 2018, p. 20).

My current perspective is that reality is constructed from multiple realities; for example, a case is part of a greater whole (Stake, 1995). A degree of relativity should be placed upon each perspective, which is influenced by different contexts and circumstances (ontology). This vision of multiple realities influences how I perceive knowledge, as I understand it as diverse and complex, as well as socially constructed. Therefore, in order to be able to access complex and diverse data produced across interactions with me as a guiding adult and between young children, I have to diminish my distance to access not only an "insider's" view but a participant's role (epistemology). My values are deeply embedded in ethical considerations influenced by my professional teacher identity and my vision of young children as competent citizens with their own rights (axiology).

In addition, the feeling of belonging to the early years professional community, as well as the feeling of ownership of the present study, are transmitted through my tone, as well as the use of the first person (rhetorical assumptions). This set of assumptions naturally develops into a social-constructivist or interpretivist worldview or paradigm. Concerning my methodological assumptions, my choice of visual and participatory methodology has exceeded my personal curiosity for innovation and has become the means of achieving

answers to my research questions. This is fundamentally based on an ethical approach, connected to my axiological assumptions, and towards research with young children that uses methods consistent with common early childhood pedagogical practices.

Child-led and child-centred play-based pedagogic approaches have been well founded, accepted, and encouraged as developmentally appropriate and effective practices for young children across cultures and nations in early childhood education and care settings (e.g., Pramling-Samuelsson & Carlsson, 2008). Some argue that play and learning are inseparable notions of practice (Pramling-Samuelsson & Johansson, 2006). Through my classroom practice and further study, I have consistently reaffirmed that children learn naturally within motivating, engaging, participatory, and playful environments. In the present research, therefore, I used an approach derived from my professional experiences and learning that is underpinned by ethics and children's rights. I considered issues around respecting children's time, interests, and natural desire for playful learning. I used ethically and pedagogically appropriate methods and procedures to provide an innovative and meaningful research experience for young children. In this way, I aimed to achieve an exploration of critical thinking in early childhood that has an authenticity to the perspectives of children and the methodological and pedagogical practices of early years classrooms and, as such, contribute new knowledge to the field of critical thinking research.

1.4 Thesis outline

This thesis consists of ten chapters (see Figure 1.1). The current chapter contextualises this study and establishes the rationale and the position adopted by me, the researcher. The following chapter will review the literature that has informed this study, including understanding critical thinking, reviewing established critical thinking instruction approaches and examining what is known in relation to early years pedagogy and critical thinking. The literature review helped me to develop three research questions to guide the project. Chapter 3 provides an overview of the qualitative multiple case study methodology and discusses and justifies the methods and analysis approach that have been applied to meet this thesis' objectives. This will be followed by Chapter 4, in which the ethics underpinning this study are

discussed, with particular attention to how the adopted ongoing informed consent approach was designed and implemented in practice. This chapter also seeks to understand the benefits and challenges of using this approach for ongoing consent with young children. Chapters 5-6-7-8 describe this thesis' four case studies. These four chapters discuss the design of the four detective experiences, implementation, analysis and reflection upon each of the mystery cases. Chapter 9 follows with the discussion across the four cases. The last chapter, Chapter 10, provides the final conclusions and recommendations for early years teachers, researchers and policy makers.
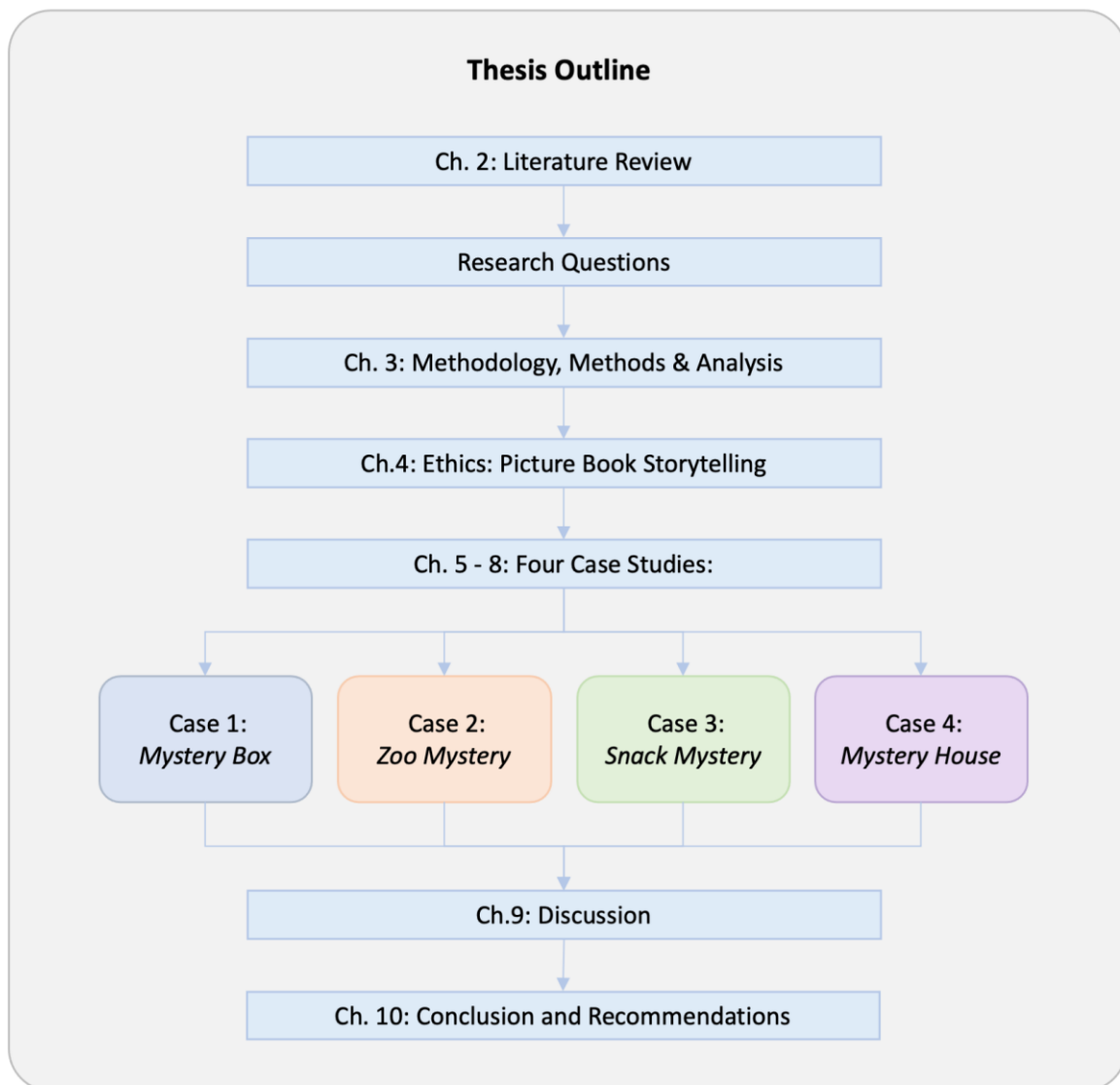
Figure 1.1: Thesis outline.

Chapter 2 Literature Review

2.1 Introduction

This thesis seeks to investigate young children's critical thinking in the context of play and the ways in which it can 'best' be facilitated in such contexts. For this reason, the purpose of this literature review is to first examine and gain clarity about what is currently known in relation to critical thinking, to better locate and understand the commonalities and differences in conceptualisation, as well as to explore the diverse perspectives across experts and fields. Ultimately, the aim is to find out what we know and what we do not know in relation to critical thinking in the context of early years education.

More specifically, in Part 1, I will explore different definitions in the literature that inspired and influenced me to create a definition of critical thinking for the purposes of this thesis, with particular application to an early year's educational arena (perspective). I will identify and discuss critical thinking abilities and dispositions that will help form a clear and comprehensive understanding of what critical thinking may look like in the context of young children and play. I will explore the relationships between critical thinking and constructs such as thinking skills, problem solving, creative thinking, and metacognition. I will conclude the section by discussing the basic critical thinking instructional approaches and attempting to visualise what this might look like in a play-based setting. This is important, because a clear conceptualisation of critical thinking that will fit the purpose (in relation to the early years' playful pedagogy) is necessary to design adequate methods that will increase the probability of obtaining the necessary data and analysis for this investigation.

In the second part, I will discuss what is known in relation to approaches and the facilitation of critical thinking. I will identify key gaps within the literature, particularly in relation to young children. I will discuss the pedagogical practices and related elements that have been useful, as well as restricting the facilitation of critical thinking in early years education. Ultimately, I want to comprehend what we know and do not know in regard to the context of early years

pedagogical practice and critical thinking. This will inform and benefit the design of this research.

This literature review is a narrative review. In the process of selecting the literature, peer reviewed articles were prioritised, however, relevant books and other literature related to the conceptualisation and teaching of critical thinking with a focus on education were also included. For example, books on critical thinking conceptualisation written by critical thinking experts (with substantial work on critical thinking) were considered of great value and contribution. It was considered that excluding such literature would have been detrimental for this thesis. The critical thinking literature heavily focused on specific discipline subjects was excluded (for example, nursing, physics, mathematics or political sciences). Furthermore, the search was conducted using online university access to data bases, initially using key words such as 'young children', 'early childhood', 'critical thinking', 'thinking', 'cognition', 'thinking skills' and 'dispositions', 'pedagogy for thinking' and 'cognitive development' among others. From the obtained results, only the literature related to early and primary years students' critical thinking and pedagogy was included. However, the literature on older children, young people and higher education students was primarily excluded. Given the limited literature in the context of young children, all the relevant articles, books and other resources connected to critical thinking and young children, early years and early childhood pedagogy were read and excluded only when they were not relevant or did not meet basic quality standard assessment criteria. In addition, the literature such as research articles and books that were not translated to English or Spanish were directly excluded too.

2.2 Understanding critical thinking

Critical thinking has received attention from a variety of domain disciplines, for example, education (Costa & Kallick, 2000, 2019), nursing (Zuriguel-Pérez et al., 2015), business (Smith, 2003), mathematics (Jablonka, 2020), and philosophy (Lipman, 1988; Daniel & Auriac, 2011). These studies show that critical thinking can be viewed differently within a particular branch of knowledge within its own context. I will ultimately look at young children's critical thinking from an educational perspective, as the intent is to be informed by and discuss the

implications for educational practice. However, as education is multidisciplinary, understanding will be drawn from disciplines such as philosophy, psychology, and social theory to develop an inclusive overview of the topic.

A philosophical perspective on critical thinking can be seen as focusing on the fundamentals of formal logic systems (Lai, 2011). These systems are argued to contribute to human competence rather than performance (Lai, 2011). The philosophical tradition describes the ideal critical thinker (intellectual virtues) and their ideal thinking (Gibson, 1995). Consequently, this view often does not consider reality and limitations. These limitations can be personal (including memory, motivation, and lack of background knowledge) and also circumstantial, such as time (Sternberg, 1986).

This view of the critical thinker is often criticised for its abstraction and can be considered challenging to assess. Davies and Barnett (2015) acknowledged such difficulties in terms of implementation, but underlined the importance of the philosophical tradition's contribution. Ennis (1963) recommended measuring children's actual performance to enable accurate and concrete assessment in order to grasp their level of competence for effective classroom instruction. In an early years context, further limitations might arise from considering young children as spontaneous and potentially unable to exteriorise their thoughts at a particular moment (Pantaleo, 2017). As an early years practitioner, I can see this happening in practice, for example, if the child has not developed the necessary vocabulary to verbally express themselves, if the adult is not able to understand the different ways children express their thinking, or if the child is not interested in the question or does not understand what is expected of them. Although the term 'in practice' is not used, Moon (2008) differentiates critical thinking (internal) and its representation in action by denominating the latter as "critical activity" (Moon, 2008, p. 125). This concept of demonstrable or observable critical thinking is important when researching young children's critical thinking, as there is a need to focus on what is solidly represented or expressed (visible thinking). However, this means that what it is demonstrable will remain only a part of the greater whole when we are referring to a sometimes inward-only occurring phenomenon like critical thinking.

Critical thinking definitions from a psychological perspective help develop this focus on visible thinking, as they tend to be more descriptive and often explicitly specify the set of procedures

and skills involved (Moseley et al., 2005). It is therefore implied within this tradition that mastering such procedures and skills will result in the achievement of "good thinking". However, such perceptions of critical thinking may undervalue the importance of thinking quality by simplifying critical thinking practice to a more mechanical or concrete process (Moseley et al., 2005).

The psychological perspective views critical thinking practice within certain limitations by considering influencing variables, such as the environment and overall context (Lai, 2011). Many of the experiments in psychology are executed in a laboratory context (fictional scenarios), and therefore, the multitude of variables present in a real-life scenario might be overlooked. Sternberg (1986) stated that "*proposing theories that are empirically testable sometimes results in theories that oversimplify the analysis of critical thinking*" (p. 5). However, Sternberg (1986) also commented that this limitation can be an advantage when contributing to scientific analysis. This idea can seem helpful in terms of measuring young children's critical thinking as a list of skills, as it is based on concrete procedures rather than on an ideal. However, young children arguably perform best in their familiar natural environment, such as preschool or home. In other words, unfamiliar institutions might become a barrier to their performance and limit the critical thinking observed as a result.

In contrast to the psychological perspective, social theory focuses on critical thinking as a transformation of society (Davies & Barnett, 2015). In other words, critical thinking education is believed to contribute to a change in the attitude of the individual and, therefore, society's attitude itself. Both critical pedagogy and critical citizenship are crucial in such a view (Davies & Barnett, 2015). This is important to consider, as it is ultimately the broader and overarching goal of education.

The educational perspective, in contrast, could be argued to focus on exploring the fundamentals of critical thinking in classroom settings (Sternberg, 1986). In other words, the link is between critical thinking and teaching and learning. The theory tends to be based on classroom research and is purposefully created to be implemented in a classroom environment (Sternberg, 1986). Sternberg (1986) stated that an education perspective theory is not clear in its epistemological foundations, and the lack of clarity increases the difficulty when putting theory into practice as well as assessing impact. He suggested that such theories

are often not based on meticulous tests, as in both philosophical and psychological traditions. Acknowledging this will be useful in this study since it focuses on implementing the theory and assessing young children's performance in early years classroom settings. Sternberg (1986) summarised the ideas above as follows: Philosophy tends to describe what people can do, psychological theories describe what they actually do, and educational theories can be an ambiguous combination of both. So, how does this help me to think about the critical thinking process in young children?

Halpern (1998) stated that successful thinking to stimulate pedagogy requires cognitive knowledge from psychology (p. 451). This does not necessarily mean that one perspective contradicts the other, as the educational perspective is multi-dimensional. She argued that work from all fields is necessary for successful practice. However, Halpern (1998) mentioned that psychologists and educators engaging in critical thinking instruction together can be a challenging task. Halpern's (1998) model of teaching critical thinking is grounded in cognitive psychology, as there is a need to understand how we learn to teach critical thinking (Angelo, 1995). This idea of the application of concepts is important, as this thesis will be informed by, but not limited to, literature from education and is reviewed to inform decision making that explicitly focuses on 'fitness for purpose' in the context of young children. Thus, I will ultimately sustain this early years educational lens and make choices related to conceptualisation that can facilitate and capture the understanding of critical thinking in the context of young children. Having considered the strengths and weaknesses of different perspectives in the context of this thesis, I intend to prioritise observation of particular skills and dispositions as a starting point for developing conceptual clarity. Rather than committing to and limiting the approach to restrictive skills and dispositions, I will maintain an open mind in relation to what critical thinking entails in young children.

2.2.1 Defining critical thinking

To date, a vast variety of definitions and understandings of critical thinking have been proposed across the literature (for example, Lai, 2011; Nieto & Saiz, 2011; Moseley et al., 2005; Petress, 2004), although none are specific to early years education. Therefore, there is a need to use popular definitions as a starting point:

- *"Reflective and reasonable thinking that is focused on deciding what to believe or do"* (Ennis, 1985, p. 45, 1991, p. 6);

- *"Skilful, responsible thinking that facilitates good judgment"* (Lipman, 1988, p. 39);

- *"The mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts"* (Sternberg, 1986, p. 3); and

- *"The use of those cognitive skills or strategies that increase the probability of a desirable outcome"* (Halpern, 1998, p. 450).

The diversity of perspectives has influenced the creation of the definitions, and consequently, leads to differences in understanding and implications in the integration of critical thinking in curriculum and practice. However, despite these variations potentially contributing to some confusion, experts such as Paul et al. (1995) argued that the definitions are more alike than they are different (p. 359). Some experts claimed that any perceived differences are mainly due to "how broadly or narrowly the construct of critical thinking is viewed—in its boundaries—rather than in what is viewed to be the core" (Sternberg, 1986, p. 3). Ennis (2016) referred to it as a "different way of cutting the same conceptual pie" (p. 2), with Paul and Elder (2007) pointing out that the reason why the concept can be defined in different ways is dependent on the intention or purpose. In Paul and Elder's (2007) guide for educators, *Critical Thinking Competency Standards*, a definition of critical thinking was developed to be used for evaluation, while they have also adopted other definitions in other contexts.

Ennis (1963) prioritised the refinement of the notion of critical thinking to focus on how it was applied when engaged in teaching, learning, and assessment. In this way, identifying where the students are before and after instruction could be important, because *"Clarity of justified goals is required before we can confidently make decisions about curriculum, instruction, and assessment"* (Ennis, 1991, p. 22). To understand these goals, however, critical thinking needs to be fully understood in education, and Moon (2008) argued that *"Not only do we behave as if 'critical thinking' and other such terms have agreed definitions, but we use them with learners in this way"* (p. 23). Evidence indicates that learner success is dependent on the teachers' critical thinking and understanding of competence; therefore, this is an important obstacle towards a critical thinking goal (Paul & Elder, 2007). In the context of this thesis, this shared clarity of understanding is crucial (Pollarolo et al., 2023; Nieto & Saiz, 2011; Schulz &

FitzPatrick, 2016), as so little research work has been done focused on the specific context of young children. Philosophy for children (P4C) is the exception (e.g., Daniel & Gagnon, 2012). It is for this reason that it is fundamental to contextualise and clarify my understanding of critical thinking, maintaining an open mind to diversity and tailoring it when necessary to provide greater understanding for early years practitioners, researchers, and policy makers. Ultimately, I aim to obtain a better and more targeted fit for design and overall practice to facilitate critical thinking.

Despite the differences, there seem to be some common understandings among the critical thinking experts in the *theory*. However, there is a greater lack of clarity regarding what critical thinking *is* and how it is *implemented in practice* (Vincent-Lancrin et al., 2019), and given its explicit absence, this is particularly acute in the context of young children. Consequently, "a clear and accurate conceptualisation of critical thinking is absolutely essential for the development of valid critical thinking assessment tools and effective critical thinking instructional programs" (Facione, 1990, p. 8). Therefore, it is also necessary to articulate a universal language, agreeing on key terms that are common and understandable to all (Vincent-Lancrin et al., 2019).

The definitions that started this section, more specifically Ennis's (1985, p. 45, 1991, p.6) and Lipman's (1988, p. 39), finely capture the notion of quality as well as the complexity of critical thinking, but carry a certain abstraction and ambiguity that can be considered impractical for early years educational practice. Accepting the above, I adapted Halpern's (1998) definition of critical thinking due to its clarity and fitness for including the idea of children's dispositions in addition to skills. In doing so, I explicitly drew on the relationship between skills and dispositions (Halpern, 1998; Siegel, 2010; Nieto & Saiz, 2011) and the dependency of those in relation to context (Paul, 1992; Ennis, 1989; Facione, 1990), which is important in early years pedagogy. Therefore, my definition not only covers the use of skills and dispositions in isolation, but also the process and orchestration triggered by the context or domain (such as task requirements) (Paul, 1992; Ennis, 1989; Facione, 1990). I have also integrated and emphasised the idea of 'process' instead of focusing solidly on the outcome, aligning with the thinking of Ennis (1991), Moon (2008), and Paul and Elder (2007). My definition, therefore, reads as follows:

> *Critical thinking is the use of context-dependent skills and dispositions that increase the probability of a more productive process, and that can potentially lead to a more thoughtful and possibly 'better' (or more desirable) outcome.*

This definition was developed to provide a concrete orientation on what critical thinking entails for the purposes of this study. Critical thinking skills and dispositions are examined further in Section 2.2.2. However, the level of concreteness aims to provide comprehensiveness and visibility for the context of teaching and learning, as well as research in early childhood.

I have made reference to the quality of the process in relation to the context as well as the outcome, since it is necessary to avoid the oversimplification of reducing it down to individual use of skills and dispositions. The privileging of process over result illustrates this study's educational lens and intent more accurately. Mosely et al. (2005) proposed adopting the strengths of different perspectives when putting them into practice by acquiring a descriptive approach when selecting skills, followed by a normative assessment where not only skills are assessed, but also the quality of their use within a particular context. The limitations and strengths of all perspectives are the reason for the need to embrace and take them all into consideration (Moseley et al., 2005). Therefore, following Moseley et al.'s (2005) advice, I have considered the benefits and constraints of both of these diverse strains to find the fitter-for-purpose definition above that suits the context of this thesis.

2.2.2 Abilities and dispositions

Critical thinking experts (e.g., Facione, 1990; Ennis, 1996, 2016; Halpern, 1997; Paul et al., 1995; Elder, 2014) and thinking and dispositions experts in the field of education (e.g., Costa & Kallick, 2000, 2019; Siegel, 2017; Katz, 1993; Tishman et al., 1993; Perkins & Tishman, 2006; Tishman & Andrade, 1996) have varied understandings of what constitutes critical thinking, what the desirable dispositions of a critical thinker are, how to assess critical thinking, how it is taught and learnt, and what the associated practices, including approaches, methods, and tools (including dispositional and skill-based approaches) are. However, by focusing on dispositions, researchers such as Tishman et al. (1993) and Costa and Kallick (2019) were able to develop conceptualisations and concrete lists of desirable thinking dispositions perceived

to underpin critical thinking. Some are hierarchical or distinguish overarching dispositions and sub-dispositions (Facione, 1990; Ennis, 1993), while others are treated as the same, levelled or non-hierarchical. Nevertheless, such diversity does not imply fundamental disagreement. Generally, there are similarities across researchers' thinking (Lai, 2011). For example, it is generally agreed that background knowledge (at least basic familiarity from common life experiences) is necessary, despite not being enough on its own (Lai, 2011). It is also agreed that critical thinking involves abilities and dispositions (Cottrell, 2011; Lai, 2011; Siegel, 2010; Fisher, 2001; Salmon, 2010; Ku, 2009; Costello, 2000).

Abilities and dispositions are connected and dependent upon each other in the context of critical thinking, as one can have a skill but not actually be disposed to use it (Facione, 1990; Halpern, 1998; Fisher, 2001; Siegel, 2010). They can be explained as one's competence to think in certain ways and the actual habit of behaving and thinking in those ways under specific conditions. For effective teaching and learning, it is argued that teachers should teach and aim for both abilities and dispositions (Coles & Robinson, 1991; Siegel, 2010; Fisher, 2001; Facione, 1990; Halpern, 1998). It is also useful to consider these arguments when considering the context of learning to think critically, as in the context of the early years: How can they be facilitated in a way that supports the child's emergent thinking capabilities?

In this thesis, dispositions are intellectual habits of mind defined as follows:

> 'A pattern of behaviour [sic] exhibited frequently and in the absence of coercion,
> and constituting a habit of mind under some conscious and voluntary control, and
> that is intentional and oriented to broad goals' (Katz, 1993, p. 16).

Katz suggested a distinction between mindless habits and intellectual habits of the mind, and pointed out their voluntary nature, frequency, and intention. Siegel (2017), however, disagreed, and explained that 'Dispositions are genuine properties of thinkers … neither equivalent nor reducible to rules or behaviours, and that they can be genuinely explanatory' (Siegel, 2017, p. 1). Siegel (2017) made explicit the distinction between dispositions and thinking dispositions as 'A tendency, propensity, or inclination to think (thinking dispositions), behave, or act in certain ways (general dispositions) under certain circumstances' (p. 1). Application to a play-based context with young children, I would argue, is challenging, as both

ways of thinking and behaving or acting are useful and potentially inseparable, as thinking is not considered to be restricted to or limited by, in this case, children's actions. This is related to the theory of embodied cognition. Moreover, through interactions with tools and the environment, dispositions become not only a medium to manifest thinking and inclinations, but also to develop thinking and habits as well. Hence, dispositions need to be understood in a broader sense as a way to capture the different ways of communicating young children's thinking, as well as inclinations to think in those ways (manifesting behaviours related to that). Furthermore, dispositions transcend what is purely cognitive (Siegel, 2010). Hence, I argue for the importance of finding tools to holistically capture and assess children's thinking and their doings, going beyond the skills of cognition. The links between dispositions are complex, and one cannot fully separate cognitive from behavioural or affective influences, such as emotions and feelings in real-life action.

Alongside dispositions, we also need to consider critical thinking skills, consisting of a set of skills for argument analysis, including inductive and deductive reasoning, judgement, evaluation, conflict solving, and decision making (Lai, 2011). Ennis (1991) conceptualised critical thinking as a set of 12 dispositions and 16 abilities (see Table 2.1).

Table 2.1 Ennis's (1991) critical thinking dispositions and abilities (adapted from Ennis, 1991, pp. 8-9).

CRITICAL THINKING	
DISPOSITIONS	**ABILITIES**
Clarity	Focus
Focus	Argument analysis
Total situation	Questions
Reasons	Definition
Trying to be well informed	Assumptions
Alternatives	Credibility
Precision	Observation
Self-awareness	Deduction
Open-mindedness	Induction
Caution	Value judgement

Non-scepticism	Supposition
Using one's abilities	Integration
	Orderly manner
	Sensibility to others
	Rhetorical strategies
	"Fallacy" labels

Despite the usefulness of the above to comprehend the key elements of critical thinking for its assessment, in the context of early years education it is fundamental to adopt a practical framework that will fit the context, and that is useful for teaching and learning with young children. With this intent in mind, the American Philosophical Association (Delphi Research Report) critical thinking dispositions list (Table 2.2), derived from experts' consensus (Facione, 1990), is useful. It shows relevancy in relation to practical implementation in the early years context. It also shows links to desired values that are already sought to be developed in education. This table is useful for its detailed and complete picture of the involved dispositions, as well as the clear language used.

Table 2.2: Facione's (1990) affective dispositions of critical thinking (p. 13).

AFFECTIVE DISPOSITIONS OF CRITICAL THINKING	
APPROACHES TO LIFE AND LIVING IN GENERAL:	APPROACHES TO SPECIFIC ISSUES, QUESTIONS OR PROBLEMS:
Inquisitiveness with regard to a wide range of issues	Clarity in stating the question or concern
Concern to become and remain generally well-informed	Orderliness in working with complexity
Alertness to opportunities to use CT	Diligence in seeking relevant information
Trust in the processes of reasoned inquiry	Reasonableness in selecting and applying criteria
Self-confidence in one's own ability to reason	Care in focusing attention on the concern at hand
Open-mindedness regarding divergent world views	Persistence although difficulties are encountered
Flexibility in considering alternatives and	

opinions	Precision to the degree permitted by the subject and the circumstances
Understanding of the opinions of other people	
Fair-mindedness in appraising reasoning	
Honesty in facing one's own biases, prejudices, stereotypes, egocentric or sociocentric tendencies	
Prudence in suspending, making, or altering judgements	
Willingness to reconsider and revise views when honest reflection suggests that change is warranted	

From the same committee, a core critical thinking skills list is also derived (Facione, 1990) and similarly provides a useful starting point (Table 2.3) for understanding the skills element. Given the exploratory nature of this study, along with the social constructivist theoretical underpinnings and focus on situational context, it is necessary to keep an open and flexible mind regarding existing critical thinking frameworks (particularly those that were not designed with young children in mind) to ensure the likelihood of their suitability for practice.

Table 2.3: Facione's (1990, p. 4) critical thinking cognitive skills and sub-skills list derived from the panellists' consensus.

CT COGNITIVE SKILLS AND SUB-SKILLS	
SKILL	SUB-SKILLS
1. Interpretation	Categorisation
	Decoding significance
	Clarifying meaning
2. Analysis	Examining ideas
	Identifying arguments
	Analysing arguments
3. Evaluation	Assessing claims
	Assessing arguments

4. Inference	Querying evidence
	Conjecturing alternatives
	Drawing conclusions
5. Explanation	Stating results
	Justifying procedures
	Presenting arguments
6. Self-regulation	Self-examination
	Self-correction

Facione's (1990) critical thinking model and recommendations for instruction were the result of a panel of expert consensus using the Delphi Method. The general purpose of using this method is to get expert opinion regarding a subject, problem, research matter, for prediction or decision making in conflict prevention and to develop practice guidelines, among others. In this case, the goal was to form a common and comprehensive understanding of critical thinking for instructional and assessment purposes in educational contexts. Delphi's qualitative method entails systematically collecting and analysing various rounds of expert data (for example, surveys). After the experts had produced the first round of data regarding a particular matter, the facilitator and researcher would gather, synthesise and anonymise the obtained results to later share them back with the same panel members. This provides various opportunities for the experts to gain new knowledge about the question and opportunities to amend previous views with the purpose of reaching an improved final consensus about the subject matter. This method has been found useful and has been discussed in multiple methodological studies (for example Green, 2014 and Taylor, 2020). Thus, the critical thinking report was developed from the analysis of expert opinion rather than additional empirical evidence obtained by the experts. Despite this, it is important to focus on the dimension and value of the judgement of the group of experts, and be able to distinguish this from an individual non-expert opinion.

The Delphi panel was formed by 46 experts in critical thinking from philosophy, psychology, education, social science and physical science backgrounds. The reason for adopting this model is its potential functionality for practice with young children, despite not being specific to young children, as the panellists targeted the concepts specifically for instructional use. The list consists of six cognitive skills and their sub-skills. Core skills, as listed in more detail in

Table 2.3, are: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 1990). When considering these skills, the fact that they were developed for instructional use is evident, as they show great potential for practical application. Despite the strengths and value of the views from the forty-six experts from a diversity of disciplines, one can challenge that only seven out of the forty-six experts were identified to be from the field of education. Furthermore, it is important to think that the perspectives of those seven members cannot be viewed as generalised or representative of all experts in education. Because of this, caution should be taken at the time of interpreting these models and recommendations.

Furthermore, it can also be argued that these guidelines lack context or focus, as they were developed for general instructional purposes and may require much adaptability to context and for particular purposes. Overall, Facione's (1990) critical thinking report has been widely influential in the educational research arena, and despite these potential limitations, its usefulness prevails.

The resemblance with Bloom's taxonomy (Bloom et al., 1956) and its revised version of 2001 (Anderson & Krathwohl, 2001) makes this framework potentially more familiar to practitioners in comparison to others (e.g., Ennis, 1991) and may facilitate comprehension and use. Benjamin Bloom's taxonomy (Bloom et al., 1956) is a widely recognised educational learning objectives classification framework. This taxonomy has been used across ages, from the early years to higher education stages. Originally the categories were knowledge, comprehension, application, analysis, synthesis and evaluation. However, in the revised version (Anderson & Krathwohl, 2001), the category of creating was included (instead of the synthesising category). The goal for the teaching/educational practice was to help teachers design learning around those objectives (categories). This would result in including knowledge and skills across the different levels of thinking, for example analysing, evaluating, and creating.

Bloom's Taxonomy of Educational Objectives (Bloom et al., 1956) has been criticised on theoretical and practical grounds due to the hierarchical and linear assumptions made in relation to what learning entails. The artificial segregation of each of the six aspects of the pyramid has also been criticised, since there is arguably greater fluidity between them, and

therefore educational objectives can be considered intertwined. Furthermore, and considering the previous discussion, equal attention needs to be given to dispositions instead of focusing on the components or skills alone.

In Figure 2.1 I have tried to show these relationships diagrammatically. It shows Facione's (1990) critical thinking dispositions at the heart of the person that are fluidly connected to the choice of skills under the influence of the immediate and wider context. Like Facione (1990), I purposefully do not opt for hierarchical distinctions within skills and dispositions, despite the common use of such distinctions. In the context of young children, I would argue that those in the lower order, such as interpreting (meaning-making), which requires, for example, remembering (memory) and link-making, can display particular challenges as they learn to think. This means that these kinds of assumptions are not particularly useful or applicable in the same way. With young children, Lower order Thinking Skills, for example, require equivalent attention to Higher order Thinking Skills and therefore need to be taken into consideration as equivalently useful to interrogate.

CRITICAL THINKING

CONTEXT

Critical Thinking dispositions:

- Inquisitiveness

- Concern to become and remain generally well-informed

- Alertness to opportunities to use CT

- Trust in the processes of reasoned inquiry

- Self-confidence in one's own ability to reason

- Open-mindedness regarding divergent world views

- Flexibility in considering alternatives and opinions

- Understanding of the opinions of other people

- Fair-mindedness in appraising reasoning

- Honesty in facing one's own biases, prejudices, stereotypes, egocentric or sociocentric tendencies

- Prudence in suspending, making or altering judgments

- Willingness to reconsider and revise views

Self-regulation   Interpretation

Explanation   **Skills**   Analysis

Inference   Evaluation

OUTCOME   **THINKING PROCESS**

(Adaptation Facione 1990)

Figure 2.1: Critical thinking: Context-dependent dynamics of skills and dispositions.

2.2.3 Understanding critical thinking and associated concepts

Critical thinking also needs to be considered in relation to a myriad of other commonly used terms, such as creative thinking, productive thinking, metacognition, decision-making, problem-solving, and lower-order and higher-order thinking skills. This leads to a complex and messy field of theory and practice. These additional concepts and their associated relationships often remain vague and are not always consistent across the literature (Facione, 1990), yet acknowledging them is important to discuss relationships in relation to early childhood education. I will examine them as overlapping and umbrella terms. This examination is important due to the different uses of the same terminology, as well as the diversity of terms used interchangeably. It is also important to consider their development in an understanding of emergent critical thinking. Consequently, to avoid further confusion, I will clarify my view to portray what is embedded in and related to critical thinking in the context of this thesis, particularly in relation to thinking skills, problem solving, creative thinking, and metacognition.

Within the literature, there is a broad variety of types, forms, and terms for thinking. Among others, constructs like productive thinking, logical thinking, analytical thinking, reflective thinking, possibility thinking, speculative thinking, divergent thinking, convergent thinking, lateral thinking, sustained shared thinking, vertical thinking, and practical thinking are common. Sometimes these can be used in similar ways (e.g., Dewey's (1910, 1933) reflective thinking and critical thinking), but they are also differentiated by other researchers (e.g., Beavers et al., 2017). This makes it difficult to focus on each of these types of thinking, as well as their overlapping associations, such as particular skills and differences (in classification) with critical thinking. Where concepts are portrayed in an isolated or objectified manner (Figure 2.2), 'strict' skills classifications are often artificially created to facilitate study, understanding, teaching, and improving human thought, but this does not resemble how they relate and overlap in practice (Paul & Elder, 2006), particularly early years practice. An example of how this segregation might be useful could be De Bono's (1991) six thinking hats (modes of thinking), which aimed at better thinking in problem solving, creative thinking, and decision making. De Bono suggested changing colour-coded hats or modes of thinking according to processes such as planning (blue hat), facts (white), feeling and instinct (red),

creativity possibility and idea generation (green), benefits such as analysis and reasoning of positive points (yellow), and cautions and criticality (black). This method of segregating modes of thinking has been commonly used and found useful for teaching and learning purposes, such as raising awareness and thinking about thinking and the development of thinking in early years practice (De Bono, 1991).
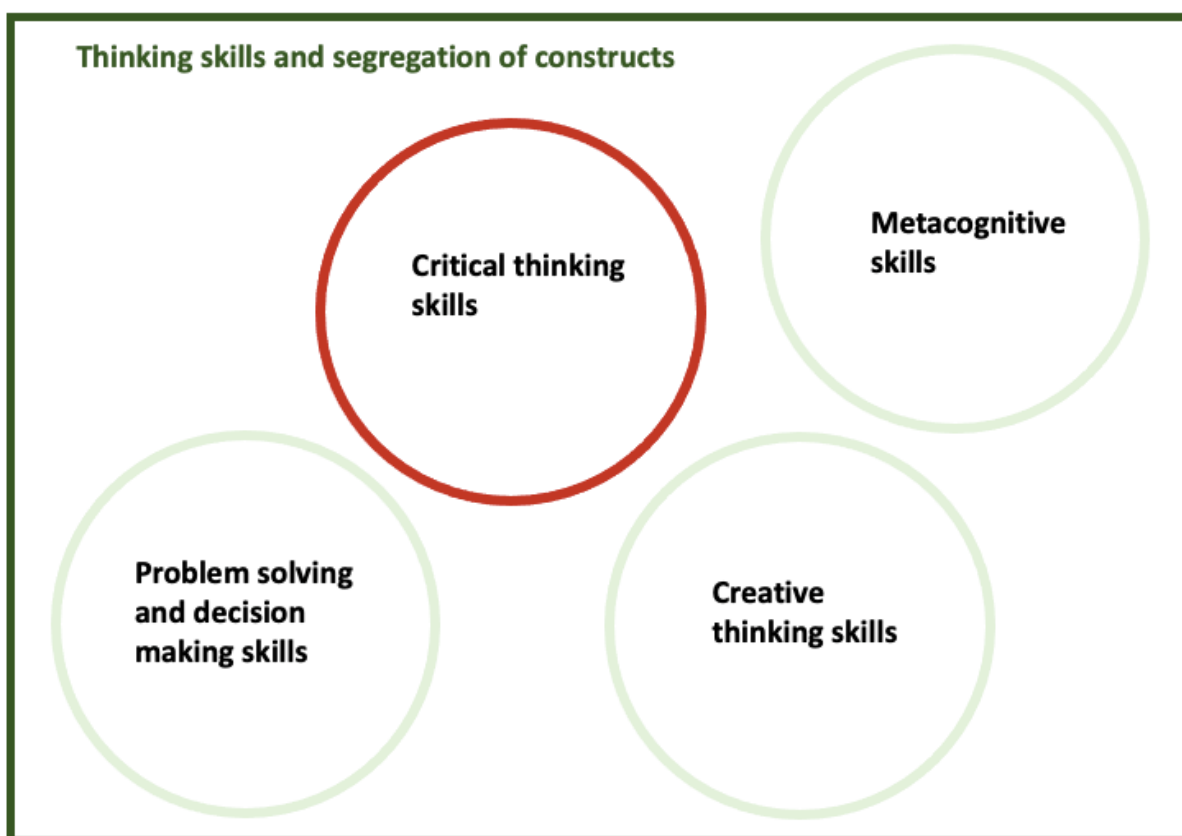
Figure 2.2: Segregated constructs and skills as they are often portrayed in the literature on teaching and learning practice

Despite the intention behind isolating constructs in theory, skills in real-life practice are interwoven and sometimes interlinked across constructs, such as 'creativity' and 'criticality' (Paul & Elder, 2006, p. 35) and therefore do not appear in an isolated manner. Critical thinking (skills and dispositions) is context-dependent (Facione, 1990). The context will 'dictate' what elements are needed to engage in critical thinking in a specific scenario. Therefore, not all critical thinking skills and dispositions may be required in any specific event or time, and the thinker will have to be able to identify what is necessary, as well as have specific inclinations in relation to that context (with this being a disposition on its own). As previously discussed, I adopted Facione's (1990) set of critical thinking skills and dispositions (see Table 2.2 on p.

18 and Table 2.3 on p. 20). Some of these skills and dispositions can be considered to be common to other constructs; for example, critical thinking skills such as interpreting, analysing, and evaluating can also be recognised as important to problem-solving, creative thinking, and metacognition.

2.2.3.1 Problem solving

Critical thinking is useful for successful problem solving when the process solution is challenging and cannot be resolved directly. It involves skills such as identifying, analysing, and formulating the problem to later resolve it (Paul et al., 1995). A problem can be defined as "A question, matter, situation, or person that is perplexing to figure out, handle or resolve" (Paul et al., 1995, p. 389). In other words, problem solving, as a challenge to resolve, is a thinking task that requires something to be discovered, resolved, clarified, or overcome. The linear process has three main phases: apprehend, generate, and execute (Parrill-Burnstein, 1981). However, it can also be viewed as a cyclical process (for example, Thinking Actively in a Social Context (TASC) (Wallace & Adams, 1993). A problem to resolve can take various forms, including:

- a mathematical task for children to solve;
- a relationship dilemma among children and parents;
- a confrontation between peers in play that requires clarification;
- a riddle that requires a solution or various solutions;
- questioning own beliefs about self after talking about mammals in circle time; or
- a class investigation of who ate the afternoon snack.

These problem-solving scenarios do not necessarily *need* to involve critical thinking for their resolution, but the process and outcome could be affected if the thinking involved is of poor substance in relation to what is required by the context. On the contrary, excessive investment, such as critical thinking, in simple problems can be counterproductive (Vincent-Lancrin et al., 2019). Depending on the complexity of the thinking task, it can require a more or less effortful solution. This can be viewed as a dilemma coming to a closer clarification. Lenburg (1997) pointed out that the difference between the concepts of critical thinking and problem solving is that the latter requires an identified problem to be resolved, which is not

necessarily the case in critical thinking.

Halpern (1997) contributed to this discussion by arguing that problem-solving skills are a necessary component located under the overarching term 'critical thinking'. In this sense, critical thinking can involve problem solving and can be embedded at the same time in a bigger problem-solving scenario.

In 1985, Powell researched the development of young children's critical thinking using problem-solving tasks. The results demonstrated improvement in children's thinking performance in those exposed to problem-solving situations (Powel, 1987). Powel (1987) said the following about critical thinking:

> "To foster such thinking, educationists need to create those kinds of (problem-solving) situations." (p. 172)

Therefore, not only is critical thinking useful for problem solving, but also providing opportunities to solve problems can trigger thinking and effort beyond ordinary tasks, making learning more meaningful and contextualised. Most importantly for this thesis, based on Powell's findings, problem-solving situations can stimulate the use of critical thinking skills; therefore, problem solving as a context and a 'tool' to trigger and facilitate critical thinking might be useful in the context of this thesis.

2.2.3.2 Creative thinking

Criticality and creativity have been 'traditionally' seen as contrasting terms to describe thinking that have little in common (Paul & Elder, 2006). Critical thinking has often been associated with convergent thinking, whereas creative thinking is thought to be more divergent (Beyer, 1987). Creative thinking has been commonly described as novel, not necessarily rational, natural, and spontaneous, while critical thinking is contrastingly characterised as rational, calculated, cultivated, foresighted, intentional, effortful, and time consuming (see dichotomy list gathered by Fisher, 2002, p. 4). This perspective varies from the vision of the constructs in this thesis. In the context of critical thinking in young children, creative thinking involves going beyond the context of "arts and crafts". Creativity can be a process as well as a product that can adopt diverse forms of representation (Paul & Elder,

2006, 2007). These representations can take not only the form of physical "materials" (e.g., a craft, dance, or poem) but also of ideas. Focusing only on a traditional understanding of creativity (arts and crafts' physical "materialisation" like a craft, dance, or poetry) can therefore inhibit the development of children's creative thinking (Prentice, 2000).

Assuming a dependency of the relationship between these concepts can also enhance the critical thinking process, as both terms interact with each other in practice (Moseley et al., 2005). The combination of both creative and critical thinking can be classified as productive thinking, originally coming from Romiszowski in 1981 (Moseley et al., 2005, p. 119). In the context of the early years, creative thinking in general and creative thinking skills more specifically can be considered as part of critical thinking and therefore contribute to children's critical thinking development. Similarly, critical thinking skills contribute to the process of creative thinking. However, not all creative thinking processes require critical thinking.

Creative thinking is defined as "Thinking that is novel and that produces ideas that are of value" (Stenberg, 2003, pp. 325–326). Stenberg uses the word novel rather than original, as it is a new way of thinking for the thinker rather than for all individuals, more specifically, to express subjective novel thinking. In the context of critical thinking in young children, I do not see that objective originality is more beneficial than subjective originality. This is because it will only be valuable externally in comparison to others, and therefore, this academic discussion is arguably irrelevant to the child. What matters is that the child is able to think in creative ways for diverse practical purposes, such as engaging in critical thinking. It is important to clarify that critical thinking's most prominent characteristic is not its novelty, but the process might require novel ways to examine an issue, find a solution, and assess, among others.

Creative thinking involves fluency, flexibility, originality, and elaboration skills (Guilford, 1967), which is stated in the most commonly used Torrance Test of Creative Thinking (TTCT) (Torrance, 1969, 1974) used to measure creative thinking from the early years up. Kaufman (2015), based on Cropley's view of creative thinking, explained that evaluations of creative thinking tests show a focus mostly on divergent thinking, where they look mainly for the production of diverse ideas, to the exclusion of convergent thinking. However, Cropley argued that the definition of creativity as "novel, task appropriate/useful" would be incomplete

without convergent thinking, as it is not enough to be novel; creativity should adjust to appropriateness and task purpose. The idea should be to aim for "effortful creativity" with solutions that require analysis to fit and aim for the purpose or functionality that is driven by convergent thinking (Kaufman, 2015). In addition, creativity requires domain knowledge, hard work, task appropriateness, and convergent thinking" (Kaufman, 2015, p. 250). Therefore, critical thinking skills interact with creative thinking skills, as will be illustrated below. In addition to the elements of novelty and functionality (originating from Barron, 1955, and Stein, 1953), Simonton suggested that the element of "surprise" (Runco & Jaeger, 2012) was important for creative thinking. The element "surprise" is not a characteristic commonly associated with critical thinking, as some argue that it is not relevant to the critical thinking process. However, the concept of surprise is interesting when discussing it within the context of early years, as this might trigger motivation and inquisitiveness. Furthermore, surprise can be a sign of realisation, the 'eureka moment' in the process of emergent critical thinking.

To think creatively in critical thinking, there is a need to acquire a set of abilities and dispositions (Halpern, 1997; Fisher, 2001; Robson, 2012). There is overlap, but there are also differences, in the associated skills and dispositions attributed to each (Wechsler et al., 2018). Dispositions like willingness to take risks, confidence in self and ability, tolerating ambiguity, valuing appropriateness for purpose, confronting uncertainty, and enjoying complexity are all important (Facione, 1990; Ennis, 2016; Costa & Kallick, 2000, 2019; Perkins et al., 1993; Paul et al., 1995). Some evidence has been found for a relationship between critical thinking dispositions and creative thinking abilities (Baker et al., 2001). Paul and Elder (2007) explained: "Critical thinking without creativity reduces to scepticism and negativity, and creativity without criticality reduces to mere novelty" (Paul & Elder, 2006, p.35). This means that it is not enough to understand and analyse information, but we must use the information creatively to find alternate ways to see and solve problems. Creative thinking is not critical thinking, but to succeed in quality thinking, both constructs need to be developed (Baker et al., 2001; Wechsler et al., 2018). Unlike critical thinking, creative thinking has long had an explicit and prominent presence in early years practice (for example, Craft, 2010; Fumoto et al., 2012; Robson, 2012; Robson & Rowe, 2012), contributing to young children's development of thinking, including skills and dispositions for the development of critical

thinking (Robson, 2012). This means that this connection could provide a productive space within this thesis.

Alghafri and Ismail (2014) developed the thinking skills strategy (TS), which combined Guilford's (1967) creative thinking skills (originality, flexibility, and fluency) and Facione's (1990) critical thinking skills (interpretation, analysis, evaluation, and inference). They used critical and creative skills as interactive elements for developing year five (approximately 10 to 11 years old) students' thinking skills in science. The results showed significant positive differences between the group of children with TS training and the control group, demonstrating that appropriate instruction of infused skills can result in successful learning of critical and creative thinking skills. The researchers' recommendation was to integrate the teaching and learning of critical and creative skills into the curriculum (Alghafri & Ismail, 2014). However, this involves a 'holistic change in educational methods' (Vincent-Lancrin et al., 2019). Vincent-Lancrin et al., (2019) argued that both critical and creative thinking involve engaging in 'four categories of cognitive macro-processes: imagining, inquiring, doing, and reflecting' (p. 46). Vincent-Lancrin et al. (2019) added that both creative and critical thinking were domain-specific and required specific knowledge to develop specific skills. This gives agency to the idea that opportunities should be created for children to develop these skills.

Despite acknowledging the distinction between the constructs (Baker et al., 2001; Wechsler et al., 2018) and the rationale for this in the research literature and for practice, creativity and creative thinking skills in general are an important component of critical thinking. However, some experts, like Vincent-Lancrin, understandably emphasise the development of both terms side by side (Vincent-Lancrin et al., 2019). I will focus on critical thinking for the purpose and corresponding scope of this thesis. It is essential to investigate this gap in the context of critical thinking in young children and possibly offer some insight for inclusion in early years practice. In practice, the skills from the constructs will not be conceptualised as segregated, but dynamically intertwined. I, therefore, argue, in agreement with Halpern, that critical thinking (as the umbrella term for this thesis) includes creative thinking skills, making creativity an essential element of critical thinking (Halpern, 1997). My understanding of critical thinking resembles, in some ways, Moseley et al.'s (2005) productive thinking construct. Consequently, creativity will be of great relevance when researching critical

thinking with young children in this thesis.

2.2.3.3 Metacognition

Metacognition, 'thinking about thinking' (Flavell, 1978), is also proposed as having a similarly prominent role in the process of critical thinking, as it involves "awareness and control of one's thoughts" (Ku & Ho, 2010, p. 252). Metacognitive skills include monitoring, evaluation, and regulation of cognition (Whitebread et al., 2009), and therefore, researchers argue that critical thinking requires at certain times metacognitive knowledge (person, task, strategy) and regulation (Whitebread et al., 2009). This can elevate the likelihood of better thinking performance and possible outcomes, as 'one must continually monitor and assess how thinking is going' (Paul & Elder, p. 34). Halpern (1998) exemplifies how critical thinking and metacognition interact:

> "When people think critically, they are evaluating the outcomes of their thought process—how a good decision is or how well a problem is solved. [It] involves evaluating the thinking process—the reasoning that went into the conclusion or making a decision." (Halpern, 1998, p. 450)

Therefore, critical thinking can be perceived as "metacognitive in nature" (Halpern, 1997; Paul & Elder, 2006; Fisher, 2001). Figure 2.7 illustrates the dynamics of an imaginary thinking process in which critical thinking has taken place. The visual shows the contribution of metacognitive intervention and the change to the thinking process aligned with Halpern's vision of the role of metacognition in critical thinking. The figure shows monitoring moments followed by change, for example, Halpern's "plan-decide-act-monitor-evaluate" (Moseley et al., 2005), which had improved the thinking performance and raised the thinking threshold, the red arrows, in this particular imaginary sample. The thinker uses metacognitive skills to redirect the critical thinking process, constantly influencing the process when needed.

Therefore, in Figure 2.3, an updated version of Figure 2.2, there are shared characteristics of critical thinking. Similarly, this is the case with some dispositions. The interactions between critical thinking and these other concepts will therefore become important within this thesis as they are applied to young children's emergent critical thinking.

Thinking skills
For example skills from constructs like…

Higher order thinking skills
Lower order thinking skills
Equally necessary for critical thinking

CONTEXT

Critical thinking

Metacognitive skills

Critical thinking skills

Critical thinking dispositions

Other elements like motivation, knowledge, affect

Problem solving and decision making skills

Creative thinking skills

CONTEXT

CONTEXT

CONTEXT

CONTEXT

Figure 2.3: Dynamics and overlapping relationships between various constructs of skills and critical thinking

2.2.4 Visualising thinking constructs in practice

The most popularly accepted skills hierarchy is Lower Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS) (see Bloom's taxonomy (Bloom et al., 1956)). They are relevant to a consideration of critical thinking in early years because they represent two levels of process: LOTS (interpretation, including recall, understand, connect) and HOTS (analysis, evaluation, inference, explanation, and self-regulation) (Facione, 1990). Lower-order thinking skills are essential to the higher-order ones in critical thinking; therefore, in this thesis, despite recognising the meaning behind this hierarchy, they are both considered equally essential to critical thinking. For example, without memory to recall knowledge and understanding, and without the use of skills to be able to associate and make connections with other familiar scenarios, we would not be able to engage in higher-order thinking skills that enable critical thinking (Powel, 1987).

To start to visualise this, Figure 2.4 provides a representation of critical thinking over time and how the thinking line fluctuates from lower-order to higher-order thinking throughout the process. It illustrates how critical thinking might develop in young learners, starting with LOTS and moving to HOTS. Of interest to this thesis is what prompts thinking to move between the two levels in young children and, more specifically, what stimulates children's emergent critical thinking. For example, adult scaffolding using prompt questions.
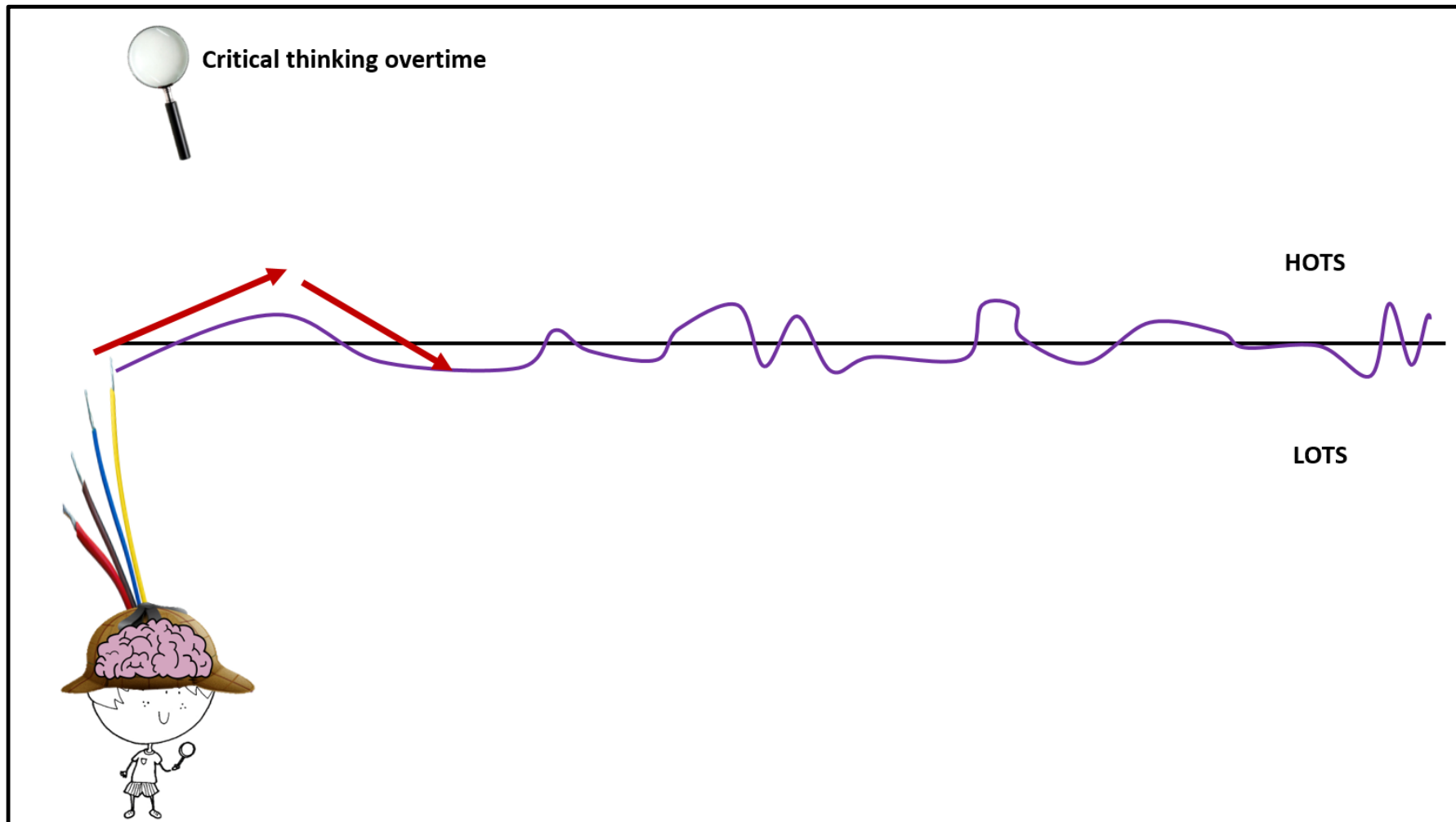
Figure 2.4: Critical thinking over time: Thinking fluctuation across HOTS and LOTS

Higher-order skills are necessary for critical thinking but, despite being useful, are not necessary for all thinking. The following sections will look at the different thinking skills in turn. If we accept that the constructs associated with critical thinking are neither exclusively organised, segregated, nor set in stone, then we need to consider how they might interact. Figure 2.5 builds on Figure 2.4, and illustrates an imaginary thinking moment in more detail. The encircled area indicates where critical thinking takes place, and other constructs' contributions to the process over time. In this imaginary context, metacognition, creativity, problem solving, and their attributed skills are key contributors to the critical thinking process. Despite creativity being key in this specific moment, this does not mean that it is exclusive to critical thinking, nor that is necessary for all critical thinking.
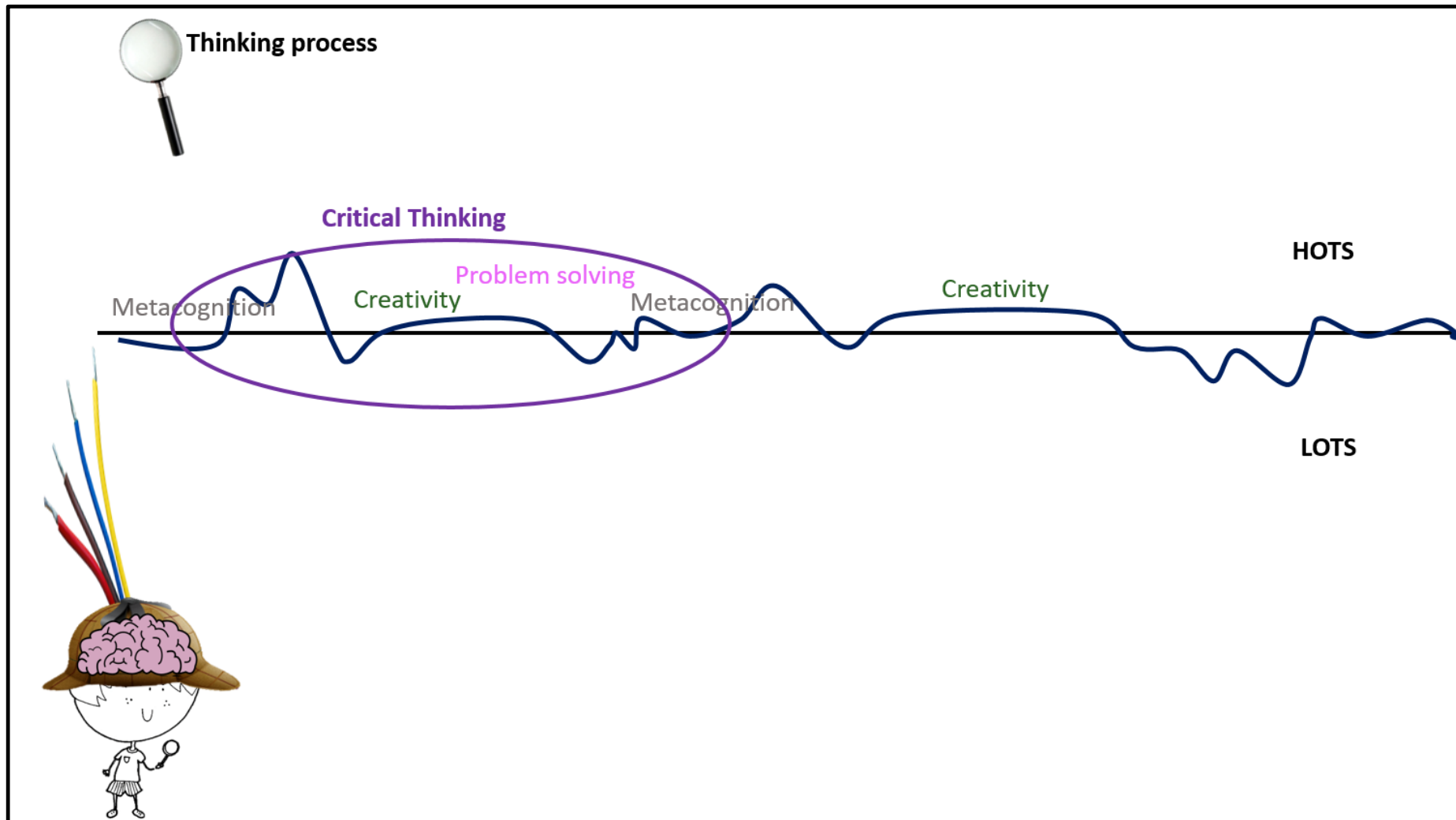
Figure 2.5: Thinking process and potential relations in practice

To continue this process of visualising thinking moments, Figure 2.6 shows an imaginary thinking episode in which critical and creative thinking skills are interwoven and interact during the thinking process. The red circles indicate the overlap between the two constructs' skills. This means that despite being different constructs, there are shared as well as exclusive skills to them. Both constructs fluctuate between LOTS and HOTS in this example. According to Fisher (2002) and Robson (2012), creative end critical thinking happens together despite being different constructs; hence, the two constructs' interaction pushes thinking between HOTS and LOTS, making critical thinking more likely.
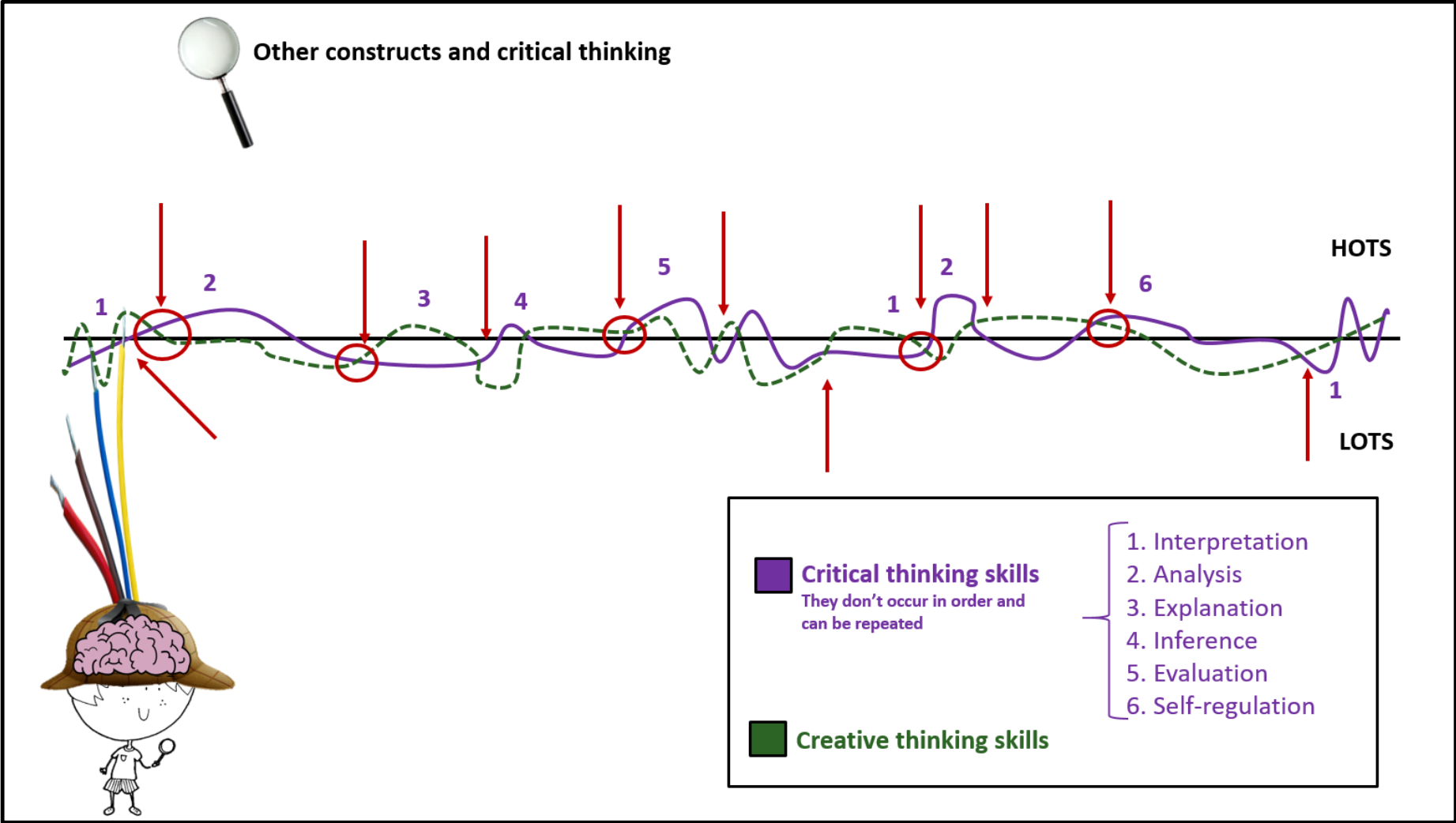
Figure 2.6: Other constructs and critical thinking interaction

A similar mapping can be done for metacognition. Figure 2.7 shows how metacognitive 'monitoring moments' followed by change, for example, "plan-decide-act-monitor-evaluate" (Moseley et al., 2005) improve the thinking performance and raise the thinking threshold (the red arrows). The thinker uses metacognitive skills to redirect the critical thinking process, constantly influencing the process when needed (Paul & Elder, 2006).

Figure 2.7 shows an experienced thinker who demonstrated metacognitive skilfulness, but it is useful, for the purposes of this thesis, to also consider someone with less experience and what this might look like. Figure 2.8, therefore, shows how a less experienced critical thinker's process is scaffolded (Vygotsky, 1978) by more knowledgeable others—adults and other children—to start moving from the lower-order thinking skills towards the use of the higher-order thinking skills. It shows limited metacognitive activity, which in this imaginary scenario is explicitly scaffolded by an adult. External influences, such as adult scaffolding (Bruner, 1966), facilitate the child to reaching the child's Zone of Proximal Development (ZPD; Vygotsky, 1978) and therefore enable going beyond what the thinker could do on their own. In other words, the figures represent what the child can do with an adult's scaffolding and potentially other external stimuli, such as facilitating pedagogy and the use of specific methods/tools, which are of interest to this thesis.
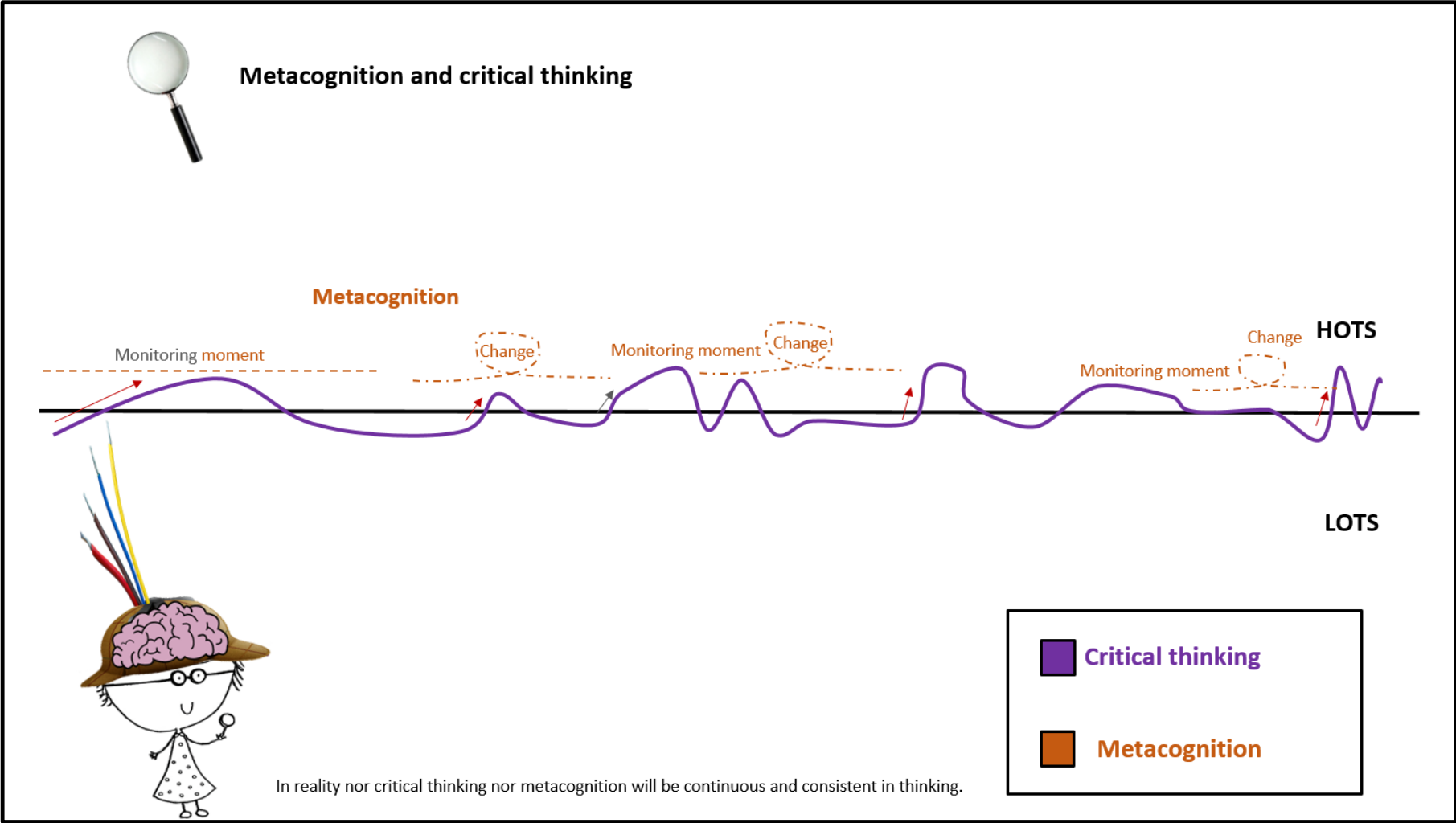
Figure 2.7: Visual representation of the role of metacognition in critical thinking
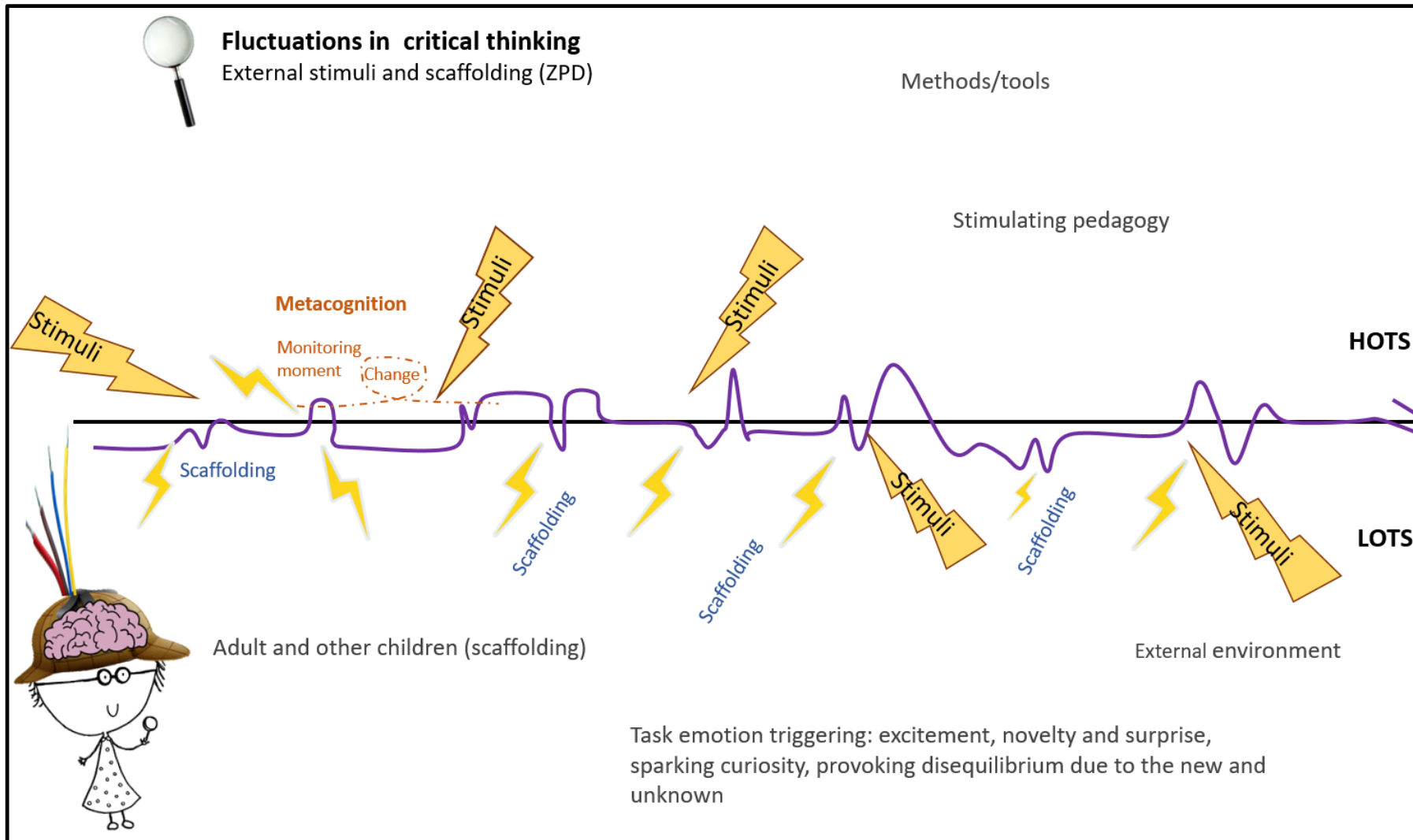
Figure 2.8: Thinking fluctuations of a novice thinker under external stimuli

Metacognition is therefore critical when intending to improve thinking, task execution, performance, and learning in general. I relate critical thinking dispositions to Facione's (1990) critical thinking disposition 'alertness to opportunities to use critical thinking' (pp. 14–15). Metacognition consists of knowledge (knowledge about self, tasks, etc.) and regulation (practical use of that knowledge) (Flavell, 1979) or metacognitive knowledge and skilfulness (Veenman et al., 2006). Ku and Ho (2010) identified the important role of metacognitive strategies in critical thinking, finding that university students using metacognitive strategies in their thinking process, evaluation, and especially planning, performed significantly better on critical thinking tasks than those who did not. Since research shows that young children are also capable of engaging in metacognitive activity (Wall & Higgins, 2006; Whitebread et al., 2009, 2012; Zike, 2021), including the use of metacognitive strategies, this could potentially be useful in relation to EY provision. They also demonstrated the importance of acquiring metacognitive knowledge in order to use metacognition to regulate thinking to effectively contribute to a critical thinking task (Ku & Ho, 2010). They concluded that teachers who aim to develop students' critical thinking should foster habits with a metacognitive nature in mind. This could include self-evaluation of task performance and understanding. Ku and Ho (2010) used the "think-aloud" method to explore the metacognitive strategies used in the critical thinking process to provide visibility of the critical thinking process.

Both critical thinking and metacognition are complex and messy in nature, which presents some challenges in their observation. They are internal in nature but also occur and develop through interaction and social contexts (e.g., Wall & Higgins, 2006). Both are challenging and require effort, and despite their higher-order categorisation, require both higher- and lower-order thinking. They are both situated and influenced by the context, and one can develop skilfulness with experience and practice across contexts. Furthermore, Zike (2021) stated that the line between cognitive and non-cognitive aspects of metacognition is blurred, acknowledging the potential influence of affect and motivation when observed in young children starting school. I share this understanding, and in the context of young children's critical thinking, I believe this does not only apply to the constructs of metacognition and critical thinking, but is also shared with other thinking constructs, such as creative thinking and even problem solving. The overlapping of interacting skills across constructs is a reflection of the messy dynamics of what thinking looks like in reality.

As I move to investigate critical thinking in early years contexts and try to observe and record thinking moments in young children, any methodological choices will need to consider and be accepting of this messiness. Researching critical thinking, as well as other constructs involving higher-order thinking, is complex. Neither children nor adults explicitly express or articulate their thought processes, for example, in relation to the activity's purpose and task solution. This is "because of its inwardness, it is difficult to observe" (Wall, 2008, p. 38). Therefore, researchers and practitioners often encounter challenges when trying to understand and examine how an individual's metacognitive processes develop, as is the case with critical thinking. Consequently, method adequacy to explore metacognition, as well as the suitability of the method adjusted to diverse participants, seems of high importance for effective evaluation. Wall and Higgins (2006) created the pupil views templates (PVTs) tool, which triggers metacognition and facilitates its articulation by young children. This method is designed to be used not only by researchers, but also by practitioners in their daily practice. Through the use of this catalytic tool, researchers found metacognitive knowledge and skillfulness in children as young as four (Wall, 2008; Gascoine et al., 2017; Zike, 2021). Such findings not only demonstrate children's competence, but also show the importance of finding appropriate methods to enable fair and rigorous research in the context of young children's thinking. This is relevant to critical thinking. For example, some investigations have not been able to find evidence of metacognitive skillfulness in children until secondary school, which Gascoine et al. (2017) related to the inadequacy of methods. This point crucially applies to young children's critical thinking research, given the relationship and shared characteristics with metacognition. Consequently, methods and approaches will require particular attention and examination for this thesis.

2.3 Critical thinking instruction approaches

Having reviewed the literature to gain an understanding of what critical thinking entails, I will examine the existing critical thinking instruction approaches to inform this study. There are a range of different instructional approaches for developing critical thinking skills and dispositions (a typology is shown in Table 2.4). Ennis (1989) simplified this field to be general and subject-specific. On the one hand, general approaches concentrate on the direct

teaching/learning of critical thinking, with infusion and immersion approaches being subject-specific and the mixed model being a combination of both. I can therefore assume that, in some approaches, success will be partially dependent on children's understanding of technical language regarding critical thinking. In the infusion approach, both abilities and dispositions are explicitly taught. In the immersion approach, however, the principles are likely to be more implicit (Ennis, 1989).

Table 2.4: CT instruction approaches (adapted from Ennis, 1989).

CT INSTRUCTION APPROACHES	General approaches (CT as content and examples given in informal content)	Subject-specific approaches (formal/informal content)		
		Infusion approaches	Immersion approaches	Mix-model approaches
Explicit instruction	●	●		●
Implicit instruction			●	●

Content in teaching critical thinking and learning can be formal discipline-specific or more informal content of everyday life events (Facione, 1990). Background knowledge (informal/formal content) is necessary, however, to engage in critical thinking activity in that particular topic or field (Lai, 2011; Facione, 1990). In the context of young children, the content, therefore, needs to be of a familiar topic (which can also include general everyday knowledge and experience) and of interest to children in order to engage learners. If teachers are to use the abilities and dispositions mentioned above explicitly in instruction, it implies the need to 'translate' those into a comprehensive language for young children.

Some experts believe in direct methods prepared for the explicit purpose, rather than using indirect teaching/learning, since these skills are subject-related (Coles & Robinson, 1991; Lai, 2011). Others argue that transferring critical skills to a new context can be challenging, but possible (Cottrell, 2011; Facione, 1990). Fisher (2001), in the book *Critical Thinking: An Introduction,* used a direct approach to critical thinking instruction and aims to teach skills to transfer critical thinking competencies to different contexts (transferable skills). The book

questions the effectiveness of implicit teaching because not all students are able to develop these skills when blurred and embedded in a context (Fisher, 2001). In addition, he suggested specific skills, followed by a demonstration of skill transference to different contexts. Ennis (1963) stated that there are people who are able to think critically in certain fields but not in others, and therefore suggests the need to develop tests for all subjects in order to gain a good overview. Therefore, it seems essential to include critical thinking explicitly in both teaching and learning by providing opportunities to practise all aspects (Lai, 2011). Halpern (1998) sees the main goal of critical thinking teaching as learning "trans-contextual thinking skills" (p. 451), arguing that the purpose of most instruction is knowledge acquisition rather than transferability. Halpern's (1998) model of teaching thinking skills for transference includes dispositions, abilities, transference, and metacognition.

Apart from learning how to transfer from one context to another from a productive and practical point of view, it is also important to acknowledge that critical thinking must be exercised in certain circumstances. Hence, children need to learn to identify key moments and decide what they should think critically about, and in which circumstances they would need this investment. Not all moments will require them to apply critical thinking skills or dispositions (Vincent-Lancrin et al., 2019); it might not always be useful, and it can even become counterproductive. For example, choosing the garden spade colour for planting a new flower should require less effort and thinking investment than choosing which flowers to pick in an arrangement for a special event. This means that, as important as it is to develop critical thinking skills, it is also important from a pedagogical perspective to create time and space, which allow sensitivity to those key moments to be developed when it is useful. Therefore, it is essential to investigate next the practices that would facilitate this in the context of the early years.

2.4 EY pedagogy and critical thinking

Reviewing the instructional approaches, general and subject-specific (immersion, infusion, and mixed model approaches), led me to think about how they actually fit into pedagogical

practices that are associated with stimulating critical thinking in the early years classroom context.

Thinking does not occur isolated from its context. It is important to examine which contextual characteristics are helpful for facilitating critical thinking in the context of early years. Furthermore, in this study thinking is situated within the social context, possibly constructed within and influenced by interactions of the surrounding relationships. For this reason, apart from what is purely contextual, it is key to distinguish and examine which relational characteristics within these interactions are useful to facilitate young children's critical thinking.

Lack of attention to relationships is criticised and opposition by those framed as relational pedagogies. Despite the interaction between relationships, type and quality being a fundamental core in learning and development of thinking in the early years, relational pedagogies argue and advocate for the level of authenticity and value given to pedagogical relationships in early years educational policy and practice. Some like Cliffe and Solvason, (2022) argue that the focus is insufficient.

2.4.1 'Traditional' practices and critical thinking

In searching the available literature in relation to what aspects and pedagogical practices were useful, or not, for facilitating the development of critical thinking in the early childhood setting, I found a number of studies that referred to 'old-fashioned' practices and the ways they inhibited this type of thinking (e.g., Fernández-Santín and Feliu-Torruella, 2017; Heyman, 2016; Murphy et al., 2014; Dewar, 2014; NAEYC, 2011; Karin-Hognestad, 2010; Ku, 2009; Paul et al., 1995). In line with this trend in the literature, I will use this 'traditional' versus 'more contemporary' binary vision in this section. I acknowledge, however, that in practice, it is far more complex, less polarising and more blurred than how it will be portrayed here.

Pedagogic practices stereotypically labelled as 'traditional' have been commonly criticised as not catering to the development of critical thinking in children (e.g., Fernández-Santín & Feliu-Torruella, 2017). This category refers to mainstream practices that have remained consistent across generations, with little attention paid to change in relation to the world and new

research knowledge related to how children learn and develop. They are often characterised as adult-centred, in which learning is acquired through repetition and rote learning rather than a process of active construction and meaning making. Additionally, learners are often perceived as having a 'lower status' in comparison to teachers; they are viewed as incomplete adults (Uprichard, 2008). Pedagogical practices categorised in this way can still be seen across the world in mainstream education, including early years education, despite some experts claiming that they do not comply with how young children develop and learn 'best' (Nutbrown, 2011). They can also be seen in the literature focusing on the facilitation and development of critical thinking (Fernández-Santín & Feliu-Torruella, 2017; Dewar, 2014; NAEYC, 2011; Karin-Hognestad, 2010).

Arguments against 'traditional' education in relation to fostering critical thinking seem to be connected to the following four categories: the utilised methods, adult's beliefs related to knowledge and learning, imbalanced power relationships between adults and children, and learners' participatory role. For example, in relation to teaching methods, 'traditional' schooling has been criticised for adopting methods "to reduce the complex to the simple, giving students formulas, procedures, shortcuts" (Ku, 2006, p.3). Hence, the argument is that simplifying the learning process can inhibit one from more effortful thinking and profound learning. These methods are argued to significantly increase the specific task 'learning' speed but are unlikely to enable learners to transfer knowledge across different contexts without further understanding and skills acquisition. Fernández-Santín and Feliu-Torruella (2017) argued that some early years teachers remain inexperienced regarding the implementation of other unconventional approaches, and therefore, can tend to shift to the familiar 'traditional' methods that do not particularly contribute to the stimulation and development of critical thinking (p. 50). They claim that early years teacher training, for example, focuses mainly on specific subject content teaching, or academic content, but lacks instruction in innovative methods and teaching the subject using alternative philosophies (Fernández-Santín and Feliu-Torruella, 2017).

The lack of clarity about what critical thinking is and how it should be implemented in teaching practice tends not to come from a lack of teacher interest in learning new, innovative ways to facilitate critical thinking (Vincent-Lancrin et al., 2019), but rather from an inherent bias

within the system towards the traditional, especially when faced with something new. Paul and Elder (2007) stated that "teachers are able to foster critical thinking only to the extent that they themselves think critically" (p. 5). Teacher training is, therefore, necessary to support the development of young children's critical thinking skills (Murphy et al., 2014, 2016). Teacher training providers are responsible for including successful approaches to promoting critical thinking skills in their teacher training programmes (Rodd, 1999). Researchers should be aware of institutions, classroom ecologies, and current research and be able to identify teachers' and institutions' needs to succeed in the implementation of programmes (Murphy et al., 2016). In other words, the communication between different professionals working around critical thinking theory, practice, and research needs to be open and flexible for effective implementation.

Despite the choice of methods and the role of teacher training in providing alternative tools and skills for teachers to challenge 'traditional' practices, the teacher's beliefs related to knowledge and learning are also found to be crucially influential and a potential impediment to stimulating critical thinking. This is because 'traditionally' students who replicate content were, and in some contexts still are, evaluated as knowledgeable (Paul, 1992). Learners are often taught to solve problems and answer specific questions, but it is sometimes taken for granted that success in a task might include thinking about the how, who, when, what, and why, and involve understanding the process. Learning, therefore, in a 'traditional' schooling sense, does not always involve understanding, which is in contradiction with a critical model of education (Paul et al., 1995). Ku (2009) suggested that to become competent in critical thinking, "students must go beyond absorbing textbook knowledge and learn to build up skills involved in judging information, evaluating alternative evidence and arguing with solid reasons" (p. 1). Karin-Hognestad (2010) labelled the notion of teaching as transmission as a 'political danger', as children are inhibited from learning how to understand, evaluate, and question and are 'guided to already defined goals' (p. 156). This means that pedagogies to support this move from traditional to more innovative approaches that facilitate critical thinking become important and give relevance to this thesis.

Apart from the adult's beliefs regarding development and learning, the relationship between teachers and children could also impact the development of critical thinking skills (NAEYC,

2011). Dewar (2014) agreed that, as well as with the more general notion that 'traditional' teaching can discourage children's thinking, in the 'traditional' education context, the power imbalance between the "competent" teachers versus the not yet "complete" child might lead the child to holistically believe adults without questioning any of their statements (Dewar, 2014), as they can be perceived as irrefutable facts (Paul et al., 1995). Hence, it is important that the communication between the teacher and children is open and nurturing, where children are invited to take risks to create their own ideas (NAEYC, 2011) without the perception of it as 'challenging the authority' (Heyman, 2016). In other words, critical thinking involves practice to evolve; therefore, children need to feel free to express themselves (Florea & Hurjui, 2015). Additionally, these power-imbalanced relationships can also pressure children to respond with what the adult wants to hear, such as memorised conventional answers without thinking (Dewar, 2014). This leads them to take a passive role in their learning. This is conflicting both from the critical thinking teaching and learning perspective and arguably related, from a children's rights point of view, specifically in reference to the United Nations Convention on the Rights of the Child (UNCRC) Articles 12, 13, and 14 (Unicef, 1989). Moreover, it can be argued that such practices may constrain children from learning about their rights in relation to freedom and voice and exercising them, as well as limit opportunities for developing critical thinking.

Beyond the notion of traditional versus more contemporary practices, Karin-Hognestad (2010) points out that contradictory lenses pressurise early years teachers and practice and impact the development of critical thinking in young children. On one side, there is increasing academic pressure (disabling participation and limiting the development of thinking), while on the other, there is a movement that advocates children's rights and children's active participation (Karin-Hognestad, 2010). This tension endangers potential opportunities for teachers to implement 'risky' practice aligned with children's rights approaches, which might naturally occur in daily situations, including 'practical decision making when getting dressed for outdoor play' (Karin-Hognestad, 2010, p. 155). She stated that 'critical thinking is related to children's rights because such thinking presupposes active participation in relation to meaning making' (Karin-Hognestad, 2010, p. 155) and emphasised the role of active participation in enabling critical thinking in early years settings.

In 'traditional' educational settings, children tend to hold a more passive role in comparison to the very active teacher who might dominate the discourse, yet the learner's degree and type of participation has been found to be significant in the context of developing thinking and learning in the 21st-century classroom (Karin-Hognestad, 2010; Vincent-Lancrin et al., 2019; Fernández-Santín & Feliu-Torruella, 2020; Florea & Hurjui, 2015). In the context of young children, Nutbrown (2011) stated the following:

> "the implication that learners are passive and non-participating beings in the process is both misleading and insulting. Children are active, enquiring learners who need to learn with and through interaction with knowledgeable educators and their peers." (Nutbrown, 2011, p. 149)

The role of interaction, for example, dialoguing, discussing, challenging, reasoning, and the questioning act, are all shown to be of great importance for developing critical thinking (Wegerif, 2010; Quinn, 1997; Murphy et al., 2014). Murphy et al. (2014) showed that language skills were precursors to critical thinking and that dialogue, in addition to play, supported the development of critical analytic thinking skills in early childhood interactions. Quinn (1997) also saw questioning as "activation of young minds", and concluded that the quality of instruction was linked to the quality of the enquiry: questioning that will not be "shallow-end or right-answer" (Quinn, 1997, p. 79). This is in contrast to 'traditional' pedagogic practice, where the role of questioning seems to be underestimated (Paul et al., 1995). Therefore, despite discourse and interaction being essential to promoting critical thinking, they can be 'traditionally' perceived as disturbances in the classroom rather than a tool to promote and scaffold thinking. To use verbal communication as a pedagogical tool for both students and teachers, there is a need to reconsider classroom rules regarding oral expression and better understand the role of speech in the daily routine (Murphy et al., 2014).

Overall, 'traditional' practice has been criticised for inhibiting space for developing critical thinking due to the adult-led approaches and methods (affected by beliefs) that encourage students' passive behaviour (such as limiting learning to listening and superficial rote learning), control over freedom of speech or other spontaneous engagement, and other behavioural perceptions within adult–child interactions, like those related to 'respect' (perceptions such as 'questioning someone' being equal to disrespectful behaviour). The

Delphi report (1990) stressed that "one cannot overemphasise the value of a solid liberal education to supplement the honing of one's CT [critical thinking] skills and the cultivating of one's CT dispositions" (Facione, 1990, p. 5). Consequently, there is a need to critically question current educational teaching approaches and purposes and re-evaluate what acquiring knowledge and learning is, to be able to teach and learn for critical thinking (Paul et al., 1995). Despite these criticisms, it is not clear whether disagreements regarding the polarisation and preferences related to teacher-led versus child-led or mixed approaches remain. In relation to the adult's role in supporting children's learning and critical thinking. Lechelt et al. (2020) found certain limitations to children working on their own, but were opposed to disregarding its fundamental value. They alleviated the limitations by offering and encouraging 'cognitive guidance' that can be prompted through conversation, collaborative work in pairs, instruction, and other kinds of help, such as journal resource support within an exploratory open-endless learning environment (Lechelt et al., 2020). Powell (1987) added that an effective approach towards critical thinking development is facilitating and guiding learning rather than its instruction, especially when facilitated in a problem-solving situation where the focus is on the learning process rather than on the solution. They underlined the need for challenging but resolvable situations to engage children in critical-thinking activities (Powell, 1987).

Despite some diversity in perspectives, there seems to be some consensus on what general aspects are important to consider when aiming to facilitate an environment for critical thinking. Among these are awareness and consideration of the following:

- the choice of methods;
- the impact of adults' held beliefs about learning;
- mutual, balanced, and respectful adult–child relationships; and
- active participation (supported when needed)

Consequently, these are of key importance in relation to informing and decision making in this thesis, as I try to overcome some of these challenges by exploring alternative pedagogies, including play-based methods, to facilitate critical thinking in the context of early years.

2.4.2 Pedagogies for facilitating critical thinking

Based on the discussion above, I can conclude that not all pedagogies are equally effective in facilitating critical thinking (Vincent-Lancrin et al., 2019; Fernández-Santín & Feliu-Torruella, 2020). It is complex to even talk about the generalised idea of *pedagogies*, with the exception of 'signature pedagogies' (Shulman, 2005) or 'holistic pedagogies', which are 'structured pedagogical models' that dictate specific approaches founded within a particular educational philosophy (Vincent-Lancrin et al., 2019, p. 100). This is because there are a vast number of mixed pedagogic formulas in which diverse philosophies, theories, and practices interact, blend, and complement each other, thus making them unique in context. Therefore, it is complex to generalise and, accurately and comprehensively, label those across cultures, as well as explicitly talk about their specific values and niche elements.

Taking this into account, and the fact that there is insufficient published research in relation to critical thinking and specific learning contexts (Vincent-Lancrin et al., 2019, p. 100), it is even more challenging to identify which individual unique elements make a pedagogy more successful for critical thinking or whether it is due to the combination that derives from a holistic approach. Finding this out is of primordial interest to this thesis. For example, Fernández-Santín & Feliu-Torruella (2020) claim that the adoption of the Reggio Emilia philosophy can foster critical thinking in 2-year-old children. This was studied in an atelier, using art as the vehicle of expression. The researchers proposed adopting the eight axes of Reggio Emilia as a pedagogic conceptual framework (Fernández-Santín & Feliu-Torruella, 2017) for critical thinking, which includes:

- The environment as the third teacher (three educators: teachers, students, and environment);
- The hundred languages of children;
- Long-term projects;
- Teacher–researcher;
- The image of the infant;
- Negotiated learning;
- Documentation; and
- Social relations (Fernández-Santín & Feliu-Torruella, 2017, p. 55).

Alternatively, Vincent-Lancrin et al. (2019) created a conceptual rubric framework for designing unit plans and assessments that could be tailored into diverse pedagogical practices and philosophies. Hence, the framework did not limit or restrict the practitioner from adopting a specific pedagogical model. They claimed that critical-creative thinking involved engaging with four cognitive macro-processes: 'Imagining, Inquiring, Doing, and Reflecting' (Vincent-Lancrin et al., 2019, p. 46). These conceptual OECD (2019) rubrics were used to design approximately 100 lesson plans across 11 countries over a period of two years. In addition to the rubrics, professionals were asked to design plans that were engaging, flexible, and open-ended, emphasising the process over answers. They added the need to create an environment in which children felt free to take risks and in which making mistakes was positively perceived as a learning opportunity. Given the request, it can be deduced that these were seen as potentially essential elements to facilitate critical and creative thinking in children aged ten years and over. Based on its open nature and the playful pedagogy underpinning this study that resembles/fits with government-supported Scottish early years play-based pedagogy, I seek to understand whether this is useful with young children, too, and to seek appropriate contextual adaptation if needed in the particular context. The results from the study demonstrated that it was possible to teach and assess critical-creative thinking using these rubrics as the baseline for design.

Vincent-Lancrin et al. (2019) also reviewed the following pedagogies that were potentially useful in facilitating critical and creative thinking:

- Creative partnerships;
- Design thinking;
- Dialogic teaching;
- Metacognitive pedagogy;
- Modern band movement (music education);
- Montessori;
- Orff Schulwerk (music education);
- Project-based learning (science education);
- Research-based learning;
- Studio thinking (visual arts education); and
- Teaching for artistic behaviour (visual arts education) (p. 100-123).

Despite having little guidance from the literature in the context of relating critical thinking to teaching and learning contexts, some of the above pedagogies share commonalities that enhance active learning and creativity (Vincent-Lancrin et al., 2019). This includes fostering intrinsic motivation; respectful relationships; quality dialogue between children and adults; flexible use of space and time; a balance between independent work and opportunities to collaborate; a balance of freedom and structure; the acceptance of non-conformity; and, usually, the creation of an artefact or performance' (Vincent-Lancrin et al., 2019, p. 100). This is an important contribution to take into account when designing the methods as well as the codes for analysis in this study. Similarly, Fernández-Santín & Feliu-Torruella (2020) also highlight the importance of relationships, cooperation, active learning and freedom and space for critical thinking. Florea and Hurjui (2015) stress the importance of creating time and space, active participation, cooperative and collaborative small group work, encouraging independent thinking and providing freedom of expression, in their Reading and Writing for Critical Thinking (RWCT) programme for elementary school children. They also add that the teaching environment needs to appreciate critical thinking and that a programme that fosters critical thinking should depart from curiosity in the first place (Florea & Hurjui, 2015).

In contrast, in Kamarulzaman and Kamarulzaman's (2016) study, teachers claimed that the use of specific questioning targeting Higher Order Thinking Skill (HOTS) was useful for students' critical thinking. This involved a more direct approach to explicitly asking students to engage with critical thinking skills within task resolution. By asking specific questions, for example, that required children to analyse and apply knowledge directly, children were able to engage with those demands, but with the condition that the understanding was there (Kamarulzaman & Kamarulzaman, 2016). Despite differences in the nature and context of this study, these findings are relevant, as the strategic questioning tool could be incorporated in the context of early years play-based pedagogy to support and stimulate children's thinking during play.

Inquiry learning has been shown to be another way of encouraging direct engagement with some of the processes involved in certain critical thinking skills. According to Klefstad (2015), an inquiry-based learning environment can foster critical thinking as they are naturally scaffolding environments that can enable children to investigate, make predictions, ask

questions, and probe multiple perspectives, among others (Klefstad, 2015). Similarly, Lechelt et al. (2020) used an exploration-based learning approach while also using physical artefacts to promote critical thinking in the topic of technology with 9-11-year-olds. In this type of approach, researchers stated that it was possible to gain a deeper understanding of technology through engagement with and practice of critical thinking, which involved questioning knowledge, testing understanding, and acknowledging limitations, among others. In contrast with the direct approach used by teachers in Kamarulzaman and Kamarulzaman's (2016) study, Lechelt et al. (2020) found that 'even though they were not explicitly asked to engage in a structured scientific enquiry process during the exploratory activities, they did so', for example, by engaging in hypothesis building, making inferences and analysing observed data (Lechelt et al., 2020, p. 10- 11). Consequently, researchers have shown the potential of open-ended, hands-on activity design to promote curiosity and critical thinking about data (Lechelt et al., 2020, p. 11).

According to Lechelt et al. (2020), physical experimentation with artefacts is key for promoting reasoning and critical reflection (p. 10). Furthermore, the manipulatives provided the opportunity to 'relate abstract data to a lived experience, and observable unexpected sensor behaviours that caused the children to step out of the hands-on activity to reflect about the data in relation to their actions' (p. 9). In other words, the artefacts helped contextualise the abstract into a meaningful concrete context, as well as the opposite, by encouraging children to take distance for reflection. This exploration triggered thinking about the topic or the phenomena at hand, but also by 'enabling the child to manipulate what is being sensed on their bodies provides a personal testing ground that can foster the development of critical thinking skills' (Lechelt et al., 2020, p. 10). Their results also showed the following:

> 'Experiencing unexpected sensor behaviours' was a good way to prompt critical thinking. Because these effects ... promoted much verbal reflection between the children about how the sensors worked, and about when they broke their expectations. This suggests that a good strategy for promoting critical thinking is to provide activities which are meaningful to the child ... puzzling or ... ambiguous

... this makes them stop and think why it is showing a given reading, especially if

it is contrary to what they expect.' (Lechelt et al., 2020, p. 10)

This means that experiencing something surprising and unexpected, triggered or prompted critical thinking, as it led children into stopping and trying to understand and explain the phenomena further. Consequently, given the important role of manipulation of physical artefacts in early childhood general learning context and development, it is reasonable to think that, as in Lechelt et al.'s (2020) study, it will also be suitable in the context of this thesis. Hence, it is reasonable to consider the inclusion of inquiry learning and the use of physical artefacts when designing and making decisions that are related to this thesis' methods.

2.5 Summary

In this chapter, I reviewed the most relevant literature and formed an understanding of what critical thinking entails in the context of this thesis. This included the conceptualisation of critical thinking, which helped me develop my definition for this study. My definition highlighted the use of both specific context-dependent skills and dispositions and stressed the process over the outcome. I explored what skills and dispositions were central for critical thinking and adopted Facione's (1990) six critical thinking abilities (interpretation, analysis, evaluation, inference, explanation, and self-regulation) and 12 dispositions (e.g., inquisitiveness with regard to a wide range of issues) to have a concrete practical frame as a foundation and starting point to observe the young children in this research study. I also examined the complex and messy relationships with key associated constructs, such as creative thinking, problem solving, and metacognition. Exploring associated constructs helped clarify how they differ, interact, and on occasion overlap in practice. This clarification is particularly useful when considering the early years context and when thinking about how critical thinking and other constructs might manifest integrally in a young child's thinking moment.

I used diagrams to aid in the visualisation of potential thinking moments, which could be helpful as a technique for thinking about the observations of critical thinking in the early years. The use of such a technique facilitated the visualisation and understanding of the

thinking theory, what children's thinking moments may look like and the potential impact of pedagogical practice (e.g., specific strategies, intervention) on the fluctuation of children's emergent thinking. I also reviewed the most common approaches to critical thinking instruction, which mainly differed in whether they involved explicit or implicit critical thinking instruction or whether they were contextualised in general or subject-specific teaching and learning environments, which was useful for questioning the suitability of the instruction against the play-based subject-integrated early years curriculum.

Furthermore, I have also discussed the literature related to pedagogy and critical thinking, more specifically focusing on practices associated with constraining and facilitating critical thinking. In this review, aspects related to methods, the vision of children as thinkers and learners, power relationships, and participation were highlighted as key areas to consider. Moreover, problem solving, exploration, inquiry, cooperation and collaboration, dialogue, surprise, active participation, motivation, curiosity, asking target questions, and freedom and independent thinking have been found to be useful pedagogic principles for facilitating critical thinking. These were all influential, as I developed a method suitable functionality-wise, as well as appropriate for the age of the children targeted in this thesis, and will be combined with Facione's (1990) list of skills and dispositions as a concrete starting point for observing critical thinking with the children in this study.

Given that this thesis focuses on young children (early years Primary 1 context), it was important to consider pedagogically appropriate approaches and methods that were useful when working with young children while at the same time being respectful of their needs and capabilities. Since the role of play is crucial in the holistic development of the child (including thinking) (Lunda, 2022) and playful pedagogy is widely recognised as successful and encouraged in the context where this thesis was undertaken (CfE: Scottish Government, 2019), I decided to use detective mystery role play because it integrated and incorporated the various elements that were found useful in the literature connected to early years pedagogy and critical thinking. More specifically, this choice allowed me to combine role-play (the act of pretending to be a particular character) with inquiry, problem-solving and questioning. In this thesis detective role-play consisted of the following:

*Impersonating a professional (**detective expert role-play**) whose job is to investigate a mystery (**inquiry**) and consequently find out what has occurred (**problem solving**) by drawing reasoned conclusions based on the interpretation and analysis of the evidence (**critical thinking skills and dispositions**).*

By detective impersonation, I anticipated that children might resort to role-playing behaviours, values, and language that would typically be associated with detectives in the process of becoming experts, and that this would be useful for critical thinking. This relates to Heathcote's Mantle of Expert (MoE) educational approach, in which drama and *becoming* an expert play a powerful role in the implementation of curricula and authentic learning (Heathcote & Bolton, 1995).

According to Heathcote and Bolton (1995), drama, especially expert character immersion (becoming the character), enables engagement *"both cognitively and affectively and requires them not merely to replay and repeat their existing understanding but to see the world afresh"* (Heathcote & Bolton, 1995, p. 8). This is because, they argue, *"thinking from within a situation immediately forces a different kind of thinking"* (Heathcote & Bolton, 1995, p. 7). The set imaginary context considers time, space, role, and situation (Heathcote & Bolton, 1995, p. 7), making it rich, complex, and meaningful for thinking and learning. For this thesis, adopting the detective character contextualised by a problem to investigate was hoped to provide a rich experience for facilitating and exercising critical thinking. For the purpose of this thesis, I therefore design four different detective mystery-solving tasks (experiences).

With this literature in mind, I formulated the following research questions:

1. **What are the relational and contextual characteristics inherent in facilitating critical thinking using detective mystery play?**

2. **What are the benefits and constraints of the four different detective mystery play cases to facilitate and investigate Young Children's Critical Thinking? (Key design ingredients and implications)**

3. **How do young children's critical thinking skills and dispositions manifest and what does critical thinking look like in 5-6-year-olds' detective play?**

Chapter 3 Methodology, Methods, and Analysis Approach

3.1 Introduction

I have conducted a qualitative multiple case study to seek answers to this thesis' three research questions. In this chapter, I present and justify my general methodological choices, which were made to fit the purpose of this study. These choices enabled me to openly explore the critical thinking phenomenon in the context of young children's play and, in particular, explore answers from an interpretivist-social constructivist (Vygotsky, 1978) lens (Creswell & Poth, 2018; Denzin & Lincoln, 2011). I will also provide a detailed account of the method, data collection, and analysis. The choice of methods was of critical importance in this thesis, as it was, to a great extent, a methodological study in its nature. Moreover, in this chapter, I will give insight into my epistemological positioning, meaning the relationship and degree of proximity to knowledge, by discussing my outsider teacher–researcher and insider participant teacher–researcher position by reintroducing some of the notions discussed in Chapter 1 (positioning section). This is relevant and important to consider, since my background, experience, and research positioning impacted my design, as well as the data production, analysis, and interpretation. Consequently, I interpret children's critical thinking based on what children said and did through my professional early years practice lens, which is influenced by my early years teacher education, experiences, and background.

Additionally, it is worth mentioning that, due to the significance of ethics when researching critical thinking with young children, and particularly the matters of young children's consent in this thesis, I have devoted the entire Chapter 4 to it. In Chapter 4, therefore, I will also discuss and justify the methodology and methods related to the ongoing informed consent process with the young participants in this thesis. In Chapters 5, 6, 7, and 8, further case-specific methodological content will be provided.

3.2 Qualitative multiple case study

The present qualitative study is a multiple-case study that aims to find answers to the following research questions:

1. What are the relational and contextual characteristics inherent in facilitating critical thinking using detective mystery play?

2. What are the benefits and constraints of the four different detective mystery play cases to facilitate—and investigate—young children's Critical Thinking? (key design ingredients and implications)

3. How do young children's critical thinking skills and dispositions manifest and what does critical thinking look like in 5-6-year-olds' detective play?

The three research questions determined the choice of a qualitative study, as my aim was to openly explore and obtain a descriptive account of what critical thinking looked like in the context of young children's detective (mystery-solving) play and to understand what it was that facilitated and stimulated such thinking. Therefore, due to the nature of enquiry and since critical thinking has not been previously researched within 5-6-year-old children's detective play in early years settings, it was necessary to adopt an open, inductive, and explorative approach. Qualitative enquiry, therefore, enabled me to understand and study in detail the descriptive accounts and qualities of the critical thinking phenomenon within social play in four different contexts. Despite acknowledging the value of what a quantitative approach could offer in terms of sample, representation, and generalisability, preceding with a qualitative approach was found to be crucial for opening the paths of 'what', 'how' and 'where' to look for in future quantitative, mixed methods and further qualitative research studies.

In addition, to understand in detail the novel phenomena under investigation, I chose to conduct a multiple case study (Stake, 1995; Yin, 2014; Merriam, 1998; Creswell & Poth, 2018). This enabled me to undertake an in-depth descriptive exploration of the phenomenon using multiple sources of data (Hancock & Algozzine, 2006). In this study, these four cases were four different play experiences developed specifically for this thesis. Moreover, my interest lies in understanding "what it is, what it does", emphasising particularisation and complexity over

generalisation (Stake, 1995, p. 8). To do this, I explored children's interaction with each other during play, with self (their own articulated thinking), the environment, tools, and other materials; therefore, this particular approach of design enabled me to "look for detail of interaction with its context" (Stake, 1995, p. 11).

Exploring the phenomenon within its particular context is the key to case studies (Creswell & Poth, 2018), and in this study, the context was of key importance, as the four cases were the four different detective play experiences with overarching core similarities. Contexts are in interaction with whoever is engaged in or part of them; hence, they can influence (to a higher or lower degree) participants' thinking, behaviour, and, consequently, performance. Therefore, these contexts and associated methods needed to be carefully studied for potential influences on participants' performance, keeping in mind each case's uniqueness, as "we do not study a case primarily to understand other cases" (Stake, 1995, p. 4). Multiple case studies were used, with each case being a different play experience that was not only bounded to the context, but was part of the context (blurring the boundaries) of the complex phenomena under investigation.

All the cases entailed children engaging in mystery solving through enquiry, but each offered differences in the context of the children's performance and type of interactions. This, in turn, provided a rich and in-depth description of the critical thinking phenomena, as well as the opportunity to explore the potential elements that were perceived as most beneficial, or limited the facilitation of critical thinking. This investigation, therefore, not only sought to understand the critical thinking phenomena, but also sought to understand in detail the possible effects (benefits and constraints) of those methodological differences in the phenomena itself.

A phenomenological study (Van Manen, 1990, p. 38; Farrel, 2017, 2020; Creswell & Poth, 2018), focused on investigating young children's experiences of the phenomena of critical thinking, was considered. A phenomenological study would have been similarly interesting and provided an important contribution to the knowledge. However, a phenomenological study would have focused more on the experienced phenomena itself rather than on the more practical methodological aspect of facilitating the phenomena or the teaching and learning aspect for actual implementation in the early years classroom. This leads to the

chicken or egg metaphor once again in this section. Due to my practice background and inherent motivation for producing pedagogical knowledge that can be directly applicable to inform current practice, I considered at the time that the current multiple case study and its focus would meet the more urgent needs of practice and hence make the most suitable design for this thesis.

3.3 Research design

The challenge of researching human thinking is widely acknowledged. Thinking is internal in its nature and is, in that sense, an 'invisible' process to the outsider if it is not manifested through verbal, written, or other symbolic language such as body language or art. When researching young children's thinking, the challenge can increase if the context of research and the methods used are not catching children's attention, are not meaningful for the participants, and are effective in capturing the different ways young children communicate. To tackle these challenges, based on my experience working with young children and grounded in the early years pedagogy research literature, I considered that it was important to create a design that was:

- **Thought-provoking and catalytic in the manifestation or expression of critical thinking** through involving inquiry-based learning and problem-solving contexts to provoke intellectual curiosity in children (as established in the literature review).
- **Pedagogically appropriate** (pedagogically appropriate practice and research methods with young children) (Wall, 2019; Arnott & Wall, 2021).
- **Play-based** for active, meaningful, effortful, and enjoyable participation (Arnott & Wall, 2021).
- Appropriate fit with **data recording tools that ethically** (see Section 4.3.2) **and efficiently capture and record young children's various modes of expression.**

To increase the probability of triggering thinking and children's manifestation of thoughts and thinking processes for the purpose of this research, I designed four mystery experiences (cases) in which the aim was for the children to understand, reason, and try to resolve various mystery scenarios adopting the role of a super detective.

The cases were designed to be solved with the support of a team of super detectives (a group of children and myself), which aimed to trigger both individual and collective critical thinking. The research interest, however, did not lie in whether children succeeded in solving the mysteries, but in the thinking, procedures, and used strategies that emerged during the activities. I will also examine the usefulness of these methods for stimulating or inhibiting children's thinking to answer my research questions.

Throughout this thesis, the term experience will be used to address the four detective mystery cases. This is important because it takes inspiration from Dewey's (1938) theory of education for experiential continuity and growth.

3.3.1 Research process

For the children to inhabit their detective role, I first explained the process of research using my specially designed picture book *Super-detective/researcher Lore & Co*. This picture book gave children an understanding of what was going to happen so that they could decide whether they wanted to take part in the research, and therefore facilitated visual expectations regarding the role they were going to adopt. I hoped this would make the children aware that I was interested in finding out how children think and solve 'difficult puzzles'. I also, as portrayed in Figure 3.1, offered each child equipment including a 'deerstalker' super-detective hat, a personalised ID badge, a magnifying glass, tweezers to collect evidence, a detective notepad to take notes, and an iPad for the group to document their discoveries, among others. Again, this reinforced the key messages of intent and participation. These tools also carried significant ethical considerations (discussed further in Chapter 4).

In this way, the detective role-play aimed to stimulate the adoption of the role of a professional and competent inquirer who needed to think critically to actively and efficiently solve the encountered mysteries.

Figure 3.1: Detective gear, including detective badge, deerstalker hat, magnifying glass, data collection tools such as notebook and crayon, and evidence-picking tweezers.

3.3.2 Research schedule

Figure 3.2 displays the voluntary research schedule (if children could or wished to participate) for the four activities (cases). The colour coding in the figure corresponds to each specific case throughout the thesis to visually aid the reader: picture book 'case 0' (pink), case 1 (blue), case 2 (orange), case 3 (green) and case 4 (purple).

Some children did not participate in all the activities or in the same groups. Additionally, some children in *Aspen Primary School* experienced *Snack Mystery* before the *Zoo Mystery Experienc*e for pragmatic reasons at the time. Following the order was generally considered beneficial in relation to experience, skill building, and role acquisition, but it was not essential, and context and individual circumstances took priority.
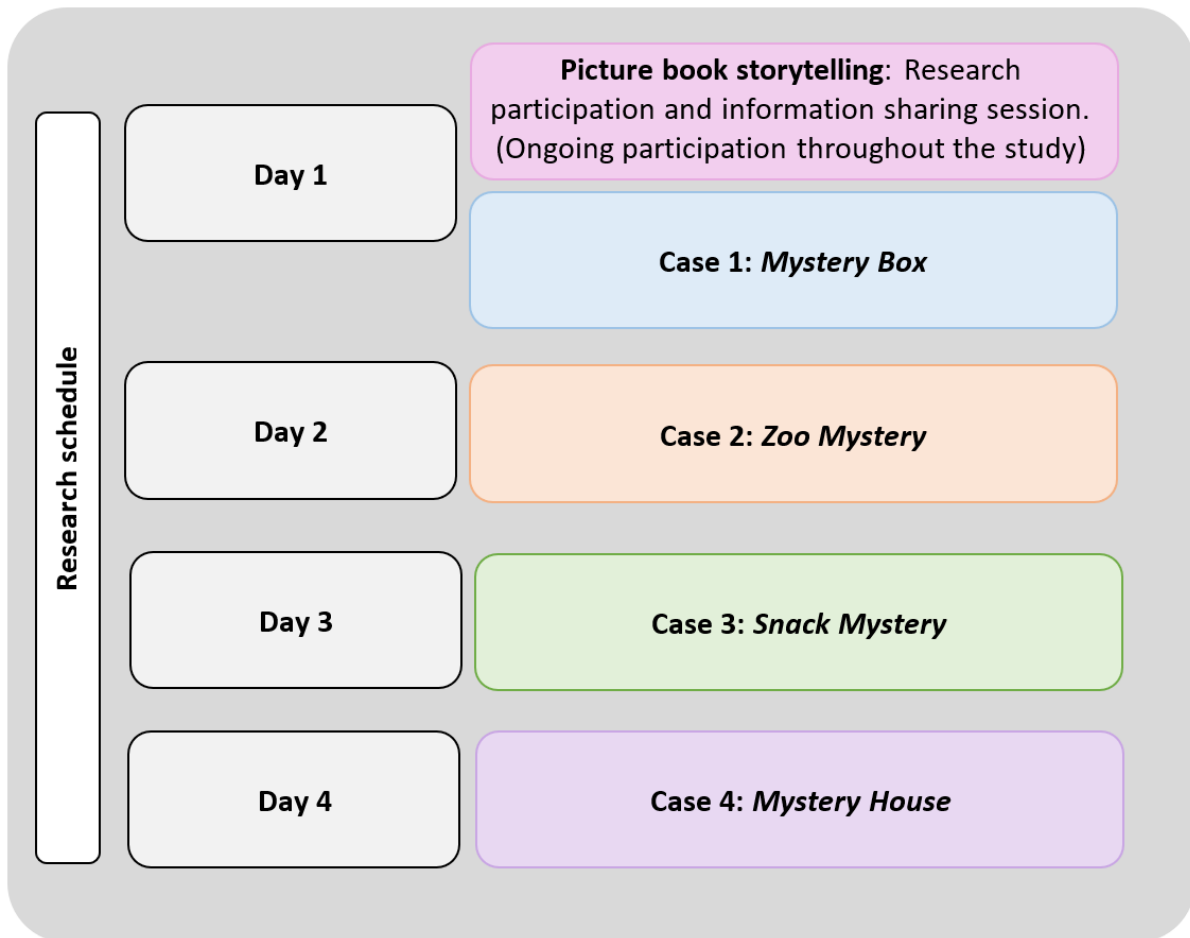
Figure 3.2: Proposed research schedule per team of detectives

3.3.3 Cases

Figure 3.3 shows the four different cases and the distinct detective experiences of the children. The overarching aim of these experiences was to provide time, space, and a meaningful context for stimulating and exercising 5-6-year-old children's critical thinking. Furthermore, the goal was to create experiences that stimulated engagement and curiosity, critical thought and its manifestation, and enabled multiple forms of communication (e.g., movement, verbal, written, artistic), individual work, and teamwork while emerging in a problem-solving role-play experience.

In more detail:

- The *Mystery Box* consisted of developing 'productive' questions with the ultimate goal of finding out what is hidden in the box. This activity mostly involved cognitive and communication skills.

- The *Zoo Mystery* was designed as a more traditional theme-based learning activity—common in schools working with a project learning approach—which consisted of the detectives investigating and designing a zoo that would accommodate various animal needs. The challenge was to select, discuss, reason, and make decisions based on their knowledge. The activity involved cognitive skills, communicative skills, teamwork skills, artistic skills, using knowledge about geography and the animal world (knowledge-dependent to some degree), as well as using resources to acquire further information.

- The *Snack Mystery* was designed as a real-life simulation mystery role-play, where detectives needed to explore by moving around the scenario, looking at and analysing material evidence, to find out who committed the snack robbery. The activity mostly involved cognitive skills, observational and analytical skills, communicative skills and teamwork skills, documenting and physical skills, as well as using resources to enquire about further information.

- The *Mystery House* consisted of investigating the mysteries occurring in small-scale doll houses. On this occasion, the children's detective role was represented by a Playmobil® figure.

FOUR CASES: FOUR DETECTIVE EXPERIENCES

Picture book storytelling: Research participation and information sharing session via storytelling and discussion.

Case 1: *Mystery Box*

Description: Guessing game (asking, remembering and guessing) 'detective' training game (aot an authentic investigation).

Key activity: Formulate question, remember clues, and make guesses to find out what's is in the box. Familiarising with and adopting a detective role.

Case 2: *Zoo Mystery*

Description: Researcher/animal 'detective' zoo designing teamwork project (resembling a more 'traditional' school project).

Key activity: Plan and design a zoo considering the habitat, animal, and customer needs. Plan, research, learn and use design learning. Adopting a researcher/animal 'detective' role.

Case 3: *Snack Mystery*

Description: Simulation of a forensic scientist 'detective' investigation (forensic simulation experience, use of scientific method and tools).

Key activity: Investigate, analyse, relate each piece of evidence and meaning-making of the clues in context and scenario following the 'scientific method and tools'. Physically and through manipulatives compare/contrast, discard, link. Adopting a forensic scientist 'detective' role.

Case 4: *Mystery House*

Description: Small scale 'Sherlock' private detective observation-based role-play (small world observation and interpretation activity).

Key activity: To engage in theorising, creative/alternative thinking, hypothesis building. Focus on observation, interpretation and theorising. Adopting a traditional Sherlock private detective role.

Figure 3.3: Summary of the cases, description, and learning skills focus.

The four different problem-solving cases required different kinds of prior knowledge, capabilities and behaviours. The intention, however, for all cases was not to make the children's success dependent on this. Both the *Snack Mystery* and the *Mystery House* required the use of previously learnt abilities and knowledge (what they already knew), but success was predominantly based on inferring new information from the context through observation and interpretation of provided evidence (which was possible to do by themselves). One example was to figure out whether John (the character) was lying when he said he did not have a bath, when the flooring was wet and the soap position suggested otherwise. The *Zoo Mystery* also involved the use of what they already knew or experienced, but the search for new information (natural sciences fact seeking, for example) was much more necessary in comparison to the other three cases: identifying what was not known (often in the form of questions), searching for information, and finding answers to new questions (e.g., finding out what giraffes eat in order to locate them in the zoo). Lastly, in the *Mystery Box,* the children did not require specific content knowledge, but rather, learnt general knowledge and experiences in order to observe and make meaning of the information to solve the mystery. The only way to obtain the information was by formulating questions to the person hiding (as this type of information is not of static knowledge) or suggesting guesses that would help form an idea of the hidden item or discard objects that did not longer fulfil the given criteria (use previously learnt strategies or develop new ones). Even though experience in playing or formulating questions would have been of great benefit, it was not compulsory for success.

The following table (Table 3.1) describes and illustrates the differences between each of the detective cases. The specific detailed design of each case study scenario will be outlined within the relevant case chapters (Chapter 5, 6, 7, and 8). Since I have taken the case study approach for this thesis, providing this level of detail in the next chapters will be crucial because each of the four contexts and their particular key elements will contribute towards influencing and informing each of the case studies, as it is characteristic of the case study approach (Stake, 1995).

Table 3.1: Cases and differences across the four *Mystery* cases.

Simplified case review/assessment		*Mystery Box (MB)*	*Zoo Mystery (ZM)*	*Snack Mystery (SM)*	*Mystery House (MH)*
General distinctions	**Type of mystery investigation**	Not a real/authentic investigation in itself. Served as a 'training' for investigation, familiarising and adopting a detective role. Context for 'activating' detective role-play behaviours and enquiry skills.	Research and use knowledge about the topic to apply in the design of a zoo. Resembling a more 'traditional' school project compared to the rest of the cases (new questions, wonders about grouping and habitats). The notion of play could be challenged by some, excluding Part 2.	Scientific–forensic. Use of scientific methods and tools.	Traditional Sherlock detective mystery.
	Specific 'detective' role	Asking, remembering, and guessing 'detective'	Researcher/animal 'detective'	Forensic scientist 'detective'	'Sherlock' private detective
	Goal	Goal: Question > Clue > Guess	Goal: Plan and design a zoo considering habitat, animal, and customer needs. Plan, research, learn, and use learning in design.	Goal: Investigate, analyse, and relate each piece of evidence and meaning-making of the clues in context and scenario, following the 'scientific method and tools'. Physically and through manipulatives, compare/contrast, discard, link.	Goal: To engage in theorising, creative-alternative thinking and hypothesis building. Focus on observation, interpretation, and theorising.

Table 3.1: Cases and differences across the four *Mystery* cases (Cont.).

Simplified case review/assessment		Mystery Box (MB)	Zoo Mystery (ZM)	Snack Mystery (SM)	Mystery House (MH)
	Specific objectives (indicates level of broadness)	Specific objectives: -To adopt and familiarise themselves with the detective role/mindset and the idea of mystery solving. -To engage in object analysis. Think about parts of the whole and particular characteristics of different objects. 'Perception-awareness' and verbal description. -To formulate questions to obtain relevant information. -To remember and use information to form guesses. -To talk and start thinking about 'wild' – 'good' (educated) guessing and to familiarise themselves with language connected to thinking, detective mysteries, investigation, tools, etc.	Specific objectives: -To engage in research/inquiry. -To become familiar with resources and learn how to use them to benefit zoo design. -To engage in thinking about the content, sharing, and discussing with others. - To reflect upon the content (researched and already known) and use content to plan and design. -To collaborate and collectively discuss, plan, make decisions, and help each other.	Specific objectives: -To engage with scientific methods of investigation and become aware of the practice (evidence, organisation, tools to explore and record data, process of meaning making, testing, and conclusion drawing). -To learn to use scientific tools to aid investigations. -To identify evidence and analyse. (To engage in skills of compare/contrast, discard, connect, inferencing, hypothesising, testing, and verifying). -Understand and relate evidence and build an understanding of what could have happened based on the findings/ discoveries. -To collaborate and collectively explore, discuss, and help each other.	Specific objectives: -To identify clues. -To interpret clues (what they are, what they mean in context, and in relation to the question rather than to focus on thorough analysis of each particular piece of evidence, as in the *Snack Mystery*). -To theorise, engage in possibility thinking and alternative ways of looking at evidence. To collaborate, exchange, and collectively discuss different points of view if given the situation.

3.4 Methods of data collection

The main method of data collection was observation. I used two types of observation to ensure a rigorous exploration of each case, the children's experiences within it, and the types of thinking that emerged:

- **Direct observations** were undertaken while actively participating in detective play and offered opportunities not only to observe closely but also to ask questions, request clarification, and contribute as a participant and researcher in the moment. This was recorded in field notes and a research journal, but also in the informed analysis of data captured through the video (in the actions I took and questions I asked). To supplement my field notes, children's drawings, notes, photos, and pictures were also collected to aid this direct observation process.

- **Video- and audio-mediated observations** enabled reflection and analysis after the event. These were useful since I was also able to observe and reflect upon my own participation, engage in reflexive practice, and explore in detail the actions and talk of the children as they participated in the activities. This is because video observations enable the capture of the 'pedagogical complexity of classrooms' (Cutter-Mackenzie et al., 2015, p. 3).

My active participant role within the detective experience inhibited me from taking detailed and complex field notes at the moment. This is because being the group's only adult required multitasking and alertness to the overall picture, predominantly to ensure the group's well-being, among others. The use of a video recording camera, however, provided an effective solution to the issue, as it captured information while being focused on the children and the experience itself. It also provided a richness of information, as I was able to look at the multiple modes of young children's communication (verbal and non-verbal), hence recording what they said and what they did. The video recording device was also a powerful tool because it captured the interactions and events of different parties that were happening simultaneously. For example, it would capture someone's private speech when working on the mystery while I was working elsewhere. This exceeded the limitations of what I, as a participating human, could reach by enabling the evidence of children's critical thinking, and

overall, giving visibility to the voice that could otherwise be overlooked. Additionally, the video allowed me to capture and follow individual and group timelines, which led to the development of Critical Thinking Moments.

The ability to replay the videos repeatedly was also important, as there were moments when I was not able to hear. This could be because of environmental noise or language issues (English is my third language and was some children's second language, and some children had additional pronunciation difficulties or additional support needs that affected language use). Furthermore, due to the length and complexity of the experiences (see Table 3.5 on p. 86) it was impossible to rely entirely on my working memory.

Despite being useful for capturing information that was possible to replay again, video also provided the valuable opportunity of stepping back and taking distance for analysis, including self-reflexive analysis, critical assessment, and general reflection. Overall, video-mediated observation was chosen to ensure an accurate, transparent, and rich picture of the scenario, transcription, and later analysis.

Backup audio recordings were also collected, for instance, when the camera's audio was not completely effective. The background noise in the schools was sometimes high, and sometimes we, the participants, also contributed background noise when placing the tripod at a distance. This made removing the background noise and nonrelevant sounds ineffective at times.

The methods were considered to be supporting and complementary, and were used in combination within each case, as shown in

Figure 3.4. The types of raw data grounding this thesis, therefore, consist of the following:

1. Video (audio-visual transcription), camera was set up to get the widest view, but also in a way to ensure that it was not in the way (not a trip hazard).
2. Audio (audio transcription), use of phone placed as close to the main activity as possible and moved to reflect the positioning of other noises in the classroom.
3. Researcher's reflective field notes (notes taken periodically before, during (taking care not to interrupt the activity), and after the data collection procedure).
4. Children's detective notes (drawing and/or writing).

5. Photographs (taken by participants and the researcher).

6. Collectively produced physical products (e.g., zoo poster).
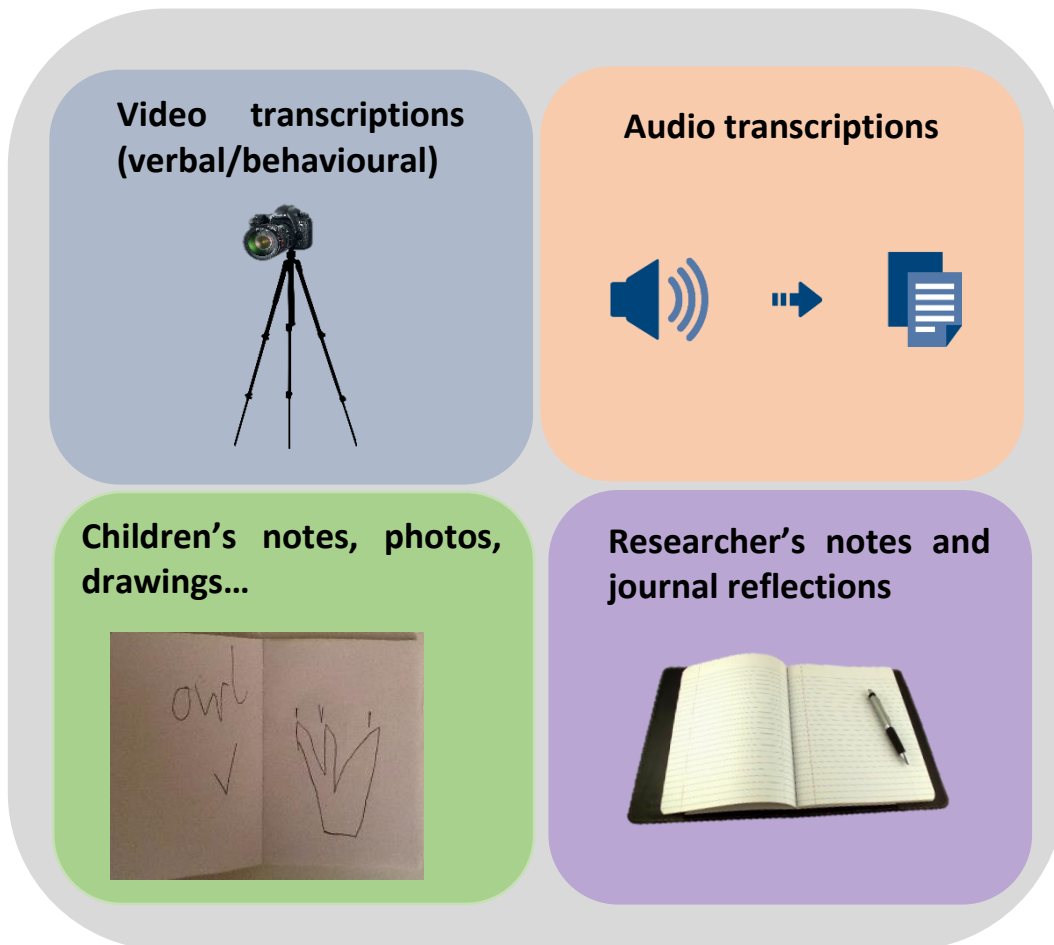
Figure 3.4: Summary of types of raw data and recording devices

Overall, the different methods for collecting data provided a rich picture for investigating children's critical thinking (see Figure 3.5, Figure 3.6, Figure 3.7).

Figure 3.5: Video recording capture of Maria taking a photograph (Maria, Birch Primary School)
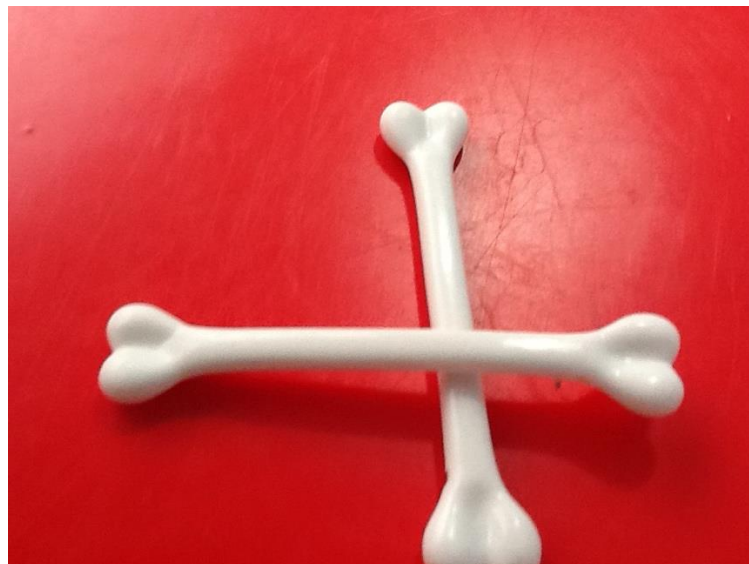
Figure 3.6: iPad photograph taken by Maria (Maria, Birch Primary School)

Figure 3.7: Maria is sharing the photograph with the other detectives (Maria, Birch Primary School)

A total of 16 hours of data were recorded, approximately 1 hour (information picture book) of audio (uniquely audio) and 15 hours of video. These were heard and viewed multiple times, and any relevant data regarding the research questions were transcribed. I will provide detailed information related to the quantity and type of data in each specific case chapter, for example, sample visuals and how many reflective notes, children's notes, and photos were produced and analysed. The details of how these data were collected are followed up in the ethics chapter (as the design and the use had to be inherently ethical) and also in the case chapters, where specific activities dictated specific data collection processes.

3.5 Pilot study

The pilot study was executed in Chestnut Nursery, a small setting with an approximate capacity of 30 children. They had four rooms, including one for children 0-2 years old and another three separated open-flow spaces for children aged 2-5 years old in which the pilot took place. The children had different daily schedules; therefore, they did not always attend the nursery on the same days and times. This meant that the expected age group of 4-5-year-

olds did not coincide. The eight children who ultimately participated in the pilot study were 2-4 years old. As shown in Table 2, two children were aged 2 years, six children were aged 3 years, and two children were aged 4 years (see also participant list in Section 3.6, p. 82).

The pilot study was carried out across four different days, as shown in the schedule in Table 3.2. At the initial meeting, I made arrangements with the head of the nursery and was given a tour of the setting before commencing the pilot study. To build rapport, I took some time to meet, talk, and play with the children. The first part of the pilot study consisted of information sharing and discussion through the picture book storytelling session. This session was performed with two groups of children. This pilot experience demonstrated that picture book storytelling was a useful tool for communicating and discussing research information and matters of participation with children. This is discussed in further detail in Chapter 4. The children in both groups welcomed the novelty of detective play and expressed a willingness to participate in the coming experiences. Before immersing in the pilot detective experience with both groups, I read a detective-themed story to the children to familiarise them and engage them further with their detective role. In addition, I provided the children with detective gear. I then piloted the *Mystery Box* once and the *Snack Mystery* with both groups. The children in both groups showed interest and were actively engaged in the experience. However, I confirmed my initial belief that the design, materials, and tools of the detective cases as developed would require further modification for the youngest participants. That is not to say that a similar case could not be designed for that specific context, but rather that it would have to be adapted. For example, the size and quantity of the clues, as well as the choice of tools and storylines, were not appropriate for the youngest children. Therefore, due to practical considerations and the critical importance of methodology and tools in this thesis, I decided to carry out the main study in a Primary 1 school setting where the same children would be more likely to attend school on a daily basis and ensure a more homogenous age group (5-6 years old) to avoid excessive modification of the already developed design, tools, and materials.

Table 3.2: Pilot study (Chestnut Nursery setting)

DATES	PARTICIPANTS AND AGE	CASE
DAY 1 16/04/2018	4 participants/group -Clara (4) -Jerry (3) -Walter (4) -Henry (3)	CASE 0: INFORMATION SHARING STORYTELLING
DAY 2 17/04/2018	4 participants/group -Clara (4) -Jerry (3) -Walter (4) -Henry (3)	CASE 3: SNACK MYSTERY
DAY 3 18/04/2018	4 participants/group and 1 teacher -Abba (3) -Sean (3) -Oliver (3) -Hugo (3) -Teacher	CASE 0: INFORMATION SHARING STORYTELLING
	6 participants/group -Abba (3) -Sean (3) -Oliver (3) -Hugo (3) -Carter -Fiona	CASE 3: SNACK MYSTERY
DAY 4 23/04/2018	4 participants/group -Sean (3) -Carter -Nadia* (2) -Nina* (2)	CASE 1: MYSTERY BOX
TOTAL 4 DAYS	**8 PARTICIPANTS PILOT STUDY**	TOTAL PILOT STUDY ACTIVITY EXPERIENCES **5** PB 2 + MB 1 + SM 2 = 5

The pilot study was useful to inform the main study. I explored what worked and did not work to better understand its suitability for the main study and to make the necessary adjustment according to these findings. Changes and decisions were made before proceeding to the main study. Table 3. 3. provides a summary of the most prevalent issues that had to be addressed throughout the pilot study and informed decision-making related to the main study.

Table 3.3: Summary of issues identified throughout the pilot study, changes to the main study and main study decision-making

Main pilot changes and main study decision-making	
Identified incident/issue	Solution/ action taken
The study included a wide range of small manipulatives for hands-on detective play participation. The participants' age range in the pilot was younger than previously informed, hence the design of some of the items was not suitable for that age. Incident: One child was exploring a small manipulative and then the child attempted to insert the object into a body orifice. This was considered potentially dangerous.	Altering the detective experiences, modifying physical materials and adapting tools for the youngest children would be required. Instead, the solution chosen was to focus of 5-6-year-old children, which was the original plan.
The age gap covered a wide range of developmental differences (2-5-years-old).	For the particular purpose of this study, age wise a more homogeneous group would facilitate research preparation and practice. Therefore, focusing on a more limited age range was the chosen solution.
Children attending the setting varied in schedule, hence this could potentially complicate childrens' participation in the different detective experiences.	The chosen solution was to find a setting in which children would regularly attend, so that they would be able to have the opportunity to participate in all the detective experiences if they wanted to do so. Children from Primary 1 class within school settings were chosen for the main study.
Lots of stimulation could potentially distract some children from the main goal or focus of the study.	Keeping it organised and simple and avoiding unnecessary additional distractions was the chosen solution for the main study.

Researching within the proximity of other groups' activities was important but it also became distracting at times. For example, you could hear other groups singing.	The solution was to emphasise to the settings' gate keepers the importance of finding a peaceful and relatively quiet environment (for example class corner) for the children to focus in detective play with visibility and close proximity to the main group.
Despite ongoing consent, children consent sheet was piloted as an additional step in the process of ongoing informed consent. This was however not thought to be meaningful or productive in the context of this study. Instead, it felt like an additional administrative burden. It felt like a distraction to paint (sign) this form to formally consent, which also required additional attention span and energy needed for the main experience.	The solution was to continue to maintain the children consent form (written assent form) attached to the legal guardians consent forms but to actually remove this formal written step from the process of data collection with children (detective play).

These challenges and solutions derived from the pilot study were considered for the development of the main study. In addition, the researcher's reflective and reflexive practice continued beyond the pilot study. I maintained an open and flexible mind, ready to modify when facing the unexpected and while learning from children's needs and performance. For example, the house mystery experience was developed and fully constructed after the main study had begun. Therefore, in this case I can show that I learnt from children's thinking and performance and modified or developed what was needed throughout the detective experiences too.

3.6 Sample

Twenty-four children participated in the study (see Figure 3.8). They were all in Primary 1 and 5-6 years old at the time of data collection and belonged to two school settings (named Aspen Primary School (APS) and Birch Primary School (BPS) in this thesis). Both schools are located in an urban environment in Scotland.
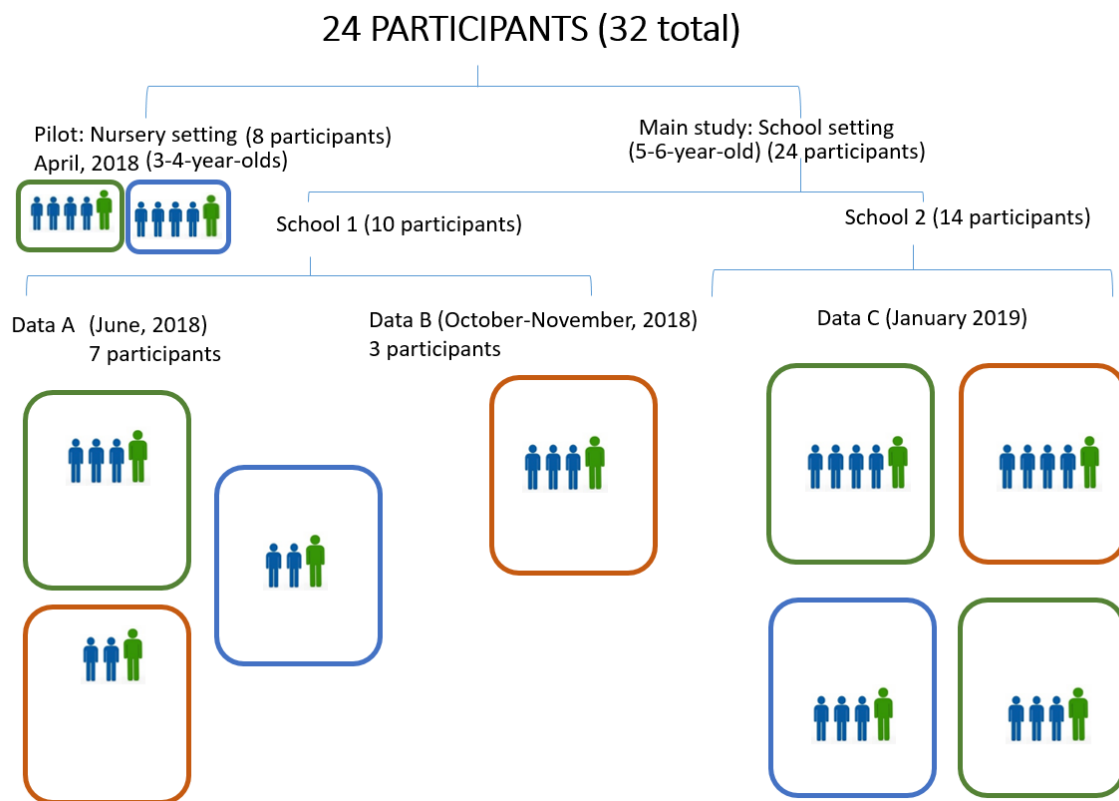
Figure 3.8: Mapping of settings, participants, and groupings

The four detective mystery experiences took place within the children's school settings between 2018 and 2019. Researching in participants' natural settings is common practice in qualitative research (Creswell, 2014). Among the benefits behind this practice is the familiarity of space, belonging provides security (safe space), and the research does not alter normal daily routines that could potentially constrain natural behaviours. The experiences were designed for a small group in order to stimulate focused interaction and performance, and so the children worked in teams of two to four, depending on the case and practicalities of the context. A larger group might elicit thinking in many different directions, which in this

context could be difficult to follow as well as keep in children's working memory. Therefore, it was considered important to give children the chance to share and interact with each other's ideas, opportunities and potentially extending and encouraging new ways of thinking.

The two school settings differed from one another in multiple ways. Aspen Primary School was located in an area with a diverse socioeconomic environment in the 10% most deprived areas, according to the Scottish Index of Multiple Deprivation (2020). Within the setting, according to the head teacher, the number of students with additional support needs was almost 50%. The ratio of children with severely restricted vocabulary and use of language was high, and a plan was set in practice to improve and contribute towards tackling the issue. Traditional, teacher-directed teaching and learning approaches were prevalent. Having said this, the head teacher's goal was to move towards a more child-centred and play-based approach to teaching and learning, which he described as being resisted by sceptical teachers. In total, ten Aspen Primary School children aged 5-6 years participated in this research.

Birch Primary School is located in a predominantly mid-to-high socioeconomic background area. The pedagogical approach in practice was predominantly child-centred and play-based. Children showed significant skilfulness in the use of language in addition to a rich and resourceful vocabulary. In total, 14 Birch Primary School children aged 5-6 years participated in this research.

The above institutions were selected on a first-come first-served basis, as they had fulfilled the following four main criteria:

1. The institution should share and express interest in the study.
2. The study aims to research 3-6-year-old participants; therefore, the institution should include a 3-6-year-old group (minimum of four children).
3. Participants, 3-6-year-old children, should attend the early years institution regularly (an average of two to three times per week).
4. The institution should have a spacious classroom space to allow all play activities and recording devices to be completed uninhibited. The location within the facility was discussed with the staff, as they indicated what space was convenient for me to use in order not to disrupt the rest of the children in the classroom.

Overall, the schools at the time mainly differed in pedagogical approaches, as Birch Primary School had a more play-oriented pedagogy and Aspen Primary School had a more teacher-directed approach to teaching and learning. Table 3.4 below shows that, in total, 32 children took part, of whom only 24 were participants on the main study. The other eight children formed the pilot study with younger children. In total, 10 children from Aspen Primary School and 14 children from Birch Primary School participated in the main study, all from Primary 1.

Table 3.4: Participant information.

PARTICIPANT INFORMATION				
Main study/ pilot	PARTICIPANTS (pseudonym)	PERCEIVED GENDER	PRIMARY SCHOOL (pseudonym)	SCHOOL YEAR
MAIN STUDY	1. Katia	Female	Aspen Primary School	Primary 1
	2. Holly	Female	Aspen Primary School	Primary 1
	3. John*	Male	Aspen Primary School	Primary 1
	4. Mia*	Female	Aspen Primary School	Primary 1
	5. Miles	Male	Aspen Primary School	Primary 1
	6. Tim	Male	Aspen Primary School	Primary 1
	7. Cira*	Female	Aspen Primary School	Primary 1
	8. Diana*	Female	Aspen Primary School	Primary 1
	9. Frida*	Female	Aspen Primary School	Primary 1
	10. Leo	Male	Aspen Primary School	Primary 1
	11. Bruno*	Male	Birch Primary School	Primary 1
	12. Ava*	Female	Birch Primary School	Primary 1
	13. Marc	Male	Birch Primary School	Primary 1
	14. Stella	Female	Birch Primary School	Primary 1
	15. Amanda*	Female	Birch Primary School	Primary 1
	16. Maria*	Female	Birch Primary School	Primary 1
	17. Will*	Male	Birch Primary School	Primary 1
	18. Robin	Female	Birch Primary School	Primary 1
	19. Anais	Female	Birch Primary School	Primary 1
	20. Isla	Female	Birch Primary School	Primary 1
	21. Cooper	Male	Birch Primary School	Primary 1
	22. Elaine	Female	Birch Primary School	Primary 1
	23. Ruth	Female	Birch Primary School	Primary 1
	24. Lara	Female	Birch Primary School	Primary 1
PILOT STUDY	25. Abba	Female	Chestnut Nursery	3-year-old
	26. Sean	Male	Chestnut Nursery	3-year-old
	27. Oliver	Male	Chestnut Nursery	3-year-old

	28. Hugo	Male	Chestnut Nursery	3-year-old
	29. Jerry	Male	Chestnut Nursery	3-year-old
	30. Walter	Male	Chestnut Nursery	4-year-old
	31. Henry	Male	Chestnut Nursery	3-year-old
	32. Clara	Female	Chestnut Nursery	4-year-old
TOTAL SUMMARY	**Total main study:** **24 children** **32 including 8 nursery pilot study** participants * 10 mixed ethnic background origin. Differences in schools 1 & 2	A total of 16 female and 8 male children in the main study 18 female and 14 male children, including the pilot study (2 female and 6 male)	In total, **10 participants from Aspen Primary School and 14 participants from Birch Primary School**	Average age in **Primary 1 is 5 years old** Average age in **nursery setting is 3-4 years old**

Data was collected in four data sets. Here is a summary timeline of data collection:

- Dataset P: April 2018 (Pilot data collection)

- Dataset A: June 2018 (Aspen Primary School)

- Dataset B: October 2018–November 2018 (Aspen Primary School)

- Dataset C: January 2019 (Birch Primary School)

Table 3.5 shows further details on data collection as organised by case. It also provides specific details on groupings, dates, and duration of the experiences per case.

Table 3.5: Main study.

CASES	ACTIVITY No.	DATE	No. PARTICIPANTS	SCHOOLS	DURATION	AVERAGE DURATION	No. PARTICIPANTS/CASE
CASE 0: PICTUREBOOK	1	05/06/2018	2 participants/group	APS	4'15''	Average 8'/ session 1-hour audio recording/8 sessions	8 SESSIONS APS 10 (12 of which 2 children repeated) + 14 BPS = 24 **24 CHILDREN**
	2	05/06/2018	3 participants/group	APS	8'55''		
	3	08/06/2018	4 participants/group (incl. 2 repeating children)	APS	8'40''		
	4	09/10/2018	3 participants/group	APS	13'51''		
	5	10/01/2019	4 participants/group	BSP	8'20''		
	6	10/01/2019	4 participants/group	BSP	7'40''		
	7	21/01/2019	3 participants/group	BSP	9'		
	8	21/01/2019	3 participants/group	BSP	4'30''		
CASE 1: MYSTERY BOX	9	05/06/2018	2 participants/group	APS	23'51''	Average 33'/ 5 session 2.76 hours video recording/5 sessions	5 SESSIONS **TOTAL CHILDREN: 16** APS 8 + 8 BPS = 16
	10	05/06/2018	3 participants/group	APS	29'58''		
	11	09/10/2018	3 participants/group	APS	52'5''		
	12	10/01/2019	4 participants/group	BSP	29'13''		
	13	10/01/2019	4 participants/group	BSP	31'15''		
CASE 2: ZOO MYSTERY	14	08/06/2018	4 participants/group	APS	59'56''	Average 50'/ session 4.16 hours video recording/5 sessions	5 SESSIONS **TOTAL CHILDREN: 18** APS 10 + 8 BPS = 18
	15	30/10/2019	3 participants/group	APS	66'59''		
	16	30/10/2019	3 participants/group	APS	42'22''		
	17	14/01/2019	4 participants/group	BSP	38'53''		
	18	14/01/2019	4 participants/group	BSP	42'37''		
CASE 3: SNACK MYSTERY	19	13/06/2018	3 participants/group	APS	66'7''	Average 65'/ session 4.35 hours video recording/4 sessions	4 SESSIONS **TOTAL CHILDREN: 14** (APS 6 + 8 BPS = 14)
	20	09/10/2018	3 participants/group	APS	46'46''		
	21	15/01/2019	4 participants/group	BSP	74'52''		
	22	16/01/2019	4 participants/group	BSP	72'8''		
CASE 4: HOUSE MYSTERY	23	07/11/2018	3 participants/group*	APS	56'46''	Average 38'/ session 3.8 hours video recording/6 sessions	6 SESSIONS **TOTAL CHILDREN: 14** (APS 3 + BPS = 14)
	24	17/01/2019	2 participants/group	BSP	37'4''		
	25	17/01/2019	3 participants/group	BSP	25'7''		
	26	17/01/2019	3 participants/group	BSP	33'2''		
	27	21/01/2019	3 participants/group	BSP	29'58''		
	28	21/01/2019	3 participants/group	BSP	29'58''		
TOTAL CASES: 5	TOTAL MAIN STUDY ACTIVITY EXPERIENCES: **28 CASES** PB 8 + MB 5 + ZM 5 + SM 4 + HM 6 = 28		APS 10 (12 of which 2 children repeated) + 14 BPS =24 **24 PARTICIPANTS MAIN STUDY**	Aspen (APS) and Birch (BPS)	Approximately 16 hours audio/video recording/28 sessions		APS 10+ 14 BPS (3 REPEATED) = **24 PARTICIPANTS**

3.7 Analysis

In this section, I will describe and justify the research approaches and procedures involved in the data analysis. I will attempt to provide transparency by discussing and reflecting on my analysis choices and providing examples, as I share Braun and Clarke's (2006) mindset that providing "clarity around the process and practice of method is vital" (p. 7) in order to fully and comprehensibly situate this study.

3.7.1 Analysis approach, method, and justification

Currently available critical thinking analytical frameworks (e.g., Halpern, 1997; Ennis, 1993) have not been specifically designed with the context of very young children in mind, although exceptionally, pre-schoolers have been mentioned (e.g., Facione, 1990, pp. 15, 18). Attention needs to be given to how these may suit when analysing young children's thinking in practice, embracing and considering children's differences in experience and development as well as overall interests. Therefore, even though helpful as a foundational–structural guide and useful on a theoretical level (as discussed in the literature review chapter), they were not felt to be suitable for their direct use unamended in this study. As this particular topic or approach had not previously been researched, my responsibility as a researcher was to explore data inductively without limiting it to a previously developed list of skills and dispositions, keeping an open mind to encountering possible new and/or unexpected findings.

Codes and themes, therefore, were predominantly grounded in and driven by data (Braun & Clarke, 2022). However, I would more accurately describe it as a hybrid approach (Crabtree & Miller, 1999) to data analysis where there was a fusion between what I inductively encountered combined with my existing knowledge of the ready-made lists of skills and dispositions within the literature of critical thinking (e.g., Facione, 1990; Halpern, 1997), for example, my 13 dispositions linked with the literature in Table 3.6 below.

Table 3.6. Links between 13 dispositions and the available literature

Linking 13 dispositions with the available literature	
13 Dispositions	Experts' dispositions from the literature
Disposition 1: 'To be curious and willing to find answers.'	Builds from Facione's (1990) 'Inquisitiveness with regard to a wide range of issues' and 'Concern to become and remain generally well-informed' (pp. 14-15), and is connected to Costa and Kallick's (2000) thinking: 'remaining open to continuous learning' among their 16 general habits of mind (2019, p. 3). This can also be related to Ennis's 'Seek the truth when it makes sense to do so, and more broadly, try to "get it right" to the extent possible or feasible', 'Try to be well-informed' (Ennis, 2016, p. 167) and 'the disposition towards sustained intellectual curiosity' (Perkins et al., 1993, p. 148) or differently but making reference to the same, Tishman & Andrade (1996) 'the disposition toward wondering, problem finding, and investigating' (p. 6)
Disposition 2: 'To be aroused to the process of enquiry and discovery. The focus, engagement, and flow.'	Connected to Costa and Kallick's (2000) 'responding with wonderment and awe' among the 16 general habits of mind (2019, p. 3), and Perkins et al.'s (1993) 'the disposition towards sustained intellectual curiosity' (p. 148), or in other words, Tishman and Andrade's (1996) 'disposition towards wondering, problem finding, and investigating' (p. 6).

| Disposition 3: 'To investigate/to be investigative (to enquire and inquire). To seek information, evidence, reasons, explanations (including challenging views) and use those (product of enquiry) to form and provide views (e.g., reasoning based on evidence).' | Related to Facione's (1990) 'trust in the processes of reasoned inquiry' (pp. 14-15). 'From early childhood people should be taught, for example, to reason, to seek relevant facts, to consider options, and understand the views of others' (Facione, p. 15); Paul et al.'s (1995) 'Faith in Reason and Intellectual sense of justice' as one of the seven traits of the mind (p. 363). Costa and Kallick's (2000) 'gathering data through all senses' and 'questioning and posing problems' among the 16 general habits of mind (2019, p. 3), 'Use credible sources and observations, and usually mention them', 'Seek and offer clear statements of the conclusion or question' (emphasis on clarity), 'Seek and offer clear reasons, and be clear about their relationships with each other and the conclusion' (emphasis on clarity). (Ennis, 2016, p. 167), 'Take into account the total situation' (part of the whole) (Ennis, 2016, p. 167), and 'The disposition to seek and evaluate reasons' (Perkins et al., 1993, p. 148) 'The disposition to clarify and seek understanding: a desire to understand clearly, to seek connections and explanations; an alertness to unclarity and need for focus, an ability to build conceptualisations' (Perkins et al., 1993, p. 148). In other words, but consisting of the same disposition, Tishman & Andrade's |

	(1996) 'The disposition to build explanations and understandings' (p. 6).
Disposition 4: **'To be confident in one's own competence (reasoning and abilities). To autonomously act and use those abilities and to be confident to request the help of others when needed.'**	Based on and adapted from Facione's (1990) 'self-confidence in one's own ability to reason' (pp. 14-15).
Disposition 5: 'To self-correct. To listen to, explore, and consider others' views and to have the ability to change one's mind (self-correct) when necessary.'	Related to Facione's (1990) 'willingness to reconsider and revise views where honest reflection suggests that change is warranted' (pp. 14-15), Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12), 'willingness to self-correct' and Ennis's 'Take a position and change a position when the evidence and reasons are sufficient' (Ennis, 2016, p. 167)
Disposition 6: 'To take risks/to be courageous taking action in different ways to open up opportunities to new learning. Explore and experiment with ideas, options, perspectives, methods, and tools.' It is opposed to being too safe with what one knows works or being open to new learning.	Related to 'taking responsible risks' (Costa & Kallick's, 2000, 2019, p. 3), connected to Paul et al.'s (1995) 'Intellectual Courage' as one of the seven traits of the mind (p. 363), Halpern's (1997) 'flexibility' in terms of 'flexibility to consider new options, try things in a new way reconsider old problems (p. 11), and the disposition 'to be broad and adventurous' (Perkins et al., 1993, p. 148)
Disposition 7: 'To be prudent when considering views, evidence, and decision making, and to accept uncertainty when given the situation (without identifying this as failure).'	Based on/related to Facione's (1990) 'prudence in suspending, making or altering judgments' (pp. 14-15), Costa and Kallick's (2000) 'managing impulsivity' among the 16 general habits of mind (2019, p. 3), 'Withhold judgment when the evidence and

	reasons are insufficient' (Ennis, 2016, p. 167), and Wegerif (2010) 'comfortable in the situation of uncertainty' (Wegerif, 2010, pp. 129-130).
Disposition 8: 'To be persistent when confronting difficulty or frustration and to understand the value of effort.'	Connected to Paul et al.'s (1995) 'Intellectual Perseverance' as one of the seven traits of the mind (p. 363). Costa and Kallick's (2000) 'persisting' and 'striving for accuracy' among the 16 general habits of the mind (2019, p. 3) and Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12) 'persistence'.
Disposition 9: 'To be open-minded, flexible, and fair to different possibilities, perspectives, and opinions.'	Related to Facione's (1990) 'open-mindedness regarding divergent world views', 'flexibility in considering alternatives and opinions', 'understanding of the opinions of other people' and 'fair-mindedness in appraising reasoning' (pp. 14-15), to Costa and Kallick's (2000) 'thinking flexibly' among the 16 general habits of the mind (2019, p. 3), Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12), 'flexibility', 'being open to the voices of others' (Wegerif, 2010, pp. 129-130), 'Be alert for alternatives' 'Be open-minded' 'Seriously consider other points of view' (Ennis, 2016, p. 167), and the disposition to be broad and adventurous (Perkins et al., 1993, p. 148).

Disposition 10: 'To understand the value of and to communicate and collaborate with others (teaching/learning with others and what can be achieved with others). To listen, respect, empathise, consider, and value others' contributions. To be concerned with the dignity and welfare of others.'	Connected to Paul et al.'s (1995) traits of the mind: 'Intellectual Humility', 'Intellectual Empathy', 'Intellectual Good Faith (Integrity)' (p. 363), Costa and Kallick's (2000) 'listening with understanding and empathy' among the 16 general habits of the mind (2019, p. 3), Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12) 'flexibility' and 'consensus seeking', and Wegerif's 'The dispositions that make for good thinkers are related to becoming a more dialogic kind of person: that means being open to the voices of others, happy questioning everything, and comfortable in a situation of uncertainty.' (Wegerif, 2010, pp. 129-130).
Disposition 11: 'To be resourceful and creative in relation to the goal/question (purposeful creativity). To be alert of possible opportunities, views, situations, solutions, methods, strategies, and use of tools when appropriate.'	Connected to Costa and Kallick's (2000) 'creating, imagining, and innovating' and 'applying past knowledge to new situations' among the 16 general habits of the mind (2019, p. 3), Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12), 'flexibility' and even though not explicitly in the set of place dispositions Ennis acknowledges the need of creativity at different levels in critical thinking for example in those 'paths (that) are not clearly laid out' and even though there is no explicit place for it. He does, however, include 'Be alert for alternatives' (Ennis, 2016, p. 167).

Disposition 12: 'To be mindful and aware of self, performance, goal, and process and to be able to use this awareness productively (to plan for change, to modify, and change action).'	Partially connected to Facione's (1990) 'honesty in facing one's own biases, prejudices; stereotypes, egocentric, or sociocentric tendencies' (pp. 14-15), Costa and Kallick's (2000) 'thinking about thinking (metacognition)' among the 16 general habits of the mind (2019, p. 3), Halpern's (1997) six 'dispositions or attitudes' (pp. 11-12), 'being mindful'. Additionally, in connection to goal achievement and awareness of process, strategy, and performance, is Halpern's disposition to have the 'willingness to plan' opposed to being impulsive, 'Keep in mind the basic concern in the context' (Ennis, 2016, p. 167). 'Be reflectively aware of their own basic beliefs (Ennis, 1997, p. 9), and Perkins et al. (1993) 'The disposition to be planful and strategic: the drive to set goals, make, and execute plans, envision outcomes; alertness to lack of direction; the ability to formulate goals and plans' and 'The disposition to be metacognitive' (p. 148).
Disposition 13: 'To be attentive in identifying opportunities to engage with particular knowledge content and critical thinking skills according to goal and context. Overall, to be attentive to identifying opportunities for critical	Connected to Perkins et al.'s (1993) 'sensitivity' to context in addition to ability and inclination, which are the three elements that 'spark' a dispositional behaviour (p. 148). Disposition 13 refers to the ability to notice the situations in which

thinking. To value skills and use them (helpful to make it explicit to become a conscious thought), to value critical thinking.'	certain behaviours and use of skills are profitable to that context, Facione's (1990) 'alertness to opportunities to use CT' (pp. 14-15), and 'employ their critical thinking abilities and dispositions' (Ennis, 2016, p. 167).

Codes and themes were naturally constructed, rather than emerged (Braun & Clarke, 2022). I must therefore acknowledge that "data is not coded in an epistemological vacuum" (Braun & Clarke, 2006, p. 12), and I am aware of my active participation and impact in influencing what I identify as a relevant code or theme related to my research questions (Clarke & Braun, 2017). Therefore, themes are understood as "constructed not found" in this thesis (Braun & Clarke, 2016, p. 742). Since I believe meaning is socially constructed, I took an interpretative stance to make sense of and construct meaning derived from the in-depth descriptions of data obtained using the multiple case study approach. Therefore, I acknowledge that my interpretative stance may potentially vary from other researchers' points of view and positioning. In addition to this, it is worth saying that I could not be purely inductive, as inevitably I could not distance myself from the influence of the previously read literature in critical thinking (nor would I find it of benefit in this particular study).

3.7.2 Two coding approaches: Process Coding and Critical Incident Technique

I employed two distinct coding approaches, Process Coding (Saldana, 2016; Strauss & Corbin, 1998) and Critical Incident Technique (Flanagan, 1954) to organise and make sense of my data in two complementary ways. However, arriving at the decision to adopt these two approaches did not come easily, and various ways of approaching the data were employed before I arrived at a technique that respected the details of the data sets, while also synthesising them to a manageable level. For example, I tried the direct application of already made coding lists, as stated above, but it felt forced and insufficient to capture the quality and complex processes represented in the data (fitness for purpose).

I sought to understand the types of actions and processes involved in each investigation of the four different cases (detective experiences) while also looking for similarities and

differences across the different cases and groups of children. I therefore ultimately chose to use a process coding approach that involved labelling "essence-capturing" "observable and conceptual action" (Saldana, 2016, p. 4 and p. 296) in children and my own detective play performance during investigation. Figure 3.9 portrays a sample of what codes looked like in NVIVO.
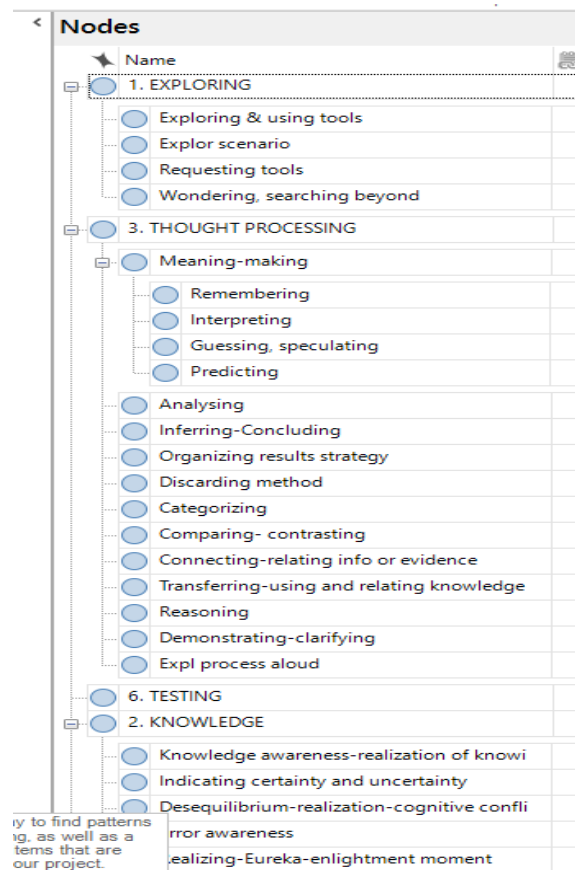
Figure 3.9: NVIVO code sample

This particular approach helped organise in detail the dynamic and complex human performance and interaction captured in audio-visual data into actions in time (Saldana, 2016, p. 296).

Nutbrown (2021) stated the importance of treating children's data respectfully by reflecting upon the notions of faithfulness, integrity, and trustworthiness during the analysis and interpretation of data. Furthermore, Nutbrown (2021) encouraged researchers' transparency. To align with this mindset, Table 3.7 portrays two samples of how codes were assigned to both visual data (description transcribed where needed) and children's verbal

utterances. The first coding sample has been assigned to two children's verbal utterances (Extracts 1 and 2) that represent speculation in thought; consequently, it has been coded as such. I have given only one code for this sample. However, it is possible that the children might move and proceed from initial speculative thinking to the use of tools and exploration.

The second is a coding sample assigned to a video footage capture (thinking moment) that shows how Holly is trying to figure out to whom the human footprint trace belongs. Holly's data illustrated her engagement in the process of comparing and contrasting: looking at various paper prints while also looking and comparing them with the other participants' feet.

Table 3.7: Visual and verbal sample data with assigned codes.
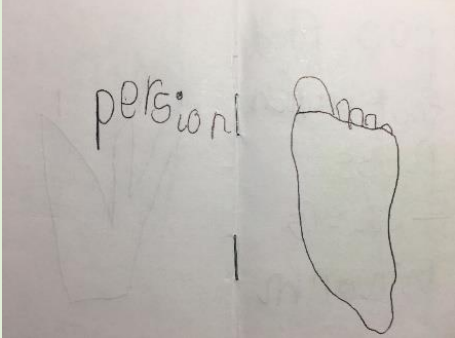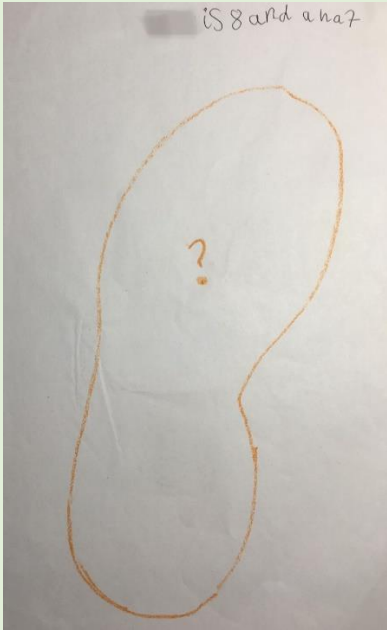
Type of data	Data sample	Assigned sample code/s
Verbal (transcribed Extract 1)	*'The animals might be here, ahhhh maybe a squirrel must be eating, this must be a squirrel, hhhhaaaa!!!'* – Amazed sound and checking the table clues (Marc, Bruno, Ava, Stella; Birch Primary School).	Speculating
Verbal (transcribed Extract 2)	*I think those are, a bird, a fox, and a squirrel here.* – Tim goes and takes the magnifying glass (use of tool to proceed and investigate further). (Tim, Cira, Diana; Aspen Primary School)	Speculating
Visual sample coding 1	(As part of the process of finding out whether the human blueprint belongs to them, Katia is placing her foot on top of the print. The rest of the children are observing and making sense of whether it is a fit.) Video capture – Holly's compare and contrast (Holly; Aspen Primary School).	Comparing/ contrasting

Table 3.7: Visual and verbal sample data with assigned codes. (Cont.)

Type of data	Data sample	Assigned sample code/s
Visual sample coding 2	 Video capture: Documenting thinking. Video capture – Documenting. (The children measure the print and the feet with the measuring tape.) Note taken by Holly: '8 inch' (complementary form of evidence, children's products).	Comparing/ contrasting and Documenting

Note taken by Mia: 'person' (complementary form of evidence, children's products).

Actual activity blueprint with the child's writing added to the top 'Katia is 8 and a half' (inches)

(Mia, Holly, Katia; Aspen Primary School)

Some of the actions were coded with one or more labels (codes). For example, if a child was observed to be looking at an item using the magnifying glass, this could have been coded as "Exploring", "Using tools/materials", "Meaning-making" and/or "Analysing" depending on the data provided by the specific context as well as previous and later behaviours and verbal explanations.

Among the benefits of this approach was to enable detailed exploration of the different processes occurring during the whole session, how often they appeared in time, and whether they were patterns indicating the stimulation (not the cause) for certain processes, among others. However, since it is sometimes necessary to code a section (shorter or longer) at various times (Bryman, 2016), caution was taken when looking at the quantity and frequency

of the coded occurrences for critical thinking. This study was not interested in the exact quantity of codes, but rather, was using these codes to support a broader qualitative examination of critical thinking. In addition, coding was useful for focusing on the exploration of specific collection processes in isolation (e.g., looking at codes labelled "exploring" could entail both children physically "exploring" the wider research scenario, or it could be verbally "exploring" an idea). It was particularly interesting to see children's verbal and physical activities and processes in this way.

An observed isolated activity or demonstrated critical thinking disposition in practice, however, could not be automatically taken as a synonym for thinking critically; rather, it was an important contribution to the process of critical thinking. Therefore, even though it is necessary to comprehend the above, single moments failed to holistically encompass the identification of critical thinking processes. According to Bryman (2016), the process of chunking and therefore isolating from context is a frequently attributed challenge to coding. For this reason, I also adopted the Critical Incident Technique (CIT) (Flanagan, 1954) to select narratives, which I referred to as Critical Thinking Moments (CTM). These CTMs were processes involving expressed thought, skillful actions and behaviours that contribute to the construction of a process that is likely to increase the probability of a desirable outcome (connected to Halpern's (1998) definition, p. 450). In other words, identifying and extracting the narratives that "make a significant contribution" (Flanagan, 1954, p. 355). The technique was not used to record live critical incidents, which is how it is most commonly used (Butterfield et al., 2005); instead, it was used to extract critical incidents from videotaped data.

Critical Thinking Moments (CTM) could involve one child alone or various children, with myself or independently, interacting with the process required by the task. During a CTM, children might show signs of growth in their thinking and investigation processes. Even though actual growth could not be physically proven, the behaviour of realisations or eureka moments after figuring something out were considered supporting evidence. These samples of Critical Thinking Moments coded with the Critical Incident Technique are portrayed in Chapter 5, 6, 7, and 8 as critical in the exploration of young children's critical thinking. Therefore, to summarise, while process coding aided organisation and focused on detailed

parts of the whole data corpus, CTM focused on larger sections of the data, with the attention on the wider constructed and interlinked thinking processes over time (which might be 5 or 15 minutes, for example).

The thematic analysis method was used to find patterns and make meaning of the coded data. In Braun and Clarke's (2016) words, coding was a "foundation for conceptualising possibly significant patterns of shared meaning" (p. 742). The foundation from which the themes were constructed moved from the obviously observable to an understanding of the more abstract fundamental meaning, the "latent underlying meaning" (Clarke & Braun, 2017, p. 297). In the end, most themes were derived from coded data rather than the other way around. The exception was CTM, where the nature of selection was firstly based upon professional intuition, which is common when carrying out initial observations in early years teaching practice. This is linked to my positioning and the inherent professional skills that are carried out in this study. In my teaching practice, initial observations and meaning-seeking usually preceded the detailed 'coding' and later meaning-making process (rather than the other way around, as in the coding process).

I manually coded the data in the first instance and then switched to using NVIVO Computer Assisted Qualitative Data Analysis Software (CAQDAS). This decision was made for pragmatic reasons, as I needed a time-effective tool to flexibly organise a large body of different multimedia data, and only technology was able to quickly provide for this. For example, the process of coding in CAQDSA facilitated visual chunking of all transcription processes under specific codes, which aided the filtering of some codes that were slightly ambiguous or overlapped with others. Simultaneously, it also helped develop distinctions, which I transformed into subcodes. It enabled easy visualisation of each code/sub-code within the case analysis, the frequency of specific coding or process in each case, the extraction of CTM and facilitated comparing and contrasting groups, schools, or cases.

In the later stages of analysis, I transitioned back to manually coding the data, since it was more appropriate and efficient within each case. This was because the same codes and method of coding were not suitable for all four cases. The *Mystery Box* case varied significantly in the type of data obtained from the *Mystery House*. The latter case was

fragmented into several different questions, and therefore this was done before analysing the case as a whole.

3.7.3 Procedure

Researchers have different perceptions of their own processes of analysis, as there are diverse processes, research perspectives, and ways of experiencing the process for each researcher. While some researchers describe it as a set of steps to follow, others view it as phases or stages, or even as a spiral process (Creswell & Poth, 2018). They do, however, maintain fundamental commonalities. I describe my own account through the idea of zoning, as shown in Figure 3.10 below.

This figure illustrates the routes taken through the process of analysis with an active participating researcher. In this thesis, the process is not a straightforward, chronological stage-based process, but could better be understood as a "recursive process, where you move back and forth as needed" (Braun & Clarke, 2006, p. 16). Partially in agreement with this idea, the arrows in the figure indicate these dynamics during the analytical path towards finding clarity. The idea of zoning accentuates the idea of going forward through the acquired experience and experiencing (and benefiting from) each zone differently throughout the process. On the contrary, however, this figure illustrates the possibility of moving forward to the 'new' zones as needed with a new and more experienced perspective rather than going back or revisiting a particular stage.
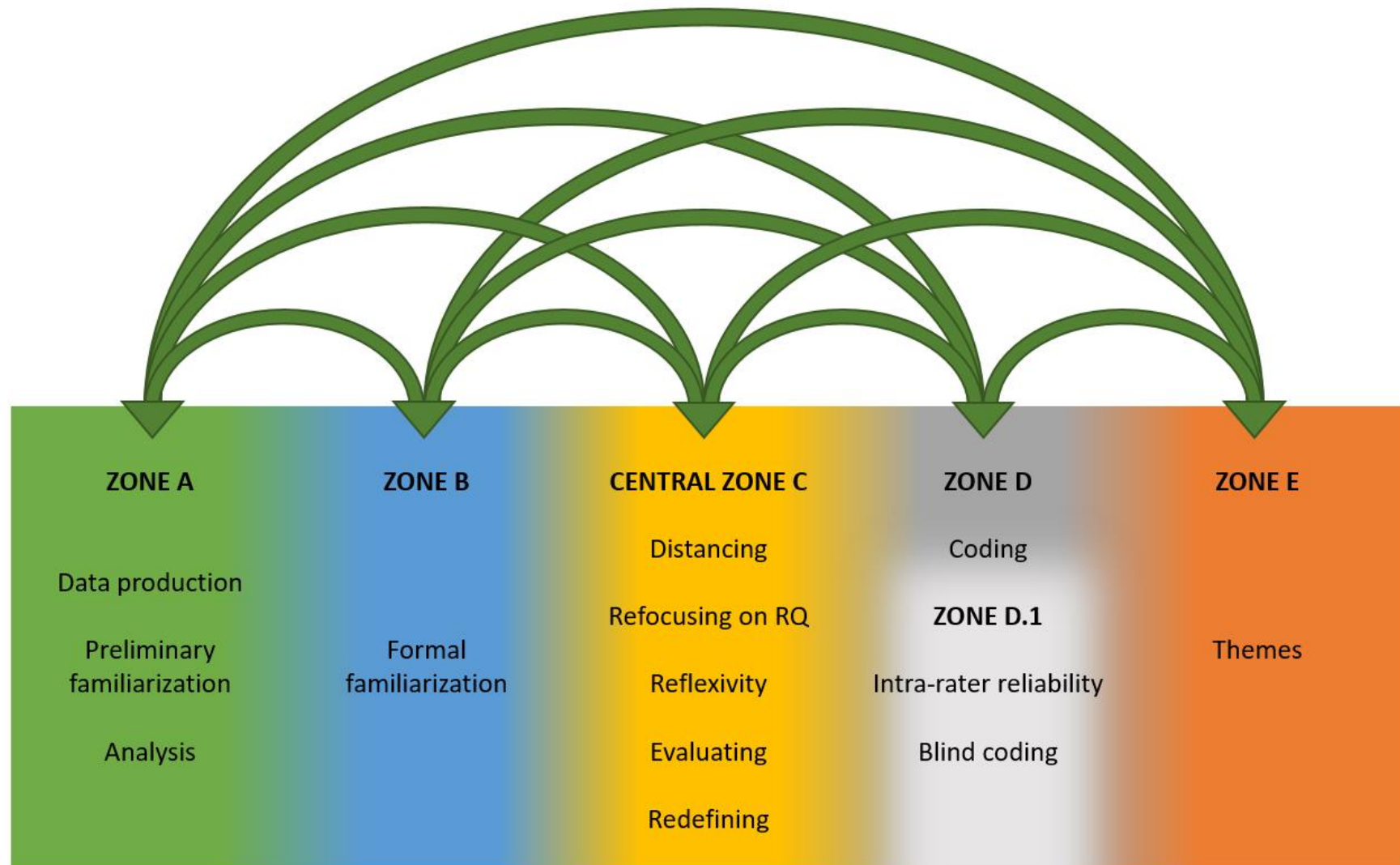
Figure 3.10: Zoning: dynamics of the process of analysis

3.7.4 Analysis through the zones

Zone A represents the space for data production, simultaneous familiarisation, and preliminary surface analysis. My active participation in investigating with the children during detective play provided me with the opportunity to familiarise myself with the data as it happened. This inevitably meant that I engaged in preliminary surface analysis during data production. For example, the initial engagement with the preliminary identification of Critical Thinking Moments began in Zone A, while data was being produced when conducting observations that were natural in my teaching practice. Since different key events could occur simultaneously, it was not possible to capture everything on the go, and the recordings were able to provide those missed opportunities for further observations and reflection. The CTM narratives, however, were ultimately confirmed in Zone E.

Zone B was a more formal space for data familiarisation post data collection. The process of formal familiarisation involved viewing, listening to, and reviewing the video and audio recordings of the four different cases multiple times. The video recordings were transcribed verbatim, including relevant non-verbal behaviour (e.g., Mia is exploring an item using a magnifying glass while showing gestures that indicate excitement). During this process, I was able to capture a fuller picture and understanding as I was able to observe actions that were happening around me while I was engaged in other activities. In addition, the process provided the opportunity to relate my experience and perception of the scene with an insider's view (e.g., information on why I did something related to somebody else). This process of familiarisation involved zooming in and out of the data (zoning to C and back), thinking about my own experience and what the scope of the camera captured. Familiarisation was continuous throughout the process as I deepened my understanding and focused on specific aspects of the data, as well as making new unheard or unseen discoveries.

Zone C (distance and reflexivity) is at the heart of the diagram and represents the zone in which one can distance from the task, refocus on research questions, engage in reflexive practice, evaluate achievement and process, and redefine goals. This zone was central to the process of analysis, particularly but not solely, due to my proximity and involvement. The nature of this thesis, the size of the data corpus, and my proximity and involvement with the data made the process complex and messy. Therefore, taking the time, with breaks away from

the data and zoning process, or moving from one zone to another with the practice of reflexivity, became a necessary process that helped me reach clarity.

Zone D focused on evolving and ratifying coding. The manual coding process began with experimentation with various coding approaches. At first, coding was based on the transcripts, except for particular sections in which I had additional context questions. However, after identifying suitable coding approaches for this purpose, as mentioned above, video recordings were used at the same time. I used NVIVO for recoding and coding some of the cases. The process of coding involved constantly amending, reflecting upon, and redefining codes.

It was often necessary to take some distance due to my direct researcher–participant involvement in this research activity, as well as my limited systematic research experience with video analysis. This distance was useful between recoding the same case sample various times to verify whether there was consistency between both at a later time. At this stage, I generated a table with organised codes to comprehend the similarities and differences across the groups. This was done first for each case and then across cases. Some codes appeared in more cases and groups and others only in particular cases and/ or groups. In relation to reliability, my thinking was shared with my two supervisors.

Zone E involved theme construction. Themes 'emerged' were discarded or reinforced throughout the coding process.

3.8 Summary

In this chapter, I have discussed and justified my decision making involving methodology, methods, and analysis. I discussed the rationale behind conducting a qualitative multiple case study and clarified that I have adopted an interpretivist (social constructivist) perspective. In addition, informed by the literature review, as well as based on my experience in working with young children, I created a design that was pedagogically appropriate, thought-provoking, and catalytic in the manifestation or expression of critical thinking, founded in inquiry-based learning, play-based problem-solving contexts, and adopted data recording

tools that ethically and efficiently capture and record young children's various modes of thinking manifestation.

I described the four detective experiences (cases) and provided insight into the research schedule, participants, and overall process. Furthermore, I conducted direct observations and video- and audio-mediated observations. Data consisted of video footage (audio-visual transcription), audio recording (audio transcription), the researcher's reflective moments, the children's detective notes (drawing and/or writing), photographs, and collectively produced physical products (e.g., zoo poster).

Moreover, I provided insight into what worked and did not work in the pilot study and how this drove the decision making for the main study. Two coding approaches were used: process coding and the Critical Incident Technique to code CTM. I also used the thematic analysis method to find patterns and themes in the coding. Finally, I also share my experience of 'zoning' in the process of analysis.

Children were acknowledged as rights holders throughout this study, which had implications on how the research was designed and conducted from the beginning to the end of the study. Firstly, the research approach and participatory methods discussed in this chapter were inclusive, accessible and respectful to children's needs. They intended to provide with space and opportunities to influence, to make decisions regarding matters of participation and to exercise of their rights in those matters that affected them. Furthermore, data recording devices attempted to capture in essence what children said and did, capturing the many ways in which children voiced their thinking. This data was thoroughly transcribed and presented in form of transcription excerpts. The intention behind this was for children's authentic voice and their capabilities to be heard in their pure raw form. Summarising, a rights-based approach to research with young children is the basis that underpins the entire study, and therefore, it is reflected differently in the different research stages and decision making throughout.

I will provide further case-specific methodology and methods details in Chapter 5, 6, 7, and 8. In the following chapter, ethics, I will discuss the matters of ethics involved in this study, particularly focusing on ongoing informed consent.

Chapter 4 Ethics: Children as Rights Holders and Capable Thinkers

This chapter shows how a specifically designed picture book was used to facilitate meaningful informed consent with the ten groups of 3-6-year-olds participating in this research study. It describes how the picture book was designed and implemented and presents findings derived from ten information sessions during which children were informed about the study so they could decide whether to participate or not. In this chapter, I present the data in relation to the usefulness and limitations of the approach to ongoing informed consent with young children.

This process was deemed important and worthy of its own chapter because ethics form the linking foundation throughout this thesis. Ethical and methodological decision making went hand in hand with my vision of children as rights holders, capable thinkers, and able to make decisions about matters that concern them. To ensure this, the processes and the provided information need to be meaningful and accessible in the context of young children. At the time, I found little explicit guidance in the research literature with a focus on pedagogically appropriate methodology, design, and methods for ongoing informed consent processes in the context of young children. Because of this, I decided to develop my own design based on my EY teacher experience and obtain data from its implementation, focusing on the benefits and constraints. Additionally, enabling time, space, and opportunities for voice and overall exercising of rights were thought to be important for the intention of designing spaces for the facilitation of critical thinking.

I have chosen to use the term children's consent in this thesis to refer to children's decision making (agreeing and opting out) in relation to their own research participation. In the wider research literature with young children, it is common to address children's consent giving using the terminology of assent and dissent (disagreement or opting out), making it distinct from that of the adult. Informed decision making relating to children's own participation is a 'critical element of ethical practice' (Dockett et al., 2013, p. 802). For children, even though

not legally binding, it is done in participatory rights-based research, where children's agency is recognised (Dockett & Perry, 2010).

The terminology related to consent with young children in research is not used consistently across the literature and according to Dockett and Perry (2012) this could be due to varied jurisdictions across countries around the world. The reason for this is that assent is used in contexts 'where children are considered unable - either legally or by virtue of their developmental status' (Dockett & Perry, 2010, p. 245). Despite this difference, there are three fundamental elements that are common to both children and adult consent, which are that it needs to be based on sufficient information, voluntary basis and ensuring the competence of the decision maker (Dockett & Perry, 2010). Furthermore, children's consent is "a relational process whereby children's actions and adult responses taken together, reflect children's participation decisions" (Dockett & Perry, 2010, p. 231). Therefore, despite understanding the terminological distinction made in the research literature and the existent legally bounded implications of adult and children consent, I see no practical significance of using a different terminology that may dimmish the meaning and value of children's consent. Moreover, in research within school settings children, legal guardians are unlikely to be present and the children would be the ones baring with the responsibility to decide upon encountering new information in research and in charge of re-evaluating matters about their own participation ongoingly. For this pragmatic reason, in this context, I choose to use the term children's consent instead of assent and dissent.

I will start by describing the overall ethical stance underpinning this thesis and will provide the rationale for developing my picture book storytelling approach for ongoing informed consent with young children.

4.1 Introduction and aims

Issues of consent, in the context of this thesis, are important for both ethical and methodological reasons. Ethiccityally, it was necessary to provide the children with opportunities to acknowledge and act upon their rights regarding their participation in the proposed research process. This is underpinned by The United Nations Convention on the

Rights of the Child (1989), which stated in Article 42 the right *to be informed about own rights* (p. 12) and *to learn how to exercise these* in Article 5 (p. 4), including the right to *"freedom of thought"* in Article 14 (p. 6), *"freedom of expression in matters that affect them and for these to be taken seriously"* in Article 12 (p. 5), *"the right to seek and receive information in various forms"* in Article 13 (p. 5), and the right to *"access maturity/age appropriate information from various sources"* in Article 17 (Unicef, 1989, p. 6) which are of key relevancy to this thesis.

In this context, by the time I was introducing the study to the children, several layers of 'gatekeepers', parents and teachers, had already given their permission (more specifically, permission approval was granted by the School of Education Ethics Committee, local city council research access, head teachers and teachers and children's legal guardians; see Figure 4.1).
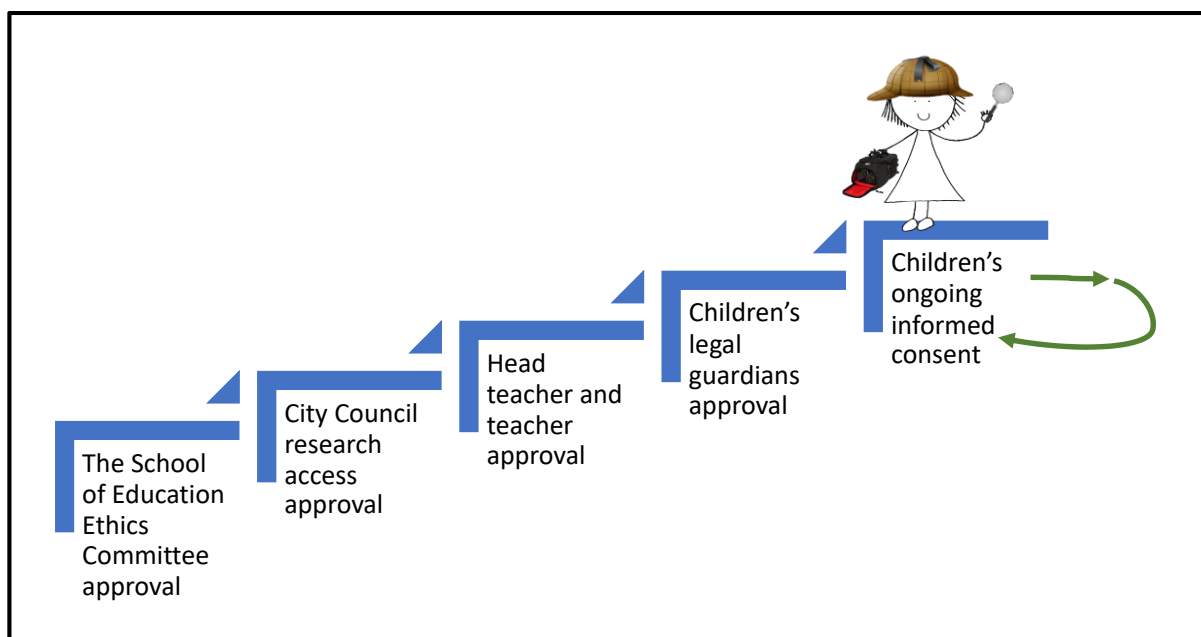
Figure 4.1: Ethics and permission-seeking procedure

At this point, however, the participants themselves had not had the chance to have their say, and therefore, as the researcher, I remained the 'gatekeeper' to their right to participate or not in the research. Without their permission, I would be limiting the children's opportunities for self-expression and decision-making in those matters that concern them, which particularly draws on The United Nations Convention on the Rights of the Child Articles 12 and 13 (Unicef, 1989, p. 5). Participants, even young children, have the right to know what

the study is about, how the study will be conducted, and in what ways they will participate to have a fair chance to make decisions regarding their own participation.

As a researcher in early childhood, it was therefore my obligation to give the participants the relevant information before the study in such a way as to be meaningful and an age-appropriate experience for young children.

Methodologically, informed consent is relevant to ensure that the participants understand what their participation involves. This is arguably a different process for young children (Arnott et al., 2021). The research on the development of thinking in playful activities presented in this thesis requires the children's active engagement, interest, and effort to figure out and solve detective mysteries. If participants lacked interest, it would not only be unethical, but the results might be affected, and the authenticity in relation to how children think and perform in the given context could be compromised. Consequently, informing children about what participation would entail, as well as the right to opt in or out, was crucial to raising the probability of recruiting participants who were interested. For that purpose, I prepared an information picture book that was read aloud to them in the context of a storytelling experience.

The ethical, rights-based participation of young children in research is the subject of numerous studies (Moore et al., 2018; Parsons et al., 2016; Pyle & Daniels, 2016; Mayne et al., 2016; Dockett et al., 2012; Dockett et al., 2013; Dockett & Perry, 2010; Lambert & Glacken, 2011; Cocks, 2006; Flewit, 2005). However, there is little literature that provides detailed practical guidance (Parsons et al., 2016) on when researchers use information-sharing methods to obtain consent. They rarely provide samples or supporting visuals. There is even less focus on the 3-6-year-old age group. For this reason, I dedicate this chapter to explicitly discussing the developed information tool, process, and findings.

4.2 Design: Picture book storytelling information sharing and discussion experience

The storytelling information and discussion took place during the first visit to each research location (see Figure 4.2). First, the children and I introduced ourselves, and I briefly explained and demonstrated the audio recording device that was going to be used to record the information session and asked for the children's permission to use it. The information storytelling session was then started using the picture book *Super-detective/researcher Lore & Co.*, allowing for spontaneous discussion where required.

After this, the original plan was to ask for initial written consent from those children who were willing to participate. However, this procedure was discarded after the pilot study because it did not contribute to the actual set process in context, but rather felt like an additional administrative burden for the children. In other words, given the circumstances, it felt tokenistic. Instead, consent was confirmed through a process that was more nuanced and continual throughout the research.

The session was concluded by preparing the children's detective materials and attire for those who expressed a willingness to participate. Children were given detective badges and notebooks, which they personalised with their names. They also collected detective hats and magnifying glasses, which were left behind when they no longer wanted to continue or when the session was finished for the day. This ended up being an additional way of expressing consent or withdrawing, as the children knew they had to leave their attire, or vice versa, put the attire on to enter their super-detective role. Despite this first experience being the allocated space for information sharing for children's consent seeking, it was made clear that this process was ongoing. This meant that, in practice, children left when they no longer wanted to participate for the day, although sometimes individuals left and then came back.

PICTURE BOOK
storytelling session

ONGOING

Part 1: Introduction and
recording devices set up

Part 2: Picture book
storytelling and discussion

Part 3: Preparation for detective
play
(For those willing to participate).
Initiating participation

- Set up

- Introducing ourselves

- Data recording device
  and demonstration
  with the children

- Storytelling and
  discussion

- Initial consent

- Ongoing consent

- Familiarize with detective play:
  Naming personal detective badges
  and other attire
- Setting up video and audio recording
  devices
- Start participation (Cases)

  Case 1: *Mystery Box*
  Case 2: *Zoo Mystery*
  Case 3: *Snack Mystery*
  Case 4: *Mystery House*

Figure 4.2: Structure of the storytelling experience

4.2.1 Design of the information-sharing experience

The children were invited to the interactive picture book storytelling experience to develop an informative foundation for meaningful informed consent. Storytelling is a familiar form of communication that is widely used in early years pedagogy, and research has shown that young children are able to learn and transfer from picture book exposure (e.g., Ganea et al., 2011; Hsiao & Shih, 2016; Strouse et al., 2018). It is an approach I am very familiar with when working with young children. Hence, this method was chosen due to its potential for 'telling' (informing about research) while also facilitating discussion of new and abstract information through meaningful and accessible visuals alongside complementing narrative without needing to master complex literacy skills.

Throughout the information storytelling experience, the children were given opportunities to learn about what research was in the context of this study, their potential participation (if they wished), and what was going to happen after the research visit. The storytelling session was interactive and participatory, which means that children were not 'passive receivers'; on the contrary, they naturally and actively contributed to the experience through various forms and ways of communication. This included asking questions, sharing thinking, and contributing to discussion both verbally and behaviourally, such as pointing and making gestures to communicate.

For storytelling purposes, I designed a specific picture book inspired by children's literature, which included both illustrations and accessible narratives, as shown in Figure 4.3 and Figure 4.4.

Figure 4.3: Picture book illustration page sample collage.

"Her job is to explore and discover things other people don't know about so we can all learn about it. Sort of a detective or explorer!"

"Lore is now on a mission to find out how children solve difficult puzzles and has prepared a mysterious detective game to play with children. But… she has a problem! Oh noooooo!"

"She does not know any children here that could play her detective game! That means she might not find out how children solve difficult puzzles! Do you think we can help her? Do you know any child who would like to play?"

"Lore wants to find out how children solve mysteries. So she will

Figure 4.4: Picture book narrative sample

The picture book contained a linear story (intent, plot, and end) represented by cartoon characters, including the researcher (me) and the children (see Figure 4.5). The story was about a researcher investigating how children think during the investigation and the resolution of various mysteries while adopting super-detective roles.
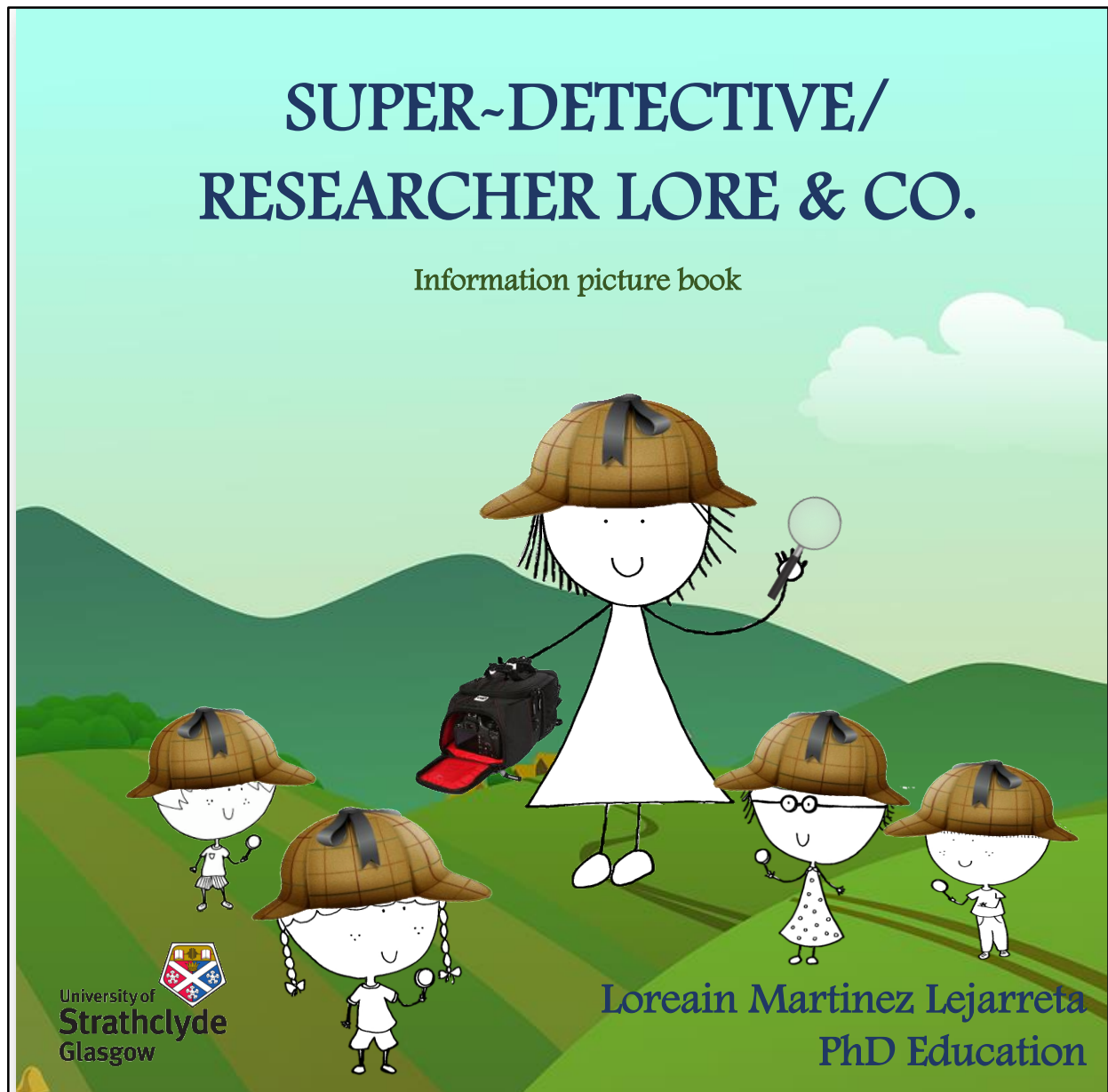
Figure 4.5: Picture book cover

The story covered the purpose of the research visit, a 'snapshot' of the research experiences, the participant-researcher's role, data recording devices, dissemination, and ongoing voluntary participation (see picture book content in Figure 4.6).

Content:

1. Introduction (self, research & research topic) p. 1-6

2. Purpose of setting visit and duration p. 7

3. Research activity
    -Sample play activity part 1 (detective mystery play   activity).
    Aim, procedure, method, researcher's & children's   role in   the
    process, data recording devices, other materials and   implications.
    p. 8-10
    -Sample activity part 2 (video taped session).
    (Visualization, discussion and reflection on   their own raw data).
     p. 11

4. Back to the office (data storage, transcription, analysis, conclusion, findings).
p. 12-13

5. Dissemination & Anonymity. p. 14-15 & Appendix 2

6. Bringing back findings. p.16

7. Voluntary participation (ongoing participation assent and dissent). p. 17

Appendix 1-4

Figure 4.6: Picture book content page

The aim of this experience was to:

- Appropriately (accessible and meaningful) inform the young children about the research and implications related to their participation in this study.

- Provide opportunities for children to voice their thoughts and ask questions related to their participation in this research.

- Provide young children with opportunities to make ongoing informed decisions about their participation.

- Investigate the usefulness (benefits and constraints) of the picture book storytelling approach in creating spaces for meaningful and accessible, ongoing informed consent with young children.

Ultimately, given the existing gap in the literature at the time, it was essential to find new pedagogically appropriate ways to obtain young children's ongoing informed consent

(including what worked or did not work) to better inform early-year researchers, teachers, and policy makers. Ultimately, the broader aim was to inform and attempt to improve young children's future research experiences.

4.2.2 Estimated duration

Assuming children would be interested in the session, the estimated duration of the storytelling part was between three and ten minutes. This estimation did not include setup time, initial audio recording device explanation and permission seeking, final conversations about participation or transitioning time, and initiation of a detective mystery play. Therefore, flexibility was incorporated into the planning schedule.

4.2.3 Location

The ten information-sharing storytelling sessions were conducted in three early years settings (see Table 4.1): a nursery setting (pilot) named Chestnut Nursery and two primary schools (two P1 classrooms) named Aspen and Birch Primary School. In all locations, the experience took place within the classroom's open-plan space. This was especially important for the information session and the initial meeting/introduction, because being in direct (eye contact) proximity to the children's teacher and the rest of the class could offer children a feeling of safety and could also facilitate opportunities for children to leave if they wished to do so.

Basic requirements for the space included:

- Space to gather around the picture book (for example, a carpet or table to sit around). See Figure 4.7 for an example.
- A place to set audio recording devices, as well as space to demonstrate the video recording device.
- Direct proximity to their teacher and other children (within the classroom or open space)
- A calm space to hear the story and one another's comments (a challenge when considering the proximity to others, classroom activities, and resulting acoustics).

Figure 4.7: Location for storytelling experience in Birch Primary School

4.2.4 Materials and preparation

The following materials were used for the information storytelling experience:

- Picture book (see Figure 4.3, 4.4, 4.5, and 4.6).

- Audio recording devices.

- Consent sheets (children's written consent. See Figure 4.8), finger paint, and crayons.

- Detective gear: badges, detective notebooks, deerstalker hats, and magnifying glasses.

Picture book preparation: Planning, design, and execution

The physical book was first created digitally in Microsoft PowerPoint using hand-drawn illustrations, photographs, and collage techniques. The picture book contains 18 illustrated pages with simple speech bubbles. The picture book also included a narrative for the adult to read (as a guide) behind every illustrated page. This enabled the illustration to be visible to the children, while the adult was able to glance at the narrative on the back. In other words, when the children were looking at the illustration page, the adult simultaneously faced the corresponding narrative. The book was printed and spiral bound at the top to resemble a typical classroom picture book.

Before making the picture book, contemporary 3-6-year-old children's literature was researched with consideration of common characteristics and rationales, for example, *'The detective dog'* (Donaldson & Ogilvie, 2016) and '*Wanted! Ralfy Rabbit, Book Burglar'* (Mackenzie, 2015). Researching this was important because book features impact children's understanding and the transfer of information to the real world (Strouse et al., 2018). This was essential to increase the probability of accomplishing the aim successfully, as a cartoon alone does not make it child-friendly (Strouse et al., 2018). Some of the key characteristics to consider in common picture book literature were the inclusion of attractive visuals, colour/brightness, texture, size, number and length of pages, text, bubbles containing interactive dialogue, structure (beginning and end), plot, and character. It also required me to think about diversity in the potential audience and reflect on the potential challenge around unknown words, meanings, and visual semiotics (Strouse et al., 2018).

The length of the narrative was important because if the text was too long or too broad in scope, it could limit space for interaction and make children lose interest and attention. In addition, if the text was short and prescriptive, it could limit space for broader opportunities for thinking and interactions and limit the meaningfulness of resulting conversations. It was important to keep in mind that the primary intention was to design a tool specifically for ascertaining consent with young children. Hence, finding a balance for the age group in relation to these characteristics was key.

In relation to the research information content, it was important to acknowledge that the presented information, its construction and delivery, implied a set of the researcher's assumptions and expectations about the children's capability (Dockett et al., 2013). The design was based on the idea that participants needed to be sufficiently informed to decide about their participation. It was the researcher's responsibility to select the information (Bertram et al., 2016), balancing between too much and too little without inhibiting or limiting the children's opportunity to learn about research and participation. For this reason, it was important for me to design a tool that could offer the opportunity for flexibility. This meant that the researcher could use the book reflexively, covering the content that was needed in relation to the response, mood, and interest of the children: if children showed curiosity about certain things, the researcher could deepen the coverage, or lighten it if the interest was not there. Hence, it reflected my positioning of young children as capable learners and contributors.

Due to this embedded flexibility, the picture book could be used in multiple ways with children:

- **pre-arrival of the researcher**, to start building a relationship with the unknown persons, as well as giving time for the children to prepare and engage with what was expected by the outsider (teacher/parent and children),
- **pre-sessional**, with the researcher and children, before data collection (data from this chapter);
- **in-session**, during data collection, in concordance with the philosophy of an ongoing assent/dissent process (this thesis); and
- **retrospectively,** after the researcher left, to reflect on the learning that took place.

It could also be adapted to other forms of presentation if those were more appropriate for the specific research context, such as video, audio, flashcards, games, and manipulatives. These, however, were not used in this thesis.

The purpose of the picture book was to inform the 3-6-year-old participants about the process of research in an audio-verbal/visual manner, as I did not consider a formal information sheet appropriate for the children's age. I decided to use this form of communication, as it was inclusive of diversity in learning (audio/visual) and did not necessarily involve mastering literacy and advanced verbal skills. The intention of this approach was also to tackle the potential exclusion of children from diverse backgrounds, learning competencies, and abilities. Due to the difficulty of planning tools and methods that were to be effective and inclusive of all types of diverse needs, the study was open to flexibility to adjust or add additional support if needed.

The ultimate target was to develop a picture book tool that was practical, durable, flexible, accessible, meaningful, informative, inclusive, catalytic, facilitating voice, and enabling listening for meaningful information sharing and consent-seeking with young children. Overall, the design of the consent process, as well as the information content and design of the picture book, was deeply embedded in the wider research design, theme, and research context. The consent tool needs to be considered and amended in a wider context and with the participants.

4.3 Implementation

4.3.1 Information sessions and duration

In total, 30 children aged 3-6 years took part in groups of two to four at a time (32 contributions*):

- **Nursery setting** (Chestnut Nursery Pilot): 8 children aged 3-4 years participated in the pilot information sessions. The two nursery information sessions took place on two consecutive days. Four children aged 3 participated on the first day and four children

aged 3-4 on the second day (two aged 3, and two aged 4). In total, six boys and two girls participated (see Table 4.1, Sessions 1 and 2).

- **School setting 1**: Aspen Primary School (Primary 1): Ten children aged 5-6 years participated in the information sessions. The four information sessions took place in the period between 5 and 9 October 2018. Two children who had participated in the first day's second session also participated in the third session (*) (10 participants with 12 contributions). In total, six girls and four boys participated (see Table 4.1, Sessions 3, 4, 5, and 6).

- **School setting 2**: Birch Primary School (Primary 1): 14 children aged 5-6 years participated in the information sessions. The four information sessions took place within a period of two weeks (11 days). In total, 10 girls and 4 boys took part (see Table 4.1, Sessions 7, 8, 9, 10).

The average duration of the ten picture book storytelling experiences was seven minutes. Table 4.1 provides specific information about the duration of each session according to setting, date, age, and number of participants.

Table 4.1: Summary of participants in picture book storytelling sessions

INFORMATION PICTURE BOOK STORYTELLING EXPERIENCE										
Data set and setting	DATA P Chestnut Nursery		DATA A Aspen Primary School			DATA B Aspen Primary School	DATA C Birch Primary School			
Session No.	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	Session 9	Session 10
Date	16-04-2018	17-04-2018	05-06-2018	05-06-2018	08-06-2018	09-10-2018	10-01-2019	10-01-2019	21-01-2019	21-01-2019
Participants age-setting Total 30 (*32 contributions)	Total 4 3 years old -Abba -Sean -Oliver -Hugo	Total 4 3-4 years old -Jerry -Walter -Henry -Clara	Total 2 5 years old -Mia -Miles	Total 3 5-6 years old -Katia -Holly -John	Total 4* 5 years old -Frida -Leo -Katia* -Holly* *Katia and Holly repeated Session 4.	Total 3 5 years old -Tim -Cira -Diana	Total 4 5 years old -Bruno -Ava -Marc -Stella	Total 4 5 years old -Amanda -Maria -Will -Robin	Total 3 5 years old -Anais -Isla -Cooper	Total 3 5 years old -Elaine -Lara -Ruth
Approx. duration **Average 7'/session**	8'30''	7'	8'55''	4'15''	8'40''	13'51''	8'20''	7'40''	9'	4'30''

4.3.2 Pre-visit and setup procedure

Before the visits, I collected all written permission from the children's legal guardians. Within this documentation sent to guardians, I included a copy of a children's consent sheet, and despite not asking for it explicitly, a few children had already signed this. The intention of attaching this document was to facilitate initial talk about the research at home, rather than prioritising the act of signing. I also arranged the space for the initial information storytelling session with the teacher and mentioned the rationale for needing a space in proximity to the classroom during the session. Furthermore, I emphasised the voluntary nature of this entire study.

On arrival at the nursery or school setting, the group of children and I sat together either on the carpet or in chairs around a round table. Each of the ten sessions began with a short introduction to ourselves. After that, because the sessions were audio recorded, I explained the purpose of the recording technology to the children and demonstrated the audio recording device to them, and they were invited to try it. Before recording the storytelling session, the children were asked for permission to record it. I invited them to turn it on, and they were told that this recording could be played and heard over and over again by me. This practice continued throughout the research. As the children themselves turned on the audio recorder, they also organised themselves to take turns turning it on during detective play (an ongoing practice that reinforced their control of their own consent).

Audio recording was chosen over video due to its less intrusive nature and because it was easier to anonymise. The video was only chosen for the four detective cases, where it was necessary to capture the children's body language and actions that were vital for this research study. Nevertheless, it was problematic to audio-record this session in view of the ethical standards underpinning this study. More specifically, in relation to recording children and using the data obtained from this stage, the children had not yet been informed about the study. The solution would have been to provide an information session within the information session that did naturally not make sense, including ethically, as it would be rather tokenistic rather than meaningful, in the context of this study. Given the need for methodologically

appropriate ethics procedures with young children, the benefits outweighed the audio recording problem.

Once the audio recording device was turned on, I began the storytelling experience using the picture book as a tool to inform young children about the nature and process of the research. The children were invited to participate, share their thinking, and discuss their thoughts during the interactive storytelling. The story was narrated in a lively manner, trying to encourage the children to comment.

After the storytelling, the children expressed their initial consent in their group context. One group of three children from Aspen Primary School was removed from the study. I did not include any data related to this group, because it did not go forward with the cases. They only took part in the informative storytelling session, and this was erased. Because of this, they did not appear as participants in the participant section. In this case, I sensed that one of the children did not trust what was happening. Two children seemed very shy, and they did not really seem to want to be there. They did not verbally say this, but it was clearly displayed, which shows the importance of listening to the different ways children may express dissent. Because of this, I told them they did not have to be there if they did not want to. Consequently, they left and went back to what they had been doing before. Subsequently, those who expressed willingness to participate got ready with their personalised detective gear and were invited to initiate their first mystery case: *The Mystery Box*. The original plan for those children who responded positively in the storytelling session and wanted to participate was to offer them the opportunity to sign the children's own consent sheet (see Figure 4.8), despite making it clear that consent was ongoing and that they could withdraw at any time. However, this idea was discarded, as due to the rest of the procedures (detective badge, wearing detective clothing, and other additional ways to express ongoing participation), it felt like a translation of adult-like bureaucratic procedure rather than something that was going to add any benefit or a positive contribution to the children's understanding of consent in this context. It felt like a tokenistic action for gaining consent if done in an isolated context, although the procedure of signing in itself could potentially be meaningful for this particular research context. It became clear (in the pilot) that it was not going to add significance to the adopted ethical approach, as well as to the specific research

experience related to consent for children. The number of visual manipulatives and activity involved in this research was large in comparison to the research playtime, so it was fundamental to decide what would be significant and useful rather than adding clutter, messiness, or more 'work' to the children. Hence, simplification was pursued at times, focusing on the key aspects, since incorporating too much could reduce the value and meaning of each thing (too fast, too much).
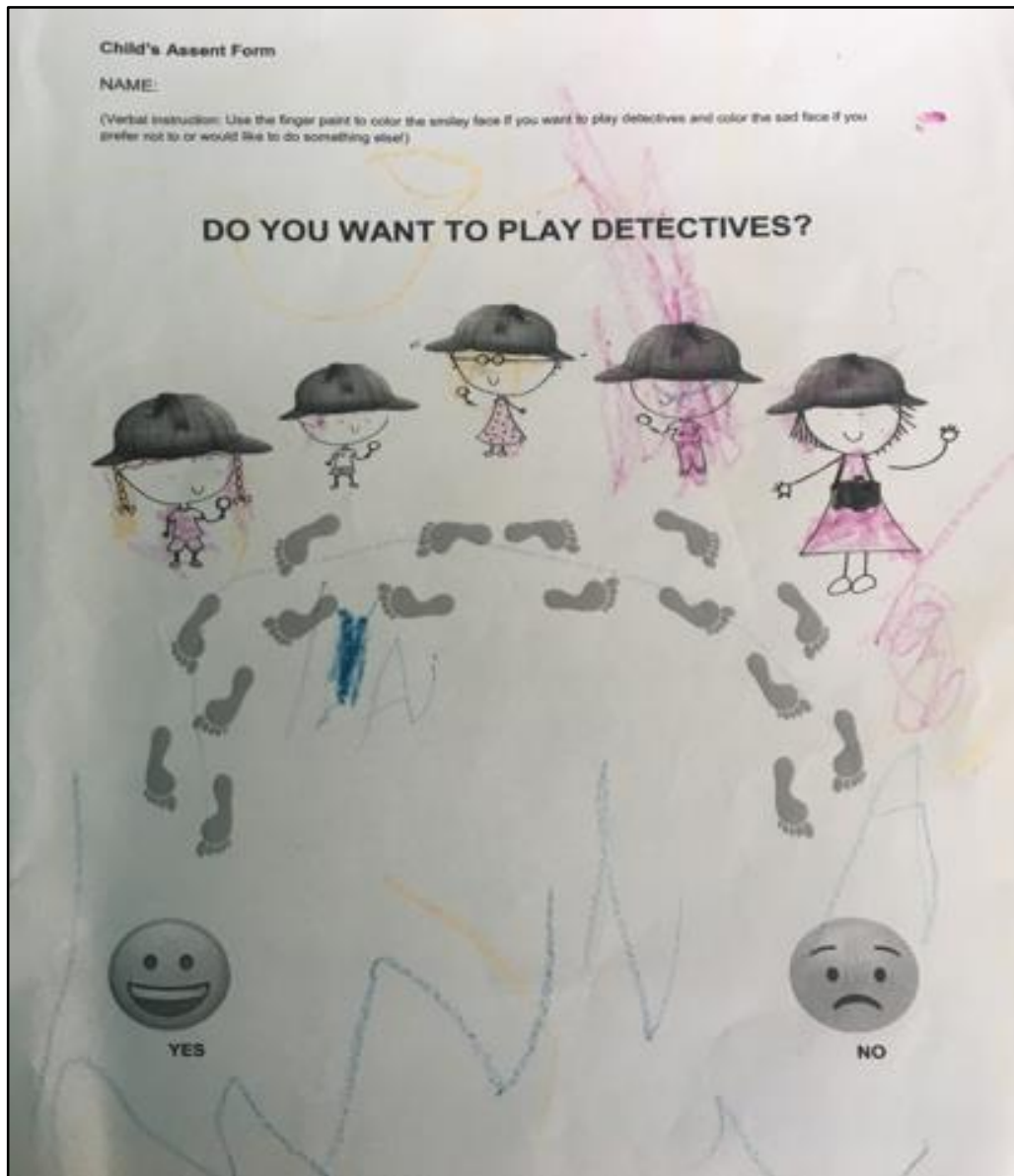
Figure 4.8: Children's consent sheet sample

The process of decision making regarding research participation during storytelling was, as a result, multifaceted and was not a single event but also ongoing during data collection. I have represented this process in Figure 4.9.

ONGOING INFORMED CONSENT: DECISION MAKING PROCESS

Tool: ✉ picture book

Method: Interactive storytelling and discussion

New information ✉

Participation

DECISION MAKING

Dissent/ opt out

Time/space

Main study Time/space
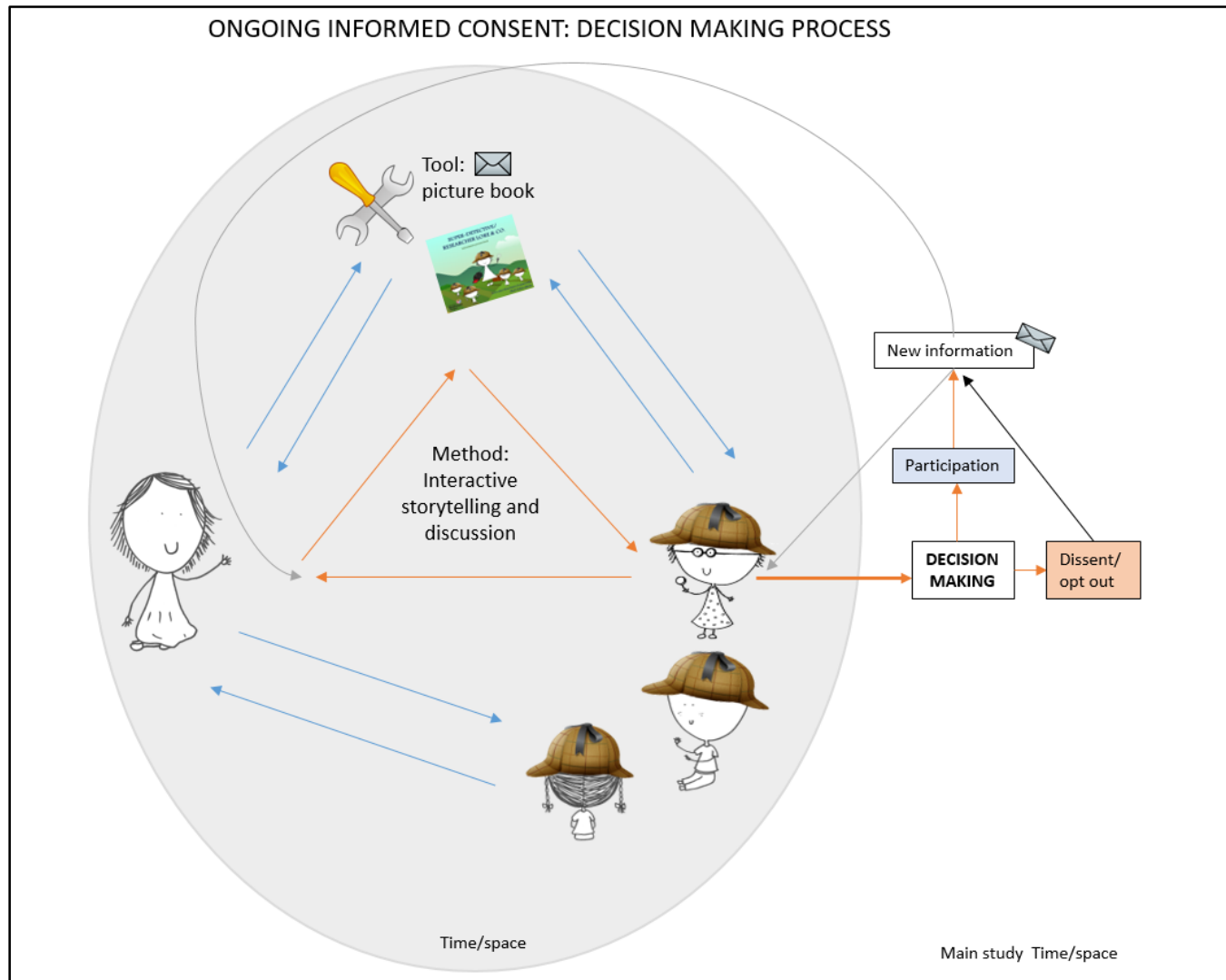
Figure 4.9: Ongoing informed consent process

Children acquired new knowledge (co-constructed information) facilitated by the picture book tool (regarding what was going to happen in the research) and started making initial decisions about participation. Consent regarding participation, however, was ongoing, and since new information appeared not only during the storytelling session but inevitably could also happen, planned or not, while 'living the experience' of the detective play scenarios in practice, children's decision-making process was fluid. Consequently, children could opt in or out when new information emerged (e.g., when hearing something of interest was going to happen or due to changing their minds).

4.4 Data analysis

As this method for consent was novel, it was researched empirically as an additional element of the study. Data collected included:

- Ten audio recordings of the storytelling discussion;
- My field notes; and
- My journal reflections (before and after storytelling).

The audio recordings were transcribed verbatim for later analysis, in addition to the researcher's field notes and reflective journal (before/after storytelling). This data was analysed to evaluate the usefulness (both benefits and challenges) of using a picture book as a tool for facilitating 3-6-year-old children's informed consent-seeking and decision-making processes. A qualitative inductive approach was taken for this purpose. I have drawn on my reflections as a researcher-practitioner, which influenced how I interpreted the data. For this purpose, I conducted a thematic analysis of the data (Braun & Clarke, 2016, 2022; Clarke & Braun, 2017). After the ten sets of transcriptions were coded, the themes were constructed.

The data was based on field notes and verbal utterances from the audio recording transcription, which made coding a straightforward process in comparison to the four detective cases. A sample of the data analysis process is shown in Table 4.2.

Table 4.2: Coding sample.

Sample No.	Conversation extracts (including additional notes, e.g. body language)	Descriptive process code	Theme
Sample 1	1. *"What people think like they think come on them and people never see it"* (Tim: commenting on children's visual thinking image in the book that shows children thinking) (Tim, Aspen Primary School) 2. (Mia explaining what a detective is) *"It's a lady who looks for clues."* (Mia, Aspen Primary School) 3. (Holly explaining what a detective is) *"Detectives look for clues, see, they look at lying out the street (image of picture book of the detective in the street) like a shop or a bottle they will find out who it belongs to and they will give it back and they say thank you!"* (Holly, Aspen Primary School)	Commenting on the picture book and sharing thoughts and what they know about the topic	Contributing to a discussion of matters of research
Sample 2	1. *"Can we bring it home?"* (Bruno) 2. *"When these days are over."* (Bruno) 3. *"But we will not take it today?"* (Bruno) 4. *"Are we gonna be the first ones on Monday again?"* (Bruno) (referring to some of the materials provided) 5. *Are you a detective?* (Katia asking me the researcher) (Katia, Aspen Primary School)	Requesting information	Informed consent (Seeking prior information)
Sample 3	1. (After sharing that I come from Spain) *"I know! (enlightening eureka moment) That's why you are talking like that funny? (referring to my English accent, Tim connects the information of coming from abroad and speaking differently) 'cause you don't even, you learn a different language to here (he clearly notices the difference) that's why you talk that language. Cause you learn another language (referring to Spanish)* Tim 2. *"I've been in the plane two, lots of times with my sister, but my brother only done it one time."* (Isla, Birch Primary School) 3. *"When I was two. I got on a plane to go on holiday. I got a pizza friend who made pizzas. She was a girl."* (Copper, Birch Primary School)	Sharing/discussing personal information	Building rapport

4.4.1 General findings

The picture book storytelling experience had a positive response from the 3-6-year-old participants in this study. Based on the interpreted data, it can be concluded that it was, overall, an informative, fairly accessible, pedagogically appropriate, and meaningful tool for the children. The medium achieved the aim of informing and co-constructing information with young children regarding their research participation in this study.

Even though the same picture book was used in all ten storytelling sessions, each experience was somewhat different. For example, the covered sections and conversations were naturally slightly different, as shown in Table 4.3. The coverage of topics also varied, as each group of individuals expressed different interests and lines of thinking. Table 4.3 shows that the durations of sessions were also different, which was due to the interactive nature of the experience.

Table 4.3: Session's coverage in storytelling session

Picture book's main theme/sections ->	(1) Introduction (self, research and research topic)	(2) Purpose of setting visit and duration	(3) Research activity	(4) Back to the office (data storage, transcription, analysis, conclusion, findings)	(5) Dissemination and anonymity	(6) Bringing back findings	(7) Voluntary participation (ongoing participation)
Information sessions (5)							
Session 1 DATA P (Pilot) Chestnut Nursery 16-04-2018	✔	✔	✔	✔		✔	
Session 2 DATA P Chestnut Nursery 17-04-2018	✔	✔	✔				
Session 3 DATA A Aspen Primary School 05-06-2018	✔	✔	✔	✔	✔	✔	✔
Session 4 DATA A Aspen Primary School 05-06-2018	✔	✔	✔	✔	✔	✔	✔

Session 5 DATA A Aspen Primary School 08-06-2018	✔	✔	✔		✔		✔
Session 6 DATA B Aspen Primary School 09-10-2018	✔	✔	✔		✔	✔	✔
Session 7 DATA C Birch Primary School 10-01-2018	✔	✔	✔	✔	✔		✔
Session 8 DATA C Birch Primary School 10-01-2018	✔	✔	✔	✔	✔		✔
Session 9 ★ DATA C Birch Primary School 21-01-2018	✔	✔	✔	✔			✔
Session 10 ★ DATA C Birch Primary School 21-01-2018	✔	✔	✔	✔	✔		✔

Overall, the picture book and associated storytelling approach was seen to be a useful tool for effective communication with young children aged 3-6 years. It was particularly useful in regards to being:

- An interactive tool that stimulated participation in dialogue;

- Attractive and arousing children's interest;

- An icebreaker and for rapport building;

- A stimulus for questions (about the story and visuals); and

- A positive starter for the research (not necessarily consenting).

These will be discussed in turn with reference to the data. It was not all easy, however, and challenging implications derived from the strengths of the tool were also encountered, and these will also be discussed below.

1. **Flexible interactive tools stimulating participation**

The storytelling sessions promoted positive interactions between the children, the picture book, and the researcher. The images, as catalytic tools (Baumfield et al., 2009), stimulated thinking, talk, and other forms of expression, in addition to exhilarating children's participation in general. Children connected with the information in various ways (visuals, narratives, content, others' comments) and also communicated via multiple different languages (from facial and body expressions, for example pointing and nodding, to verbal utterances).

Even though the interactive quality was a key indicator of success in creating space for information sharing, discussing, and decision making, there were also some challenging implications encountered in practice that are worth discussing. Occasionally, it felt that some children took over the conversation and (unintentionally) limited other's opportunities to talk. It was also a challenge to balance the lengths of conversations, as at times some children were more enthusiastically engaged and ready to talk than others. Also, on some occasions, children wanted to talk extensively about a topic that could seem overly 'long' for others. Finding the balance for a diverse group of children when doing 'live' research could be challenging and hard to achieve. The storybook was therefore used in a flexible manner,

tuning in with individual children as well as the overall group, and trying to be sensitive and perceptive to children's individual reactions and expressions. Therefore, in some sessions, a few illustration pages were passed over and left for later if it was felt they were inadequate or meaningful at that specific time and context, or if the duration of the session was perceived to be long enough for some. For example, in Session 6 (Aspen Primary School), the 'back to the office' (Part 4) was skipped, in which content related to data storage, transcription, analysis, conclusion, and findings could have been discussed (see coverage in Table 4.2 for further examples). Such dilemmas had ethical implications for me as a researcher, since I held the responsibility to provide opportunities to inform a diverse group of children, but I also had to ensure that this was what the group of children actually wanted at the time. Despite being small groups, providing information opportunities that would cater to all children's needs was inevitably a challenge. Therefore, in some cases, choosing to skip parts and leaving them for later seemed like a good ethical compromise. These situations resemble those faced by teachers in daily early years practice. However, when holding the researcher's role, one is constrained to a much narrower research timeline, and there is less likelihood of finding the times and the right opportunities for those who would like to engage further in such conversations. In addition, high levels of interaction could mean various people talking at the same time, resulting in it being difficult to hear what all the children were saying and potentially missing a comment or question from another member of the group.

Due to the diversity of children and context, there was always an element of unpredictability, which meant that as a researcher, I could not fully anticipate what interaction might be interesting for specific individuals or needs. Therefore, when confronting this situation, flexibility was found to be essential. The flexibility of the picture book tool enabled me, as the researcher, to prepare the material through illustrations and "invisible" text and decide whether or not to cover those within the session in response to the fluid environment. This flexibility enabled the opportunity for engaged children to interact further but also provided a very subtle way of not covering all the sections and leaving those for later when it was appropriate. It was also possible to come back to it later by '*popping the picture book in and out*' through data collection to make a momentary reference when necessary. This, however, was only done naturally a few times. Overall, when any of these challenges arose, the

flexibility of '*popping in and out',* as well as extending or synthesising content, was found to be a useful property of the tool for ongoing informed consent with young children.

2. **Attractive, arousing, and maintaining interest**

The picture book attracted and maintained the children's attention, and stimulated their curiosity about what was going to happen. First, to arouse the interest of young children, creating an appealing picture book was the start. However, maintaining that interest involved further effort and practice. A tool does not guarantee success; therefore, the procedure, delivery (storytelling), and mediation of conversation were key (Pyle & Danniels, 2016). For example, when reflecting particularly on the information session with the group of 3-year-olds, I noticed my "enthusiastic entertainer" tone and role was significantly more intense than with older children, to make it more exciting, and I instinctively adjusted the practice to the specific context for audience attention. Similarly, stimulating children's participation with a touch of humour or by inviting them to answer, finishing a sentence, or asking questions worked very well, as portrayed in the conversation in Extract 4.1.

Me: *If you want to remember my name, you can think about a…?* [Pretending to drive] *What is this?* [Showing a lorry image in the 'adult reading section' in the back of the picture book page for children] *Vehicle really really really big, a lo…*

Walter: *A lorry!* [Shouting]

Me: *It's a lorry. So, I am called like the lorry. So, if you don't remember my name, you can say 'Hmmm she is called like a…* [Imitating driving] *like a lorry.* [Children smiling]

Children: *Lorry.* [Smiling, they seem to think it is funny.]

(Chestnut Nursery, Session 2)

Extract 4.1: Conversation extract (Session 2, Chestnut Nursery)

The picture book visuals provided opportunities for children not only to engage, but also to re-engage in diverse ways when the topic shifted. The conversation extract in Extract 4.2 shows an example of this conversation shift. Katia connected with the idea that I come from Spain and started to share personal information in relation to that. She then shifted from the topic of Spain to her recent injury. The visuals in the picture book provided opportunities for reconnection with the topic, as indicated by Holly's comment in Extract 4.2. Despite not being

fully sure whether Holly followed the conversation of the injury or simply maintained her thoughts via the picture book, it was clear that the visuals facilitated thinking and helped connect to what they knew, triggered expression of thinking, and reconnected and focused the conversation back to the content.

Katia: *Hey, you come from Spain?* [Talk about Spain…]

[Shows me a cut/scratch on the leg]

Me: *Does it hurt?*

Katia: *I did it outside, and then I went to the medical room.*

Me: *Oh! Are you better now?*

Katia: *Yeah.* [The story of putting on the plaster…]

Me: *Does it feel better after the plaster? I think so, right?*

Holly: *And that's Scotland.* [Pointing to the other red circle surrounding Scotland on the map.]

(Aspen Primary School, Session 4)

Extract 4.2: Conversation extract (Session 4, Aspen Primary School)

Furthermore, the picture book was not only useful for guiding conversation visually for the children, but also supported me, more than expected, by aiding recall to cover key elements as well as redirecting conversation. The research process in the early years can be unpredictable and often messier than planned.

3. **Building rapport**

The picture book storytelling was an ice breaker and served as an effective initial tool to start building rapport between the children and the researcher. The storytelling elicited children's personal experiences, and therefore helped towards building new research relationships, as in the sample shown in Extract 3 with Jerry, Henry, and Walter.

> [After finding out that I come from Spain]
>
> **Jerry:** *I'm going to Tenerife.*
>
> **Henry:** *I am…*
>
> **Walter:** *I am going …*
>
> [All seem excited and talking at the same time.]
>
> (Chestnut Nursery, Session 2)

Extract 4.3: Conversation extract (Session 2, Chestnut Nursery)

Creating opportunities to get to know each other was fundamental to building the research relationships. As a 'stranger' in the children's own setting, my trying to open up seemed a sign of respect; consequently, the story started by sharing some personal information about me with visuals, which could trigger children's curiosity, making connections, opening up, and talking. The idea was to create a safe space for children to feel comfortable, speak up, and enquire freely, which also connects with the idea of creating an appropriate context for critical thinking. Additionally, it also intended to create a background story for building an understanding of the purpose of the visit and research activity.

Despite this first element of the process being a specifically created space for research information sharing, it was equally important to create a safe space for free talk and to build relationships (Cook-Sather, 2016) with one another to enable ongoing choice/decision-making regarding participation. Conversations with young children shifted quickly from one topic to the next. This storytelling session was no different from my former experience with children. At times, children shifted talk from the information content into other conversation topics, for example, birthdays, playground injuries, and holidays, which were perhaps interesting and useful (e.g., for relationship building) but less useful process-wise. This was not interpreted as a lack of interest, but rather some children's natural way of thinking and being. I perceived these conversations as interesting and of great value, and they were embraced that way.

Despite its importance, the challenge of juggling time to get to know one other while also providing information key for decision making arose due to time constraints. For example, Session 9 was developed outside the schedule, as the necessary data had already been

collected. Since some children had been waiting and very much wished to participate, I decided to come back to do the information storytelling and one of the detective experiences with the group. At the time, my concerns about timing were reflected in the conversation (see Extract 4.4).

[Children seem really happy and excited. Anais is particularly excited, which is apparent in the gestures and tone too.]

Anais: *There is, were so many people.* [She looks really happy.]

Me: *Are you excited to come?* [Talking directly to Anais]

Anais: *Yeahh, I've been waiting for a lonnnnggggg time!*

Me: *That's true.*

Cooper: *For a while.*

Me: *Exactly, today you got the chance because there was so many children, and we had to take turns. Is that right?*

Children: *Yeahhh.*

(…)

Me: *Yeahhh, I came here to be a detective, because I want to find out how children think. Do you think a lot?*

[Children are smiling and laughing.]

Children: *Yes.*

Child: *I think a lot.*

Isla: *I always make stuff.* [Linking thinking to creation and imagination]

Child: *Me too.*

Me: *You always make stuff?*

Isla: *I made a box, a card…*

[Children talking]

Child: *Miss Lori…*

Me: *Maybe you can show me later because I want you to have some time to play, all right?*

[This is me under pressure knowing that if we take too long, they will not be able to play at all, and this group of children had asked to play various times and have been scheduled outside of the actual planned research schedule, given their wish to play.]

Me: *So, I'm just gonna tell you reaaaaally quicky what we are gonna do, we are gonna be thinking a lot, sometimes we will have to listen, open our eyes, observe!*

[The children's timetable was strict, and being aware of the time, I can really feel the pressure…]

Isla: *You mean thinking with our brain?*

(Birch Primary School, Session 9)

Extract 4.4: Conversation extract (Session 9, Birch Primary School)

Furthermore, the conversation extract (Extract 4.4) shows multiple hypothetically interesting opportunities for knowing more about each other, as well as in relation to thinking and children's understanding of thinking. This conversation could have been of benefit if further extended, rather than restricted, due to the presented time pressures.

4. Talk/ formed questions related to the picture book

The children pointed at, made meaning of the visuals, commented, and asked questions related to the picture book to find out information about what was going to happen if they took part. The storytelling, therefore, provided the space and opportunity for the children to understand and ask questions regarding the research activities to make an informed decision.

Katia: *Are we going to be doing that?* [Pointing at the activity scenario]

(Aspen Primary School, Session 4)

Extract 4.5: Conversation extract (Session 4, Aspen Primary School)

Extract 4.6 shows Hugo making sense of the visuals and is already showing inquisitiveness about detective play.

Hugo: *I think that's a sock.* [Pointing at mystery scene image]

Me: *Yeah! That's a clue!*

Hugo: *That's someone's sock.*

Me: *Yeah.*

Hugo: *Whose is that, anyway?*

Me: *Whose do you think it is? Whose sock it is this one?*

Children: *Don't know.*

Me: *Then we have to discover it. I think you are going to be a great detective, Hugo!*

Hugo: *Those are prints.*

(Chestnut Nursery, Session 1)

Extract 4.6: Conversation extract (Session 1, Chestnut Nursery)

Extract 4.7 shows John's interest in the camera and tries to find out whether the recording will be uploaded on YouTube. The child demonstrates some understanding of recording devices and is also familiar with technology such as YouTube.

> [When looking at the photograph of the researcher, the children recognised the researcher]
>
> **Tim:** *Yeahhh. I think I know what your work was, I think so. 'Cause we are doing a full book to learn something. You are talking. What does that say?* [Pointing at the speech bubble]
>
> (Aspen Primary School, Session 6)

Extract 4.7: Conversation extract (Session 6, Aspen Primary School)

Explaining the reasoning behind anonymity in research can be more complex in some contexts than in others. Research contexts, for example, concerning more sensitive topics, can facilitate its understanding naturally (conflict resolution, for example). When reflecting on this issue in the context of this thesis's playful detective experiences, it felt slightly challenging and conflicting. Children felt proud of their performance, and some children wanted to share these videos with their families (see Extract 4.8), for example, by coming up and asking me whether I could show the videos to their parents. At a different time, Bruno also requested that I share what happened with his teacher as 'she will be proud' of his performance. Hence, explaining to these specific children that their faces were going to be blurred, for example, seemed a little conflicting at the time.

> **Katia:** *Are we using the camera?*
>
> **Me:** *Yes, we might be using the camera, but later.*
>
> **John:** *After the camera, it means we are going to be in YouTube?*
>
> **Me:** *No, we are not going to put it in YouTube.*
>
> **Children:** *Ohhh, come on!*
>
> **Me:** *Hahaha. No, nobody is going to see it.*
>
> **John:** *I want to be in YouTube.*
>
> (Aspen Primary School, Session 7)

Extract 4.8: Conversation extract (Session 7, Aspen Primary School)

Extract 4.9 shows part of the conversation between Holly, Katia, Leo, and me. Holly and Katia had attended a previous information storytelling session. Katia and Holly remembered and understood the discussed about research and participation from the past session. Their knowledge and experience formed empowerment in their voices, which is key in the decision-making process and very relevant in the topic of critical thinking. Participating twice in the information storytelling session was not something planned, but rather accidental (spontaneous occurrence), which provided me with the opportunity to see the role of information and the experience (belonging) in empowering, enabling, and strengthening voice.

Holly: *How children do stuff.* [She attended the last information picture book session but I am impressed by how she articulates it clearly]

Me: *Yeah! How children do stuff. Wow, Holly, you really are a good detective. It's not easy to understand; it is quite tricky.*

Holly: *Because you have told us before.*

Katia: *We have been with you before.*

Me: *Yes, because I have been with you before. You have a good memory, don't you?*

Leo: *Miss Lore.*

Me: *Yes?*

Leo: *Detectives look for stuff.*

Me: *Detectives do what, sorry?*

Leo: *Mm, they look for stuff.*

Me: *They look for stuff, exactly! And they look for clues, and what else, Katia?*

Katia: *We have already been with you, so we know what you are going to say.*

Me: *Exactly, so you can perhaps help me? What do you think about…? This…* [Passing some pages in the picture book where there are children thinking, showing the brain in the image]

(Aspen Primary School, Session 5)

Extract 4.9: Conversation extract (Session 5, Aspen Primary School)

The way both children responded during the session showed certain knowledge about the project. In general, it seemed that knowledge empowered the children, giving them pride in comparison to the new participants who had not yet attended the storytelling session. Throughout the research practice, it was visible that this knowledge and the possibility to make choices provided a sense of belonging and overall empowerment.

Some children also asked questions regarding choices and their possible implications before decision making. Overall, the children developed some understanding of what was going to happen and showed interest in wanting to know more by asking further questions and commenting on what they were seeing and hearing in the picture book storytelling session.

5. **Responded positively**

The children responded positively to the storytelling approach. Most children showed emotions of excitement and willingness to start detective play even before the end of the storytelling session, as portrayed in Extract 4.10 and Extract 4.11. On some occasions, children who had already participated had informed other children about their research participation. Consequently, some came to the information storytelling session with at least some partial information and a positive prejudice towards what was going to happen. Due to the location of the detective research experiences, it was easy for children to take a look, wonder, and comment when passing by and ask other children in the class.

> **Katia:** *And when are we actually gonna start this?*
>
> **Me:** *Do you wanna start now?*
>
> **Children:** *Yeahhh!*
>
> **Me:** *OK, and if you don't want to play anymore, you can say OK I'll be back, I don't want to play anymore, or maybe ohh now I want to play again.* [Giving specific examples to show it is OK]
>
> **Me:** *We can start with a little game…*
>
> (Aspen Primary School, Session 4)

Extract 4.10: Conversation extract (Session 4, Aspen Primary School)

Some children, like Hugo, (Session 1, Chestnut Nursery), not only showed a willingness to participate, but also wanted to contribute by offering to bring his own additional iPad when he saw we were going to be using one in research:

> **"*I am going to bring the iPad to have enough of it*"** (Hugo, Session 1).

Such behaviours showed that the picture book storytelling provided some information about what was going to happen that provoked excitement in relation to children's involvement in research participation.

Child: *Can we play now?*

Me: *You want to play now?*

Children: *Yeah.*

Me: *We are going to ask the teacher later, because maybe you need to have lunch first.*

Teacher: *Yeah, it's nearly time to start your lunchtime, guys.*

(…)

Hugo: *Can we play now?*

Me: *Do you want to play now?*

Children: *Yeahhh.*

We: *I don't know if we can play now because we need to look at the time. Who has a clock (meaning watch)?*

Child: *Not me.*

Child: *Not me!*

Abba: *Not me.*

Child: *No.*

Child: *Can we do it now?*

(Chestnut Nursery, Session 1)

Extract 4.11: Conversation extract (Session 1, Chestnut Nursery)

4.5 Summary

In this chapter, I have discussed how a pedagogically appropriate tool was designed to inform and negotiate children's research participation using my early years teaching repertoire. This repertoire was based on the knowledge, strategies, and experiences translated into research from working with young children. Additionally, I have shown how it was implemented with ten groups of young children and discussed what was found useful as well as challenging.

Overall, using the picture book in the form of storytelling was an effective tool for communicating research information in the process of ongoing informed consent with children aged 3-6 years. However, various ethical dilemmas were still faced, showing the complexity related to informed consent processes with groups of young children. For example, not being able to ethically cover all the possible research information within the storytelling experience was ethically challenging, but at the same time was the result of

ethical and reflective decision making in the context of working with a diverse group of young individuals with different needs. In this case, the book provided opportunities to support the ongoing nature of consent, since it involved a format that allowed children to return independently or with an adult or friend. Despite expressing initial consent after the storytelling session, children continued enquiring and learning new information and additionally continued expressing views related to their participation (opting in and out) in different ways (using additional signs such as clothing, camera, etc.); hence, consent remained an ongoing and reflexive process.

The storytelling information experience also showed that adopting a pedagogically appropriate method for information sharing and discussion was useful; however, the physical tool in itself was not enough without the contribution of the relational aspect of my pedagogical teacher–researcher repertoire. For example, data obtained from this experience attuned with the children's research ethics literature, showing that tuning in (Blaisdell et al., 2019), decentering (Donaldson, 1987), and being flexible, situated, and proactive in response to challenges during the process of informed consent with young children was vital to confront the ethical dilemmas of practice. Despite the benefits and constraints of the information-sharing method, the importance of intentionally creating time, space, and opportunities for information sharing and decision making emerged as central. Additionally, developing the design was not only profitable for matters of children's consent, but before this, it served as a tool to engage in reflexive activity for me the researcher.

Matters of consent were important for this research study ethically and methodologically, and contributed to the context of facilitating critical thinking in the following four detective cases. The process was empowering and stimulated children's thinking about the topic, research and choice of participation, prompt involvement in detective experiences and provided opportunities for exercising voice and agency, which was useful when aiming to create brave spaces (Cook-Sather, 2016) for critical thinking. Voice and agency in participation took different forms. For example, to illustrate this in the *Snack Mystery*, Holly took responsibility for the research, showing ownership and initiative by moving the camera when the children investigators, including herself, were no longer in the camera scope (see Figure 4.10).

| Video sequence 1 | Video sequence 2 | Video sequence 3 |
| Holly checking the time. | Holly re-centres the camera. | Holly is smiling with satisfaction. |

Figure 4.10: Camera scope correction video sequence (Holly, Aspen Primary School) (Red arrow indicates where the main investigation is occurring)

Holly approached the camera and said (in what seemed private speech) "**Let's see what time it is**." She went around to look at the video camera screen, and when doing this, noticed that the camera had moved and was not centred (she could have also noticed this before saying she was going to 'look at the time'). Therefore, she moved it herself to capture us in the centre, as we were continuing with the investigation (Video sequence 1 in Figure 4.10). She then approached us and said, *"I'm just trying to face the camera towards us."* When I asked her whether she wanted the camera to face us, she told me she wanted to **'take'** the video. The gesture showed appreciation for their work and ownership of the play, and illustrated that she was taking responsibility for the research tools involved (for their own investigation as well as for my own wider study). Often, children asked permission when using these tools, appearing not sure whether it was permitted. In this case, Holly had already understood from the beginning (usually evaluating the adult's behaviour) that there was no need to ask about everything, and she felt entitled to check and move the camera to capture the play better, which illustrates in a particular form Cook-Sather's (2016) idea of brave spaces in research participation. I checked the camera and thanked her for her actions. She seemed to be very proud. Holly continued with the investigation. This could be argued to show that the notion of consent established in the project was not one of simple passivity, but rather one that facilitated agency for the children within the research and, as such, aligned more fitfully with the child rights perspective of this thesis.

Chapter 5 *Mystery Box*, Case 1

5.1 Introduction and aims

Chapter 5 is divided into five sections. This introduction provides the rationale for the development of the *Mystery Box (MB)* case. Section 5.2 presents the design of the experience, including duration, location, material, and preparation, followed by a reflection on the design. Section 5.3 describes how it was implemented. Section 5.4 reports the data with a wide range of extract samples. To conclude, Section 5.5 provides a summary and reflection on the *Mystery Box* experience.

In alignment with my research questions, through this particular case, I sought to understand:

1. The usefulness and challenges of the *Mystery Box* experience to stimulate thinking;
2. Young children's use of strategic questioning to ultimately attempt to solve a problem; and
3. Young children's thinking techniques, used strategies, and presented challenges in attempting to solve the mystery (problem).

The overall aim of this experience was for children to engage in questioning, with the ultimate objective of collecting the necessary clues to make an educated guess regarding the contents of the *Mystery Box*.

The *Mystery Box* is not new in early years practice and has been also used in research before, although the name, process, and content might vary with different age groups, disciplines, and for diverse research purposes. For example, Straits (2005) used the mystery box with older additional support needs students in the subject of science and writing, Santos and Centaurio (2012) explored collaboration and science, Charlesworth (2004) developed 'what's in the box?' for stimulating questioning in early years and Rule (2007) utilised the method for developing young children's reasoning. In this thesis, the *Mystery Box* was adapted as a detective 'training' experience for children to engage with their detective role, stimulate thinking and exercise enquiry skills and behaviours. The ultimate goal was to use it for

researching young children's critical thinking, and to understand the usefulness and limitations of such play.

5.2 Design of the experience

The fundamental aim was to design a research scenario consistent with detective experiences for eliciting and researching critical thinking skills and dispositions. The experience was intended to arouse children's thinking by drawing attention to the properties of objects, hence noticing 'the parts of the whole'. This attention in the form of observational and analytical skills was thought to be useful for the other three coming mystery experiences. It was also thought to be important to articulate and introduce practical terminology during play, such as 'guessing', 'thinking', 'questioning', making a distinction between 'wild guesses' and 'good (educated) guesses', talking about 'evidence' in relation to making better guesses, mysteries, and the detective role, among others. Thus, modelling language useful for thinking and talking about thinking strategies was considered of benefit, as well as gradually familiarising students with detective research tools.

5.2.1 Design

The experience, as with the rest of the cases, was designed as a problem-solving activity; however, the interest lay in the use of different ways of thinking during the act of problem solving. The emphasis was placed on the process (manifested thinking during the process with the intention of achieving the goal or solving the mystery) rather than on whether the children solved the mystery. The problem-solving context (*Mystery Box* experience) was itself a catalytic tool (Baumfield, 2006) to elicit critical thinking and questioning as the "tool of inquiry" (Facione, 1990, p. 2; Dewey, 1916) needed to navigate the problem-solving process.

The *Mystery Box* experience was designed as the first case (Figure 5.1).

Figure 5.1: Structure of the *Mystery Box* experience

This case was not included with the expectation it would be the most fruitful in response to this thesis's research questions, but rather for its suitability for experiencing for the first time in practice what the detective mystery-solving job entailed and to exercise skills and behaviours to later build upon the rest of the cases. As the first case presented to the children, it was also useful for rapport building, learning about the dynamics of being part of the research group, and for me as a researcher for assessing and tailoring future cases or practice. The simple and flexible structure of the game provided accessibility and suitability for all participants. Thus, not following the 'rules' strictly did not directly involve 'failing' or terminating the game, but rather could open unexpected new arenas to understand and investigate the thinking, strategies, and behaviours of young thinkers.

The *Mystery Box* involved introducing to the children a box that contained an unknown object. Children who adopted the detective role were encouraged to formulate questions that would potentially raise the probability of a desirable outcome. A closed green bag containing a diverse collection of objects was prepared to introduce a new item into the mystery box when the previous one was guessed. My intention was to give as few clues as possible, in order to stimulate the children's question formulation. To serve as a guide, and only when necessary, I provided examples of possible questions that could be useful to ask. Questions related to object properties such as weight, size, colour, texture, state of the material, and where they belong, for example. The children were constantly encouraged to ask questions. The concept of 'wild' guessing versus 'good' guessing was discussed to encourage children to find more information regarding the object before making their guesses and avoid very specific object naming. These concepts were first introduced in the Muppets' introductory video *Kermit and Cookie Monster and the Mystery Box* (Sesame Street, 2008, 00:02:45). In this video, the character Cookie Monster shows a pronounced tendency for 'wild' guessing in a similar version of this game (full YouTube video source is in the reference list). In addition, during questioning and guessing, I sometimes reminded the children about the pieces of information that we had already identified and, when needed or asked, gave clues. The children took turns hiding a mystery object and experimenting with the role on the 'other side'. In that role, the children knew what was in the box, were able to understand the hider's perspective, and focused on others' questions. Overall, my interest

did not lie in making the questions 'right', but rather in the individual and collective process of the thinking experience and how the mystery was approached.

5.2.2 Estimated duration

Assuming the children would be interested, the estimated time was approximately 30 minutes. Additionally, 10 to 15 minutes were required to set the research scenario and another 10 to 15 minutes to pick up and leave the area as it was. The Muppets video was about 2 to 3 minutes long.

5.2.3 Location

Five *Mystery Box* experiences were performed in two schools. In Aspen Primary School, the detective experience was created in the open-corridor space in front of their classroom (see Figure 5.2). This was an important requirement to ensure that the children could go back by themselves to their classroom activity if they wished to do so, while both their teacher and I could see them. In Birch Primary School, however, the experience took place in a matted space in the corner of the children's classroom (see Figure 5.3).

The basic requirements for the space included a space to sit down comfortably (either a mat or table and chairs) and space to set up the data recording devices (camera with tripod and audio recording device).

Figure 5.2: Location: Aspen Primary School

Figure 5.3: Location: Birch Primary School

5.2.4 Materials and preparation

The following materials were used:

- A closed box referred to as 'the mystery box' (see Figure 5.4).

- A bag containing a variety of diverse objects (e.g., a fork, pen, orange, tissues, a honey jar), referred to as the 'green bag'.

- iPad with downloaded Muppets video section (Sesame Street, 2008, 00:02:45).

Figure 5.4: *Mystery Box*

For this specific experience, additional tools were not required by the children, apart from the apparel that sought to help develop their detective role-play character:

- Detective gear and tools (deerstalker hat, personalised badge, and magnifying glass).

Lastly, the researcher's materials included data recording devices (see Chapter 3), such as a camera for videotaping the session and an audio recording device, and accessibility to the research information picture book (see Figure 4.3).

5.3 Implementation

5.3.1 Sessions and duration

The *Mystery Box* activity, as presented in Table 5.1, was implemented in the two schools between May 2018 and January 2019. Sixteen 5-6-year-old children took part in the experience grouped across five sessions. The average duration of the *Mystery Box* sessions was 32 minutes, which meant the children were interested and engaged in the experience, providing a rich and wide range of data. Participants and settings are described in detail in Section 3.6.

Table 5.1: Number of sessions, sample, date, and duration.

Mystery Box Sessions			
Settings	Session number and date	Number of participants aged 5-6 years per session	Duration of session
Aspen Primary School (Primary 1)	Session 1 05/06/2018	3 children Katia, Holly, John	29' 58''
	Session 2 05/06/2018	2 children Mia, Miles	23' 51''
	Session 3 09/10/2018	3 children Tim, Cira, Diana	52' 5''
Birch Primary School (Primary 1)	Session 4 10/01/2019	4 children Stella, Ava, Marc, Bruno	29' 13''
	Session 5 10/01/2019	4 children Amanda, Will, Robin, Maria	31' 15''
Total of both schools	5 sessions	16 children	Average duration of session 32' 36''

5.3.2 Research process

Before each field trip, the practice was to go through the research itinerary list, including an overview of the activity procedures as well as the material inventory checklist, to ensure that all materials were placed in order of use in the research travel bag. This was especially important considering my limited research session time with each group.

I organised the materials in order of use, starting from the information picture book, mystery box materials, detective gear, video or audio recording device positioning, and lastly, two extra detective games. The latter were planned in case the children finished the game earlier than expected, were not interested, or wanted to continue playing other detective games after the *Mystery Box* was completed. As a researcher and former teacher aware of the uncertainties that fieldwork may raise, I understood the necessity of planning for unpredictable moments. This was not needed across all participants and groups; hence, it was not analysed.

On day one, the children took part in the research information storytelling session. Afterwards, the children were invited to dress up and join the activity with their own group if they wished to do so. I organised materials carefully to access them and put them away quickly for the different stages of the activity. The physical pre-arrangement plan was important, as it was necessary to accommodate the scenario in each of the school setting spaces as comparably as possible, making sure the scene was first captured within the scope of the video recording device. Next, the *Mystery Box* experience was introduced with the support of the related Muppets video, and the actual mystery play proceeded after this.

5.4 Data analysis

Data was process coded manually and with NVIVO. Process coding (Saldana, 2016) was useful in labelling and organising the content. Categorising it helped me understand the different types of children's formulations of questions, types of guesses (for example, 'wild' or 'good (educated)'), interactions, used strategies, presented challenges, and my input in the specific case. These codes were later useful for the development of themes. In this section, detailed

data will be discussed alongside the appropriate literature. Following Nutbrown's (2021) advice on paying 'due respect to the data' given by children in relation to its interpretation and analysis (p. 94) and acknowledging the challenges of illustrating the child's authentic voice from an adult's perspective, I will therefore include sections of raw data with examples of children's dialogue and visuals throughout the next section. This practice will continue throughout the rest of the cases.

5.4.1 Themes

The themes of interest are related to the following:

1. Strategic questioning (Ruggeri et al., 2021) for mystery solving;
2. Strategies used for goal-oriented problem solving; and
3. Usefulness and challenges of using the *Mystery Box* and detective role-play as a method for stimulating critical thinking.

Even though the intention was for children to use strategic questioning to solve the given mystery, and this 'instruction' was constantly emphasised during play, the findings demonstrate that children used eight alternative and resourceful strategies during detective play. The following nine strategies were used in the five *Mystery Box* sessions:

- Questioning strategies;
- Requesting clues strategy (direct information-seeking strategy);
- Guessing strategy ('educated' or 'wild') and discarding strategy;
- Discarding strategy (looking at what is left in the bag);
- Sensorial strategy (feeling the movement of an item by moving the box);
- Trying to memorise items when it was their turn to hide and remember them;
- Looking at camera footage;
- Objects seen in their immediate environment, within my materials (for example, sensory toy brain); and lastly
- Peeking strategy ('cheating'). This was not regarded as an equal strategy and was generally discouraged.

5.4.1.1 Questioning strategies

A total of 108 questions were asked in the five *Mystery Box* sessions, as shown in

Table 5.2.

Table 5.2: Question formulation frequency

Question formulation					
School	Aspen Primary School			Birch Primary School	
Session No.	Session 1	Session 2	Session 3	Session 4	Session 5
Questions No.	6 questions	28 questions	11 questions	23 questions	40 questions

The 108 questions asked by the children could be categorised in several ways, as portrayed in Figure 5.5:

- 57 were related to object information (e.g. **'Do you clean with it?'** Miles: Natural questioning but more difficult to intentionally formulate relevant questions),

- 40 were very specific (trial-and-error) regarding the object (e.g. **'Is it a toy horse?'** Robin, or **'A fake orange?'** Robin: Specifying further whether the item is real or pretend),

- 13 were 'copied questions' repeating right after hearing my encouraging question samples (e.g., **'Is it big?'** Bruno), and

- 4 were classified as 'others' (e.g., asking to feel the box to figure out clues based on movement, weight, etc.).

- A few were related to more than one category.
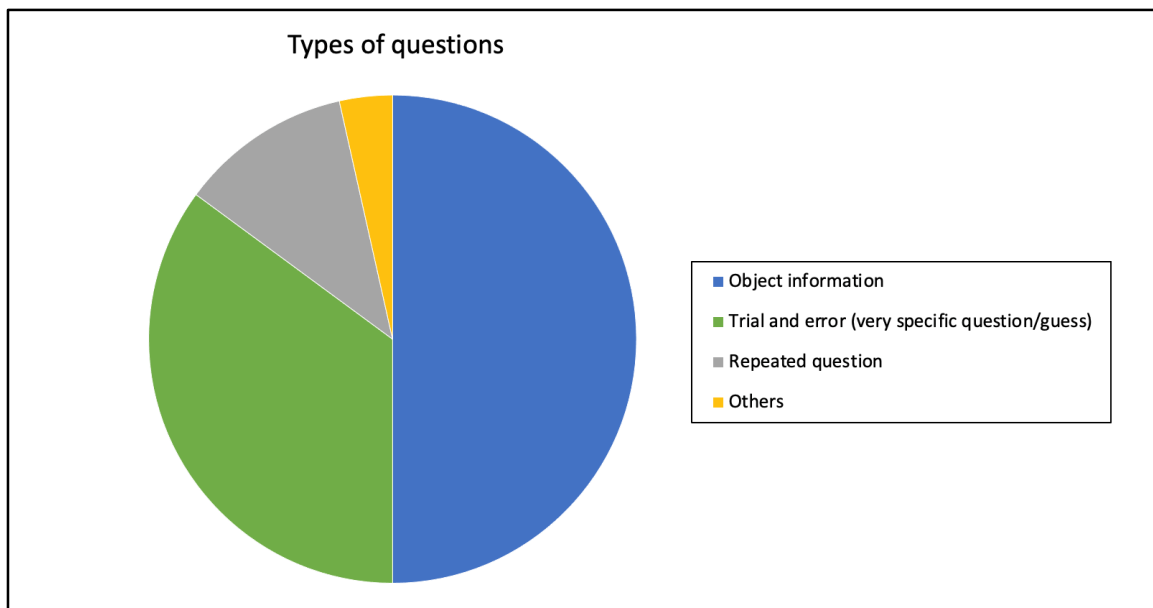
Figure 5.5: Visual representation of the types of questions

Differences in questioning strategies were found among the children. Some children, like Maria, (Session 4, Birch Primary School), directly understood the purpose of questioning and what a question was. At the start of Session 4, as soon as I explained the purpose of the game and gave various sample questions, Maria offered her own sample question: *'Is it stripe [pronounced stripy]? Does it have red stripes?'*. This demonstrated that she understood what was expected. Others, however, had difficulty formulating questions to achieve the goal (getting as many clues as possible) but showed skilfulness in guessing when several clues were achieved by the group. Some children, like Ava, asked fewer questions but listened carefully, retained information, and made successful guesses as a result (Birch Primary School). Ava's successful guessing showed the merits of her own thinking as well as others' critical input; hence, thinking was interpreted as both collective (Wegerif, 2015) and individually constructed.

Some of the children in Sessions 1 and 3 from Aspen Primary School had the most difficulties forming questions. The reasons for this could not be determined with certainty. However, possible factors could be related to language and semantics (terminology). For example, not knowing what a question is, abstraction without visual stimuli, first experience with this style game, limited working memory, anticipating, and planning (what they wanted to know framed as a question), time constraints due to speedy play conditions, more impulsive

behaviour due to eagerness to guess, the influence of other typical games such as 'I spy with my little eye' and struggling to adapt to the new rules of the *Mystery Box*. Overall, considerable cognitive orchestration and effort were required for this activity.

Some children insisted on requesting direct clues (see Extract 5.1) and when it was their turn to hide, they also offered a variety of clues to 'us' the 'guessing' detectives.

> **Mia:** *Can you give us clues?*
>
> **Me:** *I can give you clues, but you can also ask me questions to get the clues. For example, 'Is it alive?'*
>
> **Mia:** *Can you eat it?*
>
> [Some children repeated previously learnt questions. Experience can give skilfulness.]
>
> (Aspen Primary School, Session 2)

Extract 5.1: Session 2, Aspen Primary School

Similarly, but with a very different outcome (Extract 5.2), Katia requests clues directly, as she shows signs of finding the task challenging. The clue, however, was not to her satisfaction, as she showed awareness of the large number of items in the class, so she expressed awareness of the lack of probability of guessing well based on that clue. Even though she did not attempt to ask questions, the positioning of not knowing, her awareness and understanding was an excellent first step to the *Mystery Box* game. This position can lead to an understanding of the key to success in this specific experience.

> **Katia:** *Give us a clue.*
>
> **Me:** *It's in your classroom.*
>
> **Katia:** *How are we supposed to know? There are so many things in our classroom.*
>
> (Aspen Primary School, Session 1)

Extract 5.2: Session 1, Aspen Primary School

This evidence regarding the challenge of formulating questions is supported by Rule's (2007) findings based on 90 preservice teachers' reflections on the use of a similar version of the mystery box with preschool and elementary school students. These results are interesting in view of the significant number of questions that young children pose throughout the day.

Young children are equipped to formulate questions in both natural and artificially stimulated environments. Rule (2007) mentioned that 'a few children did not know what a question was but understood once several examples were given' (Rule, 2007, p. 15). Children's natural curiosity regarding their environment produces questions, and if they understand how to behave (give an answer) when a question is posed to them, then meaningful conversation arises. However, it cannot be taken for granted that all children consciously understand what the word 'question' in itself means or that they can easily formulate a question when asked to do so. Charlesworth (2004) mentioned that some children were able to infer and acquire meaning from context exposure during problem-based learning: 'there are several activities that we carry out regularly, and in some cases without noticing, to develop their understanding of a question' (Charlesworth, 2004, p. 17). However, Charlesworth (2004) pointed out that not only is it important to know what a question is, but also to be aware of how questions can function as tools for enquiry (Charlesworth, 2004).

Mills et al. (2010) investigated the abilities of 50 children aged 3-6 years to use questioning as an epistemic tool in problem-solving contexts. They pointed out the importance of three main skills for successful problem solving through questioning. The first relates to whom to ask the question after identifying the problem; the second skill relates to the actual formulation of the question; and the third is the ability to use the information for problem solving (Mills et al., 2010). This last offers a significant insight, as formulating appropriate questions or even memorising effective questions previously heard and getting key information as an answer is 'non-profitable' if the children are not taking the information into account when making their guesses. In Extract 5.3 below, the children were successful in formulating questions and acquired useful clues (they know that the object is small, round, and orange) to make some good guesses. However, Will seemed to focus on the last attribute of the object (being orange), and he guessed the object to be a tiger. In this example, even though the information suggests otherwise, the child has not utilised and applied it effectively, as discussed by Mills et al. (2010). Will's error could be attributed to various reasons, for example, focusing only on recent information (working memory), not hearing the clues, lack of attention, lack of time due to the speed of the game, not focusing on the task, or even impulsive response due to the eagerness to guess correctly.

Child: *Does it have… is it big or small?*

Me: *It's quite small. I think it is around this big.* [Demonstrating]

Child: *Is it a ball?*

Me: *It's not a ball but is the shape of a ball, it's round.*

Maria: *I know, I know, it's a sphere!*

Me: *Yes, it's a sphere. But what is it? It is the shape of a sphere.*

Child: *Aaaah.*

Child: *Mmm.*

Child: *Eeee.*

Child: *What colour is it?*

Me: [Answering another child] *The shape is of a sphere.*

Maria: *A tennis ball.*

Child: *What colour is it?*

Me: *Good question.* [Praising and mentioning question] *The colour is orange, like your magnifying glass, orange.*

Child: *Emmm.*

Me: *It's round and it's orange. What is it?* [Reminding children of what they found out.]

Child: *I don't know.*

Child: *Emmmmm, a tiger?* [Is he focusing only on the last attribute?]

Me: *It's not a tiger; it's something that is round, small, and orange.*

Robin: *Emmm, an orange?*

Me: *An orange.* [Repeating Robin's answer as if confirming]

Robin: *A fake orange.*

Me: *An orange. If it's a fake one? Actually, it is a real one. Do you want to open the box?*

[Children open the box, excited]

Me: *It's round, it's small, and it's orange.* [Repeating the clues from which they conclude it is an orange]

Robin: *Aaah, it's medium size, I think.*

Me: *I suppose it can be medium size, yes.*

(Birch Primary School, Session 5)

Extract 5.3: Session 5, Birch Primary School

In another study involving 37 children aged 4-6 years, Legare et al. (2013) found that children were able to formulate questions earlier than developing the ability to 'successfully coordinate and maintain the information in working memory' (Legare et al., 2013, p. 74). This influences the effective application of the received information. The results indicated that 4-

year-olds were able to generate questions spontaneously without always selecting the final correct answer (Legare et al., 2013, p. 74).

Both Mills et al. (2010) and Legare et al. (2013) found that pre-schoolers were able to ask effective questions; however, there were significant developmental differences in the outcome. Differences were found between the ages of 3 and 5 (Mills et al., 2010) and 6-year-old children, who asked more constraint-seeking questions than 4-5-year-olds (Legare et al., 2013). In the present case, even though all children were in Primary 1 (5-6 years old), the results did show differences in outcome. These findings are useful to understand errors such as the one illustrated in Extract 5.3 regarding Will's 'a tiger' guess, where despite having some information, the inferred guess was not concluded from the premises.

A distinction was mentioned to children between 'wild (trial-and-error) guessing' and 'good (educated) guessing'. Wild guessing means guesses or predictions based upon no evidence, and educated guesses are those concluded from at least one piece of evidence (clue) that would raise some sort of higher probability of a desirable outcome. Both 'educated' and 'wild' guesses were observed in all sessions. Generally, children used a wild guessing strategy to achieve the goal by trying to guess very specific objects and objects' characteristics that they might have in mind. This could be due to the presented complexity of not having any visual representation or fixed referencing of an object, which might arouse children into seeking, needing, and thinking about specific objects (e.g., those found in their immediate environment), and possibly asking very specific questions related to those thoughts (Extract 5.4 below). Extract 5.4 below shows a sample of how children were 'wild guessing' in the form of very specific object naming (trial-and-error strategy). To try to guess and discard, the children named random items, such as a giraffe, cow, or even a teddy bear. I, therefore, took such an opportunity to remind the children to ask questions and explicitly mention when they were 'wild guessing'. In response to this, Robin, Amanda, and Maria returned with a question, which I praised to attempt to raise further awareness.

[Children are the guessing detectives, and I am hiding the object.]

(…)

Will: *A giraffe?*

Me: *Not a giraffe.*

Will: *Is it a cow?*

Me: *No, it is not a cow.*

(…)

Will: *Is not a teddy bear?*

Me: *These are 'wild guesses'; you have to ask some questions to get some clues.*

Robin, Amanda, and Maria: *What colour is it?*

Me: *What colour is it? Good question! The colour is greyish, grey or black. I think grey, let me check, a little brown, also.*

(Birch Primary School, Session 4)

Extract 5.4: Session 4, Birch Primary School

On other occasions, when considered appropriate or needed, I suggested a more general sample of a question to illustrate the idea in practice. In several cases, children used the 'copying strategy' and repeated and used the question I had suggested immediately. Charlesworth (2004) suggested that the 'key is to model and develop their use of questioning' (p. 32). However, the 'copying strategy' might also be of some benefit, considering that some children repeated the previously appearing questions in their next guesses, which could possibly suggest some learning from the previous trial (e.g., ***'Does it live in the kitchen?' Ava)***. Ness (2017) suggested identifying wonders that can ultimately be transformed into questions in the context of story narratives. In addition, even though the context and purpose of DiStefano and Ness's (2018) work is different, the recommendation of transforming observations—in this case, a simple guess—into wonders and helping the child to rephrase it into a more general question may apply. For example, when Miles suggested that it could be a small brain-prep elicitation artefact, this guess could be transformed into a question with help.

The hidden object in the mystery box made questioning a bigger challenge due to its visual absence. In addition, clues are mere mental pieces of information to juggle in the child's memory and orchestrate with further questioning and inference making. In Mills et al. (2010),

the possible shapes that could go on the blickets to open a specific box (purpose of task) were visible to children beforehand, and in Legare et al. (2013), the photographs of the animals that were hidden in a specific box were shown to children previously; hence, the children's imagination and possibilities were narrowed down. This type of information can provide a helpful constraining focus and help diminish young children's abstraction, triggering the formulation of questions and providing inspiration about what to possibly ask when figuring out how to solve the problem. Charlesworth (2004), for example, suggested showing five objects to children, one of which would later be introduced in the bag (Charlesworth version of the mystery box).

Demonstrating the items in advance eliminates abstraction, which might help focus question forming, but might also simplify the challenge significantly. There would be fewer possibilities to capture children's thinking for open, explorative research purposes. For example, Tim's use of strategies in Extract 5.6 might not have been necessary if there had only been five items and those had previously been presented to children. In the present study, no options of what could be inside the box were shown to the children. Thus, visual accessibility of the items was only granted for a few seconds when it was their time to choose the item from the 'green bag' in order to hide it in the mystery box.

In a different study, Kemler et al. (2004) studied children's questioning regarding unfamiliar artefacts. It was to be expected that unfamiliar items would arouse curiosity and, as a result, questions. The results showed that the children's questioning was productive. I suspect that showing children the visual stimuli (concrete) was important for question formulation, making questioning more natural to children without the barrier of abstract information based on guesses and answers. Formulating questions related to an unknown object requires anticipation of characteristics, the ability to formulate questions, and considerable abstraction, as the object is not present to the eye. In addition, to be able to achieve the goal of guessing what is in the box, it requires an orchestration of listening skills and memory skills to be able to record, organise/orchestrate and maintain a load of information that has been collected between all the members of the group.

5.4.1.2 Alternative use of strategies

Apart from using the question formulation approach, other strategies were used to attempt to find out what was in the mystery box. Some children looked around the classroom environment, possibly looking for inspiration, key characteristics, or even whether anything was missing. Tim (Session 3, Aspen primary School) in Extract 5.5 found it difficult to get the necessary information through questioning, so he made a playful attempt to peek into the 'green bag' of items to see what was yet to be introduced into the box (not the actual hidden item). His agenda seemed playful at first, but it was confirmed in a later turn that the plan was to memorise the items (memorising strategy). In Extract 5.5 below, Tim took the role of the person hiding the item and, while Cira and I were trying to guess, Tim suggested we look in the bag to see what was missing. His thinking shows resourcefulness, good logic, and creativity.

Tim: *And is made of metal and got a lid.* [Last part, very soft, I did not hear it. The child starts using that kind of description and talks about the properties of the materials.]

Me: *Keys?*

Tim: *It is something from that bag.* [The bag that I was holding with all the *Mystery Box* items.]

Tim: *How about you look in the bag, and you see what's not in it?*

Me: *That's really clever.* [Impressed appearance in response to the twist of thinking]

Cira: *You look in the bag.*

Me: *If I look in the bag and see what is missing, I can figure out what's in the Mystery Box!*

Cira: *A whistle.*

(Aspen Primary School, Session 3)

Extract 5.5: Session 3, Aspen Primary School

In addition, in Extract 5.6 below, while Cira is hiding the item, Tim decided to put the 'identifying the missing item' strategy into practice. He looked in the bag, even though Cira said that he had to guess, and kept giving away clues without being asked. Cira expressed enjoyment regarding how long we were taking to guess what she had hidden. Tim put all the items on the table to figure out what was missing. He seemed determined to find out his way; however, he was not able to recall all the items and identify what was missing. The bag held between 10 and 15 items, and therefore, it would have been a true memory challenge for any

child or adult to be able to remember them all, especially since he had only been able to peek for a few seconds on the turn before. Without giving up on solving the mystery with his unique strategies, Tim ran to the camera to see what Cira had put in the box. He tried touching things to look at the film, as he was aware that the camera was recording everything. He was laughing about it, which leads me to interpret that he was probably aware that his strategy was not expected, a little deceptive, and beyond the boundaries of the 'rules'. Even though a playful strategy like that was not expected to happen, it was an alternative way into finding what was in the box without opening it, so I played along. I asked Cira whether she allowed it, and when she agreed, we continued.

[I am about to hide something else, but Tim tells me I have already had a turn. Cira hides something.]

Me: *That's very fair, Tim.*

Cira: *It's something round and has a tape.* [Gestures with a hand. Cira is starting to describe. Tim stands up and goes quickly to take the item bag and looks inside.]

Cira*: It's a clue, you have to guess.*

[Tim keeps looking in the bag to find out what it is instead of asking questions.]

Cira*: It's round.*

Me: *Is it made of plastic?*

Cira: *No.*

Me: *Is it made of wood?*

Cira: *No.*

[Cira is enjoying seeing that we cannot guess. Tim spreads all the items on the table to figure out what is missing. He seems determined to find out this way.]

Tim: *This is all we've got that was in the bag.*

[Cira does not seem to have more patience, so she is showing she wants to open the box and show us.]

Me: *Let us guess first.*

Cira: *It's round, and it can roll.*

[Tim cannot figure it out, as he cannot remember what was in the bag, so he goes and tries to use a different strategy rather than asking for more clues. He runs to the camera and wants to see what she has put in there. 'Let's record it.' He is trying to touch things to look at the film. He is aware that the camera is recording everything. He is laughing about it.]

Me: *Should we look in the camera to see what she hid?*

Tim and Cira: *Yesss.*

Me: *Do you think we should do that, or should we try to guess? It will be sort of like cheating, I suppose? Or I suppose it's a good idea.*

> **Tim:** *I don't think is cheating! I don't think it is.* [Tim is moving the camera, trying to see the tape as it is still recording the actual video.]
>
> **Me:** *Do you allow us, Cira?*
>
> **Cira:** *Yes.*
>
> **Me:** *OK, fine.*
>
> **Children:** *Yesss.*
>
> <div align="right">(Aspen Primary School, Session 3)</div>

Extract 5.6: Session 3, Aspen Primary School.

Other children also attempted to resolve the mystery by trying to memorise the items in the 'green bag'. In Session 4, Bruno was able to guess the item based on one clue (colour). When Marc and I asked him about how he found out, Bruno responded with the following explanation:

> ***'I saw the blue hairbrush in the bag, that's how I know. I saw a blue hairbrush in the bag so that means… because I used my imagination.' (Pointing his finger to his head)*** (Bruno, Session 4, Birch Primary School)

Bruno verbally articulated his thinking process and state by recalling and using his memory as 'I used my imagination' while using gestures of pointing his head. In this example, the child used the word 'imagination,' which might be a word that is associated to a mental process that might have been more heard by or familiar to young children. This was not unique, as a similar event occurred during a different detective case. In this case, the children and I were talking about thinking, and a child responded that she was good at thinking based on her skill at 'making things'. I suspect that children in their early years are more exposed to explicit talk and verbal praise related to creativity and imagination compared to other types of thinking or mental processes. On the other hand, 'using his imagination' could be interpreted. These examples show children's capacity and engagement with thought as they articulate thinking with the terminology they know. Examples like this demonstrate that thought can precede verbal articulation, which means that children have a thinking capacity beyond what can be heard or observed. These examples show the importance of modelling language that is useful

for thinking and learning and providing spaces and opportunities for exercising talk in the early years.

Language-wise, some children had a wider range of vocabulary and were more precise than others. Some expressed their disagreement about precision with words as well as by correcting others. In Session 4, Stella corrects others by saying 'that's a comb' rather than a hairbrush, while others are wondering whether she remembered or actually cheated on the game. Marc does not believe Bruno has not peeked. Bruno then tries to defend himself by saying, *'I was looking at Camembert (teddy bear object in the classroom) I was looking at Camembert and looking at her and looking at everyone else but not Marc, and then I found that in the box'* (Bruno). Stella corrected him again by saying that he found it in the bag, not in the box, and Bruno continued with his explanation by saying:

> *'I found it in the bag. Maybe I'll take blue, and then and then he said I said he said, I said what colour is it? He said blue and I just used my imagination (talking about memory and remembering again) and that's how I knew it was a hairbrush.'* (Bruno, Session 4, Birch Primary School)

Bruno asked me if I could tell his teacher 'the thing about my imagination', as he thought she would be proud. He felt happy and very proud of himself and wanted to share this event with specific people—interestingly, first with his teacher, and later, he asked if I could send the video with the detective performance to his parents. Stella also asked for it to be shared with her home.

Overall, children seemed to enjoy the experience, and some, like Ava, expressed this by saying, '*When I get home, I will play detectives*' (Ava, Session 4, Birch Primary School)

During the mystery box experience, the children seemed to be very curious regarding what was in the box, and some showed signs of agitation (nervous facial expressions/body language) which on a few occasions led to the use of the peeking strategy. In the first session, John opened the box as soon as it was introduced to the children, even before the game was fully presented. Throughout the game, though, peeking to see the item that was being hidden was verbally 'discouraged' and therefore was not understood to be a strategy within the rules.

Despite this, a few children took the opportunity to use this strategy. Some peeked during the period of hiding the item, while others, like John and Tim, attempted to open the actual box. The reasons and intentions behind peeking could be various, but, based on video observation, on most occasions, peeking seemed to be part of playful behaviour rather than deception for personal gain. For example, Katia playfully said aloud, 'I'm peeking' while she was covering her eyes and not actually looking, and others slightly separated their fingers to form a peeping hole while covering their eyes.

On other occasions, as mentioned above, some children put their hands in the box, attempting to open it up; they seemed to be unable to resist the impulse of agitation. John, for example, showed an expression of regret after he opened the box -having heard the rules-during play time which showed some evidence of self-regulation as a result.

Lastly, peeking could also be interpreted, based on my experience, as a defensive mechanism, as keeping the eyes closed might make anyone unconsciously feel 'vulnerable', particularly when not knowing each other well or not knowing exactly what is going to happen next (nervous reaction). In other words, opening an eye might help keep a certain alertness and security. When hiding the item, children were encouraged either to close their eyes, look at a certain point in the room (in Birch Primary School, children were looking at their French teddy bear called 'Camembert') or cover their eyes and count until ten. These strategies were not just for helping them cope with the temptation of peeking, but also to make the experience more mysterious and exciting for children.

In Session 4, Bruno was asked whether he had peeked, and as a result, an interesting conversation emerged. Here, Bruno tried to articulate and convince the other detectives how he had succeeded in the task without peeking. Thus, direct talk and questioning about Bruno's strategy stimulated Bruno to think, recall, and share with the others.

The sensory strategy consisted of holding the box to 'feel' what was inside without touching the actual item or bringing it out of the box. Among other things, the children felt the weight of the box, moved the item around inside, and listened to the sound of the object while it moved in the box in order to get further information that could lead them to get closer to the answer. In some cases, I encouraged the children to 'feel the box' when they seemed to be

stuck. It seemed that for some children, this was helpful, catalysing further questions or inferences, and they later requested to use this strategy in subsequent turns. Some made assumptions regarding the hidden item, such as in Extract 5.7, in which Tim concludes it is a ball after feeling the box, which he probably assumed as the object felt round in the way it moved. It was not actually a ball, but a tangerine, that could be compared to the shape of a ball. Cira, for example, said 'it's heavy' while moving the box from side to side, or Tim with another item concluded 'it's made of metal' after shaking the box and listening to the sound of the item against the box.

Marc: *You can touch as well.*

Tim: *It's a ball.* [While moving the box and feeling the movement, sound, and weight of the object inside.]

Me: *Yes, it is round.* [It's actually a tangerine, but he is concluding that, based on the movement of it in the box, as it is a round object.]

(Aspen Primary School, Session 3)

Extract 5.7: Session 3, Aspen Primary School.

In Extract 5.8, feeling the box also elicited further ideas and Tim articulated his thinking in the following way: 'It rolls but it doesn't roll like in a ball way. It rolls like that (demonstrating with a gesture with his hands). So, I think it's a pipe (detective theme).' He gave an explanation of what he felt during the movement of the box. He clarified that it did not roll like a ball, discarded the shape, and, based on that, he concluded that it was a pipe. Despite this thinking, he did not actually guess what was inside the box, as he did not interpret the movement correctly, but he did demonstrate he could guess based on reason.

[Moves and listens to the box.]

Tim: *It rolls, but it doesn't roll like in a ball way. It rolls like that* [gestures with hands]. *So, I think it's a pipe.* [Detective theme]

Me: *Ask me for clues. You can ask me what it is made of. It's made of plastic…* [Sometimes giving answers]

[It's a hairbrush, so his guess is not even close]

(Aspen Primary School, Session 3)

Extract 5.8: Session 3, Aspen Primary School.

The sensory strategy could include using other senses, such as object touch, smell, or taste; however, in this particular experience, the presented objects were mostly not edible, so this was not encouraged.

5.4.1.3 Language and voice

Differences were found in children's use of language and vocabulary. Some children were more accurate when sharing information regarding the items they had hidden. This included a description and the use of vocabulary regarding the identification and distinction of materials, the actual name of particular materials, as well as other characteristics.

In Extract 5.6 Session 3, for example, Cira provided the guessing detectives with some inaccurate information when it was her turn to hide the item. She started describing the hidden object, a glue stick, by saying, '***It's something round and has a tape*** (gestures with hand)' (Cira, Aspen Primary School). To aid her talk, she used gestures to express her ideas in a different way. She also added that it was not made of plastic even though it was made of plastic on the outside, and that was '***round and it can roll',*** which is partially true but could be wrongly interpreted as a ball or something of a similar shape. When I finally ask her for a clue, she responded by giving the actual answer, 'glue'. I then responded, 'But that is not the clue, that's the answer. For example, a clue could be it's something sticky', trying to clarify the distinction with a context-relevant example. After that, she repeated 'it's sticky…'. This episode provides insight into the opportunities for developing language and thinking during detective play. The children were given opportunities to think about those parts of the whole as well as time to exercise descriptions of items. This opened up opportunities to learn to distinguish particular item features and vocabulary. In Extract 5.9 below Robin identified the material of the item she had hidden and described this to the other guessing detectives, later specifying it was made of glass. After that, Maria, who was guessing, demonstrated what glass is with gestures and by clicking her nail tip against the magnifying glass.

[Robin hides the small honey jar in the box. The rest of the children and I are the guessing detectives. We are talking about not peeking or cheating.]

Maria: *Is it blue?* [Like the last item, coincidentally?]

Robin: *No, we can see through.* [Transparent]

Robin: *It's like one circle, one circle, one circle, and then a tiny tiny sphere.* [Describing in '3D' with her hands also]

Me: *A tiny tiny sphere at the top?*

Robin: *It's something you can see through.*

Me: *Mmm, what is it made of?*

Robin: *Glass.*

Maria: *Like here.* [Maria is trying to show what glass is by making the noise of glass with the nail in the magnifying glass, /cli, cli/]

Me: *Like the window, yeah.*

(Birch Primary School, Session 5)

Extract 5.9: Session 5, Birch Primary School.

Some children showed precision in their choice of language. For example, in Extract 5.3 Session 5, Robin guessed that the item could be an orange; she then made her guess more specific by asking whether it was a fake orange. On another occasion, Will asked whether the item was a tree, and Robin continued by saying **'he means a fake tree'**. In Session 2, Miles made a distinction between real and pretended by using the word 'toy' when saying, **'It's a small <u>toy</u> brain, Miles'** after having just asked whether it is '*a small brain*'. Other similar episodes appeared in relation to the specification between real and fake or pretended objects.

In addition, some children, like Stella, felt confident in expressing disagreement and correcting the other detectives, including myself. In Session 4, both Bruno and Marc used the word 'hairbrush' to describe the item, even though they were conversing about something else. Stella expressed disagreement, and her focus was on challenging the two detectives by correcting, **'That's a hair comb'**. After that, Bruno used the word 'box' instead of 'bag', and Stella pointed out: **'No, you found it in the bag'** (Session 4, Birch Primary School). In Extract 5.3 Session 5, after guessing it was an orange, I repeated the clues acquired by the children and what the object was in the end, intending to reconnect all the evidence with the result in

a summarising phrase. Robin, however, expressed disagreement about my perception of the size by saying, **'Aaa, it's medium size, I think'** instead of small. In Extract 5.10 Session 4 below, Marc challenges my comment **'not that soft'** by saying that **'playdough can be hard',** which helped us see playdough in a different state. These examples show that the children felt comfortable challenging one another. Even though, in this conversation, I did not pursue extending thinking much further, Marc's answer opened multiple opportunities for posing follow-up questions or requesting reasons for further clarification of his claim.

Me: *You can ask me questions like 'Is it soft or hard? Is it long or short?'*

Children: *Is it soft?*

Me: *It's quite soft, not very soft, but it's kind of.*

Child: *Playdough!*

Child: *Playdough.*

Me: *Not that soft.*

Marc: *Playdough can be hard.*

Me: *Sometimes, if it's dry.*

(Birch Primary School, Session 4)

Extract 5.10: Session 4, Birch Primary School.

Examples like this showed that the co-created environment provided the freedom to express thought, including disagreeing with and challenging others' statements. Children also demonstrated taking leadership and responsibility by, among others, controlling turns. This did not only occur when it was done to point out their own turn, like Stella in Session 4, but also when monitoring the turns of the others (see Extract 5.6, Session 3). In Extract 5.6, I was about to hide something else when Tim told me I had already had a turn. I replied by saying, '**That's very fair, Tim'**. In this example, Tim feels comfortable as an insider regarding the power relationships between all the participants and myself. After listening to Tim's view, I recognised that he was being fair rather than perceiving this as a challenge to authority, which explicitly reinforced my intention of trying to develop balanced interactions in practice (even though recognising that, to a certain degree, the relationship might never truly be completely equal).

Giving space for voice and decision making to others was considered important, building a respectful relationship during the period of research. In Extract 5.6 Session 3, Tim attempted to use the video footage strategy to find out what the item in the box was, but I first asked **'Do you allow us, Cira?'** to give Cira space to make a decision regarding the unexpected turn in the game. After the mystery box (Part 1), some children also voiced their thoughts regarding participation by saying they did not want to continue playing, as well as expressing willingness to participate even if others would not continue. Lastly, Tim (Session 3) showed initiative, interest, and responsibility (participant belonging to the group) regarding whether the camera was on at the beginning of the session ("**Have you turned the camera on?**").

5.4.1.4 Content-oriented conversations

The mystery box experience provided children with opportunities to learn new concepts and words. The extracts below show the potential of detective play not only for researching children's Critical Thinking but also for providing spaces to construct and share knowledge (scientific, linguistic, etc.) during play. Some children (e.g., Session 5, Birch Primary School) manipulated, explored with the magnifying glasses (a provided detective tool), and shared their insights with others in between guessing and hiding. Robin (Session 5) observed and explained that when you place the magnifying glass on the badge, you can see the same, but if you put it at a distance, you can see everything bigger. **'I've only got a bigger one'** (Robin) (a bigger magnifying glass in her house). The others continued the conversation, but instead of following the thread regarding how the magnifying glass works, Amanda and Maria talked about having their own magnifying glass at home, '**a giant one'**.

In Extract 5.11 Session 5 below, a conversation between the children and myself illustrated how a new concept and word (solid and liquid) was introduced to the children. This was an interesting opportunity to learn a science-related concept, the state of materials, providing space for extending vocabulary and thinking about objects and their characteristics. In the beginning, it did not seem that the children recognised the words 'liquid' or 'solid'. Amanda expressed that it was not liquid, even though the object did contain liquid matter. I later tried to explain with gestures what I meant by liquid and solid. After finding out what the object was inside the box (perfume bottle) and demonstrating what solid and liquid were by

providing additional examples, Robin showed understanding and tried to demonstrate the same by saying, *'This is glass'* while holding the bottle and showing she could actually hold it. Then she said, *'If you put it on an x, it will fall apart'*. This conversation shows how learning (regarding specific science curriculum areas) can be developed during an informal detective play experience.

Me: *It's not honey? Is it liquid inside?*

Children: *No.* [With the head and smiles]

Me: *I mean, this is solid,* [demonstrates] *and liquid, it's like water.* [Gesture as if it is running through my hands, just in case she didn't really know what 'liquid' is]

Amanda: *It's like water.*

Me: *Yeah, then it's liquid. Liquid is when it is not solid, hard like that.* [I did not have time for a better explanation, as she opened the box immediately]

Robin: *It's perfume.*

Me: *It's clear and made of glass and liquid inside. Liquid can be everything that looks like water, you can actually not hold it like that* [demonstrating] *it runs through, it could be milk; it is liquid, soap is liquid, perfume is liquid, right?* [It could be a very good opportunity to extend on materials and the state of materials] *And solid is something that we can actually hold,* [demonstrating with gestures], *and it doesn't fall apart.*

Robin: *This is glass.* [She says this holding out the bottle, showing that she can hold it.] *If you put it on a* [unintelligible], *it will fall apart.*

[Amanda holds the perfume bottle, and I put it down.]

Me: *So, we can hold it because the outside, the glass, is solid, so we can hold it, but we can hold the inside's water(liquid), can't we? It would fall apart because it's liquid, right?*

(Birch Primary School, Session 5)

Extract 5.11: Session 5, Birch Primary School.

5.5 Reflection upon experience and design

The findings show that the *Mystery Box* experience was useful for eliciting and capturing children's thinking in a goal-oriented problem-solving context. It was particularly useful to understand children's capacity for strategic question forming at the time and to examine children's use of alternative strategies for obtaining the necessary information. Even though the question formulation strategy was encouraged, this case provided enough flexibility for

the children to show an interesting range of strategic repertoires with the intention of guessing the hidden item. The children were resourceful and able to find critical, creative ways when attempting to obtain the information they needed to make their guesses. Insights into the children's strengths and challenges were found in the task.

As shown in the extracts across the chapter, differences in performance among children were evident, which provided a rich set of data for analysis and interpretation. Despite naturally pointing out variations in children's performance, one cannot interpret this as purely individually owned, since thinking and children's performance were situated within the group context. Hence, each detective performed individually, but was influenced, triggered, and enriched by what was happening around them. Not surprisingly, 'whether the focus is on thinking understood as a property of a shared culture or thinking understood only as the property of individuals is another tension that can be seen in the field of research on teaching thinking' (Wegerif et al., 2015, p. 6) certainly came to light across this case.

This case was useful for facilitating familiarisation with particular concepts (meanings) and their terminology, for example, 'wild guessing' and 'educated guessing', and understanding the role of the formulation of questions to obtain 'clues' to increase the probability of guessing the item. This was a useful training practice in the context of this thesis. This experience also provided some opportunities for talking about thinking, including clarifying thinking procedures (how someone got somewhere). Upon reflection on the design, I would have liked to encourage adding the word 'because' after making an attempt to guess. For example, instead of presenting the guess alone, for example, 'perfume', the child could be encouraged to say, 'I think it's a perfume bottle *because* it is liquid inside and glass outside and has a smell...'. This would put further emphasis on educated guesses. However, this opportunity was probably more adequate to be included in later *Mystery Box* experiences.

The findings show the different ways children articulated their thinking with variations in language skillfulness, disposition, or capability to seek preciseness. This was interesting and remains relevant to questions about the role it plays in facilitating the research of evidence for critical thinking with young children. Despite their complexity, it is a reminder of the need, as in this thesis, to also look beyond the scope of verbal utterances.

One of the most important limitations, as well as benefits, to consider when interpreting the findings of the *Mystery Box* case is that the 'novel experience' was only played during one session per group. Bearing this in mind is significant, as playing it multiple times might influence the outcome due to the probability of children becoming more skilful in play. This assumption is supported by Rules's (2007) findings regarding the use of the mystery box for developing reasoning in young children.

To conclude, the *Mystery Box* case was effective for children to engage in their detective role. The adoption of the role, engagement with the practice of enquiry, formulation of questions, collective discussion and familiarisation with the detective tools were important aspects in understanding children's critical thinking, as well as important for the coming cases. The children showed motivation and excitement in participating. Despite being the first day and first case, some children showed a lot of initiative, ownership, and responsibility in play, took opportunities to express their thoughts freely, and shared their input. This was found to be key to this study.

Table 5.3 below summarises the most recurrent behaviours related to critical thinking observed during the *Mystery Box* experience. The colour scheme represents frequency, with the most frequent ones being the darkest and the least frequent ones being the lightest.

Table 5.3: Behaviours related to the Critical Thinking dispositions in the *Mystery Box* case

CT dispositions: Mystery Box
1. To be curious and willing to find the answer
2. To be aroused to the process, focus and flow
3. To investigate
4. To be confident (autonomy and seeking help)
5. To self-correct
6. To take risks or have the courage to take action in different ways to open up to new ways of learning
7. To be prudent
8. To be persistent
9. To be open-minded, flexible, and fair
10. To communicate, collaborate and value the contribution of others (dialogical thinking and collaboration)
11. To be resourceful and creative
12. To be mindful, aware of self, goal, process, performance, etc. and use awareness productively (to plan for change, to modify, to change action, etc.).

Key: Most frequent (darkest) - least frequent (lightest).	Frequently across the case	Occasionally/sometimes across the case	Rarely across the case

The *Mystery Box* was useful as a 'training' experience but did not however give an optimum scope by itself for stimulating critical thinking. Instead, it was useful to exercise particular thinking skills, such as the following:

- Categorising
- Comparing/contrasting
- Understanding parts and the whole
- Object analysis and characteristics

To exhibit behavioural inclinations in the context of an investigation, such as:

- To be curious and willing to find the truth.
- To be resourceful and creative.
- To value and be thoughtful when considering clues/evidence and using them to form conclusions.
- To have the courage to take risks.

To use and learn useful terminology and vocabulary:

- Relevant to specific content and thinking in itself, such as wild guessing or good guessing, evidence/clue, questioning, and remembering.
- To develop understanding and verbal precision. To learn vocabulary and general content understanding, such as the state of the material, types of materials, weight, and size.

Chapter 6 *Zoo Mystery*, Case 2

6.1 Introduction and aim

As in the previous chapter, Chapter 6 is divided into five sections. This covers the rationale for the development of the *Zoo Mystery (ZM)* case, in which children engage in a collective investigation while designing a zoo blueprint, how it was implemented, and how the data was organised into themes, providing insight into children's thinking and performance narratives within the investigation context and a summary and reflection of what has been learnt.

Aligned with my research questions, through this case, I sought to understand the following:

1. Young children's critical thinking and performance during the collective investigation experience; and
2. The usefulness and challenges of *Zoo Mystery* experience to stimulate such thinking and practice.

The overall aim of this experience was to engage children in individual and collective thinking during group investigations. Therefore, it involved engagement with what they knew, purposeful use of resources and strategies to tackle the unknown, planning, problem solving, and decision making based on reason. It also involved the general skills of engagement with researcher skills and behaviours.

6.2 Design of the experience

The *Zoo Mystery* was structured in the five parts shown in Figure 6.1, although these parts were not formally separated, and the progression from one element to the next was relatively fluid. The underlying structure was less obvious for children than in Case 1 (the *Mystery Box*), as there were no sections or separated parts other than the opening conversation, the creation of a design, and the free play on their blueprint creation.

Figure 6.1: Structure of the *Zoo mystery* experience

The experience was initiated with a conversation about world habitats and was followed by the introduction of research resources for the children. The children then proceeded to plan and design the zoo. In the end, the children were invited to play freely in their own designs with human and animal figurines. By 'free', I mean that we were no longer required to keep the detective role nor investigate.

6.2.1 Design

The children were invited to conduct a short and open research project involving the construction of a zoo blueprint (for example, Figure 6.2 and Figure 6.3), which was designed to provide a context for understanding critical thinking during investigative play.

Figure 6.2: *Zoo Mystery* experience (Aspen Primary School)

Figure 6.3: Zoo blueprint design sample 1 (Aspen Primary School)

Figure 6.4: Zoo blueprint design sample 2 (Birch Primary School)

Figure 6.5: Zoo blueprint design sample 3 (Birch Primary School)

The objective was for the children to plan and design a zoo to accommodate different animals. The children were told that animals had needed to mysteriously leave their former habitation (former zoo), due to it not fitting their basic needs appropriately. Therefore, the children were called to help investigate the issue and to construct a new space for the animals. For that purpose, children were invited to adopt the role of 'animal detective'. The objective for the children as a group was therefore to create an area that was both pragmatic for the animals as well as offering the basic amenities and services for zoo visitors. This added an extra layer and focus to the thinking about design.

The focal interest of this study was to understand the following:

- children's individual and collective thinking during the investigation,
- knowledge and strategies to tackle the unknown,
- use of research skills and habits like planning, anticipating, and problem solving, and
- purposeful use of resources and decision making based on reason.

This experience was significantly different from the other detective cases, as the theme of detective role play was less figurative, with the researcher's role being more explicit. Hence, it resembled a more 'formal' classroom research project in comparison to the other cases. This approach was chosen to understand young children's thinking in a more 'school-like' collaborative work context. Furthermore, whether the *Zoo Mystery* experience as a whole was perceived as play could be debated (Sutton-Smith, 1997).

The topic of environment, nature, and animals and zoo life was chosen with the assumption that young children in the Primary 1 (5-6 years old) would have already had some familiarity with and basic knowledge of the topic. In the *Zoo Mystery* case, the specific content knowledge requirement was more significant than in the rest of the cases, where no very specific subject content was required to 'succeed'. In this case, previous subject knowledge was anticipated to be helpful, even though it was not strictly needed. It was felt to be important to explore this distinction, as some studies suggest CT skills are content specific rather than transferable across disciplines (Coles & Robinson, 1991; Lai, 2011) as opposed to

others (Fisher, 2001; Facione, 1990; Cottrell, 2011). This might mean that CT manifests differently across contexts (cases) and participants.

In regard to this case, and assuming there might be variation in content knowledge between children and not wanting this to hamper the CT skills exhibited, I introduced the topic of habitats with visuals (photographs) to all children to contextualise the experience. It was important to include the urban habitat (including local city visuals), hence basing the task on what I thought they knew, to locate new learning (other habitats) in relation to what they were already familiar with. In other words, the objective was to relate their proximate environment, the urban habitat, to the rest of the world. Accessible resources and tools were presented to the children. Some simple but key initial instructions were given to enable children's independent research and use of tools. Among others, a variety of books (Figure 6.6), a world globe (with clear colours and animal guides), and a couple of zoo map samples were provided.

Figure 6.6: Animal picture books

Figure 6.7: Zoo resources (Birch Primary School)

The accessibility of resources was important. The tools and materials had to provide useful information in a decodable form for these young children. Even though young children present dispositions, for example, curiosity and wonder regarding the unknown, most typical information-seeking tools require particular literacy skills for access. All the materials were carefully selected to avoid this issue and were placed at the children's eye level in order to be available without needing to ask for permission or help. For example, the picture book *Arctic Encyclopaedia* provided generous realistic, attractive, and relatively inferable photographs. The chosen world globe, shown in Figure 6.8, also provided some visual information about animals, since they were located geographically to guide the children.

Figure 6.8: World globe with guiding, accessible visuals

Exploring children's ability and dispositions towards seeking information and using resources, and how and why they were used, was one of the Zoo *Mystery* case intents. Initial simple explanations for encouraging independent use of the resource were prioritised, complemented, and extended during the design experience. Overall, the use of available resources, evidence-based decision making, and reasoning were encouraged.

The children were prompted to plan and sort the zoo areas and reflect upon factors such as climate and diet choices. This process, therefore, involved anticipating, hypothesising, and finding alternatives to prevent issues. A poster and various craft materials (scissors, glue, crayons, etc.) were given to the children (see Figure 6.9) to aid this process.

Figure 6.9: Poster, crayons and markers sample

The children had access to an organised materials table with a large variety of sticker-like animals, foods, natural sources and scenarios, temperature, and climate indicator photograph cut-outs to create the zoo blueprint (see Figure 6.10).

Figure 6.10: Animal cut-out sample

At first, the children were encouraged to go to the cut-out photographs table as a group to collaborate in selecting the items needed, with the condition that only one nominated

member of the team (this changed over time) could pick up the items. This was done to stimulate communication and therefore facilitate the manifestation of thinking processes. Consequently, the children were required to communicate with one another and voice their thoughts explicitly, and it was possible to further enhance awareness of choice and slow the pace of the process as a whole. The children were encouraged to explain their thinking aloud and to reason their decisions.

I adopted a multifaceted role, moving beyond guiding and helping children into a more active participant role of doing and creating with children. I intended to provide some ideas but also to contribute to the execution of the collective design. This type of participation might be less common in high child–adult ratios or more traditional school environments. The ultimate intention was to shift adult roles and to utilise my insider, 'peer' role to enable me to learn from children's thinking and facilitate opportunities for input when necessary to fulfil my agenda. The use of content-specific vocabulary, for example, was included in my 'performance' during instruction, execution of design, and free play.   The rationale behind this was that I considered adults' active participation in children's play an opportunity that could lead to an evaluation, the development of thinking and learning, and the establishment of a close, emotional, and healthy relationship. In other words, I considered play and interaction in the time and space offered by the case to be a powerful opportunity to construct together and influence reciprocally, which could potentially be missed by a more distant 'outsider' role.

6.2.2 Estimated duration

Assuming the children would be interested in the task, the estimated task duration was approximately 30 to 90 minutes. This estimation included 20-30 minutes to set up the research scenario and 15-20 minutes to pick up and leave the area as it was.

6.2.3 Materials and preparation

The following materials were used to set up the task:
- Animal and nature-related photograph cut-outs (sticker-like)
- Blank poster

- Diverse habitat and animal books to consult

- World globe

- Zoo map samples

- Animal figurines (see Figure 6.11)

- Crafting material, such as glue, scissors, colouring pencils

The following materials were used by the children:

- Detective gear and tools (hat, ID personalised badge),

- Personalised detective notebook,

- Crayons/pencils/pens,

- Magnifying glass,

- iPad

Figure 6.11: Animal figurines

Lastly, the researcher's materials and data recording devices were the researcher's guideline notes with key questions and instructions, photographs, and task information, zoo maps, books, a video camera with a tripod, and an audio recorder.

Figure 6.12: Detective suitcase.

6.2.4 Location

The *Zoo Mystery* experience was set up in Aspen Primary School as portrayed in Figure 6.13 - Figure 6.14 and in Birch Primary School as shown in Figure 6.15. The basic requirements for the space for this case included:

- table or working surface to place the blank poster, and chairs to sit,
- an area to set all the material for the construction of the zoo (for example sticker-like cut-outs);
- a separate surface to place necessary tools for children (for example iPad);
- resources for the detective work (for example books), and
- space to set data recording devices (camera with tripod and audio recording device).

Figure 6.13: Session 2, Aspen Primary School.

Figure 6.14: Children's names, Session 3, Aspen Primary School.

Figure 6.15: End of Session 4, Birch Primary School.

6.3 Implementation

6.3.1 Sessions and duration

The *Zoo Mystery* activity, as presented in Table 6.1, was implemented in two schools (Aspen Primary School and Birch Primary School) between November 2018 and January 2019. A total of 18 children aged 5-6 years took part in five sessions. The average duration of the *Zoo Mystery* activity was 50 minutes, which shows that the children were immersed in the experience for a significant time.

Table 6.1: Number of sessions, sample, date, and duration.

Zoo Mystery sessions			
Settings	Session number and date	Group of participants aged 5-6-year-old per session	Duration of session
School 1 Aspen Primary School (Primary 1)	Session 1 06/06/2018	3 children Mia, Miles, John	66' 59''
	Session 2 08/06/2018	4 children Katia, Holly, Leo, Frida	59' 56''
	Session 3 30/10/2019	3 children Tim, Cira, Diana	42' 22''
School 2 Birch Primary School (Primary 1)	Session 4 14/01/2019	4 children Stella, Ava, Marc, Bruno	38' 53''
	Session 5 14/01/2019	4 children Amanda, Will, Robin, Maria	42' 37''
Total for both schools	5 sessions	18 children	Average duration of session 49' 49''

6.3.2 Research process

Before each field trip, my regular practice was to go through the research itinerary list, including an overview of the activity procedures as well as the material inventory checklist, to ensure that all materials were placed in order of use in the research travel bag. This was especially important considering my limited research time with each group.

On arrival at the school, all the materials were set up. All resources and materials needed to be accessible for children's use or sight; therefore, considering children's height in relation to furniture and the placement of tools was important. Furthermore, organising resources in separate areas was important for independent access. For example, the research resources (books, etc.) were set up in an area separated from the construction materials. Additionally, it was important to place the camera appropriately, within a reasonable distance, to ensure that the video captured the scenario (both spatially and with a clear sound). It also had to be in a safe position, as well as respecting the participants' space (comfortable and enabling the usual movement around the space).

Once the materials and recording devices were set up, the children were invited to take their detective apparel and play. Once gathered around the table, the children were told the objective of the *Zoo Mystery* experience and the reason why the detective's expertise was needed. To contextualise the mystery, the children were shown diverse visuals about world habitats, including their own urban habitats, which prompted interaction with tools and conversation. For example, while looking and pointing at the photograph, Miles commented, *'See right there? My gran lives right there'*; or Holly commented, *'I have been there before. I've been there before'*. After this introduction, the children initiated investigation and zoo design.

6.4 Data analysis

The design of the zoo was a collaborative investigation in which, unlike in the three other cases, the children's detective role was abstracted from a more obvious pretended role-play

towards a more 'realistic' project investigator role. Across the five sessions, I identified five main outcomes and points of interest:

1. The *Mystery Zoo* case stimulated children's thinking and its manifestation regarding nature and animal life. This took different forms, including verbal and behavioural interactions with people and tools. Children also drew, wrote, sang, and role-played, and as a result, they had the opportunity to manifest thinking in different ways.

2. The children took part in collaborative work, which involved engaging in discussions, agreements, and disagreements with themselves and others. They negotiated, helped one another, scaffolded opportunities, and made decisions.

3. Children engaged in investigative work, which required self-reflection and awareness of specific knowledge, and sought strategies to tackle the unknown, such as requesting support regarding a specific question from peers or myself, the adult, and used resources for information seeking. During this process, children practised prediction skills and planning and engaged in evidence-based decision making.

4. The children showed engagement in the project with ownership, initiative, and autonomy.

5. The children showed curiosity and pleasure while learning about nature and animal life and engaged in motivated, specific content learning. Consequently, evidence of knowledge growth was visible throughout the session, based on the children's utterances and behaviours.

The *Mystery Zoo* experience catalysed the manifestation of thinking and interaction with tools and participants.

The experience stimulated both social and private speech. When introducing the topic of habitats with visuals, the children interacted with the pictures (e.g., pointing) and expressed what they knew (interactions with others). Some children (Session 1, Aspen Primary School), for example, contributed:

> *'That's where the penguins live in',* Tim: pointing at the Arctic (Session 3, Aspen Primary School).

> *'The desert is where the mommies are',* Tim (Session 3, Aspen Primary School).

> *'Sand and desert' 'Hot' 'Like same, like that'* Holly: pointing and comparing desert and savannah as both look brownish earthy or sandy, appearing hot and dry (Session 2, Aspen Primary School).

The children's thinking did not only occur in social interaction, but also in the form of private talk when they were on their own interacting with the visuals. For example, when the children were about to choose the animal cut-outs presented on the resource table to complete the zoo design, the camera was able to capture episodes of some children thinking aloud while considering the items to select and narrating what they were going to do (see Figure 6.16). In Session 1, Aspen Primary School and Session 4, Birch Primary School, for example:

> *'Wowww, what a big frog! Crocodiles need meat to live on the islands. What will I choose? What will I choose?'* Mia: singing, imitating animals while taking them playfully (Session 1, Aspen Primary School).

> *'I'll take some yucky animals. What I will take? What I will take?',* Mia: using a singing tone and dancing in her private speech (Session 1, Aspen Primary School).

> *'Let's get some, let's get, ohhh! Let's get some grass! 'grasss…'* Marc (Session 4, Birch Primary School).
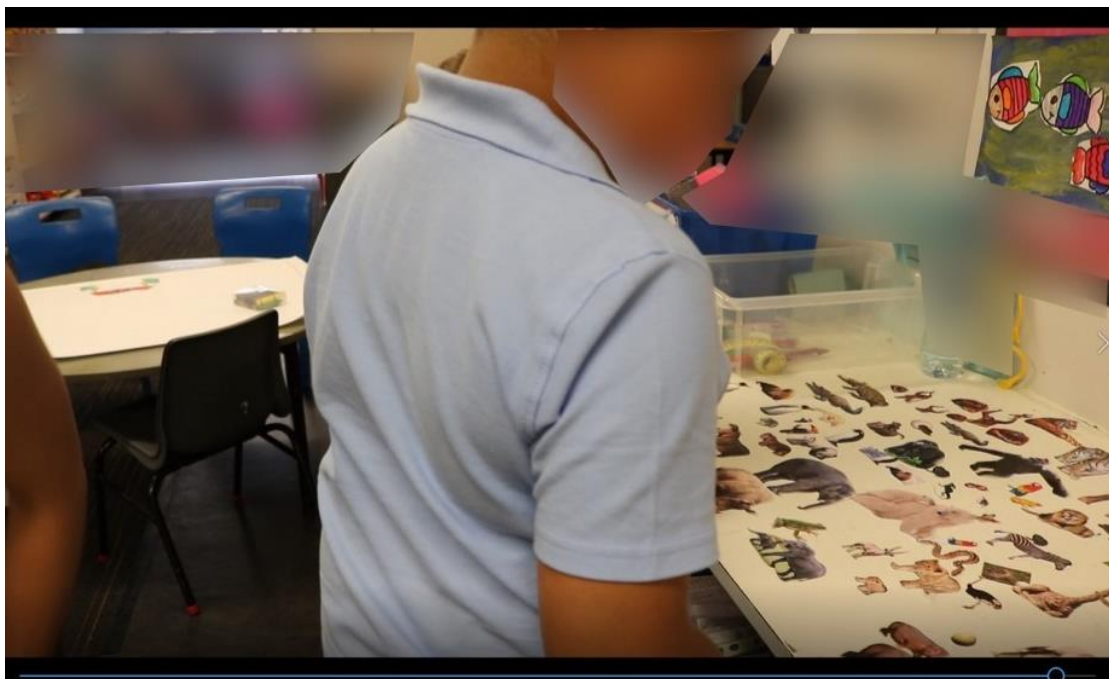
Figure 6.16: John, Session 1, Aspen Primary School. John is observing the material and thinking aloud

This shows the importance of thoughtfully selecting appropriate visual-manipulative materials and pedagogically appropriate methods with young children, since they have the potential, as tools, to elicit thought and communication, and hence played a significant role in this case. The key role of the adult here was to introduce and orchestrate such materials and show the children their possible uses. Listening to and valuing children's contributions and supporting and guiding children throughout the experience making use of those visual-manipulative materials when needed was fundamental.

6.4.1 Themes

6.4.1.1 Introduction of context and accessibility to information resources

Initially, simple instructions were given and discussed with the children to contextualise the experience. This relates to the information and tools provided with familiar materials and experiences. In Extract 6.1 (Session 4, Birch Primary School), due to a previous conversation (as part of the *Mystery Box* case), I became aware that the children were familiar with the world map. In addition, Ava shared that she had a map puzzle at home, making connections. Such links did not mean all children fully comprehended that it was a representation of a larger whole in real life (see Stella in Extract 6.1) but opened potential links for making new relations with what they knew. I attempted to contribute to and link the map to the globe:

> ***'It's in a globe because the world is actually round, isn't it?'*** Me: turning the globe around with the finger and making gestures to represent links between the flat map and the world globe (Session 4, Birch Primary School).

Figure 6.17: Stella raising her hand. Ava looking at the globe with the magnifying glass.

The children physically interacted with the materials, shared what they knew, and commented on what they saw. In Figure 6.17, the children and I were talking about the world globe. Ava was looking at it through the magnifying glass, and Stella was sharing what she knew:

> *'I know. I know. They live in the zoo.'* Stella: looking at the animals in the world globe (Session 4, Birch Primary School).

I intended to raise awareness about climate—superficially initially—by pointing out the colours used in the map (yellow, brown, green, and blue) and giving them their meaning (e.g., blue represents the ocean; yellow is for drier areas such as desert, savannah). After that, links between animals and specific habitats around the world were also made, relating them to climate and adaptation. The intention was to provide basic strategies to facilitate accessibility (inferring and decoding) and resource use by making the tools useful for the children. Once they were used, further opportunities for expanding in detail emerged. This was prioritised above the accuracy of the information. In Extract 6.1, for example, I role-played a hypothetical scenario where I pretended to not know about giraffes, which would require the use of the

world globe and books to seek information and tackle the 'problem'. This hypothetical scenario was thought to be useful for understanding resource use. The children expressed active interest and enthusiasm.

[Taking the world globe with my hands]

Ava: *I have a puzzle about that.* [Referring to the world globe]

Bruno: *Do we get to take it today?* [Referring to the materials]

Me: *Not yet, but soon. Not today.* [In this case, as he has asked me about keeping the object many times, I am assuming he is talking about that, but upon reflection, he could just be referring to using the globe. Bruno needs to ask to make sure he is understanding step by step.]

Me: *This is a map, just like the one you have on the wall.* [I point at the map on the wall, Stella turns her head and looks that way. Relating knowledge to what they know.]

Marc: *Yeah.*

Me: *But it's in a globe.* [Turning the globe with the finger and making links with the flat map and the actual world globe] *Because the world is actually round.* [Showing with gesture] *Isn't it?* [Adding information to what they know, 'the world is actually round']

[Stella and Ava turn the globe with their fingers. Bruno gets up and takes a closer look. Ava brings out the magnifying glass and takes a closer look as well through the magnifying glass.]

Ava: *But this is a very special globe. If you look at it, it has so many animals here. This is to give us clues about where the animals live.*

[Stella raises her hand, Ava continues looking at it through the magnifying glass, Bruno is standing, paying attention.]

Stella: *I know, I know!* [Raising her hand as if she wants to share something] *I know.* [Rising]

Me: *Yes?* [Referring to Stella]

Stella: *They live in the zoo!* [Relating the activity to the material she is just looking at, children's minds are constantly active.]

Me: *They live around the world; they don't really live in the zoo* [meaning most animals], *but today we are going to make a nice zoo for the animals. All the animals live in different habitats: Scotland, green… blue, the ocean… Down here, what do we see?* [Pointing at the Arctic – shortened explanation] [Simple instruction about how to decode the world globe]

Marc: *The Arctic.* [Sharing what they know]

[Stella seems to be getting excited looking at the material table with animals.]

[Commenting about Antarctica, children commenting: the winter? the penguin? and sharing what they know: the ice, it is really cold]

Marc: *I see some sharks.*

Me: *Yes.*

Marc: *I see some whales.*

[Children pointing]

Me: *If you want to investigate animals, get over here, and get the globe.* [Putting the globe back on the resource table, children looking]

Me: *Mmmm, I don't know where the giraffes are! Mmmm.* [Putting my fingers over my mouth, pretending to think, and trying to give a hypothetical occasion that could require getting the globe, the resource] *Let me go and see.* [Turning to the resource table, pretending, and demonstrating the hypothetical scenario through talk and gestures] *I don't know if the giraffes live in a very cold area or if they need hot weather* [gestures], *so then I can see the globe. And that's why I brought this really nice book* [picking up the savannah book]*, and polar world.* [Reading the title of the next book]

[Giving an example of a hypothetical situation regarding the need for resources]

Ava: *Wowww.*

Me: *The desert and desert animals.* [Picking up and showing the next book]

(Ava is really interested, standing up to see better]

[Relating the topic of animals to personal lives. Catalysing the sharing of personal experiences]

Ava: *I have that book.* [Pointing at a book]

Me: *Do you? Animal encyclopaedia.* [Turning the pages at speed]

Ava: *I have a pet fish.*

Child: *I didn't have a pet.*

Me: *I don't have a pet, either.*

Ava: *I have three fish* [showing three fingers], *but the baby one died, so I have two ones* [showing two fingers].

Me: *Oh.* [empathetic tone]

Bruno: *I had one dog, but it was 12 years and then he died.*

Me: *Ohh, 'cause it was very old.* [empathetic tone]

Bruno: *I got a puppy now. My dad got it for my birthday, another dog.*

Me: *How lucky…*

[Presenting the material table (animals, foods, etc.) Children looking and touching some of the items]

Marc: *Wait, I can see some chicks.* [Pointing]

Bruno: *Where are the cheetahs?* [Children actively commenting on interaction and instruction during the session]

Me: *Exactly, and here we have the weather* [showing the area]*, pictures* [pointing], *temperature heat, cold, snow… Food, not everybody eats the same food, so herbivorous, vegetables and fruits, and others meat, carnivorous, omnivorous,* [showing another area of stickers]. *Some live on the glaciers, some in the savannah. There is glue* [showing]*, think about zones, which animals go with which? We can make the*

areas in the zoo and then we'll have some visitors in the zoo. [Eliciting planning and thinking about factors to consider when sorting]

(Birch Primary School, Session 4)

Extract 6.1: Bruno, Marc, Ava, and Stella, Session 4, Birch Primary School.

When introducing the world globe, such as when discussing world habitats, children shared what they knew, as well as personal experiences. Miles, for example (see Figure 6.18 and Extract 6.2, Session 1, Aspen Primary School), pointed to where Santa's home was. This showed Miles's knowledge about the world and linked it to his own interests and experiences. It was interesting to listen to what they knew and remembered regarding geography. This meant that the adult could extend the conversation to develop geographical concepts connected to the interests of the children.

In the extract below, I gave some basic explanations regarding the world globe for its accessibility and its use as a resource tool for young children in a more independent manner.

Figure 6.18: Miles pointing at the Arctic while saying, 'I know where Santa lives. He lives here' while John, Mia, and I are observing and listening, Session 1, Aspen Primary School.

Me: *I brought this globe with me.* [I have put the world globe in the middle of the table.] *You can later take a further look. But first, I'm gonna tell you a few things about it. This is all the world. We live (…)*

Miles: *This is America.* [Miles tells a personal story]

Mia: *This is Madagascar.*

Me: *The main colours in the globe are blue, which is water, yellow, which is hot, like the desert and savannah. Do you see all the yellow parts?* [Rotating the globe] *Some animals live in the sea and blue parts, others in the green…* [Understanding the globe as it is planned to be a resource, they can seek information…]

John: *I know where Santa lives. He lives here.* [Pointing at the North Pole]

Me: *Is it warm where Santa lives?*

John: *Nooo, it's very cold.*

[I show the children the South Pole, and Miles says it is Ibiza.]

Miles: *I'm going to go to Ibiza.*

Me: *It's in Spain, actually.*

Mia: *I live in Poland, and I still live there, and everyone in my family lives there.* [She also wants to share her experiences, as she is Polish.]

Me: *Do you know where Poland is?*

Mia: *I don't know.*

(Aspen Primary School, Session 1)

Extract 6.2: Session 1, Aspen Primary School.

Children not only showed interest in the resources and tools, but also demonstrated curiosity for independent learning and exploration about the topics presented in the books, sometimes individually and other times sharing their thoughts collectively. In Extract 6.3 (Session 4, Birch Primary School), Ava agreed to take responsibility for starting the design of the rainforest zone. Marc was invited to join in and expressed that he was happy to help. Both Ava and Marc engaged in an exploration of the rain forest with the help of Bruno, who was in and out of the book discussions, and the collection of cut-out animals from the materials table. The children seemed motivated, reacting with enthusiasm to discovery and sharing what they were learning (see Figure 6.19).

Ava: *I've got a poster about rainforest.*

Me: *You know about the rainforest, maybe Ava, you can make a zone of the rainforest.* [I open the picture book about the rainforest. It has pop-out, 3D pieces coming out.]

Ava: *Woww.* [Impressed]

Marc: *Ohh, that's a cool book about the rainforest.*

[I offer the book to Marc.]

Me: *Would you like to help Ava with the rainforest?*

Marc: *I will.*

[Bruno is involved with the book.]

Ava: *Are you gonna help me?* [Referring to Marc]

Marc: *I'd love to help.*

[Short interaction between Stella and myself.]

Ava: *Water* (while looking at the rainforest book). *What?!* [Looking at the page]

[Bruno taking items from the materials table]

Marc: *What do you see?* [Opening a page]

Ava: *I see, I see a sea snake. And a crocodile…*

Marc: *What is that?*

[… Short interaction between Stella and myself …]

Marc: *They are playing with their mum* [Marc telling Bruno and Ava while they all look at the same page].

Ava: *Wowww, look in here!*

Marc: *There is a lot of snow.*

Bruno: *My turn.*

Marc: *Oh no, I got scared.* [Reaction to the photo on the page]

Ava: *An ant! Tarantula!*

Me: *Yes, because in the jungle… there is (are) so many bugs.* [Looking at the insects from the jungle]

Ava: *Yesssss, that's a spider, a tarantula.*

Me: *Would you like to take some spiders and snakes for the rainforest? There is (are) some over there.*

[Bruno and Ava go to the materials table to take some photos.]

Marc: *You know, that tarantula scared me!*

Me: *Did it? You can go and find some on the table.*

Marc: *I'm scared of tarantulas.* [Marc joins the material table to find some animals.] *Ohhhhh.* [Rejection reaction to spider photos] *I don't like spiders.* [Marc while looking at the material table with Bruno and Ava]

(Birch Primary School, Session 4)

Extract 6.3: Session 4, Birch Primary School.

Figure 6.19: Session 4, Birch Primary School.

Giving meaningful context and accessibility to knowledge and tools gave children power, autonomy, and ownership of their doings. The children's performance shows these resources and tools were powerful catalytic tools that generated thinking and connection making and provoked thinking manifestation, providing many opportunities for growth and, simultaneously, opportunities for me to access children's manifested thinking for research. It was particularly interesting to see how children built bridges of knowledge, relating and linking with what they knew, which is reflective of and aligned with the literature on how children learn.

The key role of the adult was to meaningfully introduce and demonstrate the possible uses of those tools and resources to support and enable children's decoding and ensure accessibility for independent use throughout the experience.

6.4.1.2 Planning, anticipating, and problem solving

In order to stimulate planning (e.g., animal sorting) and raise children's awareness of what to keep in mind when implementing the design, I mentioned that not all animals could live together. In Extract 6.4 (Session 1, Aspen Primary School), I asked hypothetical *'What if…'* questions to trigger awareness and reasoning. Consequently, the children imagined the given situation and anticipated certain events that could potentially help in planning their zoo. Mia, for example, based on her knowledge that '*tigers eat meat and penguins have meat',* and anticipated *'the tiger can eat the penguin' (Mia),* and Miles contributed with *'they can die'.* Additionally, when prompted, the children thought about additional factors to consider, such as the climate.

> **Me:** *What happens if we put a tiger with a penguin?*
>
> **John and Mia:** *Noooooo!*
>
> **Mia:** *Because, because, tigers eat meat and penguins have meat.*
>
> **Me:** *What do you think might happen to the penguin?*
>
> **Miles:** *They can die.*
>
> **Mia:** *Yes, the tiger can eat the penguin.*

Me: *Do you think the penguin cannot defend (itself) from the tiger? Why else does the penguin not live with the tiger? The penguin lives in a place where (it) is…*

Mia: *Coldddd. And the tiger?*

Miles: *Hot.*

Mia: *Lives here.* [Pointing at one of the habitat photographs.]

(Aspen Primary School, Session 1)

Extract 6.4: Session 1, Aspen Primary School.

Similarly, in Extract 6.5 (Session 3, Aspen Primary School), Tim foresaw the possibility of what could have happened if we sorted inappropriately. In the extract, it is also possible to get an idea of the children's tone, ownership, and initiative.

Me: *What happens if I put the iceberg in here* [with the tiger]*?*

Tim: *The tiger will be with the penguins.*

Me: *The tiger will be with the penguins?*

Tim: *And then they will eat them.*

Me: *They will eat the penguins?*

Tim: *Yeah.*

Me: *So, I shouldn't put this one here then. I'm gonna make an area with the iceberg in here.*

Tim: *I can make an area.*

Me: *OK.*

Tim: *Oh, we might have to move it.* [Meaning the poster]

Me: *Yeah, it's a bit tight here* [the physical research space]. *We can make it really, really big.* [Referring to the area]

[Tim is drawing the area. He seems to be struggling to reach the top of the poster.]

Me: *Do you want me to take one table away? Do you think it will be better?*

Tim: *Yeah.*

Me: *Let me try. It might not completely fit.* [The table left is smaller than the poster.] *Be careful. Don't hurt yourself.* [While Cira is helping to move the table] *Let me pull it out; excuse me, sorry, sorry.* [Carefully bringing it out]

Cira: *What if we put it on the floor?* [As she can see, the poster is bigger than the table.]

Me: *Don't you think it will be dirty?*

Cira: *No.*

(Aspen Primary School, Session 3)

Extract 6.5: Tim, Cira, Diane, Session 3, Aspen Primary School.

In Extract 6.6, children were providing alternatives to prevent the 'lion from eating the ostrich', as the Zoo design involved anticipating hypothetical issues as well as finding alternatives. When I asked the children to evaluate their designed area, Mia expressed that she was not yet satisfied with the result, as there were missing animals. The children seemed motivated to complete their design, and Mia showed the ability to be critical as well as persistent with their work. Mia's enthusiasm was reflected in her private speech, as she was 'singing her thoughts' along with dance movements.

[We are talking about separating the lion from the ostrich so that the lion does not eat it.]

Me: *We can make a highway, we can move the ostrich, and what else could we do?* [These are some solutions found, and I am trying to encourage children to create new solutions.]

Miles: *We can make a hideout.*

Me: *I think also something they do in aquariums as well is to feed them a lot of food so they don't eat the other fish.*

Miles: *Meat.*

Me: *If we feed the lion, the lion might not eat the ostrich.*

Me: *Are you happy with the savannah?*

Mia: *No.*

Me: *What else (do) we need?*

Mia: *We need ehhhhhhhh, more animals.*

Me: *Also, the weather. What weather is in the savannah?*

John: *Hot.*

Mia: *I'll take some yucky animals* [singing and dancing], *what I will take? What I will take* [She is using a singing tone while dancing in her private speech.]

(Aspen Primary School, Session 1)

Extract 6.6: Session 1, Aspen Primary School.

Other than asking questions directly, indirect ways, such as formulating 'I wonder' questions, proved to be effective tools for the adult to stimulate conversation and thinking. In Extract 6.7 (Session 4, Birch Primary School), the children were prompted to think about and plan the animal's dietary needs:

Me: *I'm wondering, what can we feed the animals?*

Marc: *Here is some chicken.*

Me: *Do you think they eat chicken?*

Stella: *Noooo.*

Me: *I do think that some eat, the polar bear* [hello to someone passing], *I do think some eat meat.*

Marc: *I'll get some fish, I'll get some fish. Some animals eat fish.*

Marc: *I got some fish for the polar bears.*

(Birch Primary School, Session 4)

Extract 6.7: Session 4, Birch Primary School.

Planning in this case design was considered important; therefore, I encouraged thinking explicitly before starting, making thinking gestures. I introduced the concept of '*freenking*': a time when children freeze and think that encouraged children's imitation. In Extract 6.8 (Session 1, Aspen Primary School), the children brainstormed ideas about what they considered essential for the zoo. On this occasion, I created a list of the children's contributions to make the thinking visible and reviewed the list as a reminder before the children picked up physical items.
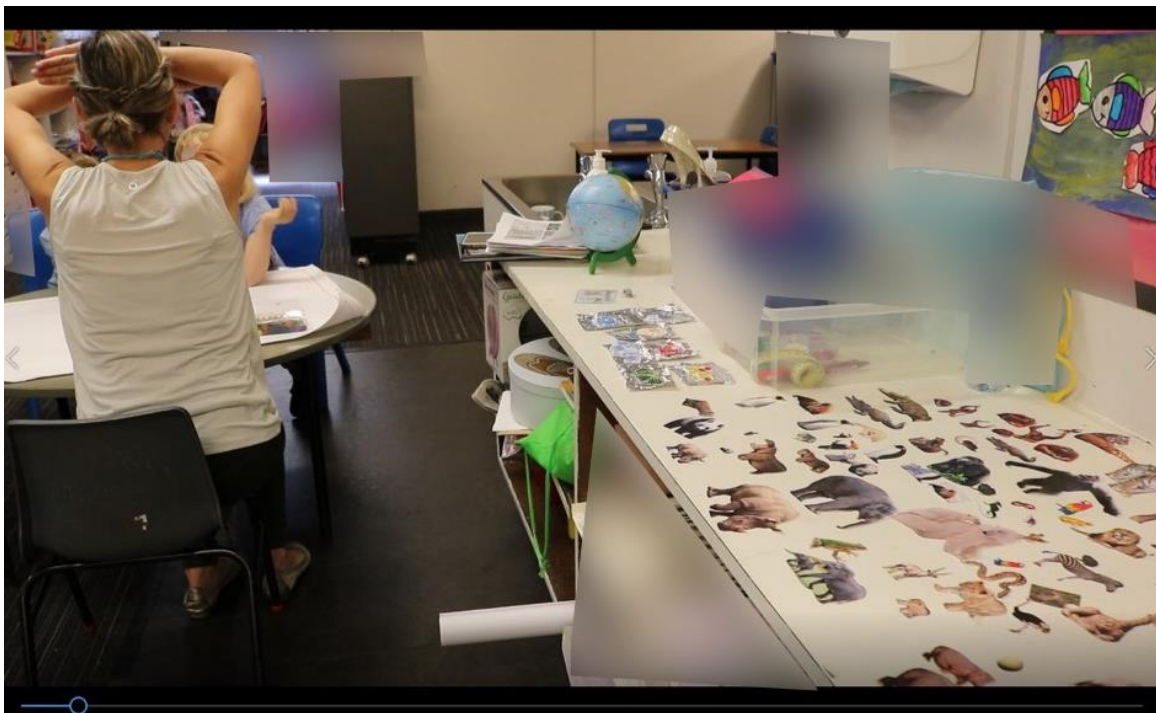
Figure 6.20: The children and I being intentional about and taking the time for thinking.
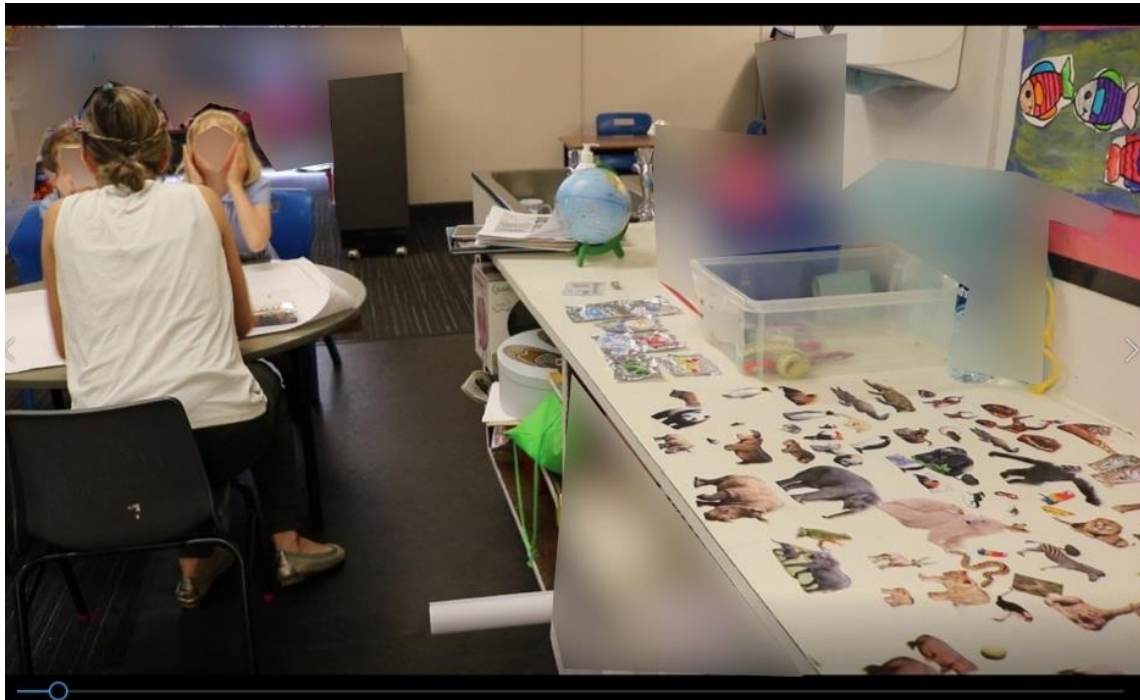
Figure 6.21: Miles and Mia thinking while closing their eyes and putting their hands on their head, Session 1, Aspen Primary School.

Figure 6.22: Children with their 'thinking hat' while talking about wild and educated guessing when using the *Mystery Box* experience in the *Mystery Zoo* case.

Mia: *I know! Ice.*

Me: *We need ice. Let me find another paper. Ice* [writing the word *ice* on the list] *What else?*

John: *Water.*

Me: *Water* [writing on the list], *what else?*

Miles: *Food!*

Me: *Yes, what kind of food?*

Miles: *Ehhh…*

John: *Meat.*

Miles: *Salad.*

Mia: *Fruit!*

John: *Grass.*

Miles: *Yellow Grass.*

Me: *Green and yellow grass. Why is the grass yellow sometimes?*

John: *When it's really hot.*

Miles: *Ibiza is very hot.*

(…) [Linking Ibiza with the climate…and personal experiences]

Me: *True, what else do we need?* [I review and read the things we have mentioned: ice, water, food, meat, salad, etc. as a reminder] *What else?*

John: *Tomatoes. Hahahah.*

Me: *We have some tomatoes in (and*) vegetables* [meaning in the paper cut-outs].

Miles: *Bananas.*

John: *Bananas.*

(…)

(Aspen Primary School, Session 1)

Extract 6.8: Session 1, Aspen Primary School.

However, the children were not equally organised in all sessions, and some children were more spontaneous and showed less explicit planning than others. In Session 2 (Aspen Primary School), Frida planned in a less systematic way and got some food items and an animal to the poster after having looked at the world globe resource. However, Frida very quickly went to get many more items rather than spending time organising those that she already had. Providing too much variety of attractive material without limitation could overwhelm the children's choice, as well as trigger some children to take too many at once without processing the choice and what to do with the items later. Having said that, this more spontaneous behaviour did not necessarily mean that the child was not involved in the planning process.

An open, creative, and flexible mind was needed to organise and plan what to do with those choices retrospectively. Overall, to help children's organisation and think and make the pace slower, I recommended that children reduce the number of items they picked up per go, so they were more mindful of what they picked up each time.

Children commented on the areas they planned to make and share with others (stimulating planning and choosing an area if they had not yet done so).

'*I will make Iceland',* Mia.

Additionally, some children made use of specific vocabulary introduced throughout the experience. When Miles said he was going to make:

'*A very hot place',* Miles. Mia responded with the following question:

'*You mean Savannah?'* Mia

The Zoo Mystery was designed to support children's approaches to problem solving, facilitating their planning and anticipation of what was needed regarding skills and resources. A key role of the adult here was to slow things down and prompt thinking when the children were struggling or were too quick to act. The tools and materials that enabled this to be autonomous for young children were crucial in helping them to learn for themselves and to try thinking strategies independently or with peers. In this trial and error process, children had opportunities for safe risk taking and to show behaviours related to the ability to change their minds, make errors, and correct themselves or be corrected.

6.4.1.3 Collaboration: Constructing and developing thinking within interactions

The process encouraged the children to go to the cut-out photographs table as a group to select items, with the condition that only one person on the team could pick them up. This was not only to stimulate thoughtful planning, but also to manifest thought (see above in the design section). This was considered beneficial for capturing children's thinking, both individually and collectively. Group decision making involved accounting for diverse perspectives as well as compromise. In Session 1, Aspen Primary School, for example, children expressed their opinion in this way:

'Maybe not that,' *Mia:* disagreeing with her peer's option (Session 1, Aspen Primary School).

'Not the ostrich because the ostrich lives in the hot place' John (Session 1, Aspen Primary School).

Through these interactions, some children, like Miles, took the opportunity to reflect upon our input and rectify their choice. In Extract 6.9, when I asked Miles about his change, he was able to reason his choice by showing thinking that required foreseeing:

'*Because the baby tigers will be freezing'* Miles (Session 1, Aspen Primary School).

[Suggestion for teamwork* (Everyone will go to see the printed images, but only Miles will actually grab them first, so the others will tell Miles which things to bring and then the person who takes items can change taking turns. Only Miles, then Mia and John.) It's teamwork. That way, the children may have a conversation about it or a discussion, or they may brainstorm items...]

John: *Penguins, polar bears, foxes, polar bears.*

Mia: *Polar bears, penguins.*

John: *Walruses* [?]

Mia: *Maybe this.*

John: *A seal!*

Miles: *Hahaha.*

John: *The walrus and the seals!*

Miles: *Hahaha. Look at that.*

Me: *All right, you can take a little bit more.*

John: *Walrus, polar bear.*

Mia: *A baby polar bear* [there are many items repeated as well, some big and some small, some cubs as well].

Miles: *Ohhh, look at that* [and takes it]

Mia: *Maybe not that* [disagrees with option].

Me: *What is that?*

John: *A leopard?*

Mia: *No, a baby tiger.*

Me: *It's a baby lion.*

Mia: *Ohhh* [expression for cuteness/love]

Me: *But Miles, can we put the baby lion in the Arctic? Let's bring them to the table, and we can decide later.*

John: *Not the ostrich, because the ostrich lives in the hot place.*

[Miles has changed his mind, as he has glued the baby lion in the savannah space and had first picked it for the Arctic space.]

Me: *Why didn't you put the baby tiger in the pole?*

Miles: *Because the baby tigers will be freezing.*

Mia: *And they will turn into ice, and then they will stay like that* [Mia pretending to freeze].

(Aspen Primary School, Session 1)

Extract 6.9: Session 1, Aspen Primary School.

Generally, when children were asked to reason their choices, they could, like Mia in Session 1:

‘Because in the Arctic, there is snow there. It will freeze because is very very low temperature’ Mia (Session 1, Aspen Primary School)

Learning therefore occurred through collective interactions. In Extract 6.10, Marc repeated my previous comments, which gave a sense that he could be internalising information. This extract also shows how many different things were happening simultaneously in the context of a collective investigation, as the children were connected and focused on different tasks and people. Even though Marc was talking about Antarctica, he was multitasking and, while maintaining his subject thoughts, bringing materials to Ava. The challenge as an adult was to be able to connect and be present in the children's diverse thinking 'places' at the same time. During the conversation, I was juggling, like the children, between various children's 'thinking places' (Antarctica, the farm, etc.)

Me: *Do you think we can find a tree like that in Antarctica? It's so cold that they wouldn't survive.*

[Stella agrees and shakes her head in a gesture of 'No'.]

Me: *But we can give it to Ava, and we can put it there* [meaning a different area]. *All of these.*

Marc: *A tree cannot survive in the Antarctica.*

Me: *Ohhhh!*

Marc: *That tree wouldn't survive in the Antarctica.*

Me: *It wouldn't survive.*

[Stella brings a different tree and shows it to us as a suggestion.]

Me: *Do you think this one could survive in the Antarctica?*

Marc: *Noo.*

[Stella smiles and says 'No'.]

[Stella and I check the book with photographs of Antarctica.]

(...)

(Birch Primary School, Session 4)

Extract 6.10: Session 4, Birch Primary School.

The zoo mystery design highlighted the value of collective thinking and working together for exercising, scaffolding, and developing thinking. The design required the need to communicate with each other, and this involved slowing the pace down as well as encouraging the children to put their ideas into words or other comprehensive forms of communication. Children engaged in valuable learning moments involving agreements and disagreements and consensus seeking, which required them to be persuasive, to reason, and to demonstrate dispositions towards changing their perspective when new evidence was considered. The case study showed that thinking is both individual and collectively constructed (Wegerif, 2010). These examples show how the collective, through the process of scaffolding (Bruner, 1971), pushes children over that threshold into critical thinking.

6.4.1.4 Reasoning and alternative perspective-taking

In Extract 6.11 (Session 1, Aspen Primary School), Mia, John, and I engaged in a conversation regarding wild animals living in a restrained environment outside of their habitats. This space provided opportunities for reflections on the issue of disagreement, with each child offering a different perspective and benefiting from hearing other perspectives different from their own (pros and cons of the problem). Even though this conversation was not taken further, this extract shows the potential to deepen and extend that contribution, facilitating critical thinking in the context of zoo design play.

> **Me:** *Do you think animals like to live in the zoo?*
>
> **John:** *No.*
>
> **Me:** *Why not?*
>
> **John:** *Because is too small. Because is not big enough.*
>
> **Me:** *Why else?*
>
> **Mia:** *But the crocodiles like that because the crocodile just had a baby crocodile* [pretend play].
>
> **Me:** *But do you think he likes it more in the zoo or in the forest?**
>
> **Mia:** *Maybe here* [in the zoo] *because here he gets meat.*
>
> **Me:** *Because in here it always has food? That's true, that's true.*
>
> (Aspen Primary School, Session 1)

Extract 6.11: Session 1, Aspen Primary School.

The zoo mystery design showed the importance of providing space and an opportunity for dialogue to learn from the self and one another and develop children's critical thinking skills and dispositions. The adult role was crucial for supporting, sustaining dialogue, identifying potential opportunities, and persuading some of those at the appropriate time.

6.4.1.5 Work approaches that are more realistic or imaginary

The children showed different approaches to the task. Holly had a realistic and Frida a more imaginative, playful approach to the zoo design. Holly took animal needs and characteristics of their habitats into account, while Frida was focused on making *'a walking bed'* in *'the bedroom'* as well as making toys for animals (Extract 6.12). For example, she made an area for a panda with a sun as well as added a thermometer indicating a very cold temperature (symbol). This dissonance between the children's working approaches created some disagreement. This was repeated during the experience and created some frustration, particularly in Holly. In Extract 6.12, both Frida and Holly used assertive tones, showing ownership and voice regarding their work. When I asked Frida to write what she was creating, she stated with certainty, *'I'm not gonna write it',* and when I offered to do so, she gave me explicit instructions regarding where. Holly showed initiative and confidence in her decisions through her choice of words: *'**We need some water, we need some water'**.* She also showed frustration and confrontation when Frida showed a less realistic approach, which could indicate that she cared and was committed to the decision taken.

Holly: *We need some water; we need some water.*

Holly: *Ohhh, come on! I took the cold bit* [annoyed tone and body language].

[Holly decides to leave it and gets another cold weather image for her cold area.]

[Frida looks at the globe again (perhaps to make her new area). I ask her what she is going to do in the new area.]

Frida: *This is the bedroom.*

Me: *For which animal?*

Frida: *This is going to be a walking bed.*

Me: *Can you write here (a) walking bed so we can remember it later?*

Frida: *I'm not gonna write it* [Frida was not comfortable with writing, as they were just starting to learn].

Me: *You don't want to write it? OK! Should I write it?*

Frida: *In here.* [Pointing, telling me with assertiveness, taking control of her work, and pointing at a corner where she wants me to write it.]

Me: *Over there?*

[Frida nods]

(Aspen Primary School, Session 2)

Extract 6.12: Session 2, Aspen Primary School.

The design of the case captured the children's different working approaches, and included opportunities to see the unique ways some young children saw the world, at times blurring the boundaries between realism and fantasy. It foregrounded how children dealt with challenges and disagreements when working together in regard to the approach taken and their conceptual application. Space for differences is important, and the thinking skills needed (sometimes facilitated by the adult) to deal with this were interesting to observe. These situations could be catalytic of the move to critical thinking individually or as a collective.

6.4.1.6 Knowledge and awareness: knowing or not knowing

There was variation in prior content knowledge among children regarding animal life and world inhabitants. Some children showed and shared a lot, while others struggled with the recognition of 'fairly' common animal names (see Extract 6.14). On the one hand, Frida did not recognise the frog or associated terminology, even though she later added she had seen one. In contrast, Leo knew the word, but was still uncertain and needed to confirm with me. In line 18 (Extract 6.14), for example, Leo identified the lion as a 'tiger'. I assumed that Leo

had seen lion visuals before in some form or another, but did not use the term correctly to name it. The children spoke English well and fluently; however, their vocabulary seemed basic in some specific areas. Animal terminology is usually common in most children's worlds, but I had been informed by the head teacher of differences among children's vocabulary and specific content knowledge, and this certainly seemed evident in this extract. In this case, my assumptions about children's access to cultural and economic capital might have influenced (and disadvantaged) some children's critical thinking performance. Furthermore, viewing children as a homogeneous group, and hence targeting for an inclusive research design (topic) for children as a whole is problematic (Thompson, 2007) particularly so when aiming to meet knowledge expectations for all children. Dockett et al. (2013) argue that understanding and considering both individual differences and commonalities across children for the purpose of research design might help mitigate this issue.

Some children showed awareness of knowing and not knowing the area. This could be explicit awareness of what they knew, as in Extract 6.13 where Mia confidently shared what she knows and how she knows it, or it could be an explicit statement of what they did not know:

> **'I don't know the animals',** Frida (Session 2, Aspen Primary School. See Extract 6.14);

[Mia is picking up some bright-coloured snakes and spiders, and tells me some of these have poison.]

Mia: *I read it in a book* [awareness of knowing].

Me: *Why do they have poison?*

Mia: *Because…* [I don't understand her explanation]

Me: *Also, because they need to protect themselves and they have poison so (that) other animals don't eat them.*

Mia: *Yes, I know that.*

(Aspen Primary School, Session 1)

Extract 6.13: Session 1, Aspen Primary School.

Other children realised things that they did not know during interactions within the investigation (with me and other children), for example, Leo with the lion and Frida with the frog (above). A realisation of knowing could come from something they explicitly did not know

before (awareness of learning) (e.g., **'*I know what they eat, Miss Lore, they eat flies!*'** Leo, with enthusiasm) (Session 2, see Extract 6.19).

In Extract 6.15, Holly was trying to create the area of the zoo based on her knowledge and criteria. She seemed to notice that Leo and Frida were not following the 'rules' (animal habitats and needs) the way she believed was appropriate. She seemed alert and felt the need to make sure that Leo was going to paste the frog in the 'right' place.

Leo: *I'm gonna put the frog in the pool.*

Frida: *That's not a frog.*

Leo: *Yes. Is this a frog?* [Leo directing to me]

Me: *Yes.*

Frida: *Yeah, all right.*

Frida: *I have seen a frog.*

(…)

Leo: *Look, the frog is there* [on top of the lake made by Holly].

Me: *Do you want to glue it?* [as he has only put the frog on top of the water Holly made without actually glueing it]

Leo: *I* [aye?] *glue it on?* [Showing a bit of doubt. Leo seems to want to make sure and asks to double-check first.]

Me: *Yeah.*

Leo: *In the water, please!* [with a serious voice, seemingly having lost some of her patience]

Leo: *OK.*

Frida: *I need another frog.*

[Holly brings more images, including a lion and lots of meat.]

Leo: *A tiger.*

Me: *Who's that?* [pointing at the lion]

Leo: *A tiger.*

Me: *This is a lion, right? A lion.*

Leo: *A lion.*

Me: *What does the lion eat?*

Children: *Mmmm, hmmm.*

Me: *It's carnivorous; it eats lots of meat. Look at the sharp teeth. Because they need them to eat meat.*

Holly: *Too much meat for him!* [using a 'role-play' deep voice. Holly and Leo are taking a lot of meat.]

Holly: *A waterfall, guys!* [Holly is going to get more items.] *We have a waterfall!*

[While talking to Frida]

> **Frida:** *I don't know the animals.*
>
> **Holly:** *You don't know the animals?*
>
> [She shakes her head for no.]
>
> **Me:** *Do you like animals, Frida?*
>
> (Aspen Primary School, Session 2)

Extract 6.14: Session 2, Aspen Primary School.

Despite specific content knowledge not being strictly necessary in this case, it did slightly influence the level of engagement with the topic at times. Some children seemed slightly restricted by either content knowledge or particular terminology. This case, however, also showed that such experience made children aware of what they knew and did not know, and facilitated reflection upon this and initiated paths towards finding out. These conflicting encounters with knowledge (including becoming comfortable with what we do not know) are crucial to critical thinking.

6.4.1.7 Strategies to obtain information and tackle the unknown

Linked to this awareness of not knowing, some children used different strategies to find out. These strategies are connected to the questioning strategies observed in the *Mystery Box* case. Some asked questions (to me or other children), and others used the resources to find answers to their questions. In Extract 6.16, Holly chose a book about the Arctic habitat to research information (Strategy 2 in the *Mystery Box*). When I asked, she said:

> *'I'm just checking what kind of animals would go in this bit, I'm trying to figure what kind of animals go in there'* Holly: pointing at the Arctic area she is creating (Session 2, Aspen Primary school).

During the research and interpretation of the visuals in the book, Holly expressed emotions aloud. Both in the form of private speech (e.g., '*Ohhh, poor thing*' Holly) as well as with the intention of communicating with others:

> *'Look!!!! Look what the penguin is doing!!!'* Holly, surprised (Session 2, Aspen Primary school).

Holly showed satisfaction with her search and enjoyed the process. She expressed surprise regarding what she was learning (finding out) by saying, '**Look!!!**'; she was attracting our attention. These are important opportunities where one's interest and positive emotion can spread and stimulate the interest of others.

In the same Extract 6.15, however, Leo requested information by using me as the information source (Strategy 1). He was interested in the methodological aspect of 'glueing' and finding a more effective strategy. This is interesting, as Leo seemed to have trouble with the glue and hoped that there might be an easier technique. This shows reflection, as well as intricate and complex thinking, planning, and prediction. He also repeated the question three times, which could mean it was important to him, or because he did not get the answer as quickly as he would have liked as I was talking to someone else, but he persevered.

[Holly takes the polar world book, as she is making the Arctic area.]

Leo: *Is there an easier way to glue?* [N1]

Me: *What are you checking* [in the book], *Holly?*

Leo: *I'm just checking what kind of animals would go in this bit* [pointing to the Arctic area she is creating] *I'm trying to figure what kind of animals go in there* [pointing at the Arctic]

Me: *That's an excellent idea.*

Holly: *I wanna to check this book.*

Me: *Good idea.*

Leo: *Is there an easier way to glue?* [Interrupting that conversation] [R2]

[After Holly finishes what she was saying]

Me: *Yes, Leo?*

Leo: *Is there an easier way to stick the meat down?* [R3]

[…others talking…]

Holly: *Ohhh, poor thing* [making a cute sound while looking at an animal in the book of the Arctic, probably in danger…] [children are commenting and often thinking aloud].

[…others talking…]

Holly: *Penguins!* [In a tone as if she was saying they were naughty, while reading the book.]

Look!!!! Look what the penguin is doing!!! [surprised by what she is encountering in the Arctic book]

(Aspen Primary School, Session 2)

Extract 6.15: Session 2, Aspen Primary School.

In Extract 6.16 Leo asked me *'What do frogs like to eat?'*. However, instead of answering the question, I proposed to Leo to check it out in the animal encyclopaedia, as I wanted to see whether he would actually use the resource or know how to use it on his own. On this occasion, Holly provided him with an answer without giving him time to find out on his own, demonstrating opportunities for learning in collaboration with peers. Leo felt satisfied with Holly's answer and wanted to express learning explicitly by letting me know:

> *'I know what they eat, Miss Lore. They eat flies!'* Leo (Session 2, Aspen Primary School)

Leo: *What do frogs like to eat?*

Me: *Frogs like to eat… Should we check? Do you want to check here?* [Offering the animal encyclopaedia] *Let's see if we can find it* [I am not looking in the book with him, as I want to see if he uses the resource and finds it himself rather than answering his question directly].

[Just at that time, Holly tells him an answer.]

Holly: *Frogs eat flies!* [Pretends that her arms are wings]

Leo: *I know what they eat. Miss Lore, they eat flies!*

(…)

[At the same time, Leo is telling me that he now knows what frogs eat.]

Me: *How do you know?*

Leo: *Because.*

Holly: *I just told him.*

(Aspen Primary School, Session 2)

Extract 6.16: Session 2, Aspen Primary School.

In some cases, children were inclined to guess wildly rather than research information, utilising a different path to discovery (trial and error). This is reflected in Extract 6.17, for example, where I encouraged Marc to explore the books to make a choice based on evidence. The key was for children to develop the disposition to want to find out, the ability to understand the role of resources, and some knowledge regarding how those work for independent use, rather than getting or knowing the right answer.

Me: *Who is gonna live here? You have to decide.* [Telling Ava and Marc] *What else goes in the rainforest?*

[Ava is holding the gorilla.]

Me: *The gorilla, perfect.*

Me: *Who else?*

Ava: *The giraffe?*

[I tell them that the giraffe does not go there.]

Bruno: *A lion.* [They are still learning about the topic, so even though they know some things, there are many other facts that they have not heard about.]

[Marc pastes a panda in the rainforest.]

Me: *The panda doesn't go in the rainforest.*

Marc: *Where does it go?*

[I encourage Marc to look at the book, and we find a crocodile. He goes to the book area to search in the books.]

(Birch Primary School, Session 4)

Extract 6.17: Session 4, Birch Primary School.

In Extract 6.18, Stella picked up a penguin, which stimulated the process of finding out where the penguin lived. I took the world globe to encourage the use of resources. Mark contributed the information that the penguin belonged to the Antarctic. Using Marc's information, we identified Antarctica on the globe, and then I asked Stella to see whether the representation of the penguin visual was there. In the end, Stella did not just learn that penguins live in Antarctica, confirming Marc's belief, but she also learnt that the polar bear inhabited the same area. Extract 6.18 showed a part of the collective learning process and discovery using resources.

[Stella turns facing the table and picks up a penguin. She attracts my attention to show me.]

Stella: *I got a penguin.*

Me: *Where do you think we can put the penguin?*

[Stella points at an area (not sure where, maybe the savannah, but based on my answer, guessing it is not an area appropriate for penguins)]

Me: *I think the penguin goes... I'll bring the globe.*

[Marc has overheard the conversation and joins to say.]

Marc: *It goes in the Antarctic.*

[We identify the Antarctic on the world globe, and I ask Stella.]

Me: *Can you see if you can find a penguin?*

[She spots one, and points at the penguin.]

Stella: *There, hehehe* [Stella giggles].

[Stella points at a polar bear.]

Me: *What's that?*

Stella: *A polar bear.* Stella turns around and wants to find a polar bear on the materials table. This shows how this process is helping her understand and learn about not only sorting of animals, needs, and habitats but also to make use of resources.]

[Stella spots the polar bear.]

Stella: *Polar bear, polar bear, polar bear* [singing] *found it!* [showing it to me]

[Stella keeps focusing on the Arctic.]

(Birch Primary School, Session 4)

Extract 6.18: Session 4, Birch Primary School.

In some cases, resources not only provided the information they required, but also aroused further questions or interest. In this task, cultivating the use and development of the disposition to seek information in resources was considered more important than factual accuracy. The accessibility of resources for young children's independent work was considered key. For example, Frida was exploring the world globe, which seemed to arouse and spark her curiosity regarding where Scotland was located:

> **'Miss Lori, is this, is (this*) Scotland?'** *Frida, bringing me the world globe and pointing at a spot in the north of Africa.*

Holly joined the conversation, and we all looked for Scotland on the globe together. Frida's actions demonstrated that visual and manipulative materials can catalyse thinking: wondering, generating, and formulating questions, stimulating and attracting children's interaction with tools, others, and learning materials, and finding answers and opportunities for teachers to learn what children know or wonder about.

New sparks of interest emerging from objects, such as the one mentioned above, also occurred with visual manipulatives. Placing specific objects strategically could capture interest and potential questioning, like Bruno in Extract 6.19, where he became interested in

the brain. Bruno picked up the toy brain, and we briefly talked about the brain and where it was located. Bruno then placed the toy brain on his forehead (see Figure 6.23). Marc was observing attentively, and Ava expressed curiosity about manipulating the item.

Figure 6.23: Bruno placing the toy brain on his forehead after my explanation, and Marc and Ava are observing with interest.

Bruno: *This is my brain* [Holding the brain, smiling, making gestures].

Bruno: *Is this what brains look like?* [Touching the toy brain and observing it]

Ava: *Can I? Can I?* [Placing her hand open to try to touch it]

Me: *Yeah, that's what they look like, inside* [Pointing at my head. Making gestures to explain where it goes]*, but this is not a real one.*

[At the same time, Marc is pointing with the index finger of each hand to his head.]

> **Ava:** *Woww, it feels so weird.* [while feeling the squishy toy brain]
>
> **Bruno:** *It's squishy. I got a squishy brain.* [squishing the toy brain pointing at his own head]
>
> **Me:** *It's inside our bone in here.* [Touching the cranium to illustrate. Bruno places the toy brain on his forehead.]
>
> (Birch Primary School, Session 4)

Extract 6.19: Session 4, Birch Primary School.

Overall, the children were resourceful and demonstrated a variety of strategies to tackle the unknown, both individually and collectively. The selection of accessible resources and the role of the adult in guiding and supporting the children when needed, particularly initially, were fundamental.

6.4.1.8 Resources as evidence

Some children utilised information resources to do research; in addition, resources were used to support reasoning. In Extract 6.20 (Session 2, Aspen Primary School), Frida decided to stick the iceberg image in the area where the panda bear was located, apparently without reflecting upon the hypothetical consequences. It could also have been that Frida was not aware of the appropriate climate for these animals or that in her 'play world', this reality was not relevant. Leo was also unsure and asked whether it was supposed to go 'anywhere'. But Holly clearly disagreed and attempted to take the iceberg away. There was a dispute between the children regarding decision making, both verbal and through gestures of sticking and taking the glued item away. To break down the children's frustration and stimulate explanation, I asked Holly to reason why. Holly tried to explain it multiple times, and after insisting on an explanation (three times), she went to the resource area to find evidence to support her perspective. She first tried a book, but finally took the world globe and demonstrated that the panda did not belong in the Arctic. She was able to use an accessible information source to demonstrate and help strengthen her argument. It seemed that the diversity of thinking positioned the children against each other, and they defended individual thinking rather than what was collectively constructed. These opportunities could positively stimulate growth, teaching, and learning from one another if everyone's work on the team is valued.

[I bring the iceberg picture.]

Leo: *Should we put it anywhere?*

Me: *I think we can put it in a very cold country* [meaning area, not country]. *Leo, there are some penguins here, so should we put the ice here?*

[Frida takes a big iceberg image and sticks it in the area where the children located the panda bear.]

Holly: *Ohh, come on, Frida!*

Me: *Hold on, what's the problem here? What's the problem of (with) putting the ice here?* [R1]

Holly: *Because* [she tries to remove it from the area].

[Frida puts it back again with her hand.]

Me: *But why?* [R2]

Holly: *Because... She explained that the iceberg should not be there for those animals and that area. That should not be in that area.*

Me: *But why?* [R2]

[She goes to the resource area and seems to be looking for some evidence to show. First, she goes to grab a book, but she finally takes the world globe.]

[She removes half of the iceberg image stuck on by Frida. And Holly finds the panda on the globe to demonstrate it is not in the white area (Arctic).]

Me: *That's a panda, yes, so it's not in the icy area* [She wanted to show evidence of why she was stating the ice was not there and it could be even to verify whether she is right.]

[She starts taking the iceberg away, and I ask her.]

Me: *Do you think we should take it away?*

Holly: *Yeah* [she takes it away].

(Aspen Primary School, Session 2)

Extract 6.20: Session 2, Aspen Primary School.

The children used resources to get information, as well as to help other team members with their questions. In Extract 6.21, Leo and Holly were not sure about the colours of the giraffe, so they used the animal encyclopaedia to find out. At the same time, Frida took the world globe to search for the same information and help Leo and Holly. Frida confused the giraffe with the panda (as she did not know the names of some animals); however, her performance demonstrated she was inclined to use resources, was competent to use them, and understood that they were to obtain information and, as a result, potentially help Leo (see Extract 6.21, Session 2). She mastered a more complex process than identifying an animal,

but without the basic information, Frida was not able to 'succeed' with her intention to help Leo on her own and needed to be helped by Katia.

Leo: *Miss Lorri, do you like my tree?*

Me: *Excellent!*

Me: *Who is gonna eat from this tree? Which animals like to eat from trees? The leaves?*

Holly: *Giraffes.*

Leo: *A giraffe?*

Me: *Perhaps they can go up and find the leaves on the trees.*

Leo: *What colour is the giraffe?*

Holly: *I know what colour. Brown and …* [Holly grabs the animal book]

[Leo and Holly start looking for the giraffe in the book to find out about the specific colours to draw it like it is in real life.]

Me: *I'll find Frida.* [while simultaneously looking at it around the globe, making use of the resource. Frida tells me she found the giraffe and points it at me. I tell her it is a panda (bear) rather than a giraffe. Katia wants to help, and they look together. Finally, Leo and Holly find the giraffe. I ask whether they found it and they tell me 'Yes'. I can see the animal encyclopaedia is opened on that page.]

Leo: *Can I use any colour?* [I am assuming that the children are used to specific instructions; however, I am surprised that he was interested in finding out about the actual colour if he was going to choose a different one.]

(…)

Leo: *I'm just doing my giraffe like that* [with the book at his feet. He could have taken an already made giraffe (photo), but Leo had chosen to draw it instead.]

Holly: *We need some water! We need some water, you know?*

Leo: *My giraffe is all right. Miss Lore, is my giraffe all right?* [It seems he wants recognition of his work, or he might need some sort of approval.]

Me: *It's perfect!*

Leo: *I don't need this book anymore* [while he puts the book back in its place].

Holly: *We need some water; we need some water.*

(Aspen Primary School, Session 2)

Extract 6.21: Session 2, Aspen Primary School.

Similarly, some children showed the disposition to use resources to obtain the necessary evidence to help the team. In Extract 6.22, none of the team members knew whether elephants lived in the Arctic. Marc took charge of seeking information, took a book, and said:

'I will see', 'I will check' Marc (Session 4, Birch Primary School).

This showed some control over resource use and information-seeking for evidence-based thinking. After checking the book, he commented:

'Stella, I don't see any elephants in here, in the Arctic', Marc (Session 4, Birch Primary School).

Without considering whether not finding the elephant in the book meant elephants did not live in the Arctic, he continued to search the globe instead (see Figure 6.24) and said:

'Let's check' Marc: Looking at the globe (Session 4, Birch Primary School).

After researching two resources with his own initiative, Marc concluded:

'Nope, Stella, there are none in the Antarctic' Marc (Session 4, Birch primary School).

Figure 6.24: Stella and Marc seeking information.

[Marc is standing, but does not seem to have anything to do in his hands.]

Me: *Do you want to help Stella?* [referring to Marc, so he finds a task to do]

[Marc goes towards her with the book in his hand, putting it up on his head.]

(…)

[Stella takes the elephant and is about to put it on the Arctic, but shows it to me first.]

Me: *Do you think the elephant goes in the Arctic?* [talking to both Stella and Marc, who is helping her construct the Arctic area]

Marc: *I will see.* [Marc starts looking through the Arctic book, turning the pages, trying to search whether any elephant appears in there.]

(…)

Bruno: *Can I get that book?*

Marc: *Stella, I don't see any elephants in here, in the Arctic.* [Still searching for the elephant in the Arctic book]

Me: *No, there is (are) no elephants here in the Arctic. I don't think so.*

Marc: *I'll check in the Antarctica* [meaning in Antarctica within the globe this time].

Marc: *Let's check* [looking at the globe]. *Nope, Stella, there are none in the Antarctic.*

Me: [Helping the children to the table to look at other animals for the space.] *Which one do you think goes in the space?*

Marc: *I think the penguin.*

[Stella finds a baby penguin]

(Birch Primary School, Session 4)

Extract 6.22: Bruno, Marc, Stella, and Ava, Session 4, Birch Primary School.

Marc's behaviour continued throughout the session. In Extract 6.23, Marc poses the following question:

> **'Where do you find zebras, mostly?'**

It seems that he could have been talking to himself, as he directly took the globe to seek answers. We both engaged in the task of reconstructing and redirecting the design together (Figure 6.25).

Figure 6.25: Marc exploring Africa

Marc: *Where do you find zebras, mostly?*

[Marc takes the globe.]

Me: *I think…*

Marc: *I'll check here. I can't find it.*

Me: *Somewhere here, in Africa.*

Marc: *In Africa, ohh, here.*

Me: *Did you find it?*

Marc: *I couldn't see it because of the map.*

Me: *We need the magnifying glass because it's so small.*

[Marc takes the magnifying glass.]

> **Me:** *I'm pointing to Africa…. The zebra goes with the giraffe, the hippo…* [Helping Marc, as he has shown some interest.]
>
> [Stella brings a lake and sticks it onto the savannah.]
>
> **Me:** *We are making Africa. Look at the colour here, yellow; that means it's really hot and dry.*
>
> [Bruno is quite focused on the animal cut-outs.]
>
> **Me:** *Should we go and get something there... for the zebra?* [Marc and I go to the table.]
>
> **Me:** *Warm weather.*
>
> **Marc:** *Heat.*
>
> (Birch Primary School, Session 4)

Extract 6.23: Session 4, Birch Primary School.

This case intended to highlight the significant role of information resources and how they might stimulate and enable cooperative research. Children used the information from the resources to aid their construction of thinking and to support their arguments and decision making. Accessibility was considered the key property, since without this, it could limit what the children could do. In this case, it empowered and enabled children to go beyond -the Zone of Proximal Development- (Vygotsky, 1978).

6.4.1.9 Creative participation

Some children were surprised by my degree of active participation in play as an adult. In Extract 6.24, for example, Leo gave meaning to his creation and referred to it as if the lion was thinking about meat; consequently, Leo and I decided to draw a thinking bubble (see Figure 6.26). When I was picking up the crayon to draw, Katia seemed surprised and asked me whether I was '**gonna be drawing**'. Katia seemed surprised about this adult participation in what might be considered a 'children's task'. This could be due to perceptions of the teacher's more distant role (especially in Primary 1 age phase and the start of more formal schooling) or possibly time constraints. Despite agreeing that 'private' time for children to play with their peers is important, I consider adults' active participation in children's play as an opportunity for positive outcomes, including evaluation, development of thinking and learning, and cementing a close, emotional, and healthy relationship. In other words, I consider play and interaction time a powerful opportunity to construct together and influence reciprocally what might otherwise be missed from a more distant 'outsider' role. This has led

me to become very aware of the benefits and constraints of capturing young children's thinking from a closer or more distant standpoint.

Figure 6.26: Visual representation of the lion's thoughts.

[Leo glued a large piece of paper food on top of the lion's head.]

Leo: *Miss Lori, it looks like he is thinking of meat* [referring to the lion].

Me: *That's true. How do you know he is thinking? Is this a thinking bubble? Should we make a bubble? A thinking bubble?* [I make a gesture of a thinking bubble.]

Leo: *Yeah.*

[I take a crayon to draw that.]

Katia: *Are you gonna be drawing?* [Smiling, surprised]

Me: *Should I?*

Katia: *Yeah.*

(Aspen Primary School, Session 2)

Extract 6.24: Session 2, Aspen Primary School.

In Extract 6.25, my 'adult participant' role was more 'playfully' obvious and showed further potential opportunities to co-construct and extend due to the 'closer' relationships with children. My role was one of playing, making, and doing, rather than helping, proposing, and advising. When Katia and Leo left, Frida, Holly, and I prepared the zoo scenario for role play. On some occasions, I was more instructive or directive, but I also allowed the children to direct, being an active player, not only observing play but also having the opportunity to co-create and co-construct with children. At times, I asked questions:

> **'So, what are we selling in the store of the zoo?'** (Me)

I normalised not knowing and showing and accepting not being omniscient:

> **'I don't think I know how to make a penguin'** (Me).

It was crucial to listen, negotiate, and adapt to others' wishes. In Extract 6.25 Holly wanted to include a zookeeper, and when I proposed the idea of a drawn one, she did not see it as appropriate. I, therefore, looked for a different figure—a manipulative one. In the end, Holly politely proposed:

> **'Maybe you can be the zoo keeper'**

Holly offered me the character to play, reflecting her wishes and taking initiative in play.

Me: *I am going to write down all the areas. How (What) should I call this one?*

Holly: *Cold.*

Me: */C-oooo-llll-dddd/* [I write it down]

Me: *How about this one?*

Holly: *Store!*

Me: *So, what are we selling in the zoo store?*

Me: *We need to get some…* [she goes and tries to find something to draw things for the store]

Me: *I could make ice creams.*

Holly: *Oh yeah.*

Me: *Strawberry and chocolate.*

Holly: *Yeah, I like that. Make it chocolate.*

Me: *I am drawing them. Also lemon. What else?*

Holly: *Lollie? A toy!*

Me: *A toy for visitors? Maybe toy lions or toy tigers? Which ones?*

Holly: *No, maybe this one* [pointing at the fox].

Me: *The little fox?*

Holly: *Yeah.*

Me: *What else?*

Holly: *Maybe aaa, penguin, a penguin.*

Me: *I don't think I know how to make a penguin.*

Holly: *We need a zookeeper.*

Me: *I think so. Who's the zookeeper? I think we can make one.*

Holly: *But with crayons?* [She does not seem to like the idea that much.] *On a piece of paper?*

Me: *How about this one?* [Found her a toy, that is actually something she can manipulate.]

Holly: *Yeahhh.*

Holly: *Maybe you can be the zookeeper* [that is when I was offered the zookeeper character's role. In play, one is negotiating rules and characters continuously.]

(Aspen Primary School, Session 2)

Extract 6.25: Session 2, Aspen Primary School.

Figure 6.27: Holly and I playing with figurines using the zoo design

In Extract 6.26 below, Holly and I were role-playing in the zoo. I was invited to be the zookeeper, as explained above, and Holly was a parent with two young children, one of whom was a baby in a stroller. We both engaged in our new characters, probably with different agendas, but meeting both of our needs. For me, playing with Holly was an opportunity to bond and co-construct, as well as a privileged opportunity to capture and construct thinking during play. While adopting our characters, we were able to sustain a substantial conversation resembling reality when visiting the zoo, and Holly's pitch and tone changed while adopting those roles. When she heard the entrance ticket was ten pounds, she used a high pitch 'lady' voice for role play and said, surprised:

> **'10 pounds??!!** (Holly, role-playing the mother and visitor)

Both of our characters seemed to influence our thinking and agendas; mine as the zookeeper was one of informing visitors, and Holly's mother's primary focus was on watching and caring for the children. The role seemed to have given Holly a maturity beyond reality, imitating adult behaviour and replicating the young child's behaviour (her own) in the child Playmobil® characters. Holly seemed to be thinking from a different perspective, and when I gave the ticket to each child and herself, Holly did not consider it appropriate to give one to the baby and told me (the zookeeper):

> **'Don't give one to the baby because he is very little'.** Holly (the role is influencing mature protective behaviours)

In another example, Holly screamed with concern when the child was in danger. She played three characters (her children as well). Holly showed an understanding of maturity and was able to express it throughout the session through the mother's character. She screamed:

> **'Son!!! Don't touch it!'** Holly, screaming, protecting the child while pretending to be the mother.

Throughout role-play opportunities, content learning emerged, offering crucial moments to extend what the children had learnt or already knew. For example, in Extract 6.26 I was able to evaluate some of Holly's mathematical skills on various occasions with further opportunities to extend in an enjoyable and playful manner.

Me: *Hello!* [pretending to be the zoo staff]

Holly: *Hello!* [pretending to be a visitor with her two children with a role-play character's new voice]

Me: *Welcome to the zoo. Do you want tickets for the zoo?*

Holly: *Yeah.*

Me: *It is… 10 pounds.*

Holly: *10 pounds??!!* [Holly is putting on a high-pitched 'lady' voice for role play] *We don't have 10 pounds!* [the character who is carrying a child in the pram and another child]. *We have 30!* [Holly seems to think she does not have enough high numbers to manage quantity.]

Me: *You have 30 pounds?*

Holly: *Yeah.*

Other child: *That is perfect because (it) is 10 pounds per person. 10 pounds for the baby, 10 pounds for the mum, and 10 pounds for the child.*

[Holly is smiling.]

Me: *10 plus 10 plus 10 is 30.*

Holly: *Yeyyy.*

[This is an excellent opportunity to learn maths, for instance, and extend this conversation. For example, a zoo receipt can be made using the equation. It could be a much more interesting way of learning by identifying opportunities in daily life.]

Me: *Do you have 30 pounds?*

Holly: *Yeah.*

Me: *Can I have them, please?*

Holly: *Here.*

Me: *Thank you!*

Me: *Three tickets, one, two, and three* [giving them to each character]

Holly: *Don't give one to the baby because he is very little* [the role is influencing maturity and talk].

Me: *Should I give you the ticket?* [instead of to the baby]

Holly: *Yeah, thank you!*

Me: *If you have any questions, just let me know* [regarding the zoo visit].

Holly*: Should we ask questions to the animals?*

Me: *Yes, we can ask.*

(Aspen Primary School, Session 2)

Extract 6.26: Session 2, Aspen Primary School.

Additionally, I drew on previous learning and detective experiences and utilised some of the content involved in the zoo design while my character was offering a zoo tour to visitors.

Including new vocabulary playfully was important to internalise new information/learning. As a play partner, I was an insider and had the privilege of fulfilling both of our agendas in a more informal role-play scenario.

When I asked Holly whether the tiger was dangerous, she replied that it was not '**because his eyes are not red**'. This is usual in children's toys and movies, where red eyes indicate evil, an answer that I have heard multiple times while working with young children (child's thinking experiences, world). If the figure's eyes were red, the character was evil, as Holly argued, and she applied the same reasoning to the animal figurine within the context of pretended play. When I argued that the tiger could also be dangerous if it were amongst people, she took a crayon and drew a fence:

> ***'Maybe we can make a gate for the tiger so it doesn't hurt anyone.'*** Holly: takes
> the crayons and draws a fence surrounding the tiger.

Holly was seeking alternatives to problems co-constructed while playing. For example, in Extract 6.27, when she insisted that the character was injured (even though I attempted to try to evade that turn by saying he seemed OK), she decided to make a first aid room and an ambulance. Both children's and adults' creativity sparks in such contexts, with many opportunities to learn from one another. Both Holly and I tuned in with each other, listening to and following each other's comments. Extract 6.27, for example, shows she finished some of my phrases, which showed focus, connectness of relationship and attunement (Blaisdell et al., 2019).

Me: *If you have any questions, just let me know* [regarding the zoo visit].

Holly: *Should we ask questions to the animals?*

Me: *Yes, we can ask.*

Me: *I'm starting to make a zoo tour. Here is the leopard, and the leopard is carnivorous and eats meat* [Trying to include some facts and vocabulary, some repeated from before, to reinforce them].

Holly: *Son!!!* [she screams] *Don't touch it! Screaming* [The role is influencing maturity and talk]

Me: *No, no. Because the leopard can hurt the person. They are (…) they are hunting, but the elephant is not carnivorous; the elephant only eats vegetables or fruits.*

[Holly is riding the elephant now and takes it to another part of the zoo.]

Holly: *I bring her some food because the elephant is herbivorous, eats only fruits and vegetables, and doesn't eat meat.*

[Holly is making elephant noises.]

Holly: *Do you like the food?*

[Noises of agreement]

Me: *I think it likes it. Now, let's go and look at the tiger.*

Me: *Do you think the tiger is dangerous?* [She asks her character as she is touching it.]

Holly: *No.*

Me: *Why not?*

Holly: *Because his eyes are not red.* [This is typical of children's toys, and I have heard this answer multiple times while working with young children. If the figurine's eyes are red, the character is evil, the same as with animal figurines.]

Me: *Are they only dangerous when their eyes are red? Like the (a) leopard?*

Holly: *Yeah.*

Me: *The tiger is also dangerous.*

Holly: *Maybe we can make a gate for the tiger, so it doesn't hurt anyone.* [She goes and takes the crayons and draws a fence surrounding the tiger. Alternative seeking, co-constructing while playing].

Me: *Now he (it) cannot escape, and it cannot hurt us!* [Me pretending to be the character all the time.]

Me: *We need some food. What kind of food does the tiger eat?*

Holly: *Meat.*

Me: *It's carnivorous. Let's go back and get some meat* [I am trying to use the vocabulary in the game on purpose. Holly takes the meat for the tiger.]

Holly: *Now we can go and see the lion, but we are not going to touch it. He is thinking about meat.* [Leo made the area, and we drew the lion with a thinking bubble with meat in it.]

Me: *We can touch the water and animals in the water; we can touch the turtles but the frog… It depends (on) which frog* [another chance to extend] [There is much background noise in the video that sometimes makes it hard to hear.]

Me: *The giraffes need leaves. Leaves from the tree.*

[Holly grabs a tree.]

Holly: *We can touch those.*

[Holly is finding a little tree for the baby giraffe.]

[Holly takes the actual giraffe figurine.]

[I pretend to be the giraffe and say, "I am not with my family, where are they?" (giraffe area Leo made before)]

Me: *We take the giraffe there with the other giraffes. How many giraffes are there here?*

Holly: *One, two, three* [Holly counts].

> **Me:** *This is my…* [pointing at the giraffe].
>
> **Holly:** *Sister?* [Holly finishing my sentence]
>
> **Me:** *This is my…*
>
> **Holly:** *Mum* [Holly finishing my sentence].
>
> **Me:** *And this is my?*
>
> **Holly:** *Dad* [Holly finishing my sentence].
>
> […Bla bla…]
>
> [We go to the Arctic.]
>
> **Holly:** *Freezing.*
>
> **Me:** *It is so cold.*
>
> [The characters leave, as it is cold.]
>
> [The baby character of Holly has an accident and gets hurt.]
>
> **Me:** *I think it is better now.*
>
> **Holly:** *Noo.*
>
> **Me:** *Oh nooo! We haven't made a nurse room* [first aid room].
>
> **Holly:** *Yeah.*
>
> [Holly fetches the crayons to make it.]
>
> **Me:** *Yes, this is a really important room.* [Holly makes a first aid room].
>
> **Me:** *Do we need an ambulance?*
>
> [Holly makes an ambulance.]
>
> **Me:** *Here (are) the lights… The sound (lights?) (are) here, the doctor's suitcase…*
>
> [Ideas to put inside the doctor's suitcase]
>
> (Aspen Primary School, Session 2)

Extract 6.27: Session 2, Aspen Primary School.

6.5 Reflection upon experience and design

The *Mystery Zoo* experience was motivating and meaningful for the children. It was particularly useful to see how the children used resources to obtain information, build understanding, and make reasoned choices. The children showed interest in sharing about themselves, what they knew, and their perspectives on the subject matter. The children engaged in dialogue that provided valuable opportunities for scaffolding thinking in the group context. They had moments of agreement and disagreement with one another, which led to new learning opportunities and awareness of the self. The provision of accessible and

meaningful tools, and the role of the adult and other children in supporting, guiding, and prompting thinking when necessary was crucial.

Overall, the *Mystery Zoo* case proved to be a fruitful context to empower children and provided opportunities to exercise and develop critical thinking skills and dispositions within the context of independent and collaborative design work. To navigate this experience, children were driven to engage in key activities (e.g., making intentional reasoned choices in design) stimulating particularly prominent behaviours linked to critical thinking dispositions, for example, to be investigative, to seek information, to evidence, reason, explain, and provide views.

The following table (Table 6.2) summarises the most recurrent behaviours related to critical thinking observed during the Zoo *Mystery* experience. The colour scheme represents frequency, with the most frequent ones being the darkest and the least frequent ones being the lightest.

Table 6.2: Behaviours related to the Critical Thinking dispositions in the Zoo *Mystery* case.

CT dispositions: Zoo Mystery
1. To be curious and willing to find the answer
2. To be aroused by the process, focus and flow
3. To investigate
4. To be confident (autonomy and seeking help)
5. To self-correct
6. To take risks and have the courage to take action in different ways to open up to new ways of learning
7. To be prudent
8. To be persistent
9. To be open-minded, flexible, and fair
10. To communicate, collaborate and value the contribution of others (dialogical thinking and collaboration)
11. To be resourceful and creative
12. To be mindful, aware of self, goal, process, performance, etc. To use awareness productively (to plan for change, to modify or change actions, etc.).

Key: Most frequent (darkest) - least frequent (lightest).	Frequently across the case	Occasionally/sometimes across the case	Rarely across the case

The children showed resourcefulness and creativity within the flexible structure provided in the case. This meant that they had the space to act, contribute, and influence freely. This

provided a more profitable context for the research and opportunities for exhibiting and developing critical thinking dispositions.

This experience provided multiple opportunities for academic learning and curricular skill development, as well as critical thinking development, as the engagement of the intellect in meaningful contexts incites academic interest (Katz, 1993). As an illustration of this, Bruno, who was not able to write conventionally, stated:

> ***'I wanna write I found a clue'*** *(Bruno, Birch Primary School).*

Such behaviours showed that those academic skills were developing 'in service of the intellect' during the *Zoo Mystery* experience (Katz, 1993).

Chapter 7 *Snack Mystery*, Case 3

7.1 Introduction and aim

As in the previous chapter, Chapter 7 is also divided into five sections. These cover the rationale for the development of the *Snack Mystery (SM)* case, present the design of the activity, how it was implemented, report the data organised into themes, and reflect on what has been learnt.

Aligned with my research questions, through this case, I sought to understand the following:

1. Young children's critical thinking in the context of detective simulation experience; and

2. The usefulness and challenges of the *Snack Mystery* experience for stimulating such thinking and practice.

The overall aim of this experience was to engage children in a hands-on mystery-solving simulation experience by adopting the role of an expert detective. I use the word 'simulation' to emphasise the direct "practice of living in real-life situations" (O'Sullivan, 2017, p. 611). It was anticipated that adopting the expert role could influence their behaviour and performance. Role play could provide the possibility of "diverging from confines of their normal self-imposed limitations or boundaries" (O'Sullivan, 2017, p. 611), as well as from externally imposed school and society's expectations around their competence, performance, and behaviour: "Role-play operates in no 'penalty-zone', where people are freer to explore and try out a range of solutions to problems and issues, without having to worry about the outcome" (O'Sullivan, 2017, p. 611). The objective for participant children was to investigate a pretend crime scene and determine which animal was behind the disappearance of the snack, based on reason and the encountered evidence.

Simulation mystery role-play activities, particularly with adults, such as escape-room play, forensic role-play, detective play, and murder mystery-play, use role-play from a ludic to a training and learning point of view, provoking considerable interest among children and

adults. Moreno-Fernández et al. (2020) found that escape rooms used in educational contexts are highly motivating, inclusive, and promote collaborative learning (Moreno-Fernández et al., 2020). In the context of education and research, escape room activities have been used for learning in primary school (Borrego et al., 2017) and even in universities (Eukel et al., 2017). The heart of this interest might be within human nature, which naturally triggers curiosity for making sense of knowledge dissonance towards attaining cognitive equilibrium. Similarly, the *Snack Mystery* was designed as an attractive problem-solving experience intended to create such a cognitive conflict to trigger children's curiosity and motivation towards its resolution.

The particular mystery theme was chosen in order to naturally arouse young children's inquisitive nature towards discovery and stimulate thinking skills and dispositions during the playful task. The activity, differing from the others, was set throughout the research space to trigger the children's movements. This provided the freedom to explore the area, as well as a wide range of research tools and materials. This freedom, due to the open nature of play, was predicted to trigger children's natural investigatory repertoire and provide insights into children's intentions, actions, and thinking within a new experiential simulation that transformed children's daily classroom experience.

Even though it was fundamentally exploratory, I predicted the presence of some strategies based on Facione's (1990) list of critical thinking skills, such as interpretation, analysis, and evaluation. In addition, my critical thinking dispositions, informed by the literature, such as willingness to find the answer, open-mindedness, and perseverance, were explored alongside creative thinking skills (Halpern, 1997). These predictions were based on the assumption that mysteries may trigger us into explicitly exploring, making sense of, analysing, and evaluating information, as well as making sense of the parts within the whole, looking for and inferring from evidence.

7.2 Design of the experience

The *Snack Mystery* was structured in two parts. Part 1, the *'Animal Prints Mystery',* served to build the knowledge and experience for Part 2, the *'Snack Mystery'* (see Figure 7.1).

The experience was initiated using a small projection from the second part. In this taster, children were offered animal prints in plasticine to explore and name. Over time, a method to evaluate and test initial assumptions was developed, meaning that they had the possibility of testing and verifying their claims. This provided them with the opportunity to concentrate on the prints and associated techniques in isolation and at their own pace, with space to discuss each item. This was informal but intentional preparation for the '*Snack Mystery' (Part 2),* where there was a broader range of contextualised clues that increased complexity. This involved an increased load for orchestration and cognitive challenges. For example, the context provided a new dimension, as a print was no longer isolated, but part of a track with additional information regarding direction as well as possible connections to other clues.

7.2.1 Design

The task was designed as a problem-solving activity; however, the focus for the purpose of this study was on the process (thinking during the activity) rather than on its resolution, just as with the other cases. In other words, the problem-solving context was set to serve as a catalytic tool to elicit thinking (Baumfield, 2006), and critical thinking was the "tool of inquiry" (Facione, 1990, p. 2).
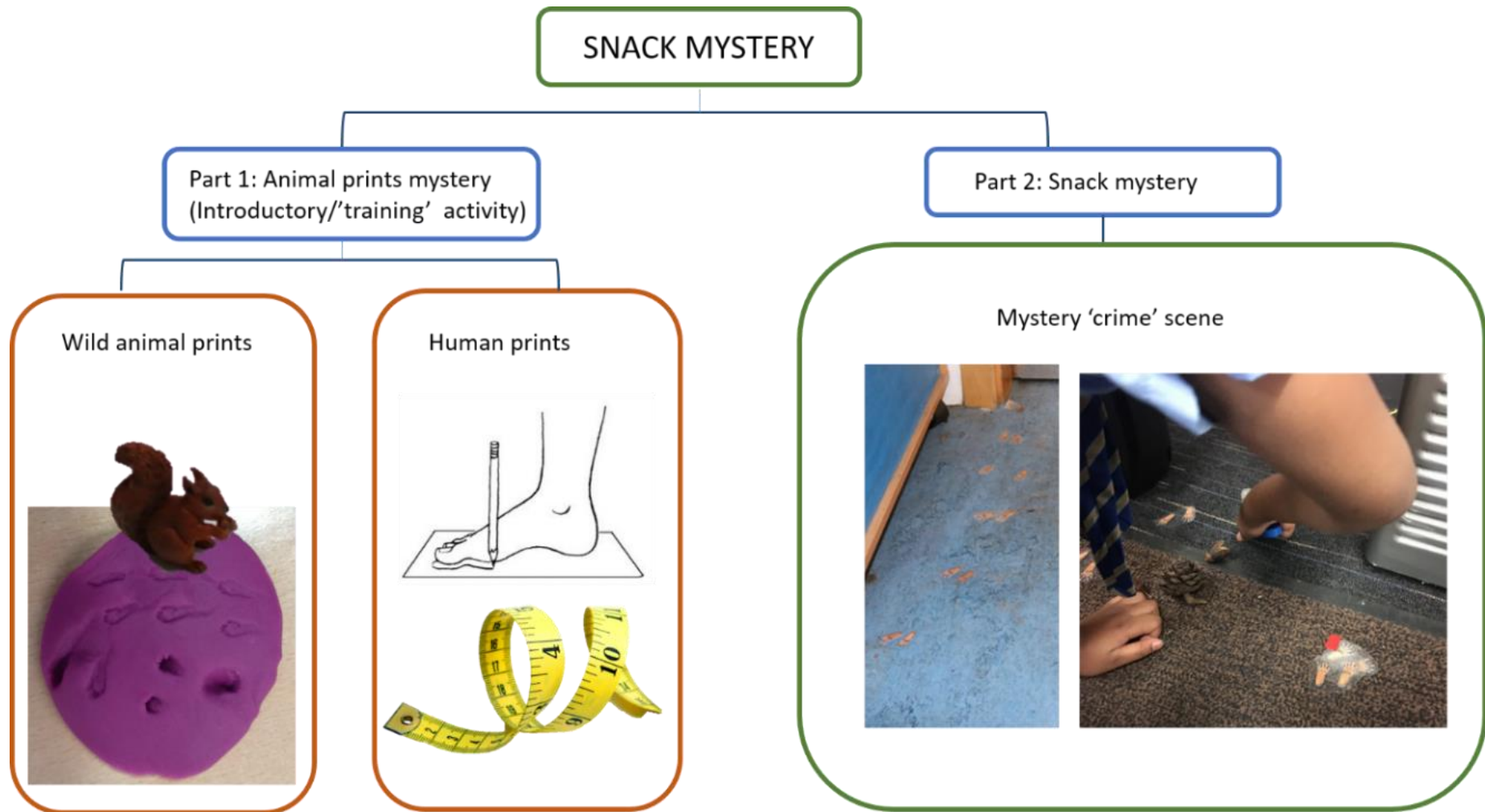
Figure 7.1: Structure of the *Snack Mystery* experience.

Furthermore, choosing an appropriate and familiar theme and a consistent type of resource and role were important considerations. The former is because engaging in critical thinking requires some knowledge of the subject matter. An individual could critically think within an area of 'expertise' (e.g., the existence of dinosaurs), but might be unable to do so if the topic was unknown (Facione, 1990, p. 5). Facione (1990) stated that "while CT skills themselves transcend specific subjects or disciplines, exercising them successfully in certain context demands domain-specific knowledge, some of which may concern specific methods and techniques used to make reasonable judgements in those specific contexts" (Facione, 1990, p. 5). It is, therefore, not only important to acquire skilfulness in critical thinking skills but also to learn how to use and transfer such skills into the different contexts. As a researcher, my restricted knowledge regarding the individual children's interests and background knowledge (partially ethical and pragmatic rationale) was a recognised limitation. Even though children's interests could not accurately be generalised simply as a group characteristic, the choice of the topics of both detectives and animals was made according to probability, relating to trends perceived in the media, consumer data and my early years experience.

In Part 1.A. the children were given animal paw print flashcards, and they were then asked to explore whose paw prints they could be. They were given some time to talk about it before I give them small animal figurines and playdough to stamp print tracks, to compare/contrast and verify whether they were right or wrong. There were also animal photographs hanging on the wall to trigger link-making; however, this was complementary material, and therefore, whether these were used was up to the children. They were offered tools like a magnifying glass and their personal detective notepad to make notes if they wished.

In Part 1.B. the footprints of the children and the researcher were traced onto pieces of paper, and the children then tried to figure out which footprint belonged to whom. They were offered tools such as detective notepads, crayons, magnifying glasses, and a measuring tape to support the investigation.

The *Snack Mystery (Part 2)* was then based on a mystery crime scene, where the children were told that a snack left on the table had disappeared. The detectives, the children, needed to make sense of it and find out what had happened, based on the evidence at the scene.

They were encouraged to explore and discover which animal could have been responsible for the disappearance of the snack. Animals were chosen because they were considered to be less relatable to self than humans, and to avoid, if realistic enough, negatively affecting or upsetting someone. The animal suspects were set on the wall to guide the children through the activity.

Clues were set around the play space (diverse feathers, paw print tracks, various types of playdough droppings, and plastic bones, among many others). The children were encouraged to observe and mark clues with red tape without moving the item first, and to document what they had found in various ways (e.g., by taking photographs with an iPad and taking notes on their personalised detective notepad). The children were also encouraged to reason their answers. The scenario included evidence that could lead to divergent outcomes, providing a wider opportunity for the children to wonder and pose questions. This was thought to be more fruitful for the research than a close-ended solution, where the clues only led to one animal. This approach aimed to provide a wider opportunity to learn how children explore, make sense, speculate, and find meaning. In addition, the activity was planned to be challenging enough that it would engage (ZPD; Vygotsky, 1978) the children while still being accomplishable in order to maintain interest. As I was an outsider who did not know the children well, the key was to create a flexible design that could be amended or used in different ways.

Comparable hands-on problem-solving activities have been used in past research in the area of scientific thinking, for example, forensic science with pre-schoolers and scientific reasoning and the use of a microscope with second and third graders (Bonebrake-Barriger & Sauders, 2006; Howitt et al., 2011). Bonebrake-Barriger and Sauders (2006) found that children in Grades 2 and 3 made use of critical thinking skills during investigations. This provided a useful basis for the task and its appropriateness for the children in the participating schools.

7.2.2 Estimated duration

Assuming that the children would be interested, the estimated duration for the activity was approximately one to two hours. This estimation included 20–30 minutes to set up the research scenario and 15–20 minutes to pick up and leave the area as it was.

7.2.3 Material and preparation

The following materials were used:

- Large animal photographs

- Blu tack

- 15 animal figurines with prints (e.g., from the brand Schleich)

- Diverse animal print tracks

- Assorted items leading to animal suspects (e.g., feathers, plastic bones, worms, artificial droppings of various types and sizes, potpourri that resembled pieces of wood, and pinecones that were found in nature).

- Soundtrack recordings were created with 'Audacity' software (e.g., the sounds of opening a window, closing a door, dropping an item, animal steps, and animal voices).

The following materials were used by the children:

- Detective gear and tools (deerstalker hat, personalised ID badge), personalised detective notebook, crayon/pencil/pen, magnifying glass, iPad, jumbo plastic tweezers, empty containers for evidence organisation, measuring tape, scissors, coloured duct tape.

- Paper and crayons

- Playdough

- Animal figurines with prints (e.g., from the brand Schleich)

Lastly, as in previous cases, the researcher's materials and data recording devices were used.

7.2.4 Location

Four *Snack Mystery Simulation* sessions were set in Aspen Primary School, as illustrated in Figure 7.2, and in Birch Primary School (shown in Figure 7.3). The basic requirements for the space needed for this case include:

- a wall on which to hang the suspect animal photographs,

- a surface to place the necessary tools for the detective work,

- space to place the animal clues,

- a table and chairs to sit on if they wanted to do so; and

- space to set up data recording devices (camera with tripod and audio recording device; see Figure 7.3 for their position.)

Figure 7.2: Aspen Primary School

Figure 7.3: Birch Primary School

Figure 7.4: Birch Primary School (before the *Snack Mystery*)

7.3 Implementation

7.3.1 Sessions and duration

As presented in Table 7.1, the *Snack Mystery* was implemented in two schools (Aspen Primary School and Birch Primary School) between June 2018 and January 2019. A total of 14 children aged 5-6 years took part in four sessions. The average duration of the *Snack Mystery* experience was 60 minutes.

Table 7.1: Number of sessions, sample, date, and duration.

Snack Mystery sessions			
Settings	Session number and date	Group of participants aged 5-6 years per session	Duration of session
School 1 Aspen Primary School (Primary 1)	Session 1 13/06/2018	3 children Mia, Holly, Katia	66'7''
	Session 2 09/10/2018	3 children Tim, Cira, Diana	46'26''
School 2 Birch Primary School (Primary 1)	Session 3 15/01/2019	4 children Stella, Ava, Marc, Bruno	74'52''
	Session 4 16/01/2019	4 children Amanda, Will, Robin, Maria	72'8''
Total for both schools	4 sessions	14 children	Average duration of session 64'28''

7.3.2 Research process

At school arrival, on day 2 and 3 with each of the groups, I organised the materials so as to be able to put away and quickly access the new materials for the different stages of the activity. It was important to invite the children to play after the scenario was set up, as if they joined during the setting up, not only would they observe how the items were placed, but it was more likely that boredom would have caused chaos or early opt-outs.

The physical pre-arrangement plan was important, as it was necessary to accommodate the scenario in the space provided by each of the school settings as comparably as possible. The design of the activity needed to be flexible enough to fit into the diverse given spaces, while also having sufficient core similarities, such as a wide space to set up the activity and recording devices, basic furniture to plce materials within easy access by the children, and classroom accessibility. Additionally, it was important to place the camera appropriately, as well as at a reasonable distance, to ensure that the video captured the scene (both spatially and with a

clear sound). It also had to be located in a safe position while respecting the participants' space (free movement).

Materials were organised in such a way that the children were able to clearly see what was available at a glance (e.g., avoiding mixed-up items inside a box). This order was encouraged where possible throughout the task, for example, by putting the items back when they were no longer needed to ensure that everybody could find what was needed in an autonomous manner. According to Rodrigues and Pandeirada (2018), an overload of visual stimulation can distract children and may affect cognitive performance. Placing all tools and resources on one piece of furniture or in one area also aimed to help children's physical and mental organisation. On one side, I set up the *Animal Prints* activity Parts 1A and 1B next to the detective gear and tools area. On the other side of the space, I arranged the *Snack Mystery* scenario. If the two scenes had not been not clearly distinct, the children might have got confused and distracted by the second part of the activity. To set up Part 2, I placed various clues that were likely to be related to several animals (not only one, but also not all) to support the goal of creating an open-ended mystery with various solutions that provided space for thinking and creativity (see Figure 7.5, Figure 7.6, Figure 7.7, and Figure 7.8).

Figure 7.5: Animal tracks (Birch Primary School)

Figure 7.6: Animal tracks (Birch Primary School)
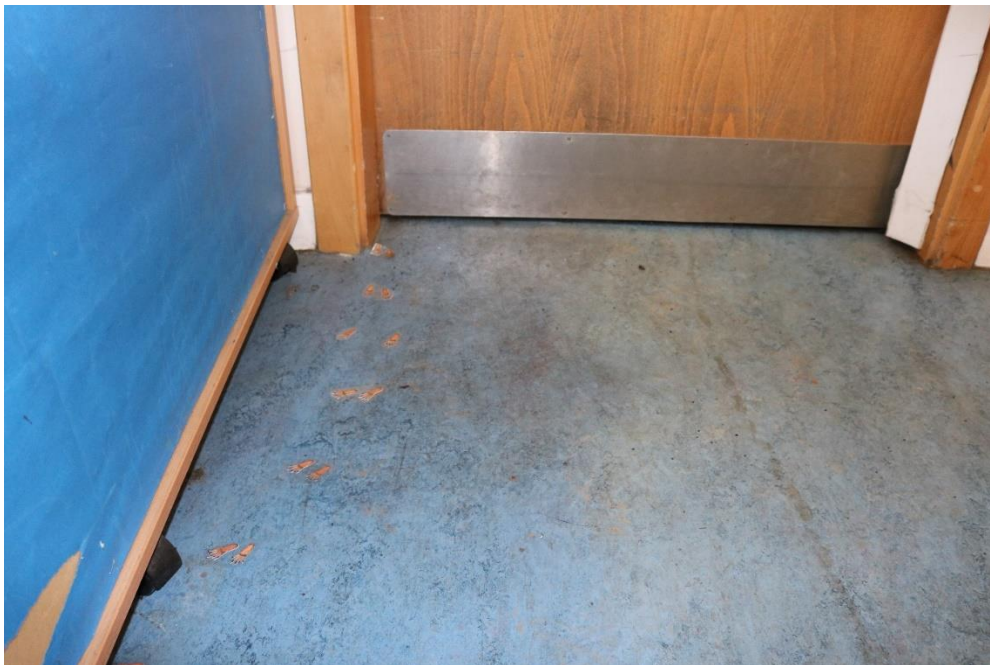
Figure 7.7: Animal tracks (Birch Primary School).

Figure 7.8: Animal figurines (Birch Primary School)

Figure 7.9: Paw print and testing playdough

All the materials needed to be accessible to the children; therefore, considering the children's height in relation to the furniture and the placement of tools was important. For example, when placing the animal suspect photographs on the wall, I used 14 images. The more the suspects and clues, the more complex it becomes to retain and handle information, focus, evaluate the importance of clues, and link to the suspects. During the detective investigation,

it was helpful to suggest to the children to remove the 'no longer suspect' photos from the wall or otherwise indicate that they were discarded, or to indicate with a sign such as a clothes peg the ones that were actually the suspects. If this activity is too complex, or when working with younger children, narrowing the suspect list would be a possible solution.

Once the materials and recording devices were set up, the children were invited to take their detective gear and play. The group gathered around a child-sized round table, and sat down to talk about what the new mystery required of us, the detectives. Instead of giving specific instructions regarding all the activities, I started by explaining the first part of the mystery. Only after the activities of Part 1 were completed, did I explain Part 2; otherwise, the children would have been overwhelmed by the vast amount of information, which would have confused them, or they could have forgotten. The general information was shared via storytelling (Chapter 4).

7.4 Data analysis

Data will be presented thematically in Section 7.4.1.

7.4.1 Themes

In this section, I will present the overarching themes that were constructed from 'process-coding' (Saldana, 2016; Strauss & Corbin, 1998) of audio-visual transcription and simultaneous video examination.

Diverse manifestations of thinking

Children showed the urge to share what they were thinking and doing from the start of the *Snack Mystery* experience. In general, the children communicated confidently, listened to one another, and respectfully contributed with their perspectives in discussions. For example:

>*'I will show you.' or 'I know that because…'* Mia (Session 1, Aspen Primary School)

Thinking manifestations within interactions, just like the one above, took different forms. While some children interacted verbally, others tended to manifest their thinking through

body language (although for most, both were simultaneous), like the **'I will show you'** comment that introduced a physical demonstration. The children also drew and wrote and used other tools to develop and manifest their thinking. Such variations in manifestation showed the importance of being aware of the "hundred languages" of young children (Malaguzzi, 1998) and the need to capture these when teaching and learning, and researching young children's thinking. For example, when analysing the prints, Stella touched my shoulder (to get my attention) and pointed at the elephant figurine (to indicate a connection to the elephant). She had the prints and materials that she had been working on at eye level.

Figure 7.10: Stella indicating that she wanted my attention (Birch Primary School)

Stella wanted to communicate what she had been investigating. Marc responded to Stella's verbally 'silent' but behaviourally outspoken manifestation with **'it does look like it',** agreeing with her findings. Listening to the various modes of expression and watching the children tune in to one another enabled such communication. After introducing the playdough to test and verify whether their inferences were right or wrong, Stella physically organised the workspace with the animal print flashcard right next to the playdough print and next to the animal figurine, showing through visual representation the steps she took to reach her conclusions. Stella succeeded in communicating and explaining the procedures clearly, despite not using any verbal utterances.

During the *Snack Mystery, the* thinking was individual and collectively constructed, and the level of collaborative work and dialogue was highlighted. The children called to one another loudly to show what they had found and proceeded together. They also naturally engaged in organised collaborative role acquisition within the group, for example, while one searched for clues, another recorded them with the iPad. For example:

> ***"Maria (pseudonym), there is some under that chair."*** Robin (Session 4, Birch Primary School)

After Robin's comment, the children went to the space mentioned looking for clues, and Will took the iPad to document this with pictures.

Figure 7.11: Marc taking a photo with the iPad of what others have found (Birch Primary School)

Emotional and intellectual encounters

This case stood out from the other cases in terms of triggering the highest level of positive emotional response. The children actively engaged in the task immediately. In the first instance, the children showed curiosity as they observed the scene, touching the set material, and making predictions of what was going to happen. During the *Snack Mystery* investigation, the children were thrilled and showed continuous excitement and strong motivation, escalating during the second part of the experience. This second part was the actual simulation of the 'crime scene' in which 'reality' blended with the play world and sparked enthusiastic expressions such as:

> *'Ohhhhh, what in the world?' 'How did these get there? Oh, my godddd!'* Ava, with mouth wide open, showing excitement while exploring the clues across the scene. (Session 3, Birch Primary School)

Emotion and critical thinking are notions that are conventionally regarded as being in opposite arenas within the critical thinking literature (see dichotomy list gathered by Fisher, 2002, p. 4). Most researchers referred to this in relation to influencing feelings, subjectivity, and potential biases, versus objectivity, intact intellect, rationality, and outweighing reason rather than personal motives. In the context of the *Snack Mystery,* however, such emotion from the young children was regarded as fuelling motivation and seemed to arouse inquisitiveness, triggering task immersion and opportunities for the children's physical-intellectual encounters. Hence, a key contextual precursor to engaging deeply in the thinking task could potentially lead to critical thinking. Children maintained focus and invested effort and time in their detective work and showed behaviours related to critical thinking dispositions, such as persistence. During a fairly long investigation (in relation to their average age and attention span), when I asked the children whether we were done, some said *'No'*. The children continued to be focused and were motivated to proceed, even though resolving the experience proved to be challenging and not straightforward at times. The children questioned things, ideas, and the self. Due to time pressure, when I suggested that we are 'almost done', Stella replied:

> *'Nooooo, we are not almost done! I found prints right here!'* Stella (Session 3, Birch Primary School)

Stella showed great persistence and was motivated to continue in light of the new line of enquiry (a new set of prints). Further evidence of this is presented throughout this chapter. These examples challenge the common assumptions of the literature above and may be overlooked more generally in the context of the early years.

Accessible catalytic tools and materials

A range of accessible catalytic tools (Baumfield, 2006) and materials were chosen to support, provide opportunities to scaffold, and reduce adult dependency during their investigation. The task comprised resources that were used autonomously. For example, many naturally

consulted the visual material set up on the wall (see Figure 7.12) without me having to provide further information.

Figure 7.12: Suspects wall

These accessible physical materials and tools encouraged manipulation and were chosen due to their fit with young children's play-based pedagogy. Most tools were relatively self-explanatory or instinctively driven resources, such as wall photographs, animal figurines with realistic prints, and animal print flashcards. During the investigation, some children took the clues they found at the scene and ran to the suspects wall to start making connections with real-life photographs. For instance, Ava picked up a feather and headed directly to the wall to compare and contrast the feather with the animal images. When I asked what kind of feather it was, she showed me it was a seagull's feather, followed by:

> *'Yeahhhh, because I was looking there (pointing)!!! And is right!!!* Ava (Session
>
> 3, Birch Primary School)

Ava expressed her thinking and process of verification through gestures, pointing at the photos, and evaluating her findings. She did not explicitly articulate that she had been 'comparing and contrasting', but she demonstrated this critical thinking skill with gestures and comments.

Figure 7.13: Tim measuring worm (children's marked evidence) (Session 2, Aspen Primary School).

Role-play: Being and acting like a detective

Children became immersed in their detective-investigator role, with some presenting behaviours related to the preconception of how a detective is stereotypically perceived to behave and work. This included, for some children like Tim, exhibiting certain physical postures and 'adult-like' behaviours, as well as the specific placement and use of tools (in Figure 7.14, for example, Tim was focused on documenting in the detective notebook while

maintaining a rigid posture and a serious facial expression). He placed the measuring tape around his neck to be at hand when needed. Tim's performance showed that he was taking the job and role seriously. He kept the notebook and took notes related to his observations and interpretations throughout the experience.
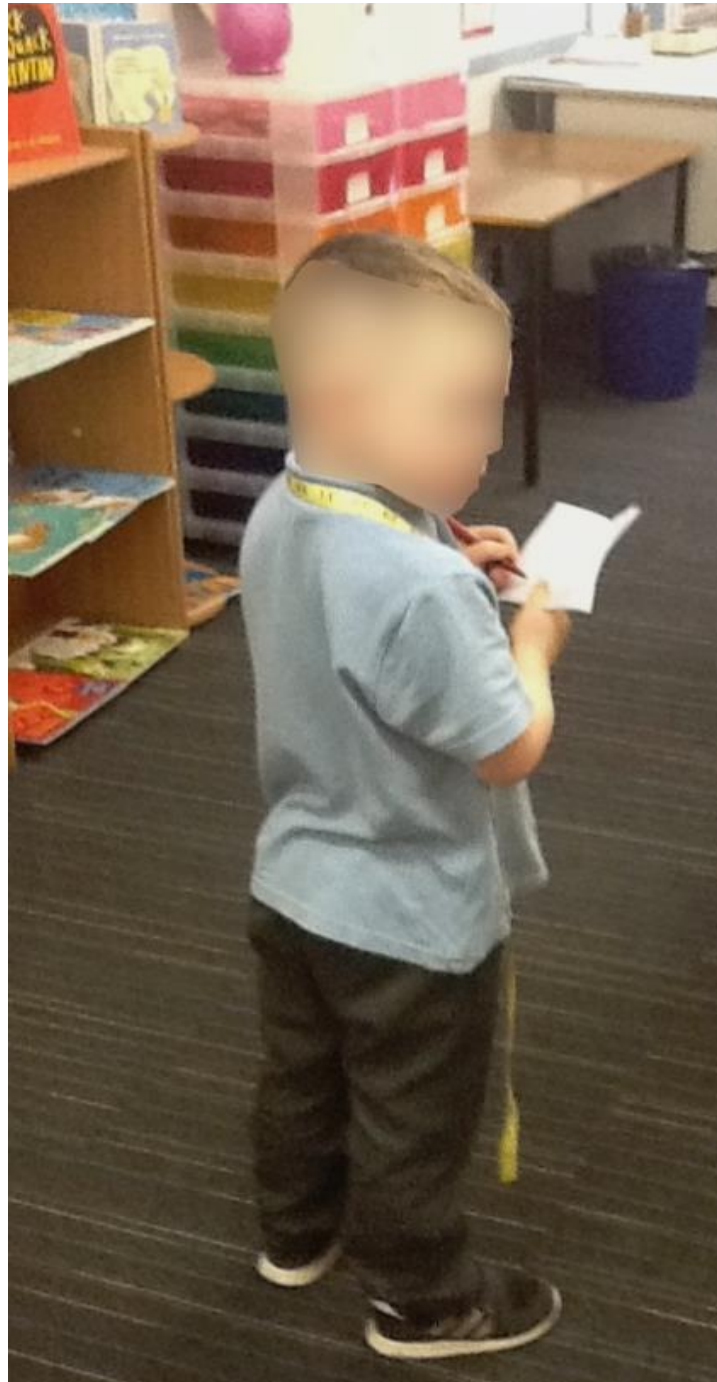
Figure 7.14: Detective Tim (5 years old) documenting the investigation (Session 2, Aspen Primary School)

Figure 7.15: Detective Mia looking at the lens of the standing camera with the magnifying glass (Aspen Primary School).

Even though most children could not write conventionally, they invested their time in expressing their achievements in written form, just like a detective would, using symbols and drawings (see Figure 7.16, 7.17, and Figure 7.18) or alternatively requesting me to write down what they wanted on their behalf (see Figure 7.20).
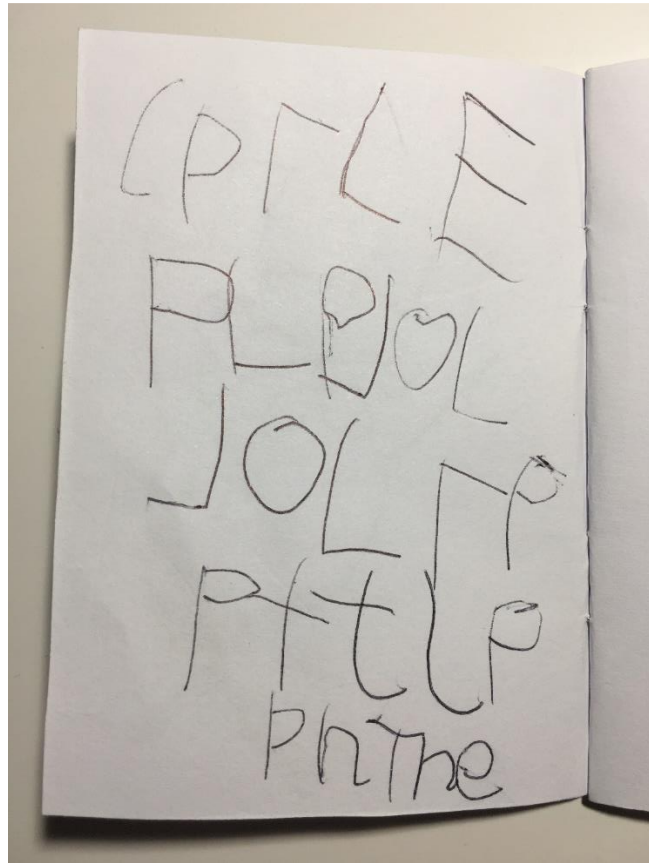
Figure 7.16: Tim's detective note (Aspen Primary School)
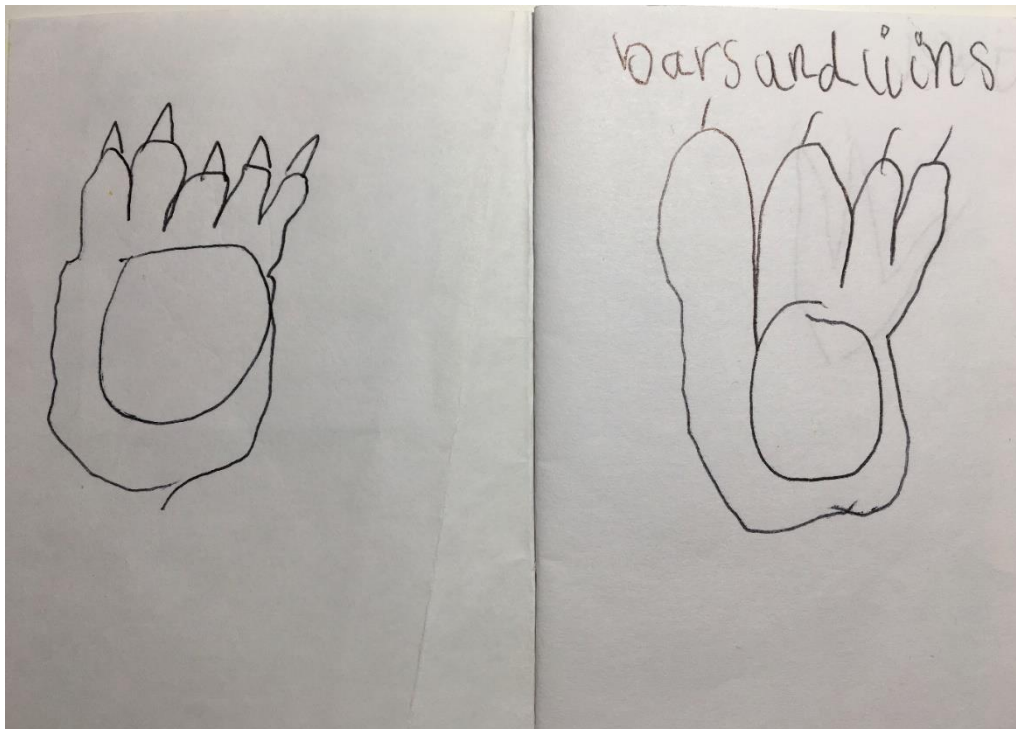
Figure 7.17: Katia's detective note 'bears and lions' (Aspen Primary School)
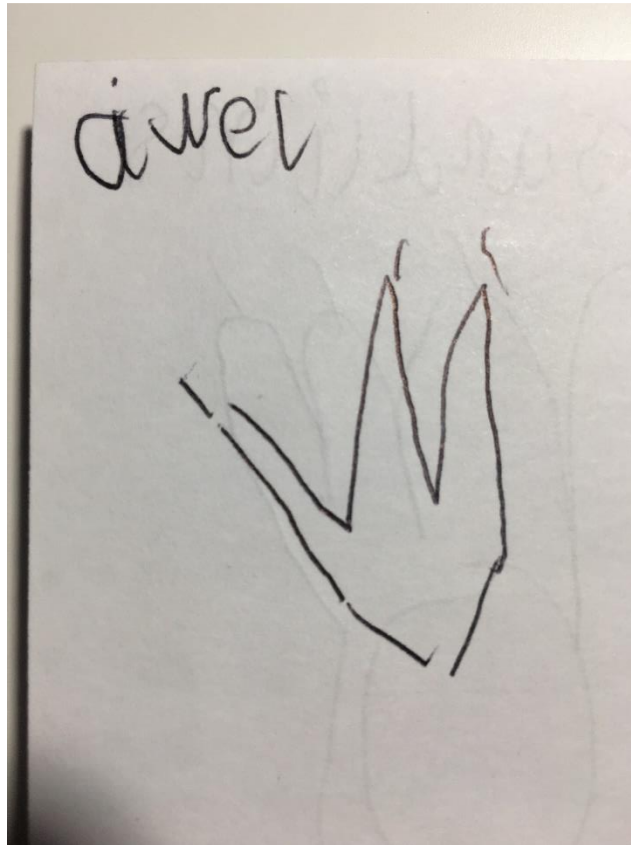
Figure 7.18: Katia's detective note *"Owl"* with visual representation of the owl print (Aspen Primary School)
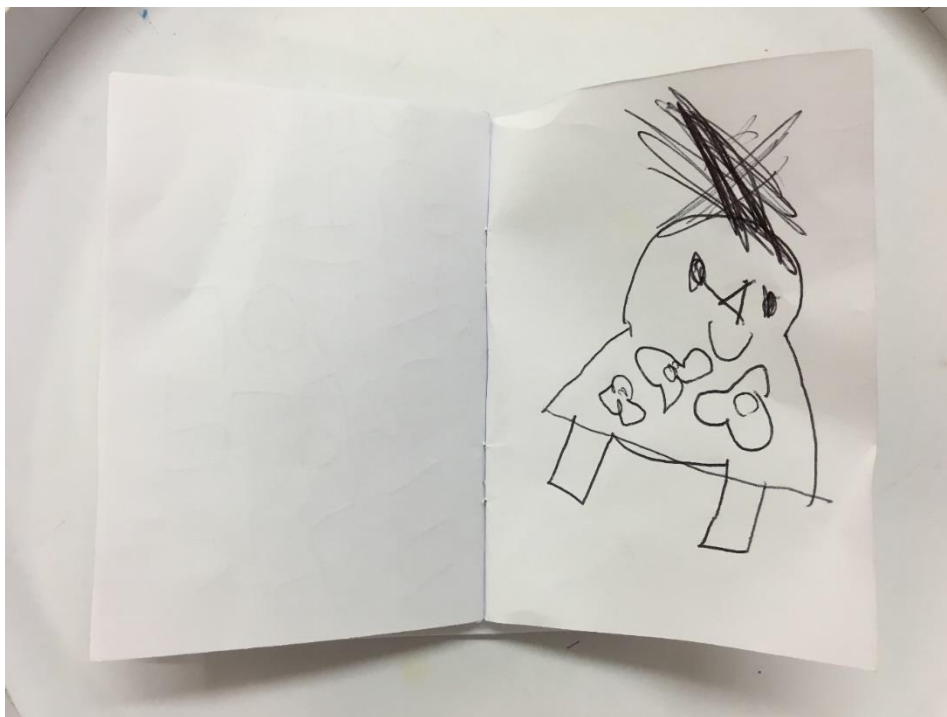
Figure 7.19 Cira's detective note (Aspen Primary School)
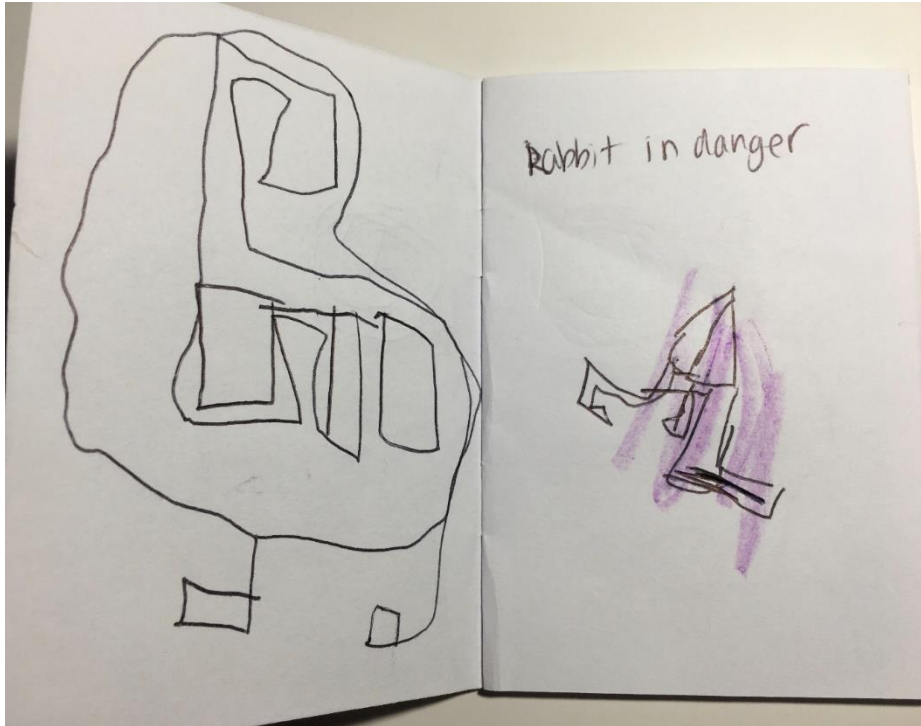
Figure 7.20: Tim's detective note with my writing '*rabbit in danger'* as he requested (Aspen Primary School)*.*

Writing what they asked gave me the opportunity to hear what they were thinking, slowing down the process and understanding what they considered important. For example, Bruno asked me to write:

'*The footprint is the right one',* Bruno (Session 3, Birch Primary School).

Adopting the role helped children to engage in investigative behaviour (hiding and observing prints and observing the photographs simultaneously as if they were searching for connections and making comparisons) and expressed their thoughts while doing so.

'*I wonder who has eaten this',* Mia (Session 1, Aspen Primary School).

Children also showed ownership of their work and expressed the need for specific resources while exploring the 'crime scene', with comments such as:

"For the mystery, I am gonna need this" Tim, pointing at the box of crayons and himself while holding his detective notepad during the investigation without letting it go (Session 2, Aspen Primary School).

"I still need my magnifying glass" Maria (Session 4, Birch Primary School).

"Where is my mystery hat?" Tim (Session 2, Aspen Primary School).

There was generally a sense of ownership and belonging, which was sometimes perceived in the use of language with words like *'my hat'* and *'we'* team spirit.

Impersonating the particular character meant trying to think like the character and accomplishing the task as the character would, from that individual's perspective. Mia's comments showed investigative engagement that pushed her to ponder and later enquire: *"It enables participants to put into practice skills they have learnt in the fictional context of the drama world"* (O'Sullivan, 2017, p. 611). Dramatisation, therefore, facilitated children's engagement with professional detective characteristics and behaviours related to critical thinking dispositions. For example, curiosity to find the answer, persistence, risk taking, and cautiousness were all evident in children's behaviours and verbal repertoire. They utilised specific verbal regulatory indicators or expressions. Naturally, some children showed certain behaviours more than others.

Some children were more cautious than others and more inclined to inform themselves before making claims. For example, Ava (Birch Primary School) took a print and stated it was a pig. Marc then engaged in the conversation and wanted to offer his opinion. However, before stating his conclusion, he used the words *'that might be'*, showing prudence through his words before verifying whether both pieces of information matched according to his interpretation before giving a positive evaluation. He stated:

> *'That might be a... (observing Ava's print and then looking at the photograph of the pig on the wall) you are right, you are right!'* (Marc, Birch Primary School)

Using expressions such as *'let's check', 'let's see',* or *'let's figure it out'* before concluding showed the dynamics and process of thinking. Some also used tentative language to specify certainty or uncertainty in their thinking, such as *'maybe', 'maybe, I think', 'It's like a'* and *'It's not quite it'*.

Even though the children did not respond to all conflicting challenges, the *Snack Mystery* offered the opportunity for me to familiarise myself with the children's critical thinking dispositions during the group investigation. It was found to be a fruitful exercise to see the children's emerging as well as more 'established' critical thinking dispositions in the play-based context. This role-play experience, therefore, showed great potential as a catalytic context for the development, cultivation, and internalisation of good habits towards approaching critical thinking, learning, and young children's everyday lives.

Enquiry

Apart from dispositions, detective dramatisation pushed children into an activity that intentionally involved exercising and developing particular skills to accomplish the detective task directly related to critical thinking skills. Children engaged in focused enquiry, involving (and coded as) activities key to the scientific method, such as interpreting (meaning-making); remembering; transferring and using past experiences (learning); guessing and speculating*; theorising*; predicting (foreseeing); analysing; inferring (drawing conclusions); connecting–relating; comparing–contrasting; organising and categorising; demonstrating (proving); formulating questions; explaining and clarifying; creating; and problem solving (including resolving a particular momentary challenge).

The frequency with which questions were formulated during the investigation was coded as the lowest in comparison to other forms of enquiry. The enquiry also took different forms, including verbal utterances and overall performance. Stella, in Extract 7.1, for example, asked a question that was potentially key in the children's enquiry, but that type of question forming was not the norm.

> **Stella:** *"What kind of sandwich?"*
>
> [I then asked her whether that would make any difference and told her that it was a cheese sandwich. The children made their guesses and held on to this piece of information. Stella said that she knew and whispered in Ava's ear. Ava, loudly and with a eureka-realisation sound, said that maybe it was a bird. Later, I asked the children whether the bee could have eaten the sandwich (trying to narrow it down by discarding it). Both Marc and Ava clearly responded 'No'. When I asked why, Ava said:]

Ava: *"Let's see, let's see".* [Looking at the suspects on the wall, she named the owl.]

[I was interrupting her investigation by wanting to know the reasons behind why they hold the belief that it was not the bee and she finally answered:]

Ava: *"Because the bee only eats nectar."*

[I then responded that it was a good point, and that if it only eats nectar, the bee did not eat my sandwich. I told Ava that I was going to remove the bee from the suspects list by removing the clothes peg. Later on, Ava said:]

Ava: *"I want to write it was an owl eating (a) cheese sandwich."*

(Birch Primary School)

Extract 7.1: Strategic question formulation 3, Birch Primary School.

This conversation showed how Stella asked for further information that was not available through observation by formulating a question. The children retained and made use of the information during the activity, even though it did not all always make sense to me as an adult. Seven key themes related to what was interpreted as a vital activity were constructed from coding using the *process-coding* technique. The themes were as follows:

- Exploring

- Knowledge (knowing and not knowing)

- Testing and evidence (for example, discarding methods)

- Scaffolding

- Documenting

- Evaluating

I will now look at these in turn.

7.4.1.1 Exploration

The nature of the experience encouraged the participants' free movement around the space, exploration of the overall scenario, examining individual pieces of evidence and exploration and experimentation with tools that were most interesting or relevant to children. Due to the large range of clues spread around the space, the children had multiple focal points to investigate and share within their team. Consequently, it significantly increased the time invested in the category of 'exploration', both physically and conceptually, in comparison to

those of evaluating and questioning, for example. Furthermore, the wide range of evidence arranged on the scene provided multiple opportunities to approach and solve the mystery, thereby increasing the task difficulty significantly. Codes related to exploration were used frequently, although there was variation in the level observed, including both surface exploration as well as in-depth exploration or 'wondering beyond the surface'. Extract 7.2 is a sample of how Maria, Robin, Will, Amanda, and I approached the investigation in the initial phase of superficial observation and exploration of the scene.

Maria: *More bone.*

Me: *Let's see if we found something else.*

Robin: *I found some fishies* [fish 'plural' in diminutive]

Amanda: *I found some clues!*

Maria: *I found some clues.*

Child: *I found some clues!*

Robin: *I found some fishies* [fish 'plural' in diminutive]

Maria: *I found some nuts.*

(Birch Primary School, Session 4)

Extract 7.2: Initial exhilarating reaction and exploration of the scenery (Session 4, Birch Primary School).

There was a constant generation of information to be considered by the children, and their expressions were emotionally exhilarating during this process.

After finding and sharing with one another what they had initially found, it was crucial to encourage the children to move beyond this 'collecting information stage' to focus more on making sense of the clues, looking at the whole from the parts (clues), organising information, analysing, theorising, documenting, and narrowing down the suspects list, among others. This was not a linear process, but rather a recurring or spiral process. With such a large number of clues, the experience could have potentially become a 'hide and seek' activity, which was not what was intended. On the one hand, the more evidence the children were given, the harder it might be to remember, make sense of, cognitively orchestrate, and use it to resolve the mystery. On the other hand, too little would simplify the experience, reducing opportunities for exercising critical thinking like, for example, considering possibilities and probabilities. Therefore, the challenge was to find a balance in design.

On numerous occasions, even after making claims, the children showed behaviours related to the disposition *'to wonder and search beyond the encountered surface evidence and information',* taking the exploration to a new, deeper level. For example, in Session 1, Mia had already made a reasoned claim regarding some prints and decided to take the exploration further into new possibilities. After Mia has identified the print as a duck print and reasoned her answer, she says:

> ***'I'm gonna see if it' has any clues.'*** Mia gets close and observes with the magnifying glass (Session 1, Aspen Primary School)

Tim similarly made some initial claims and then went to take the magnifying glass to take a further look:

> ***"I think those are a... bird, a fox, and a squirrel here"*** Tim goes and takes the magnifying glass (Session 2, Aspen Primary School).

At the end of the *Snack Mystery* experience, having already reached conclusions, Mia decided to explore the photographic documentation in case there was anything that she had overlooked. Mia took the iPad and said:

> ***'I will see if in the camera there is any more clues.'*** Mia, looking at all the evidence pictures taken with the iPad to review what they have found (Session 1, Aspen Primary School).

The children's exploration process involved identifying relevant evidence through observation, manipulation, and the use of other senses, such as smell, as portrayed in Extract 7.3.

[Robin looks at and smells the evidence she found under the furniture (which has a particular smell as it is potpourri), and her facial expression changes. (Different ways to explore through other senses)]

Me: *What's the smell like?*

Robin: *Smell.* [Robin gives it to me to smell.]

Robin: *Smells like something, smells like (an) oven.*

(Birch Primary School, Session 4)

Extract 7.3: Robin exploring with different senses (sight, touch and smell) (Session 4, Birch Primary School).

7.4.1.2 Knowledge

The data showed that the children had some background knowledge about animals and made use of this in the detective investigation and associated discussions. Even though background knowledge of the area of investigation was thought to be helpful, children had fallacies around what they took to be 'facts', but this did not intervene with the children demonstrating a logical line of thought. They showed skilfulness in certain aspects of the investigation, as well as signs of learning throughout the experience. In addition, the children's performance demonstrated awareness of certain aspects of their own knowledge, and they were able to articulate what they felt they knew and were able to do, as well as what they did not know. Even though this did not necessarily indicate accuracy, it demonstrated an ability to reflect upon their knowledge, performance, and abilities.

It was also found that some children encountered knowledge realisation or discovery moments, such as the samples provided in the dialogues below. On one occasion, Katia realised that she was able to get the same print of the animal figurine if she stamped it in the playdough.

> **'Wowwwww'** Katia: impressed – surprised facial expression with a wide open mouth – by the result of printing the paws of the figurine in the playdough for the first time and looking at the resultant tracks (Session 1, Aspen Primary School).

Amanda, in Session 4, realised the prints do not continue, and she drew the conclusion that the animal must have stopped.

> **'Wait!!! So the duck stopped right here',** Amanda: realisation of the meaning of the duck track as she suddenly understands that they do not continue (Session 4, Birch Primary School).

Lastly, Amanda explained that the reason an animal was no longer a suspect was that we had not found any evidence linking to the animal's paw print. She then noticed and made the realisation that we had dismissed a print that could be of importance.

> *'Because we did not see them (find the footprint …). Wait! We forgot to look at the footprint of that one'* (Session 4, Birch Primary School).

Children expressed awareness and realisation of knowing in the following manner, amongst many others:

> *'I think I know the foxes one, the fox's one is…Is a match!!!! Is a match!!!!'* Tim: printed the fox figurine in the playdough and then took a flash card that matched. Tim was excited. He checked and observed the feet of the fox with the magnifying glass. He then put the fox on top of the print as a found match (session 2, Aspen Primary School).

> *'I have an idea of who's print this is',* Amanda (Session 4, Birch Primary School).

The children also showed awareness of not knowing, for example:

> *'Here is another one we don't know!'* Tim (Session 2, Aspen Primary School).

> *'Ehh, they come from... I don't know where they come from'* Amanda (Session 4, Birch Primary School).

Or with body language:

> *[Robin expresses that she does not know with gestures]* (Session 4, Birch Primary School)

The *Snack Mystery* was an **open-ended** problem-solving experience with no obvious right or wrong answer. Such openness provided the children with very few limitations on the choice of which procedures to follow and which tools to use. This added more challenges and some periods of uncertainty. During these times, the children naturally made use of tentative language, such as *'maybe', 'I know', 'I think',* and phrases such as *'not quite it'*, *'let's figure it out'* and *'let's check'* to indicate doubt, which presumably indicated their thinking was ongoing. There was no guarantee that tentative language were, in all cases, intentionally chosen; they could have been language habits or impersonating perceived character habits. However, some cases were more obvious. In general, the children expressed uncertainty, as

the task on hand did not have a simple or fast solution. As important as it was to recognise what was known, it was equally important to recognise what was unknown. The children needed to be comfortable using these words and phrases as indicators of critical thinking dispositions.

The children seemed to clearly express when they were certain about something or they had made a realisation. However, they also expressed themselves in the same way when they did not know something or how to continue. For example, Marc was focused on the task and was sitting on his own, and I decided to approach him and ask about his progress. I offered him my help and asked him about his discoveries. He responded:

> ***'I found out that I have no idea whose footprint that is*** (pointing at a print). ***That's why I put a little thing in here',*** Marc: showing me that he has written a question mark in the notebook to show that he does not know (Figure 7.21) (Session 3, Birch Primary School)
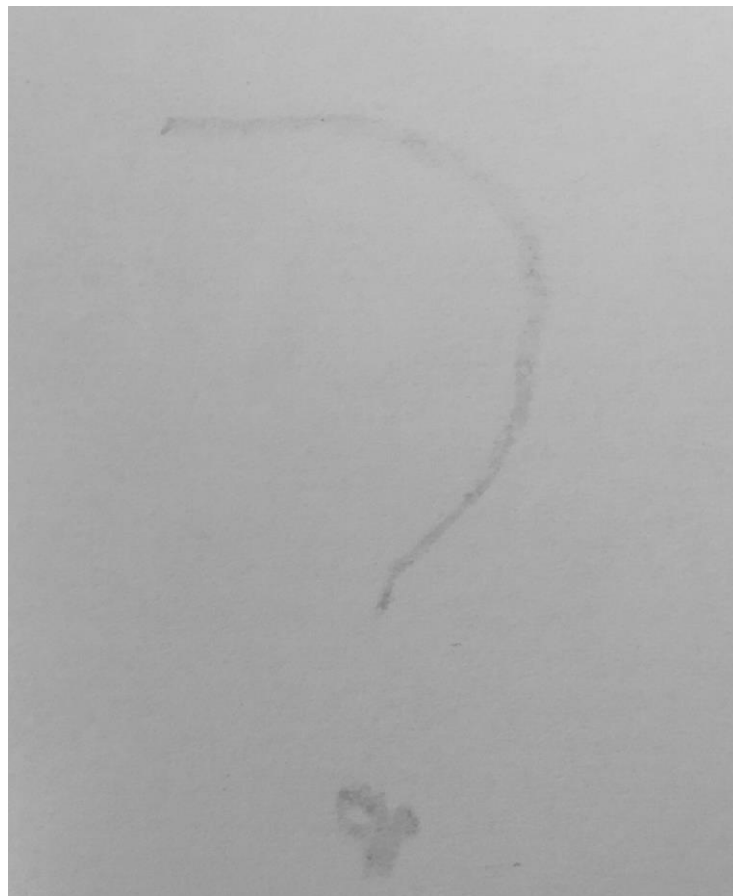
Figure 7.21: A question mark symbol in Marc's detective notebook (Session 3, Birch Primary School)

Notebooks for documentation and related tools provided me with opportunities to see children's thinking represented visually. Questions, however, remain about the level of emphasis and role such documentation plays in the development of thinking in young children. Arguably, just as writing things down helps manifest thinking, organising it, and developing accuracy opens the window for further development. In the context of the *Snack Mystery* experience, I interpreted these moments as catalytic thinking and its development. The process of writing things down, focusing on and digesting thoughts, encouraged children to select what they thought was important, aiding their memory and giving them opportunities to manifest and share with others. This is perhaps widely underplayed in the critical thinking literature.

7.4.1.3 Testing and evidence

In the *Snack Mystery* case, the nature of the experience emphasised thinking about observable evidence, analysing, making inferences, and testing them, following the scientific method. Among the testing and verifying methods and tools, measuring footprints with the measuring tape, placing your feet on top of the paper print, stamping animal paw prints into playdough, and placing clues on top of the suspect photographs for comparison were utilised most by the young children. By doing so, the children developed more awareness of the importance of considering evidence, made better-educated guesses, and formed theories in relation to the mystery scene and possible suspects. The most popular testing method was playdough stamping. This task took place in isolation in the first part of the *Snack Mystery,* and the children made use of this throughout the experience. Video footage shows children repeatedly using this testing method to help in their enquiries, and they would evaluate, often aloud, whether what they were examining matched their expectations or whether they needed to discard the suspect or clue. Using accessible tools independently and being able to self-evaluate seemed to give children a sense of empowerment and satisfaction.

Amanda's performance (Extract 7.4) showed how the process of testing helped us resolve the mystery.

Me: *Yeah, we didn't find any. What about the bee?*

Amanda: *No.*

Me: *Is it possible that the bee ate my sandwich?*

Amanda: *Bees don't even eat sandwiches.*

Me: *What do they eat?*

Amanda: *Bees eat… honey.*

Me: *They eat honey?* [In this case, my focus is not on getting every fact right. Do bees eat honey?—Specific honeybee larvae eat honey. This is what it sometimes feels we teachers are expected to do… but by focusing only on correcting facts, we could also lose the overall thinking thread, which is more the focus of this thesis: What is the thinking process during mystery solving?].

Amanda: *Yeah.*

Me: *So then probably a bee didn't eat my sandwich, right?* [building up an argument together even though not all the facts are completely correct, but based on what we know, the building of ideas makes sense]

Amanda: *Probably a bear. Bears love sandwiches.*

Me: *Bears love sandwiches? We don't have any bears in here* [pointing at the animal suspects photos].

Amanda: *But we do have a bear right here all right* [animal figurines]. *Should we see if the bear's footprint was on the floor somewhere? And you could try it out?* [with the playdough testing activity]

Amanda: *All right* [got an idea?]

Me: *We are doing such a good job! I'm gonna take a picture of this cause..*

Amanda: *Look (at) the footprint.*

Me: *Should I take a picture of that… of the bear? Did we find this print somewhere, (do) you think?*

Amanda: *Eee, we didn't find a bear footprint.*

Me: *We didn't find (it)?*

Amanda: *No, we did not find a bear footprint.*

(Birch Primary School, Session 4)

Extract 7.4: Testing and discarding, Session 4, Birch Primary School

Together, we developed an organisational system to test and discard suspects that Amanda increasingly took control of. Her dialogue also showed how she was speculating about the suspect based on the obtained information (retaining and using information) and observed the available evidence at the scene. In this particular scene, no other children were playing any longer; therefore, I changed my role slightly, taking a much more participatory role in the conversation. In Extract 7.4, Amanda used learnt 'facts' to discard a suspect. Based on her knowledge of bears, she managed to relate the sandwich to the bear as a possible suspect. I then stimulated her to proceed to look for further evidence concerning the bear's

involvement in the crime scene as well as to try out the method and test whether the prints on the scene belonged to the bear. My intention was to stimulate critical thinking dispositions to find supporting reasons for drawing a conclusion rather than simply relying on possibility. After searching and testing, she stated that she did not find any bear connections. Experiences and realisations were considered important, and it was later observed that Amanda had picked up on this habit.

The conversation also shows how I tried to achieve a balanced relationship between Amanda and myself. Our engagement in play as equal partners was reflected in our shared thinking conversations. My participation in play not only allowed me to scaffold, but also provided the opportunity for co-creating together.

7.4.1.4 Scaffolding (orientation)

The children engaged in investigation-related discussions. Generally, in this context, this occurred spontaneously, as the children showed a willingness to inform and share with others. These focused discussions created opportunities for the children to articulate thinking, often leading to agreeing and disagreeing with other team members. Scaffolding in these discussions took different forms. For example, in a few instances, it involved helping the other team member 'refocus' on the objective. Extract 7.5 shows Ava's and Marc's thinking and changing turns during the process of investigation. Both children were immersed in the task and shared their perspectives during the process of developing their ideas:

[Ava and Marc are trying to figure out to whom a specific print (a fin, without them knowing it is a fin) belongs. They are looking at animal figurines.]

Ava: *Maybe it's an owl.*

Marc: *Let's see, let's figure out what it is, right that's one of its wings, OK, let's check.*

Ava: *It's like an owl's wings.*

Marc: *It's not quite it, 'cause we are checking out footprints* [meaning not the 'wings', as birds don't make tracks with the wings]

Ava: *Maybe it's a seadog* [meaning sea lion?] [She has now refocused, with Marc's help, on the objective of the task and realises it could actually be a fin, as they are looking at animal prints.]

Marc: *Maybe I think it's a narwhal.*

[Ava points at the seal, as there is no narwhal figurine/photo and that's the only one with a fin]

Owl > Owl wing > Paw print not wing> Sea lion? > Narwhal > Seal!

Visual representation of Ava's and Marc's thinking process.

(Birch Primary School, Session 3)
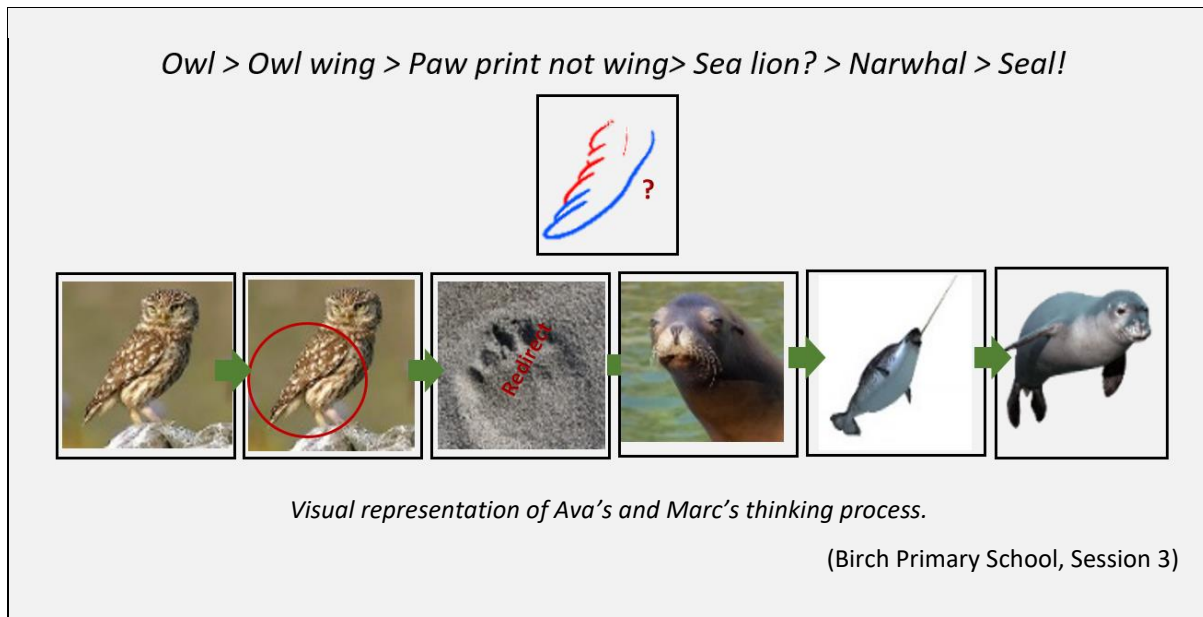
Extract 7.5: Ava's and Marc's thinking process and visual representation, Session 3, Birch Primary School.

Ava and Marc worked as a team to find an answer to their questions. They engaged in constructive dialogue about what they were currently investigating until they reached their goal. They suspected that the print could be of an owl (which seemed obvious to their eye); however, Marc was able to remember the objective of the task and redirected thinking (investigation), as the goal was to understand to whom the paw prints belonged. This involved first understanding the possible tracks that animals left while moving around, but most importantly required creativity in thinking in order to interpret the piece of evidence in light of 'new' information (instruction stating the search for tracks rather than other patterns such as the owl wing, which had a strong visual resemblance). This moment required opening up to possibilities and malleability, considering the change of direction.

The snack mystery case video transcriptions showed that young children's thinking was often dialogic (Wegerif, 2010). This can be seen in the conversation below (see Extract 7.6) where Stella, Ava, Marc, Bruno, and I were having a focused discussion regarding the identification of the animal print based on observations and comparison. The children were motivated, engaged in the topic and discussion, and made use of the available tools with an outcome in mind. However, there were agreements and disagreements regarding their early detective investigation. My involvement as an insider in their play provided the opportunity to challenge thoughts further, welcome new perspectives, and might have encouraged Bruno to

look in further detail and express his opinion. He later showed that he valued his contribution by wanting to document it.

[Stella, Marc, Ava, and Bruno were given animal prints so they could figure out whom they belong to. Stella held one and said it belonged to a pig. Ava held another one and said it also belonged to a pig. Marc corroborated that by saying:]

Marc: *"That might be a… yeah, you are right, you are right!"* [after looking at Ava's print and the pig photograph on the wall, seemingly comparing the print to the pig's feet. When I asked whether that statement was right, Marc reasoned:]

Marc: *"Yeah, 'cause I saw it"* [pointing at the wall's pig photo] [I then challenged the children, questioning whether they were both from pigs (same) by putting the two prints one next to each other. Bruno then said with certainty that they were not the same by pointing out differences. He then continued:]

Bruno: *"Yeah, I know they are different because this has that… like, it has a little… and this one's without it."* [He turns around, looks at the photo of the pig, and then turns back to the prints.

He thought it was an important discovery, as he asked me to write it in his detective book (where we wrote very important evidence and findings).]

(Birch Primary School, Session 3)

Extract 7.6: Dialogic focused thinking, Session 3, Birch Primary School.

This fragment of the session shows that the children's thinking was dialogic—in this case, a social dialogue based on children's verbal-behavioural evidence. Wegerif's (2010) dialogic theory of thinking is suitable for understanding young children's thinking during the *Snack Mystery* case. Above Stella, Ava, and Marc expressed their perspectives regarding the inferences derived from the interpretations of the evidence. My role was to challenge the children by putting the clues next to one another without stating what I thought, so that the children could further observe the details of the evidence. Bruno took that opportunity to either observe or notice further details or to speak up for himself, offering a different voice and perspective to the dialogue. Those various perspectives within the conversation were then in tension with one another, and further judgement was necessary to evaluate each perspective and draw conclusions. Based on Wegerif (2010), CT can be described as the process of judging the various (from two to infinite) other perspectives in tension that are conflicting, challenging, and competing with one another within the form of dialogue (either

social or internal). Wegerif states that this form of thinking as a dialogue might start developing within human-to-human relationships and is later on similarly internalised into the form of invisible dialogue happening within oneself. An example of this is when Stella brought a second voice questioning her initial statement (Extract 7.7).

[Stella is saying that the animal responsible was the polar bear.]

Stella (voice 1): *"It was a polar bear."*

Stella (voice 2): *"But how did he do it!?! It's so big!"*

{Birch Primary School, Session 3}

Extract 7.7: Multiple inner voices questioning conversation (thinking aloud), Session 3, Birch Primary School

Stella was reasoning aloud and questioning her own statement without the intervention of others. Examples like this can be challenging to observe, and that might be an issue concerning the difficulty of accessing children's internal thinking. This occurred because outsiders, in this case, I the researcher and you the audience, can mostly see the traces of thinking (Wegerif, 2010). However, based on young children's thinking aloud and private speech episodes, as the one above, listening to children's perspectives about thinking and learning, and based on what we know about ourselves as adults, we are able to identify that internal dialogic thinking can and does happen. Narratives during the *Snack Mystery* showed that the play-based activity provided space and motivation for participation and stimulated focused thinking regarding the topic under investigation in the form of dialogues. In that sense, it could be the detective role and experience that enables possibilities to interact with more knowledgeable others.

7.4.1.5 Documentation

Documentation via writing and drawing in the detective notepad was used throughout the experience, but most prominently in Part 1. In Part Two, it was used particularly for generating the list of the clues found in the scene. This type of documentation was introduced to the children to record 'very important' clues and findings. Some children, whether they could write or not, like Stella in Figure 7.22, invested extensive time in this process. Among others,

Stella mentioned that in the writing, she took footprint notes as well as confirmation of what she found out (as indicated by my writing and arrow).
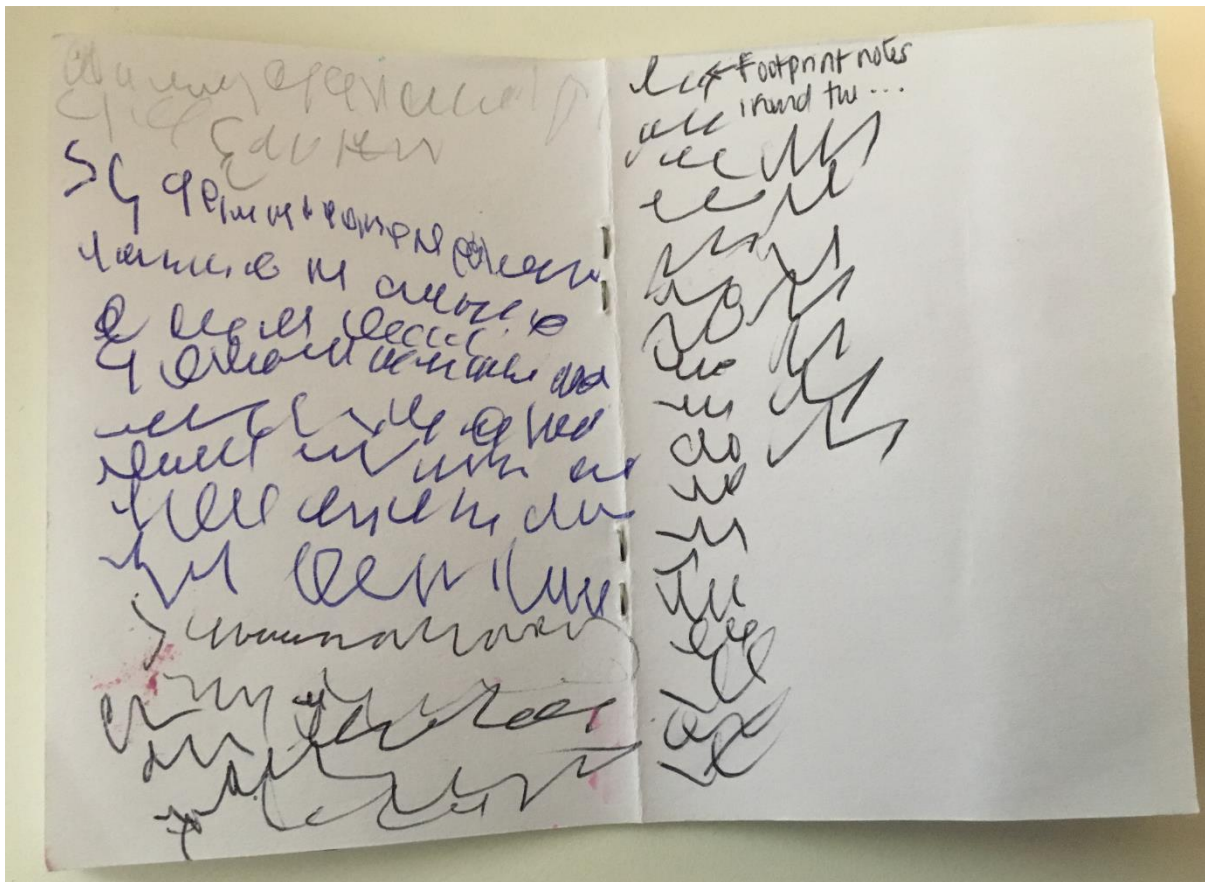
Figure 7.22: Stella's detective notes (Session 3, Birch Primary School)

Such focus on and investment in the task and given the context in which it occurred indicated that it was useful for their thinking during the process. Stella showed motivation, effort, and great persistence in achieving the goals. Furthermore, some children revised documentation after producing it to use at a later time or to share it with others. Tim, in Figure 7.23, for example, evaluated and documented this using various symbols and drawings, including tick and cross symbols representing right and wrong.
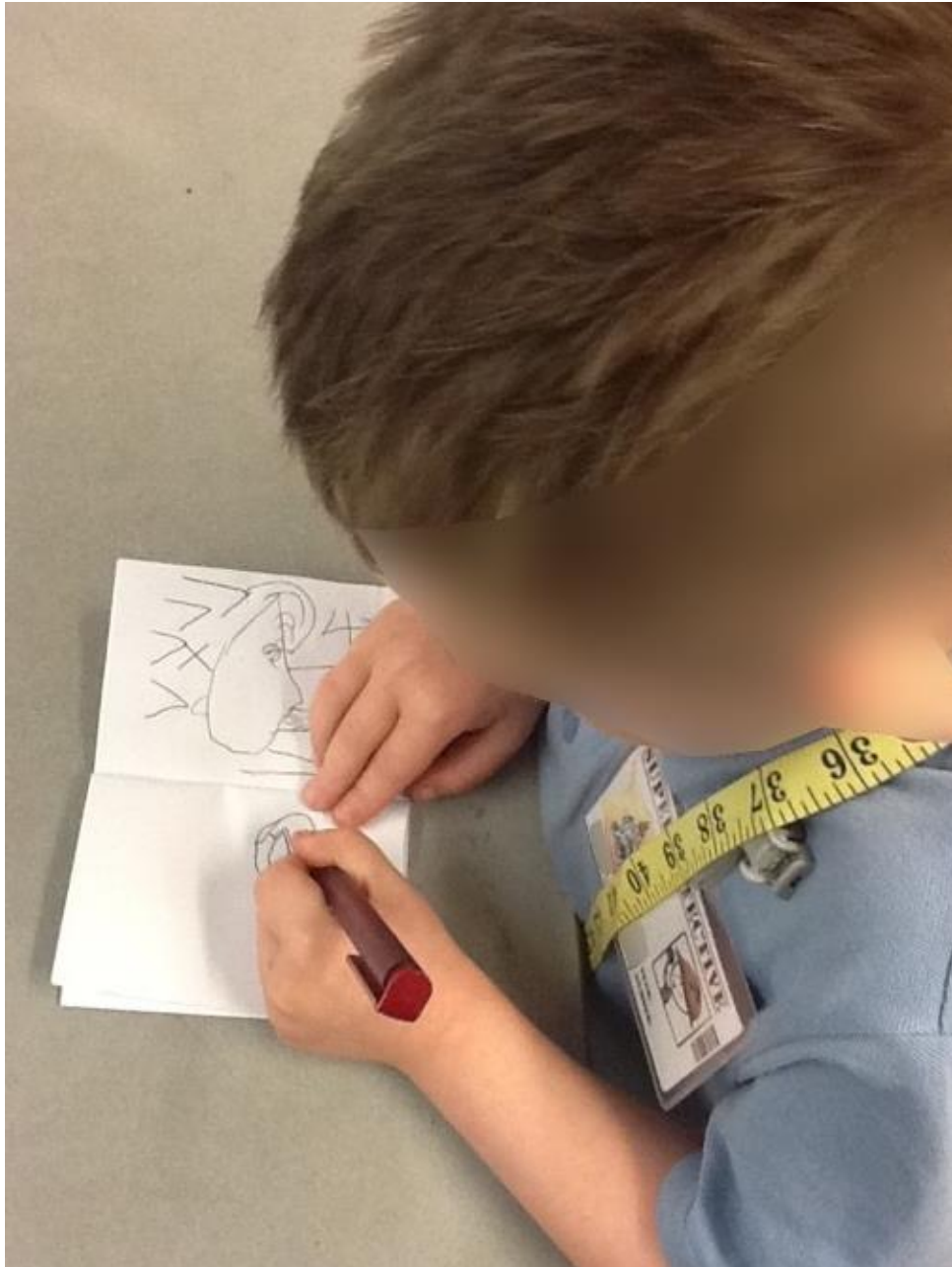
Figure 7.23: Detective Tim (5 years old) documenting (including the use of various drawings and symbols, such as tick and cross symbols indicating right and wrong).

Similar to what was found in Case 2, *Zoo Mystery,* it seemed that academic skills were developing 'in service of the intellect' (Katz, 1993). Photographic documentation with the iPad was most prominently seen during Part 2, where certain children tended to adopt the role of the detective photographer while others made the discoveries.

Documentation took various alternative visual forms. In Birch Primary School, clothes pegs were used to mark and discard suspects (see Figure 7.24 and Figure 7.25). Some children

made use of the system, and it turned out to be an effective visual thinking representation, helping with clarity and organisation of the generated chaos (narrowing down and recording).

Figure 7.24: Clothes peg-marked suspect wall
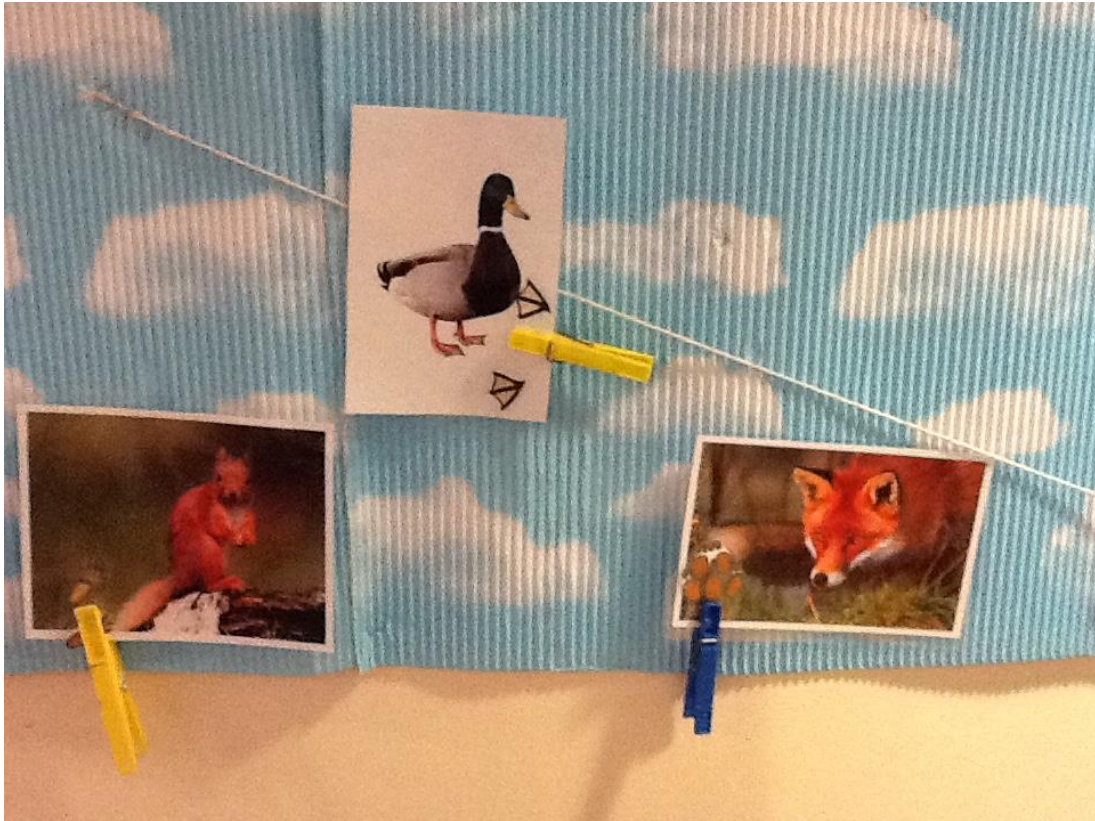
Figure 7.25: Use of clothes pegs to document suspects (paired with prints) (Birch Primary School)

Additionally, the children marked evidence by placing red sticky tape to highlight it within the scene and to indicate that it had been looked at. The children also made use of tweezers and containers to organise and gather the key pieces of evidence (clues) on the table.

Overall, documentation as a visual strategic tool was found useful as a personal reflective activity to develop thinking as well as to slow down the pace of thinking, aid children's recall, and prioritise and share what was found with the other members of the group and myself.

7.4.1.6 Evaluation

The children engaged in self-evaluation, evaluating, and praising others' work, clues, and interpretation, and relevant/irrelevant clues evaluation. The children also showed the ability to accept when they were wrong and to correct themselves. For example, when the children used the playdough testing method to confirm whether they were right or wrong when interpreting prints, it stimulated evaluation naturally, as well as facilitating a verbalisation of their findings. Most of these comments were in reference to being correct:

> *'Look, I'm correct'* and *'Guys, this is correct with the fox!'* *(Mia, Aspen Primary School)*

> *'This is right'* *(Holly, Aspen Primary School).*

Apart from self-assessing their outcomes, being loudest when they were right, the children also expressed self-awareness regarding their knowledge and abilities, mostly relating to what they thought they could or could not do (practical skills such as writing or drawing, for example) and did or did not know (specific facts or views about something, for example). In Extract 7.8, this awareness was linked to skills such as writing.

Bruno: *Wait, can you write already???* [He seems really impressed. Even though she is not actually writing, it seems so, and Bruno is impressed with her. Because he can't really read, he asks the following:]

Bruno: *Can she really write?* [pointing at her notepad]

Bruno: *I can't.*

Me: *Well, ermmm, we can all write in our way, and that's really good practice.*

Me: *You can try. You did try writing here, didn't you?* [Talking to Bruno] *You are doing great, Bruno.*

Me: *You are all doing excellent.*

[Some time later]

Bruno: *Can you write, Stella?* [He is very curious and this might be something important for him, as this is the second time he asks the same question. Perhaps he is worried about learning it himself or that he can't really do it yet.]
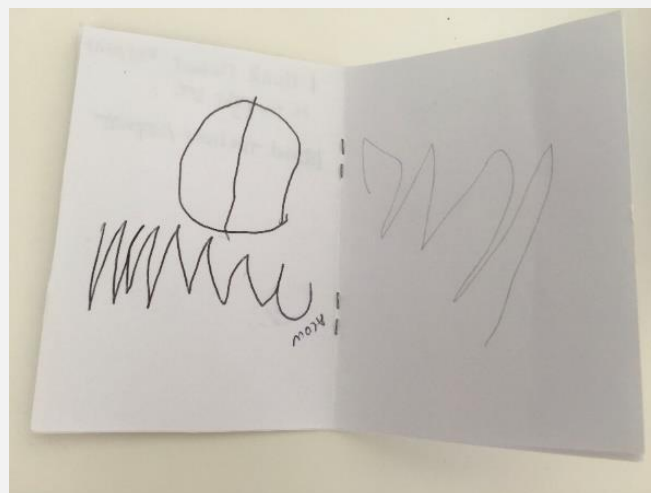
Bruno's writing sample (my writing in the bottom corner 'a cow')

(Birch Primary School, Session 3)

Extract 7.8: Knowing and not knowing, Session 3, Birch Primary School

7.5 Reflection upon experience and design

The *Snack Mystery* experience triggered emotions, motivation, active autonomous engagement, focus, and immersion in the experience. It was particularly productive and meaningful for stimulating and developing a wider range of critical thinking skills and dispositions in relation to other cases. Emergent in the detective role and the explicit engagement with enquiry, it required provoked opportunities to directly engage in independent action requiring key skills related to critical thinking.

The children showed a wide range of skills repertoire when engaging in collective investigation. Regarding the data organisation stage, the children showed more difficulty in refocusing on the ultimate goal and less awareness of goal achievement after collecting all the evidence. The children needed support in the transition from 'collecting data' into organising and focusing on understanding in a broader context. Visuals and manipulatives (such as clothes pegs) helped scaffold this process, as well as supporting more abstract 'data' organisation through documentation in order to proceed. A simplified version (fewer clues or suspects) of a *Snack Mystery* could have provided a more natural path for that transition and an increased capacity for 'data' control for young children, but the challenge remains in finding the balance between too much and too little.

The activity was designed to fit within the negotiated research session slot in participant settings; however, it would have been preferable to have a longer slot accommodated around children's daily routines (outdoor time, lunch, etc.). The activity had the potential to be implemented across a whole week or even a month, or to be used as a set detective area in the classroom. If opportunities to focus on different aspects had been extended, this may have deepened and extended Critical Thinking Moments. Additionally, replaying the detective game could have provided opportunities to master the process and facilitate deeper analysis as well as give more time for reflection, as children have already acquired some experience and skills.

The following table (Table 7.2) summarises the most recurrent behaviours related to critical thinking observed during the *Snack Mystery* experience. The colour scheme represents

frequency, with the most frequent ones being the darkest and the least frequent ones being the lightest.

Table 7.2: Behaviours related to the Critical Thinking dispositions in the *Snack Mystery* case.

CT dispositions: Snack Mystery
Dispositions
1. To be curious and willing to find the answer
2. To be aroused by the process, focus and flow
3. To investigate
4. To be confident (autonomy and seeking help)
5. To self-correct
6. To take risks and have the courage to take action in different ways to open up to new ways of learning
7. To be prudent
8. To be persistent
9. To be open-minded, flexible and fair
10. To communicate, collaborate, and value the contribution of others (dialogical thinking and collaboration)
11. To be resourceful and creative
12. To be mindful, aware of self, goal, process, and performance. To use awareness productively (to plan for change, to modify or change actions).

Key: Most frequent (darkest) - least frequent (lightest).	Frequently across the case	Occasionally/sometimes across the case	Rarely across the case

While all the children had the same scenario to investigate and they engaged in valuable thinking as well as actions and behaviours connected to critical thinking skills and dispositions, each individual's performance showed differences in their level of depth and sophistication. For example, while investigating the evidence, most children engaged in analysis, but in different ways. Experiences such as *Snack Mystery* can be very useful, as each person will reach a satisfying milestone according to what they can do and what they can do with others (ZPD; Vygotsky, 1978). Due to the richness of the context, it could also be used with older children and still be useful and relevant to critical thinking practice and the development of skills and dispositions. This flexible attribute to the experience, therefore, provided opportunities for growth across diverse groups, respecting each member's pace and personal readiness. Furthermore, learning was visible in children, with evidence of how the experiences built upon the previous parts and cases.

Overall, the *Snack Mystery* experience not only provided a context to assess, but also provided meaningful opportunities to develop skills and dispositions and emerging critical thinking in the classroom setting.

Chapter 8 *Mystery House*, Case 4

8.1 Introduction and aim

Chapter 8 is also divided into five sections: the rationale for the development of the *Mystery House (MH)* case, the design of the activity, how it was implemented, the data organised into themes, and a reflection on the *Mystery House* experience and what has been learnt.

Aligned with my research questions through this particular case, I sought to understand:

1. The usefulness and challenges of the *House Mystery* experience to stimulate critical thinking and
2. How young children's thinking skills and dispositions manifest in the context of semi-structured small-world detective investigation.

The overall aim of this experience was to stimulate children in the process of investigation in the context of the small world, with the ultimate objective of resolving the four short mystery tasks based on the attained evidence and plausible explanations.

8.2 Design of the activity

The *Mystery House* activity was structured in the four parts shown in Figure 8.1. Each part consisted of a short mystery task. The experience commenced with a general introduction to the experience, and the different parts were followed in sequence. The underlying structure was made apparent to separate one mystery task from the other and to avoid a mix-up. Each part of the task required different types of skills to solve the mystery. For example, the first mystery can be solved by general *logic, intuition,* and *personal living experience*. However, the other mysteries relied on *observation*, *interpretation* of clues, *relation making*, *analysing*, *making inferences,* and *theorising* skills rather than solidly upon intuition.
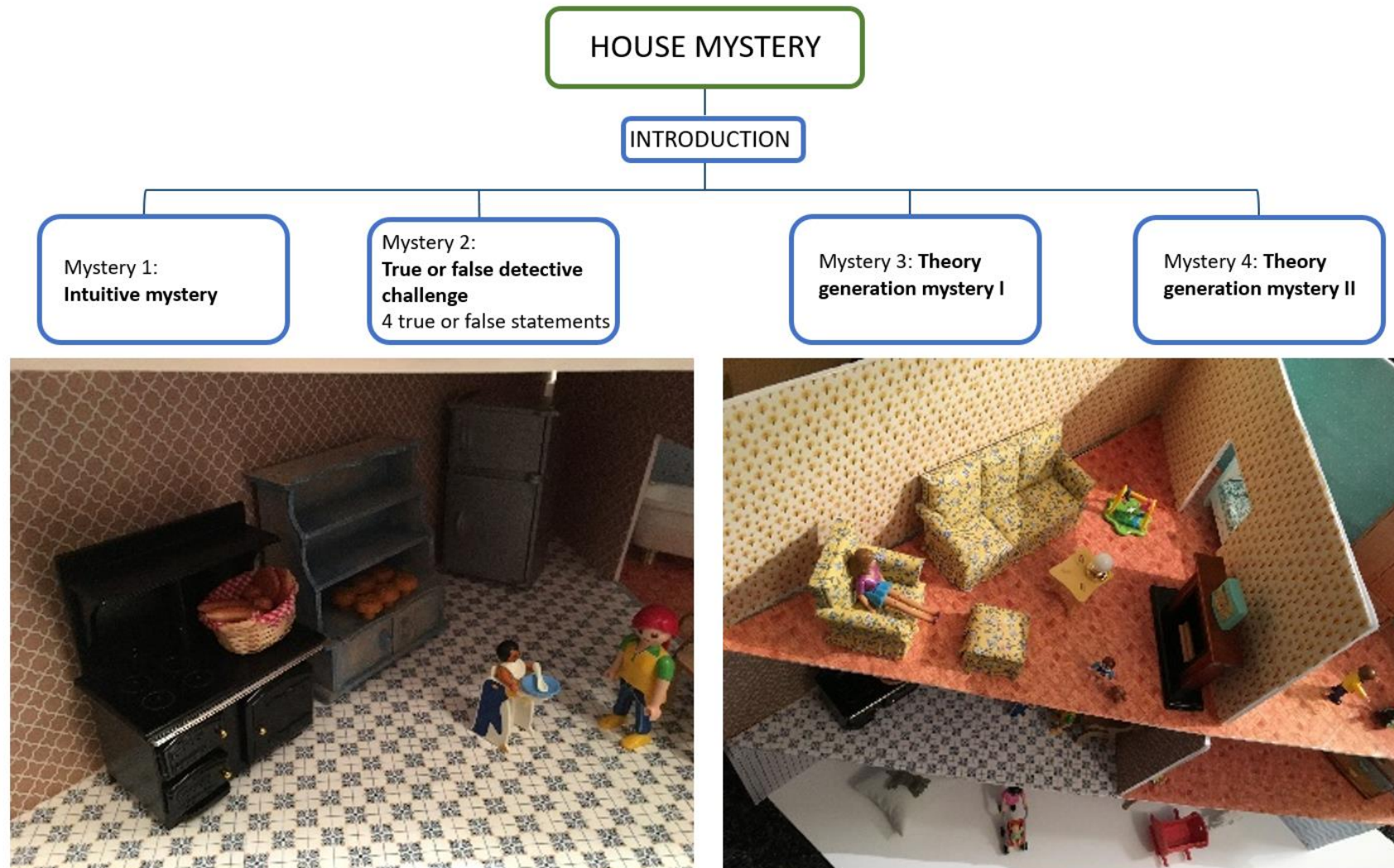
Figure 8.1: Structure of the *House mystery* experience

8.2.1 Design of the experience

A small-world house, shown in Figure 8.2, was presented to the children. It was specially designed and constructed to stimulate thinking in the play context and ultimately understand how children explore, interpret, theorise, and draw conclusions based on the evidence, which are particular characteristics of critical thinking.

Figure 8.2: *Mystery House* set up (Birch Primary School)

Each child was invited to pick a figurine (Playmobil® character) to impersonate their detective role throughout the *Mystery House* experience. The house and John, the character living in the house (played by me initially), were formally introduced to the children's detective character (please note that this character became Tommy in some sessions due to the children's preferences). The character John was played by me throughout. The children were told that their assistance was needed to help John resolve the mysteries that took place at his home.

Even though the house and John's character remained the same throughout the full experience, each part was presented as an independent mystery with no connections to be made.

The *Mystery House* experience was designed to be the last case. It was considerably more structured than the previous three, and it was important for the children to listen to and consider each mystery's instructions to successfully understand and participate in the experience. As such, it was considered the most challenging experience to successfully implement.

This experience was designed so that it could offer opportunities for the children to express their thinking both verbally and using tools. For example, the children had the potential to physically demonstrate their thinking by impersonating the figurine character and making use of miniature-scale scenarios. A similar method was found to be useful for researching children's perspectives on conflict solving in my master's dissertation (Martinez-Lejarreta, 2014). In this thesis, children used their figurines to show what they thought, visually enabling alternative opportunities for children's voices. Due to young children's negative perceptions of having conflict with someone, it was a difficult topic to talk about for some, so rather than articulating, demonstrating through play seemed to be helpful. Furthermore, small-world play has been previously shown to be useful for adults and children in the field of psychological therapy and social research, such as Lowenfeld's World technique (Bowyer, 1970; Lowenfeld, 1950). It is also a commonly used pedagogy in Scottish Early Childhood Education. Therefore, even though the general purpose, content, and task structure of the present study differs from previous research, the process of stimulating the manifestation of thinking in various forms remained constant. Furthermore, the small-scale model provided the opportunity to physically set various challenges (plant clues), one at a time and one after the other, while the children were physically present. It provided an opportunity for children to investigate from a different perspective: in this case, it meant having physical control of the scenario. The interest lies in whether this controllable small-world model would affect children's thinking and performance when investigating. Taking an outsider's perspective (eagle eye view from the children's perspectives), I was interested in understanding how the scale could potentially be catalytic of thinking and performance (benefits and limitations) compared to conducting an investigation in real life, such as the *Snack Mystery* experience.

The *Mystery House* experience was divided into the following four parts (tasks):

- Part 1: Intuitive mystery (familiarity vs. novelty)

- Part 2: True or false detective challenge (four statements)
- Part 3: Theory generation mystery
- Part 4: Theory generation mystery

In the first part, the children were told they needed to investigate where John's remote control was (it was hidden under the sofa in the living room where the miniature TV was located). This task was the simplest and most logical. I assumed that it was a scenario that may have happened within the child's home environment and therefore could be resolved through *logic* (the physical miniature TV is in the living room, hence the remote is likely to be nearby) and personal experience. This was considered an appropriate first task due to familiarity, reduced challenge, and opportunities to facilitate children's talk and personal experience sharing.

In the second part, the children were given four statements, and they were asked to make judgements about the accuracy of each. In other words, children (the detectives) were asked whether John (my Playmobil® character)'s statements were true or false and to give reasons for their answers. Two statements were phrased positively and two negatively.

In this part, differing from the previous one, specific clues were planted throughout the *Mystery House* (for example, bubbles, soap, and water on the floor). These clues were related to each of the statements and were to be treated as evidence by the children to make their judgements. Therefore, guessing based on instinct and own experience was ineffective without observation, exploration, and interpretation of the physical scene. The task was designed in this way to be able to study the children's behaviours and approaches when confronting the task, their attention, observational skills and handling of clues (evidence), and to explore signs of the skills related to the interpretation of the clues. Relation-making, inferencing, theorising, and reasoning in general were crucial skills in the process of critical thinking. There was no single right or wrong answer, however, and the key lay in using the provided evidence to draw their conclusion and reason their judgements. Consequently, due to the open nature of the design, the answers could go in either direction.

- Character's statement 1: *'I had a shower'* (physical clues placed in the bathroom: bubbles, soap, some water on the floor) (Task 2. 1).

- Character's statement 2: *'I didn't eat any chocolate'* (physical clues: chocolate bar with a bite missing, water indicating he could or couldn't have had some chocolate in the kitchen) (Task 2. 2).

- Character's statement 3: *'I didn't eat any cake'* (physical clues: miniature entire cake in the kitchen) (Task 2. 3).

- Character's statement 4: *'I picked up the post (mail)'* (physical clues: letter in the post box) (Task 2. 4).

Each statement challenge was expected to be relatively short, as the answer was assumed to be more or less straightforward once identified.

In Part 3, the aim was to figure out where the character's teddy bear was. This involved investigating the scene and constructing theories around the planted evidence. Ultimately, the children needed to explain how the toy got there. The miniature teddy bear figurine was hidden outdoors behind the house, and the planted evidence (leaves, mud, muddy welly boots, puddle, and wet umbrella, among others) suggested an investigation path towards the outdoors. In this detective task, the opportunities for different interpretations and theories that could explain what had happened were endless (open nature for creating new opportunities). Unlike Parts 1 and 2, the evidence did not directly lead to the question in itself (where was the toy?), which made the storyline much more complex to create and follow. This significantly increased the level of complexity.

Finally, in Part 4, the aim was to investigate the disappearance of an item (a cake) and construct a theory based on evidence that would explain what had happened to it. The children needed to observe all of the scenes thoroughly, identify, and interpret evidence, analyse it and make relations, and theorise and explain to find the item and give an explanation. The planted evidence (mud, twigs, and a nest with eggs, among others) suggested an investigation path possibly linked with nature and animals, among many other creative alternatives. This task was designed to be similar to the previous one (Task 3) with associated complexities, open-ended nature, and intentional ambiguities. Furthermore, the evidence was not directly linked to the question itself, which in practice created an additional second problem for children to resolve (problem 1, cake; problem 2, nest, twigs).

The third and fourth tasks were designed to be similar and, due to their nature and 'openness', were expected to bring out more creativity and flexibility in comparison to the first two parts (for example, whether it is true or false that John had a shower is a closed question with limited and less flexible space for children to excel creatively beyond boundaries).

The overall aim was to use the four challenges to explore children's investigative strategies in the context of small-world detective play: what type of critical thinking skills and dispositions they applied and how they manifested in such a relatively controlled and close-ended context in comparison to the rest of the cases. The planted evidence was carefully selected in order to guide the children in a wide variety of possible directions. Even though the evidence was specific, the children could interpret them either in an obvious or elaborated manner. For example, in Task 2.3, when the children were asked whether John had eaten any cake, an entire cake was placed on the kitchen counter. Not all of the children were able to interpret wholeness in connection to not eating the cake. However, most did. A step beyond would be to also argue that a cake being there would not necessarily mean that John did not eat it, offering an alternative view, such as that there might have been two cakes instead of one.

8.2.2 Estimated duration

Assuming the children would be interested in the tasks, the total estimated task time was approximately 20 to 60 minutes, including 20 minutes to set up the research scenario and 15 to 20 minutes to pick up and leave the area as before.

8.2.3 Location

The *House Mystery* experiences were performed in two schools, Aspen Primary School as portrayed in Figure 8.3 and Birch Primary School as shown in Figure 8.4.

The basic requirements for the space included floor space or a table on which to place the small-scale house and chairs to sit on as well as to help them reach higher if they needed to do so, an area to role-play with the characters while I was setting up the planted evidence in between tasks, a surface to place necessary tools for the detective work, and lastly, as in

previous cases, space to set up data recording devices (a camera with a tripod and an audio recording device).

Figure 8.3: Tim, Cira, and Diana. (Session 1, Aspen Primary School).

Figure 8.4: Lara, Ruth, and Elaine exploring the scenario using magnifying glasses (Session 6, Birch Primary School).

Figure 8.5: Cooper observing through the magnifying glass (Session 5, Birch Primary School).

8.2.4 Material and preparation

The following materials were used to set up the task:

- Foldable small-scale houses and furniture

- Small world figurines, diverse in age, gender, and appearance (e.g., Playmobil®)

- Clues and mystery story lists

The following materials were used by the children:

- Detective gear and tools (deerstalker hat, ID personalised badge),
- Personalised detective notebook,
- Crayons/pencils/pens,
- Magnifying glass,
- iPad

Lastly, the researcher's materials and data recording devices, which included the researcher's guideline notes with key questions and evidence instruction, a video camera with a tripod, and an audio recording device.

8.3 Implementation

8.3.1 Sessions and duration

As presented in Table 8.1, the *Mystery House* experience was implemented in two schools between November 2018 and January 2019. A total of 17 children aged 5-6 years took part in six sessions. The children worked in groups of two or three at a time, which was important due to the limitation of physical space for tool interaction. The average duration of the *Mystery House* activity was 37' minutes.

Table 8.1: Number of sessions, sample, date and duration.

House Mystery Sessions				
Settings	Session number and date	Group of participants aged 5-6-year-old per session	Duration of session	
School 1 Aspen Primary School (Primary 1)	Session 1 07/11/2018 Parts 1 and 2 (2 days*)	3 children Tim, Cira, Diana	56' + 15' (Intro) = 71'	This data was not included in the final data set (see section 8.4.1.5. for an explanation).
School 2 Birch Primary School (Primary 1)	Session 2 17/01/2019	2 children Ava, Bruno	37'	
	Session 3 17/01/2019	3 children Stella, Marc, Will	25'	
	Session 4 17/01/2019	3 children Robin, Maria, Amanda	33'	
	Session 5 21/01/2019	3 children Isla, Anais, Cooper	29'	
	Session 6 21/01/2019	3 children Elaine, Lara, Ruth	29'	
Total for both schools	6 sessions	17 children	Average duration of session 37'	

8.3.2 Pre-visit and setup procedure

As with the other cases, before each field trip, my regular practice was to go through the research itinerary list, including an overview of the activity procedures as well as the material inventory checklist, to ensure that all the materials were placed in order of use in the research travel bag. This was especially important, considering that I had limited time to spend with

each group. Each mystery task's miniature clues (1-5) were individually stored in envelopes for efficient task setup.

On arrival at the school, all the materials were set up. All the resources, particularly the house, needed to be accessible for children's use and sight; therefore, considering the children's height in relation to furniture and the placement of tools was important. For example, due to the size of the house, some children needed chairs to access the higher floor. Additionally, it was important to place the camera appropriately, within a reasonable distance, to ensure that the video captured the scenario (both spatially and with clear sound). It also had to be located in a safe position, as well as respecting the participants' space (allowing the usual comfortable movement around the space).

Once the materials and recording devices were set up, the children were invited to put on their detective apparel and play. The children showed curiosity as soon as they saw the miniature house. They were looking and touching, showing interest in the detective experience that was about to start.

I was just starting to introduce the mystery when some children already wanted to adopt a character:

> ***'I want to be the doggy'*** *(*Bruno);

> ***'I wanna be the people'*** (Ava);

> ***'I wanna get this one'*** (Bruno);

> ***'I wanna be John'*** (Bruno) (e.g., Bruno and Ava in Session 2, BPS).

In other words, they had assumptions about what was going to happen next, probably based on their previous play experiences. Cooper even found one that had similarities to himself:

> ***'I want this one, 'cause this one looked like me when I was two. It looked like me when I was two'*** (Cooper, Session 5).

Once the initial excitement was over, the group gathered around the house, and the children sat down to talk through the new mystery experience.

After I introduced the character John (the child Playmobil® character living in the house) to the children, John then invited the children on a tour of the house to familiarise them with the rooms and materials. The children's characters followed John throughout the house. He also explained why he needed their detective expertise.

Instead of giving specific instructions about all parts, I started by explaining the first part of the mystery through John's character (first person). Once Task One was completed, John would continue to explain the next task. This ensured the children were not over-informed prematurely, and prevented overlap of different task information so as not to confuse children with too much information. This also avoided the peeking temptation, and helped to prevent them from forgetting the details and primary focus of each task. Consequently, breaks for setting up between the short mysteries were necessary and provided a solution to the previously mentioned issues. These short breaks consisted of quick, free role-play time with their characters. It was valuable to take a break from the previous task.

8.4 Data analysis

Although the *Mystery House* data was constituted of four separate tasks, I will present the overarching themes constructed from examining the detailed manual "process-coding" of audio-visual transcript data and simultaneous video examination throughout the full experience.

8.4.1 Themes

8.4.1.1 Development over time

Throughout the *House Mystery* tasks, the children showed signs of learning and development. In particular, they shifted from *'wild' guessing* to *exploring* the scenario, making specific *observations, interpreting the evidence,* and using those to *draw conclusions*. Overall, they sustained an *attentive* and *alert attitude*.

Initially*, 'wild' guessing* seemed to be the most common reaction across the groups. In every session, some children acted upon impulse and commented on or made guesses without giving much thought, without taking a glance or exploring the physical mystery house. Because of this, the children had no concrete evidence to base upon or support their guesses. In Task 2, for example, when asked whether they thought the character John had a shower, some guessed in the following ways:

> ***'True, because you have to shower'*** Ava (Session 2, Birch Primary School). Ava's response, for example, was related to general social practice rather than focusing on the physical house and the concrete planted evidence.

or

> ***'A lie'*** Amanda (Session 4, Birch Primary School). Amanda was 'wild' guessing without looking at the scenery. When I asked her why she thought it was a lie, Amanda looked at me, showing signs of not being sure and therefore looking like she was guessing randomly.

or

> ***'Is a lie' 'Because he's kidding' 'Because he said he had a shower'*** (Ruth, Session 6, Birch Primary School). Based on the context, Ruth's answer seemed like a random guess and she was unable to sustain it with an explanation.

With a slightly different approach, Marc provided a very literal explanation drawn from the physical observation of John's figurine rather than from the observation of the scenario and planted clues. He argued:

> ***'I know it's not true.' 'Because I know, Tommy, he didn't even go to the bathroom. He didn't even take off his trousers.' 'He can't be able to'.'*** Marc: while looking at Tommy/John, the Playmobil® figure (Session 3, Birch Primary School).

Marc was being very literal in relation to the figurine's pre-formed nature. Marc used *observations* to make his first decision, but he only focused on the figurine, and his

relatively realistic thinking did not encompass the pretend nature of role play. Marc definitely showed an interesting way of thinking across as well as a rich level of language in his talks.

Since most children's reactions were to make similar wild guesses, I encouraged them to observe. Bruno and Ava, for example, had not engaged in any observations until they were encouraged to do so. They responded and reacted in the following way when they did so:

> **'Because, /Aaaa/oooohhhhhh/ I see soap and bubbles'** Ava/Bruno: expressing in a surprised manner a eureka reaction after putting the two pieces of information together (Session 2, Birch Primary School).

Similarly, Amanda, in Extract 8.1, gave the true or false verdict without giving it much thought. However, when I encouraged the children to investigate, they instantly realised that there was concrete information indicating that Amanda could potentially be wrong. Extract 8.1 shows how the children mentioned the set of clues they had found and how Maria proceeded to conclude, screaming with excitement:

> **'Is not a lieeee!!!'** Maria (Session 4, Birch Primary School).

Maria and Robin: *Oh, there is, there is…*

Amanda: *It's true because there is (are) all those pieces* [looking at the clues (evidence), she changes her mind about the lie].

Me: *What are those pieces saying?*

Maria and Robin: *Waterrrrr!*

Amanda: *Water* [very quietly].

Maria: *Can I see it?*

Robin: *There is a sign thing* [picking up the image with the soap that says the word 'soap'].

Me: *It says 'soap'.*

Amanda: *It just says soap* [putting the soap in the bathroom sink where the soap is commonly located].

Maria: *Is not a lieeee!!!*

(Birch Primary School, Session 4)

Extract 8.1: Session 4, Birch Primary School.

When the children noticed the clues, some acted with surprise and intrigued expressions. Even though the children did not engage in observation at first glance and *guessed wildly*, after being encouraged by either me or the other children, most changed their action strategy to *conclusions based on observations* and physical *evidence*.

The procedures and steps taken during enquiry were often silent, and some children, like Maria in Extract 1, implicitly showed the thinking without articulating the explanation behind it. This could have been due to many reasons, including taking for granted that others could interpret the clues differently (theory of mind). In reality, in this particular case, all the children noticed, identified, and interpreted the planted evidence in a similar way. They pointed at the clues, and most made comments such as:

> *'Water!' 'He had a shower'* Elaine, replying to my question about what the water meant (Session 6, Birch Primary School)

> *'Because is wet and is not clean in there.'* Stella, referring to observations on the house bathroom (Session 3, Birch Primary School)

> *'I see soap in the floor'* Marc (Session 3, Birch Primary School)

> *'I see a sponge'* Marc (Session 3, Birch Primary School)

> *'I see water inside'* Stella (Session 3, Birch Primary School)

> *'Water and bubbles, nothing in the toilet'* Bruno/Ava? (Session 2, Birch Primary School)

In addition, some children went into further detail, like Anais and the rest of the detectives in Extract 8.2, and Bruno and Ava in Extract 8.3 below. In these cases, the children showed attention to language and awareness of a technicality. They discussed that John did not actually have a shower, as there was no shower; rather, he had had a bath. All the children in Extract 8.2 agreed with Anais; however, Ava, in a different session (Extract 8.3) argued that:

> *'A bath is a shower as well'* (Session 2, Birch Primary School).

This shows that some children were precise with language and aware of technicalities, which opened new opportunities for talk, developing skills for dialogue, dialogic thinking, and further opportunities for critical thinking. Those opportunities were not all pursued in reality, but understanding and identifying the potential for Critical Thinking Moments was key.

Anais: *Ahhh* [Anais seems to be realising]

Isla: *Yeahh!!!*

Me: *Did he?*

Cooper: *Yeah, because it's here* [pointing]. [Cooper noticing theyre are some clues suggesting he could have had a bath. All the children are looking at the bathroom.]

Anais: *Well, I think he got a bath cause there is no shower* [they differentiate whether we are talking about a bath versus a shower]

Cooper: *There is no shower.*

Children: *Because...*

Anais: *Definitely bath.*

Isla: *Let me see. Bath, definitely bath.*

Anais: *I think he was inside the toilet?* [carrying her Playmobil**®** figure around while looking]. *No, No, No.*

Me: *You think so?*

Anais: *No, I think not inside the toilet. He was over here. I think he was also here* [pointing at spots; it looks like they are following the evidence and interpreting where John was based on clues].

Me: *So, do you think he did actually have a shower or a bath?*

Children: *A bath!* [all at the same time, with the clues they were very certain]

Me: *All right. Was he saying the truth?*

Children: *Nooo* [All the children; they confidently solve the mystery].

Me: *Because he had a bath, OK.* [restating/summarising]

(Birch Primary School, Session 5)

Extract 8.2: Session 5, Birch Primary School.

Ava: *True, because you have to shower.* [Children are wild guessing, and Ava is reasoning based on what we are supposed to do rather than on evidence] [wild guess; they have not observed until they are encouraged to do so]

Me: *But how do you know if he had a shower? You can look around pointing at the rooms* [making a reference to invite them to observe further] *Because…*

Ava: *Aaaa/oooohhhhhh* [surprise/eureka reaction, as though she was putting these two pieces of information together]. *I see soap and bubbles.*

Me: *What else?*

Ava: *Water and bubbles, nothing in the toilet.*

Me: *What is this?*

Ava: *Water.*

Me: *Water. So, do you think John was saying the truth? Why do you think that?*

Ava: *Yeah. To be clean* [responding to why as to what for question].

Me: *But how do you know he is saying the truth? What do you see?*

Bruno: *No, he had a bath* [Bruno suggests he is not telling the truth about having a shower because he had actually had a bath.]

Me: *So, did he had (have) a shower or a bath?*

Bruno: *A bath.*

Ava: *A bath, a bath, a bath is a shower as well…*

(Birch Primary School, Session 2)

Extract 8.3: Session 2, Birch Primary School.

The children's attitude after the second statement in Task 2 was more *focused and alert, and they paid more attention to detail*. Children explored and observed the scene with curiosity, showing engagement and confidence in their detective role. Among others, they used expressions such as:

'Let's see, let's see' (Session 5, Birch Primary School).

'Let's check upstairs just in case', Isla (Session 5, Birch Primary School).

'I need my magnifying glass', Anais, utilising some of the detective tools (Session 5, Birch Primary School).

I encouraged *observation* of the *evidence* and guided the children when necessary to making *inferences*. This input was useful and affected how they encountered the next challenges. In Session 3, Maria, Robin, and Amanda showed a significant change in their attitude with observable alertness, standing posture and watching, carefully listening to what seemed to be coming next, and continuously observing as if they were getting ready for the next mystery. As a result of the challenge, it seemed something had clicked within the children, as if they had grasped the key to success in this particular game and had understood that the evidence would potentially lead them to an answer.

By John's fourth true or false statement, the children seem to have become skillful in the specific detective task. The children were attentive (ready body position and observant) and were alert to what John was going to say. Therefore, as soon as John said 'I picked up the mail', the children started their enquiry and verbalised their thoughts. For many, this question was straightforward. This shows the building of experience and learning over time, which involves a shift from what was novel to familiarising and interiorising.

In summary, the children showed a tendency to wild guess or impulsively answer at first glance, but they were observant and more attentive as soon as they were encouraged to be. The change in attitude and performance remained the habit throughout the rest of the *House Mystery* tasks. They were attentive and generally made meaning of the provided evidence and inferred from them to draw conclusions about whether the statement was true or false. Some children were faster to identify and interpret clues and draw conclusions. Others took a bit longer. Some children were more meticulous with details and language than others and pointed out details, such as taking a bath rather than a shower.

8.4.1.2 Familiar and relatable versus novel

Critical thinking requires intention–motivation, involvement, time–skill investment, and effort when facing challenges. A familiar and intuitive task (including familiar content), such as Task 1, was not likely to involve much challenge or cognitive effort nor provoke increasing curiosity. For this reason, I presumed that a straightforward task like the first one would not be the most profitable context for critical thinking. In the first task, the children were told they needed to investigate where the remote control was (which I had hidden under the sofa

in the living room, where the miniature TV was also located). Most children suspected and then looked in the living room, and only a few suggested other places. The intuitive nature of the task provoked instant and predictable answers. In Session 2, Ava was even able to anticipate the problem based on 'I was watching TV'. She interrupted by finishing my sentence:

'The remote!' Ava: with a eureka expression (Session 2, Birch Primary School).

Expressions like this showed her detective role engagement (alertness) and task predictability, even before explaining the full task instruction.

Bruno, in Session 2, for example, looked behind the miniature sofa without verbally articulating anything. This seemed to be a logical thing to do and likely a familiar experience. When I asked why he thought it was behind the sofa, he said:

'I think he accidentally dropped it, and then it's behind here and here.' Bruno (Session 2, Birch Primary School).

Bruno gave a valid explanation and a possible theory of what could have happened.

Some children mentioned places that were less likely, and in some cases, gave clear reasons for why they thought this. Even though Marc, Will, and Stella suggested that the remote was probably in the living room, Marc later suggested the plausibility of it being in other places, offering alternative views:

'It might be down there, and it might be broken!' Marc: pointing under the bed (Session 3, Birch Primary School).

When I asked why he thought it could be under the bed, Marc responded:

'It might be, 'cause someone might accidentally use it to control the telly in night view (?) And it might hide it somewhere' (Session 3, Birch Primary School).

It is possible to see how this child constructed an argument of plausibility for the remote being under the bed.

Some children checked in the living room but not thoroughly (it was a tiny remote control, so they might have had difficulties in finding it); they then checked in other locations. Bruno, for example, later concluded:

> **'It's not in any of the rooms here, so that means, so that means it's in here'**
> Bruno: pointing at the rooms we talked about, like the bathroom, then pointing
> at the living room (Session 2, Birch Primary School).

Bruno's line of thinking is clear. He first searched in the area where he originally thought it would be without success, and then proceeded to look elsewhere. After the second unsuccessful search, Bruno logically reasoned using the *discarding strategy* and concluded that if the remote is not in the rest of the rooms, it must be in the living room.

No child mentioned anything regarding the miniature TV being in the living room. This could be because it was obvious to them, and they simply did not feel it was worth mentioning. Furthermore, it could be that children could relate to the disappearance of a remote, and so were able to predict with common sense, probability, and personal experiences. As previously foreseen, it seemed that the level of challenge and familiarity (including openness) did affect how productive the task was in relation to stimulating critical thinking skills and dispositions.

It would have been interesting to see what would have happened if I had put the miniature TV in a different, less common room, and whether the children would have noticed and therefore made reference to the physical TV. My suspicion, based on the first question's response, is that the children's first instinct seemed to be to give a logical answer without much observation unless they were encouraged to look around. It seemed that most children were led by probability logic rather than based on actual observations of the miniature home. When I asked Lara why she thought it was in the living room, she responded:

> **'Yeah,'cause that's where we watch TV'** (Session 6, Birch Primary School).

Isla said she knew it was below the sofa:

> **'Because I put stuff under by accident'** (Session 5, Birch Primary School).

Isla's comment shows how her experience is linked to how she acts and thinks in the mystery house, as she is relating what happened in the mystery with something common that is already familiar to her.

Some children shared their experiences regarding what they had done when the same kind of thing happened to them. Anais said:

> **'I always lose it',** Anais (Session 5, Birch Primary School), and when I asked her how we could find it, Anais shared the following strategy:

> **'I check everywhere until I find it.'**

Anais also related the task to when she wanted to find her parents' wedding video, for which she had looked everywhere in the house except the attic, where she is not allowed because of the dirt. She used the Playmobil® figure to demonstrate how she looks for things when something is missing at home, checking in different rooms using the Playmobil® figure:

> **'I checked over there, over there, there… (exploring the house, demonstrating with the use of Playmobil® and the house what she did when that happened to her at home) I checked below the sofa then I check everywhere except the attic, I'm not allowed there'** Anais (Session 5, Birch Primary School).

Similarly, Cooper said:

> **'I find it, and if I can't find it, I wait for the next day. I look everywhere, and I think I'm really good at finding my sister's x (clothes/goes?), I found six already'** Cooper (session 5, Birch Primary School).

This type of common and realistic problem was easily relatable to their personal experiences, which could catalyse the sharing of their own stories. This was good as a starter task, as well as to set a standard level of thinking with a marked difference from tasks that involved 'find the randomly hidden object'.

Summarising the most familiar–relatable task, as predicted, was not challenging enough to stimulate children's critical thinking skills and dispositions. Instead, it was useful to stimulate

talk and share personal experiences and own strategies in aspects of their lives that were familiar to the children. Familiarity seemed to be useful when one's intention was to understand how children did certain things, or if the intention was for children to be aware and think about those strategies and help make those techniques more concrete. Aspects of critical thinking that were more directly relevant to this *House Mystery* experience happened in greater abundance when the task context was novel, challenging, and requiring more effort. Consequently, it was more likely to be present when confronting a motivating challenge, rather than something more familiar and relatable that could be resolved through intuition rather than investigation.

8.4.1.3 Observation, exploration, and interpretation

Guessing purely based on instinct and own experience was ineffective without observation, exploration, and interpretation of the physical scene in Tasks 2, 3, and 4. The tasks were designed this way to be able to study the children's thinking and behaviours, and the approaches they took when confronting the mysteries. The focus and interest lay in the children's attention and handling of clues (evidence) and to explore signs of the skills related to the interpretation, relation-making, analysing, inferencing, theorising, and reasoning, which are crucial for critical thinking. Due to the open design, the answers could differ and go in various directions. In other words, there was no one right or wrong answer. The key lies in using the evidence provided to draw conclusions accordingly and reason to find the answer.

The children immersed in the detective role during the *House Mystery* utilised detective gear and tools. Extract 8.4 for example, shows how Marc, Stella and Will used their tools for investigation, in this case a magnifying glass, to explore the evidence in detail and try to look for further information. Marc observed the cake meticulously, and even though the cake seemed whole to the naked eye, he identified a 'micro' piece missing (a pixellated detail of printing). On the one hand, as mentioned earlier, he could have been trying to look for further information and found that detail as confirmation; however, on the other hand, the possibility of them trying to make it more playful and interesting is possible, given that it was detective mystery play.

Me: *Is he saying the truth?*

[They all look in the kitchen, and Stella races to find the pie in the kitchen. They are all observing it.]

Marc: *Let's just check. OK, I'll need my magnifying glass.* [Marc takes his magnifying glass to inspect the pie well to see whether any of it has been eaten. Both Will and Stella also follow and get their own. The item is small, but this activity invites children to use their tools on their own initiative without being encouraged. Marc is looking at the pie with the magnifying glass.]

Marc: *There! it's there.* [While looking at it with the magnifying glass]

Will and Stella: *Let me see* [approaching to look at it with the magnifying glass as well].

[The children are checking carefully.]

Marc: *He did eat pie.*

Stella: *He did eat pie.*

[The pie is whole; however, they are looking at the millimetre level, finding a small hole invisible to the naked eye.]

Me: *He did? Where did you see it?*

Marc: *Right there, with the magnifying glass, he shows me then.* [I don't see anything.]

Me: *Is it a little piece?*

Marc: *Yes.*

Me: *All right.*

Marc: *Tommy, you tell the truth every time!* [Marc is giving a lecture to Tommy/John.]

(Birch Primary School, Session 3)

Extract 8.4: Marc, Stella, Will (Session 3, Birch Primary School).

On the second question of Task 2, most children were *alert*, some *standing, listening,* and *observing* as if they were ready and in tension to respond as soon as they heard John's statement. This was different from that of the first task and the first statement of the second task. The children's behaviour showed they had learnt from the previous activities that the key to resolving the mystery was through drawing conclusions from *exploration*, *observation, identification, and interpretation of clues* (see Extract 8.5).

[The children are observing with alertness. Stella immediately looks in the kitchen and finds a clue.]

Marc: *That must be chocolate.*

[The children looked at the chocolate (they found it, but they must make sense of it before answering whether Tommy/John lied or not)]

Marc: *Lie (?) You have!* [addressing his comment to John the Playmobil® character]

> **Me:** *Have you? Why?*
>
> **Marc:** *'Cause I see a little bar off of it* [showing a piece of chocolate he found]. *Tommy, you have been eating chocolate!*
>
> **Me:** *Yeah.*
>
> **Marc:** *Because I see a bar.*
>
> **Stella:** *Broken, hehehe.*
>
> **Marc and Stella:** *Yeah.*
>
> (Birch Primary School, Section 3)

Extract 8.5: Marc, Stella, Will (Session 3, Birch Primary School).

When the children were asked why they drew a particular conclusion, the children stated things like:

> **'Ohh, well, the cake is there, it's not chomped (not eaten)'** Ava (Session 2, Birch Primary School)

> **'No, he didn't,'** Anais.

Cooper followed with:

> **'Because still all the pie'** Cooper (Session 5, Birch Primary School)

Similarly, Robin stated:

> **'Noooo, 'cause it doesn't have any bites'** Robin (Session 4, Birch Primary School).

In Session 2, immediately Bruno *identified and reasoned* why he believed that John was lying:

> **'Look, I found chocolate' 'I think he is lying'** *(holding the chocolate)'* Bruno (Session 2, Birch Primary School).

When I asked why, Bruno said*:*

> **'Because someone has eaten a bit, so I think it's him'** *(showing that the piece of chocolate is missing a tiny piece)'*.

Concluding his judgement with:

'Yeah, I think he is lying', Bruno (Session 2, Birch Primary School).

Cooper, Isla, and Anais are looking in the kitchen. They all clearly expressed with words and gestures that John lied when they were told that John/Tommy said he did not eat the chocolate. Cooper also specified:

'He ate the chocolate. He ate a tiny bit,' Cooper: demonstrating they have noticed there was a bite in the planted clue (Session 5, Birch Primary School).

In Session 3, the children acted in a similar way, and, as in the previous examples, Amanda stated that she thought that John was lying:

'Because it has a munch' Amanda: while showing me the evidence of the piece of chocolate and the bite (Session 4, Birch Primary School).

There was naturally some variation in the children's interpretations of the same object, for example, regarding the meaning of present object versus absent object. Elaine in session 6 said that John/Tommy did not eat the chocolate, but when I asked why, Elaine said:

'Because the chocolate is there' (Session 6, Birch Primary School).

This happened in other examples, too, and it seemed that for some, the object's appearance in the scene was an indication that something did happen. Maybe it is about a dissonance between not eating ALL the chocolate, rather than taking just a bite—is this the same as eating the chocolate?

In summary, most children's alertness (visual, listening, posture) increased after the first parts, more prominently after Task 2.2. The children showed the ability to explore, observe, identify key clues, make meaning of them, create relations, engage in analysis of the item and ideas, engage in reasoning, and draw conclusions regarding the specific question in different ways. Natural variations were found across the children. Interpretation of the clues varied from individual to individual. raising interesting reflections about objects' presence and meaning in the reality and context of play. Many opportunities to pursue and extend dialogue

for potential critical thinking moment (PCTM) were found. Identifying these opportunities was key; however, more time and space were needed to pursue them and provide each child with the value and time to fully flourish. The present study faced time limitations from both the children's schedule and the study timeline.

8.4.1.4 Theory construction and creativity

In the *Mystery House* experience, children demonstrated skilfulness in theory construction in regard to the challenges they faced. Children used different approaches for constructing their theories as explanations during detective play, and while some children held more realistic perspectives, others shared more imaginary and playful outlooks. Theory construction was naturally more prominent in Tasks 3 and 4, since the task was designed with the intention to stimulate that particular purpose. While the first task was more intuitive, the second task required alertness, exploration, identifying clues, interpreting meanings, and making connections. This was built into the third and fourth parts, which involved further challenge, putting emphasis on relation-making, analysing, theorising, and explaining. This further challenge was affected by the mysteries' openness. The last two parts did not have straightforward answers and were open to interpretation, which stimulated uncertainty, alternative perspective, questioning, and dialogue. Tasks 3 and 4 also stimulated collective speculation, making sense of the part and the whole, prompting questioning, and alternative ways of thinking.

The sample from Session 5 below illustrates that it was possible to see what the children's thinking process was like: the children's dispositions when confronting uncertainty, how the made sense of the clues, and how they built possible explanations, with contrasting playful and realistic approaches interacting with one another within detective play. It also showed how the children needed support at certain moments. Isla found a twig indoors and expressed her thoughts about it like this:

> **'That's odd. Why would you have a twig inside?'** Isla (Session 5, Birch Primary School).

Isla's statement and behaviours showed role engagement, a sceptical attitude, wonder, and curiosity to find the reason that would explain the odd item. Since the cake was a key item to

consider, Anais speculated and creatively constructed a scenario that would connect the above-mentioned twig and the cake:

> *'I know, how about, well, he went outside to play then he went back inside, then he accidentally dropped the twigs, then he went here* **[pointing at the kitchen]** *to get some cake and then he might have eaten it'* Anais (Session 5, Birch Primary School). *(theorising creatively)*

Isla expressed doubt in relation to Anais' explanation, like*:*

> *'Mmm… I'm not sure',* Isla (Session 5, Birch Primary School)

Cooper also disagreed with Anais's theory, but rather than focusing on her explanation, his thinking presented a more playful role-play dimension:

> *'No, because I'm smelling it',* Cooper: pretending to smell the cake, and therefore the cake couldn't have been eaten yet (Session 5, Birch Primary School).

When I asked Isla about her thoughts, she remained doubtful.

> *'I'm not really sure',* Isla (Session 5, Birch Primary School)

Since Isla was not convinced, she kept thinking and looking for more convincing answers, showing a persistent disposition. By that time, towards the end of the task, even when Anais had left, Isla remained clearly determined to keep working on the mystery. Isla kept her focus and repeated with curiosity:

> *'Where is the cake?!!!* Isla: excited and curious, displaying her motivation to find answers.

The bell rang. They had a couple of minutes left. Isla insisted:

> *'Well, I can't see the cake anyway,'* Isla.

Given the time constraint (a few minutes left) and her curiosity and need to find the answer, I encouraged thinking about the possible meaning of the absent item and suggested a link with the other clue (the nest):

> *'How do we explain there is no cake? Could it have something to do with the nest?'* Me.

And responded with:

> *'Mmmmm, no. Or did the birds eat it? Birds eating cake, yeah',* Isla (Session 5, Birch Primary School).

Children showed very different ways and approaches to thinking like a detective when trying to interpret the clues and generate explanations and possible theories regarding the mystery. Some utilised creative fantastical theories, which would not be considered reasonable from a realistic, adult-centric point of view. However, what is considered plausible and reasonable shifts in the context of role-play, since imagination and fiction are likely to be involved.

In Session 6, Ruth's line of thinking differed from the others. Ruth believed that worms could have eaten the cake, and even though I tried to challenge her thinking by questioning the plausibility, she persisted, making meaning of the next clue (the nest) based on her first assumptions. In addition, Ruth interpreted the 'mud' clue differently from the rest, making it fit with her original story. When encountering the eggs in the nest, Ruth stated that the worms were coming out of the eggs. She even pointed out that only one egg had hatched due to the worm quantity.

I asked the other detectives' views in order to include them in the conversation and to learn about what they thought. While explicitly taking Ruth's theory into consideration as a possibility, I also encourage alternative ideas about what other things could come out of the eggs. The children responded in different ways. Lara mentioned that it could be chicks. Lara's thinking showed a more realistic lens for investigation and interpretation of the context compared to Elaine's more fantastical 'baby unicorns' suggestion. Ruth maintained her position regarding the worm throughout the process and when asked to think about how the

twigs got indoors, Ruth did not respond to the actual question but provided an explanation that related the twigs to the worms like this:

> ***'Maybe the worm likes to lay on the twigs'*** *(Ruth) (selective in her thinking)*.

Elaine thought that unicorns were born from eggs, which would be unreasonable from a realistic world perspective but plausible in the context of play. Whether she actually believed unicorns existed in real life or not remained a question. Even though the children did not agree or find a consensus, I summarised all the ideas and left an open ending to the mystery by stating that it could have been either a chick or a worm, forgetting to mention Elaine's contribution, which she did not hesitate to restate:

> ***'Or the unicorn'*** (Elaine).

After apologising to Elaine, we proceeded to start the next task. Belief in fictional creatures is prominent in young children, sometimes blurring the line between fantasy and reality for some, and there should be no such existing boundary in the context of play.

At times, even when children had found key information (for example, the nest) for some, the tendency was to keep looking for more clues rather than trying to understand what it could mean. This was a similar habit to that which appeared in previous detective experiences, such as in the *Snack Mystery*. In these cases, I tried to redirect the children, for example encouraging thinking and relating those clues to the question, as in Session 2, so I said:

> ***'We have a nest, so who do you think took the cake? Does this give us any clue?'***.
> After that, Stella said with a eureka sound, ***'Ohhh, I know, a bird came'*** (Stella, Session 2).

In Task 3, the children shared their thoughts and *constructed their theories* aloud:

> ***'He was playing outside because he has his boots also, em, he wasn't playing outside'*** Isla (Session 5, Birch Primary School).

This is followed by:

'But it might be still inside', Isla (Session 5, Birch Primary School).

Isla was making sense and constructing thinking while sharing it aloud. Her first assumption based on her interpretation of the clues is that John was playing outside (with the toy), but her thinking shifted and developed while she was talking, as she was able to see the *plausibility* of the toy being inside. She demonstrated seeing diverse possibilities and looking at the issue beyond the obvious; for instance, the clues suggesting someone is outside do not mean that the bear is still outside.

Anais followed with a different theory:

'Ohh, I know. How about, he was gone with no shoes on and the grass was so dry and walk with no shoes on', Anais: imitating walking with her fingers to demonstrate in practice (Session 5, Birch Primary School).

After *exploring* some of the clues, the detectives in Session 5 *found new evidence,* and they *explored* those in detail with the magnifying glass as I shone a light with the miniature lamp. *They commented and drew conclusions* in the following way:

'Muddy boots, welly boots.' 'Mmm. It's wet' Anais: referring to the umbrella (Session 5, Birch Primary School).

The detectives were all focused on the same area, and when I asked them what that meand, they answered:

'John was playing outside' (Session 5, Birch Primary School).

While the detectives were looking outside with the magnifying glass, Anais said:

'Ohh, I found some mud! That means it must be over there. That means it must be over there somewhere.'

When I asked how they knew it was outside, Isla responded:

> *'Because there is a wet umbrella so it must have been outside and then put it back in and then lost his teddy bear'*, Isla: trying to reason what she concluded after the investigation (Session 5, Birch Primary School).

The extracts from Session 5, Task 3, shed some light on the children's engagement in the process of *exploration, theorising, explanation,* <u>and</u> *drawing conclusions.*

Other explanations from the children were specifically suited to the context of fantasy play. In Session 6, after finding the hidden bear, I asked the children how the toy ended up outside. A child* responded she did not know, and Ruth responded:

> *'Because he went out left footprints without the boy knowing'* *(meaning that the teddy bear actually went outside without the boy knowing).*

Ruth's explanation showed an alternative theory with a fantasy twist that could only be possible in a play context. I can only assume that if I suggested that theory to children, some would have responded that toys cannot walk; however, contextualised within the context of detective play Ruth's theory was plausible if she had 'given' the bear living attributes, showing a creative way of thinking.

In Session 2, when the children realised that they had to consider the outdoors area of the mystery house, Bruno shared aloud:

> *'Could it be Bluebell (dog) or the cat?'* *Bruno: while Ava looked at the dog, both gave eureka sounds showing possible ideas and explanations* (Session 2, Birch Primary School).

> *'The cat was in the living room all the time, so it must have been Bluebell (the dog)'* *Bruno* (Session 2, Birch Primary School).

With some help, Bruno made sense of the evidence and had a possible theory that explained the evidence pointing to the outdoors. He used the discarding strategy to exclude the cat and therefore conclude that 'it must have been' the dog who did it. His thinking shows organisation, change, and linear development, as he first thought about the suspects and then reasoned that one of them needed to be discarded to finally conclude who the actual suspect

was. It is important to consider where creativity and the construction of theory fit in this fantastic world. Ava agreed with Bruno, and after that Bruno took a step further by wanting to confirm the theory with John, the fictional Playmobil® character, to possibly confirm whether it was consistent, utilising the tools in a strategic manner:

> **'Did you take her (the dog) outside in the first place? (Bruno asks John if he took the dog outside.) When John (Playmobil® fictional character) agreed, Bruno concluded, 'That means she (the dog) did it'.** (Session 2, Birch Primary School).

Bruno's and Ava's investigation above is interesting in terms of how they constructed knowledge. They created a theory that fits the evidence as well as fabricating additional observations (evidence to consider, like the dog not being there all the time) to fit their theory.

Summarising the *Mystery House* experience, it was useful to see the children's reasoning, theorising abilities, and creativity skills. While some took a more playful approach to mystery solving, others maintained a more realistic lens. There was variation in how children interpreted the clues, events, and overall ideas too. It is important to consider to what extent critical thinking can be separated from the fantastical or realistic world: is critical thinking considered less when the reasoning is based on fantasy, especially when the task is play-based?

8.4.1.5 Structure, open-endedness, and readiness

All the *House Mystery* tasks were semi-structured; however, in comparison to the *Zoo Mystery* and the *Snack Mystery,* there was significantly more structure and limitation. This is interesting to think about in relation to the nature and quality of the critical thinking elicited. It was apparent that the design (type of questions, for example) tended to stimulate shorter answers and conversations. Despite that, the children listened to one another, learnt from others, and took other detectives' views into account. However, the children mostly expressed what they thought 'individually', and there was less emphasis on collaboration and working together in comparison to other cases. The children listened respectfully to each other, at times agreeing and disagreeing, but tended not to produce extensive or collective discussions for critical thinking. It was, however, effective to understand skills and

dispositions in relation to the tasks, and the views of each child in relation to what happened. In other words, because of the tighter design structure, it was more likely to stimulate skills of interest. Data was also easier to organise, code, and analyse. In comparison to the other cases, the children's actions focused on observation, interpretation, and theory building. It did not require as much actual physical and manipulative investigation, such as in the *Snack Mystery,* for example, in which the collective was more reliant on one another to manage the detective work.

The children's performance showed that the *Mystery House* required a certain readiness or maturity to succeed. This could have been due to its structured and less manipulative nature, as despite its semi-structured nature, there was more limitation in terms of performance and enquiry possibilities. The task required children to already have some skills, such as attention, listening to instructions and retaining information, and was reliant on observation and verbalisation for successful completion. This meant that the children needed to be ready with arguably more sophisticated skills than other tasks. In addition, there were limited opportunities for physical movement due to the small-world house, the task design and the nature of the objectives. This meant the task may not be appropriate for some children at certain moments in time and, along with the use of small pieces and the fine motor skills for manipulating the model, meant it would also not be appropriate for children aged 3 years and younger. These restrictions were quite different from the other tasks, which felt more adaptable.

Readiness can also be dispositional, as demonstrated by the children at Aspen School. All data presented in this analysis section was taken from Birch Primary School, as the task was not successfully implemented in Aspen Primary School (one group). The children in Aspen Primary School did join in detective play for almost one hour and engaged with the miniature house. However, they refused to follow the *House Mystery* play as intended. In this group, it was observable from the beginning that the children were not 'in the spirit' to play such a structured game. This was perceived both in the environment and in the children's behaviours. Despite giving it a try, since they stated willingness to play, no relevant data was obtained. Focused experiences like this require allocated time, space, focus, and overall readiness at the moment in time. The children were overexcited and seemed tired, possibly

due to festivities and school celebrations; therefore, it does not mean that they did not have the skills or that it could not have been implemented successfully at a different time.

Unlike the overall structure, Parts 3 and 4 were more open-ended, which increased complexity. For example, in Task 3, the planted evidence (leaves, mud, muddy welly boots, puddle, and wet umbrella, among others) suggested an investigation path linked with the outdoors. In this detective job, the opportunities for different *interpretations and the creation of creative theories* that could possibly explain what happened were endless. As a result, the task storyline could be much more complex to create and follow. The following example illustrates the level of complexity of the task and how Cooper and Bruno struggled to follow the narrative. In Session 6, Cooper demonstrated some confusion regarding the aim of the game:

> ***'I thought you said he lost his teddy bear'*** Cooper: after the other children were telling me that the evidence suggested that John was outside.

Cooper's confusion seemed to be due to the amount of information and steps to take and remember during the process of problem solving. I reminded him that John, the Playmobil® fictional character, did lose his toy, as well as what the task required and what we were doing to try and achieve it. In Session 2, Bruno also showed signs of confusion and forgetfulness on two occasions. On the first occasion, while he was investigating and looking for the item, he suddenly forgot what he was looking for and said:

> ***'What are we looking for again?'*** Bruno (Session 2, Birch Primary School).

When I rebounded the question to Ava, she clarified that we were looking for 'the teddy bear'. On the second occasion when John (the fictional Playmobil® character) said:

> ***'Should we look outside if my bear is outside? Come and look'***.

Bruno responded:

> ***'What's outside?'***

These three examples illustrated that this specific task can be full of twists with a large amount of information to think about and maintain simultaneously, among others the use of diverse characters, information sources, and props alongside the parallel individual detective journeys of peers, all combined to increase the challenge of the task.

Even though the children identified what most items were (except two groups), some had *difficulty relating the evidence in connection to* mystery, in other words, what those clues (puddle, wet umbrella, dirt, and wet boots, among others) could possibly *mean in relation* to the lost toy. The clues were intended to suggest the outdoors and lead children into *observing* the house and garden. In these cases, the children seemed to need more support to continue, so I encouraged them to think and *focus* on what those new clues suggested and to *scaffold* the children's thinking in different ways. In Session 6, the detectives named the different found items, but they *did not relate* them to any *theory* that would explain the mystery or *resolve* it. I tried to support the children and help them (more or less subtle suggestions) to make further meaning of these clues. This generally encouraged the children to talk and focus on the highlighted aspect. For example, Ruth noticed the umbrella and puddles, and when I attempted to help her by asking her to think about the meaning of those further ('the umbrella has puddles and it's wet. What does that mean?') Ruth responded with a question: *'The teddy bear went outside?'* giving an interesting but uncertain question as an answer. On another occasion, when I posed the question with curiosity, **'Why is there mud inside and outside; some leaves inside and outside? I wonder why.'** to encourage talk. Elaine responded:

> **'I wonder why, too…'** with a similar wondering tone (Session 6, Birch Primary School).

On some of these occasions, I utilised the physical material as a pedagogical tool tailored to the particular moment (e.g., encouraging children to ask John). In addition, the children utilised the material to assist them in their work with *self-initiative* as well as from *previous learning*. In Session 2, Bruno had not connected any of the clues to the question itself but rather chose to use his Playmobil® figure as a tool for communicating and enquiring further information about John/Tommy (the other Playmobil® character):

'John, what/where did you have it in the first place?' (Session 2, Birch Primary

School).

Even though I could have responded with an informative sentence to fulfil these needs, I

wanted the children to start linking the clues before giving additional information, so I utilised

John's character to fulfil my interest by providing vague information in this specific case: 'I

was playing with the teddy bear but I don't remember… (John)'. Additionally, I continued

encouraging what was of my interest at the time through my researcher's role and without

using John in the following way:

> **'But, if there is an umbrella and it's wet and there are some leaves inside… what**
>
> **else can we find?'** Me: trying to remind the children about the clues and
>
> facilitating the process of putting the information together.

In general, relating and finding a cohesive explanation with such broad opportunities to

generate diverse ideas and connecting those ideas to find answers, such as the ones provided

in Task 4, was complex for some children. Task 4 involved challenges that were far more

complex than perceived on the surface. At times, like in the *Snack Mystery,* for example*,* I

needed to repeat the objectives or summarise what the children had already found out to stir

thinking and aid memory:

> **'There is grass, there is mud, there is a worm. What else did we find?'** Me
>
> (session 4)

Or:

> **'Remember, we have to figure out what happened with the cake. Who took it?**
>
> **Where is it?'** Me (session 4)

This type of adult input was important to remind the children of what they had found and

help prevent them from mixing the information up with previous tasks. It also helped the

children retain focus and keep others informed, as some children might have been focused

on something else instead. However, not all of my input was useful. The data also showed

interesting implications and the challenges of the time limitation I faced that came to the

surface after reflecting on my own performance. For example, Ava saw the nest with the eggs and expressed that it meant that the bird was there. Even though Ava might have already related the bird to the cake's disappearance, she did not have the chance (time) to verbalise that, as I jumped in prematurely with the idea by posing it as a question:

> **'Do you think the bird eat the cake?'** Me

This particular example was an 'unintentional' reaction to the time pressure when conducting fieldwork, as it was necessary to work within the strict schedule negotiated with the teacher and the school (e.g., the teachers' daily plan, children's daily routines, such as recess, lunch, etc.) as well as my requirements and plans as a researcher. In this scenario, the children had one last task left, and another group was proceeding before the bell for recess rang. This premature (rightly or wrongly) anticipation of what a child might say may have inhibited their opportunities for making these connections themselves.

The *House Mystery's* structure and the degree to which the tasks within it were open- or close-ended played an important role in the children's performance, and it is a key factor to consider when designing children's tasks for stimulating critical thinking. On the one hand, the structure was useful to ensure data related to the development and incidence of a restricted set of skills (skills related to interpretation and theorising, for example) were stimulated; however, it was less productive when wanting to stimulate and create a more fruitful context for collective critical thinking skills and dispositions in general. The children's answers were relatively short and focused, which was useful for organisation and data analysis (with benefits and constraints). The more open-ended tasks were productive but raised complexity for some children, too. Lastly, there was a degree of readiness needed to engage in the *Mystery House,* as planned. This more 'structured' aspect did not work at all with one group, so understanding when and how children are ready to take on an activity such as this is important.

8.5 Reflection upon experience and design

In the *Mystery House* experience, the children adopted the detective role confidently (many were well experienced from previous cases), which influenced the children's behaviours and performance when approaching play (detective character expectations). However, data showed diversity in children's thinking and approaches to mystery solving, with some having a realistic and others a more playful fantasy approach to detective play.

The limited physical space restricted by the size of the dollhouse naturally led to turn-taking, regulating the pace of the experience during the investigation and encouraging listening and sharing each individual's viewpoints. The children expressed thinking using verbal utterances, body language and the use of tools (using the Playmobil® character, for example). Thinking is individual and collectively constructed. However, there were fewer occurrences of productive collective discussions (shorter conversations) for critical thinking in general in comparison to the *Zoo Mystery* or the *Snack Mystery*. Instead, some children shared their viewpoints more concisely. During the *House Mystery* experience, children showed great alertness and focus.

The following table (Table 8.2) summarises the most recurrent behaviours related to critical thinking observed during the *Snack Mystery* experience. The colour scheme represents frequency, with the most frequent ones being the darkest and the least frequent ones being the lightest.

The *House Mystery* was useful for exercising specific skills related to exploration, identification and interpretation, relating, inference making, theory construction and explaining, which was challenging for some. The last two were more challenging and evident mostly in Tasks 3 and 4. Readiness in relation to this mystery case varied in comparison to the previous cases. Structure and open-endedness can affect the child's readiness to participate. This readiness varied across the children; for example, Maria and Robin demonstrated readiness beyond what was required by the task, and when the mystery was finished, they proceeded to create their own mysteries.

Table 8.2: Behaviours related to the Critical Thinking dispositions in the *House Mystery* case.

CT dispositions: House Mystery
1. To be curious and willing to find the answer
2. To be aroused by the process, focus and flow
3. To investigate
4. To be confident (autonomy and seeking help)
5. To self-correct
6. To take risks and have the courage to take action in different ways to open up to new ways of learning
7. To be prudent
8. To be persistent +++
9. To be open-minded, flexible and fair
10. To communicate, collaborate and value the contribution of others (dialogical thinking and collaboration)
11. To be resourceful and creative
12. **To be mindful, aware of self, goal, process, performance, etc. To use awareness productively (to plan for change, to modify or change actions, etc.).**

Key: Most frequent (darkest) - least frequent (lightest).	Frequently across the case	Occasionally/sometimes across the case	Rarely across the case

Overall, there was evidence of development and learning over time. This needs to be considered by practitioners, as the notion of building and scaffolding the skill set is useful, which relates to Dewey's (1938) principle of continuity and educational experiential growth.

Chapter 9 Discussion

The aim of this study was to explore the elements that were useful to create contexts for facilitating critical thinking opportunities in early years pupils and to understand what those critical thinking moments 'looked like' (how they manifested) in the context of 5-6-year-olds' detective play. This thesis's research questions were therefore structured in two fundamental parts. The first part focused on investigating the methodological and pedagogical aspects of facilitating young children's critical thinking in four different play contexts (Research Question 1) and examined in detail the benefits and constraints of variations across the four cases (Research Question 2). The second part targeted how young children's critical thinking (skills and dispositions) manifested during detective play (Research Question 3). In this chapter, I will discuss the findings related to the three research questions, and this will mean discussing related outcomes from across the four case studies. I will begin by discussing key findings in relation to the first research question:

> *What are the relational and contextual characteristics inherent in facilitating critical thinking using detective mystery play?*

9.1 General contextual and relational findings (Research Question 1)

Overall evidence across the four cases showed that using pedagogically appropriate methods with young children was productive in the context of researching thinking with young children. The detective mystery play experiences were grounded in a Western early years play-based social-constructivist perspective, which provided a robust research context to facilitate critical thinking in 5-6-year-old children. The data showed that the detective mystery play experience was catalytic to young children's thinking and its diverse manifestations. The activity was meaningful, age appropriate, respectful to children's needs and interests and enhanced their competencies. Targeting competencies for all children was challenging, given that the children were unknown to me as the outsider teacher–researcher. Therefore, despite being problematic to some degree, the use of a flexible design and prior experience of

knowledge, skills, and experience was beneficial. This was significant, because a degree of knowledge and familiarity to engage with the topic is argued to be necessary for critical thinking (Facione, 1990; Lai, 2011; Vincent-Lancrin et al., 2019); consequently, it was important to consider and incorporate this to the best of my capabilities in the design. As a consequence, I chose very familiar topics that most children could, to some extent, engage with, to increase the likelihood of success.

Naturally, some children across the study showed differences in what they knew, as well as in the vocabulary and skills relating to the verbal articulation of thinking. Differences in knowledge, strategies, and ways to think and manifest thinking during enquiry, however, did not inhibit the children from participating or demonstrating their own capabilities as thinkers and enquirer–investigators in the four detective experiences. For example, despite a child not knowing much about certain animals and wrongly thinking that mice have feathers instead of fur, in the *Snack Mystery*, this did not inhibit the child from engaging in enquiry, engaging in dialogue, and showing behaviours and abilities coded as or related to critical thinking. At the same time, prior knowledge and experiences did facilitate some children's connection making, transference, and in-depth analysis. For example, Mia's prior knowledge and experience of having a sick cat at home was shown to be useful in helping her to form her thinking, and this was reflected in her coded Critical Thinking Moment during the *Snack Mystery* investigation. I argue that using a pedagogically appropriate method from practice as a foundation for research design was inclusive and embraced children's differences due to its adaptability to the different needs, knowledge, and enhancing capabilities of the young participants.

Given the critiques associated with 'traditional' pedagogical practices limiting opportunities for developing critical thinking in the literature (for example, Fernández-Santín and Feliu-Torruella, 2017; Heyman, 2016; Murphy et al., 2014; Dewar, 2014; NAEYC, 2011; Karin-Hognestad, 2010; Ku, 2009; Paul et al., 1995), alternative pedagogical methods and practices for this thesis were sought. Play-based pedagogically appropriate methods seemed to mitigate those restrictive issues commonly associated with traditional practice constraining the exercise and development of critical thinking. More specifically, aspects highlighted in the

literature related to methods, adult-children power relationships, how knowledge, learning, and children are viewed by the adult, and the level/ degree of participation were addressed.

Empirical and theoretical research on play and learning shows the recognition and usefulness of play-based pedagogy in connection to 4-5-year-olds' learning and development (Pyle et al., 2017). Play-based pedagogically appropriate methods and strategies have been used successfully for learning and teaching purposes in early years practice, including in diverse, distinguished, and integrated models like the Reggio Emilia educational philosophy (Malaguzzi, 1998), the Montessori method (Maria Montessori), and the Waldorf educational philosophy (Steiner). Despite not locating myself solely within these educational philosophies, I have used play-based methods, including tasks with characteristics to the mystery experiences in practice in my own teaching professional experience with 3-6-year-old children. I, therefore, utilised this knowledge, methods, and strategies from my experience with children in this new research context. Furthermore, as in this thesis, using play-based methods has been demonstrated to be useful and a good fit for young children in research and are increasingly being used in research practice with children (e.g., Arnott & Wall, 2021).

In summary, evidence from this thesis showed that using play-based pedagogically appropriate methods with young children was productive for children's engagement in tasks, stimulating thinking and its manifestation. Since play-based pedagogically appropriate methods are too broad and do not provide enough information on what may facilitate success, it was important to explore what underlying elements were key to stimulating critical thinking within this play-based context. From the analysis across the four case studies, seven main overarching themes were constructed as key to creating pedagogically appropriate contexts for critical thinking.

An overview of these seven themes can be seen in Figure 9.1. They can be considered contextual and relational moves (pedagogical moves and contextual decision making) to facilitate a context for 5-6-year-old children's critical thinking. *'Engaging in investigative enquiry processes and problem solving'* is at the centre, as a mystery-puzzle to investigate was explicit in all tasks and was found to be key to facilitating the context for critical thinking, since it demanded explicit engagement with actions that required at least the use of isolated critical thinking skills. The video footage data shows that the mystery to investigate gave a clear

purpose and meaning to children's work (doings) in a natural manner and required the children to face challenges that demanded a degree of determination (and other relevant behaviours related to critical thinking dispositions), and for many, effortful thinking and performance. Despite each theme being illustrated in isolation, there is existent relation and overlap. The mystery investigation sparked children's curiosity and interest, driving them into emotionally active engagement and collaborative problem solving. Adopting the detective role during the enquiry and associated problem solving was empowering. The collaborative nature of the experience provided opportunities for dialogue and scaffolded thinking. In addition, the children used tools independently to support and develop their thinking throughout the cases, providing a sense of autonomy and empowerment. Listening, recognising, and acknowledging children's thinking was useful not only because it provided opportunities for me, as the researcher, to identify, value, support, and scaffold children's thinking, but also to understand children's unique thinking contributions and the ways they confronted the challenges both individually and as a collective.
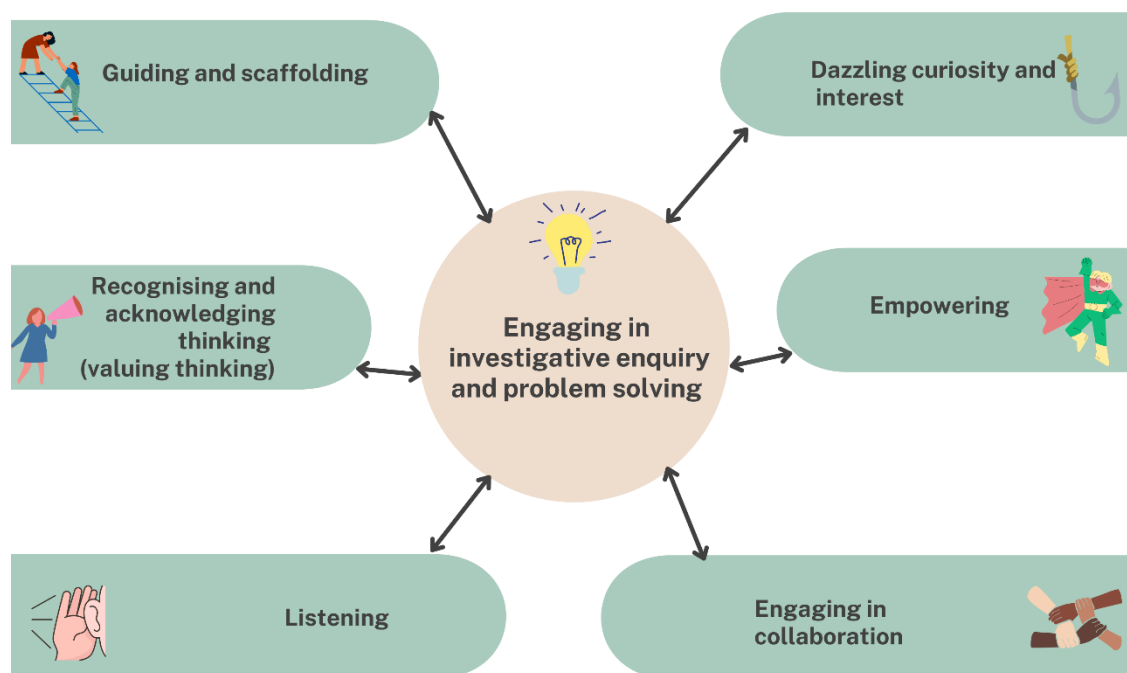

Figure 9.1: Key contextual and relational findings

In this chapter, these seven moves are phrased in relation to what the adult educator can do, create, and foster in the early years' classroom context 'to increase the probabilities of a

desirable outcome (critical thinking)'. I will now discuss these findings individually in relation to the relevant literature.

9.1.1 Investigative enquiry and problem solving

Engagement with the process of inquiry and problem solving was found to be productive when seeking to facilitate a context for critical thinking. The detective investigation was not a randomly selected theme but was chosen due to its main objective of engaging children in investigative enquiry and problem solving, including skills such as exploring ideas or things, identifying and documenting evidence, interpreting information, analysing information, connection making, testing, theorising, discarding, and drawing conclusions. This led to the following critical thinking dispositions being observed:

- Disposition 1 *'To be curious and willing to find the answer';*
- Disposition 2 *'To be aroused to the process of enquiry and discovery';*
- Disposition 3: 'To investigate/to be investigative (to enquire and inquire). To seek information, evidence, reasons, explanations';
- Disposition 8 *'To be persistent when confronting difficulty or frustration and to understand the value of effort';*
- Disposition 11 *'To be resourceful and creative in relation to the goal/question (purposeful creativity)';*
- Disposition 10 *'To understand the value of and to communicate and collaborate with others (what can be achieved with others) and to listen, respect, empathise, consider, and value others' contribution and to be concerned with dignity and welfare of others'.*

For example, in the *Snack Mystery* Amanda engaged in the speculation and gave plausible explanations in relation to the interpretation of some animal's affairs. When I asked her whether she thought that that explanation had happened she claimed that: ***'I didn't really see it'.*** Amanda showed capability of finding plausible explanations but also to cautiously recognise that she did not have direct evidence for that explanation, hence, distinguishing fact from other. Dispositions 1, 2, 3, and 11 were particularly connected to the inquiry and problem-solving theme.

This corresponds with the work of Burke (2007), who found that teachers were more likely to recognise thinking skills in science and technology subjects when compared to other subjects, such as art and music. Burke suggested that this could be due to perceptions around the need to ask questions and engage in processes of finding out, involving the application of scientific methods triggering certain thinking skills and dispositions. Burke recognised the importance of appropriate construction of teachers' and students' thinking for the purpose of teaching 'effective thinking' skills. Burke consulted teachers' and students' perceptions, and designed an intervention for this purpose. Detective mystery play was a pedagogically appropriate context for young children, but, similarly, with the intent to prompt questions and a strategic finding out, the skills and dispositions that resulted could be considered directly related to the perceptions of the teachers and children.

9.1.2 Dazzling curiosity and interest

Curiosity and interest were found to initiate and maintain intellectual-cognitive, emotional, and physical engagement in the investigation during the four mystery-solving experiences. Dazzling children's curiosity and interest, therefore, was vital to achieving that level of engagement when seeking to create a context for facilitating critical thinking. By sparking someone's curiosity and interest, several essential benefits that are crucial to increase the likelihood for critical thinking arise:

- Motivation;
- Effortful task performance (orientation);
- Initial engagement, focus, and immersion in the task;
- Intellectual-cognitive awakening; and
- Time investment

The nature of the detective mystery experiences contributed to sparking curiosity through the experience's design, each case's objectives, materials, and resources, the physical setup, role-play, and the novelty of the experiences. From the beginning children made comments such as: *'I can't wait', 'I'm so nervous'* (Ava showing signs of happiness and excitement)*, 'I want to play', 'Can my friend play?', 'I've been waiting for a lonnnnggggg time!'*.

Additionally, I used my own teacher's repertoire of creative and skillful ways to dazzle children's interests (Lea, 2016). This included the initial step of attempting to transmit my 'own curiosity and interest' in facing the mystery, for example, with the help of my voice (tone) and how the scenarios and materials were initially presented. This was important not only when initiating a task or conversation, but also when pursuing a child-initiated task or conversation, to redirect attention, or even when getting dispersed.

The children's curiosity, triggered by the detective experience, seemed to give meaning and purpose to the children's work (doings). The experience appeared to be something they felt worth undertaking, and hence they wanted to participate and invest effort. This, however, does not mean I am claiming that the children's curiosity and interest was externally triggered by context and relational moves. Children are generally curious and interested in understanding matters happening around their world (Lea, 2016), and it was not necessarily different in these detective experiences. Additionally, this spark was maintained by the children during the mystery-solving act with the following dispositions (1, 2, 8):

- Disposition 1: *'To be curious and willing to find the answer';*
- Disposition 2: *'To be aroused to the process of enquiry and discovery. The focus, engagement, and flow';*
- Disposition 8: *'To be persistent when confronting difficulty or frustration and to understand the value of effort'.*

For example, when I told Tim it was time to go home responded:

> *'I don't really want to'*
> *'Do we really have to?... we need to glue…'* (Ignoring my insistences)
> *'One more animal, one more animal'*
> *'We are just stopping now and then will come back tomorrow'* (Tim)

These examples show what some children's motivation and persistence in task was like.

Having said that, I would argue that the adult/educator should still be targeting, cultivating, and fomenting curiosity and interest at the heart of the daily doings of children (Lea, 2016). One should genuinely try to follow and trigger children's interest in learning and discovery as

a pedagogic stance, openly sharing and transmitting this interest creatively. I argue, based on the evidence of this study, and in agreement with Florea and Hurjui (2015), that curiosity (and later wonder) was the hook for engagement, which triggered thinking and possibly its development.

9.1.3 Empowering children

Children's curiosity and interest were the hook for engagement, but it would not have been enough if the children had not felt confident or if they had not had the space to exercise their agency and voice. Empowering children and creating opportunities for them to employ their competencies, agency, and voice was vital when seeking to facilitate a context for critical thinking. To do this with authenticity was significantly challenging when researching on-site for a limited period of time and interacting with children around a very specific agenda. However, prior reflective planning (anticipating potential problems and actions) and my in situ relational practice were important in combatting these factors.

I suggest that the vision and set of beliefs held by the adult can be perceived by children in various ways that can become either empowering or disempowering, influencing their performance (self-perception, orientation-motivation-efforts). Furthermore, these hidden adult agendas can be echoed in children's activities. Therefore, selecting a suitable task, such as children's detective play, was important to mitigate some of these challenges. This process required reflexivity before design, during data collection, and throughout the process of analysis. My vision of children as competent thinkers, capable of their own decision making (Nutbrown, 2011; Harcourt & Einarsdottir, 2011; Arnott et al., 2020), was therefore communicated in the detective mystery experiences in the following ways:

- The informed consent picture book session, which informed children about the research project, facilitated children to discuss and negotiate, as well as decide whether they wanted to participate in an ongoing manner.
- The design of the tools and resources supported children within their investigation, enabling them to proceed without the constant need for help to 'translate' matters to their competencies.

- Providing space for independent play and freedom to influence the outcomes of the activity, even though I do acknowledge the limitations within each case's structure.

- Encouraging autonomy in work and exploration within the collective (an individual's power within collaborative work)

- The explicit and implicit interactions taking place during detective play between adult and child(ren) support the value of children's thinking and doings, boosting their confidence, as the children explored their possibilities and limitations, for example, responding appropriately when children tried to find the limits of what they 'could say, do, or not'.

The flexibility and nature of play provided opportunities for children to 'freely' influence, which provided closeness towards the child's 'authentic' voice and therefore thinking. In a strict rule-based approach to a task or game and its associated interactions, children might be further constrained, and the desired manifestation of creative and natural thinking instances might have been restricted. Karin-Hognestad (2010) stated that imposed restrictions on children's active participation driven by academic pressure jeopardise the exercising of rights and compromise opportunities for critical thinking.

A connection to the critical thinking disposition 6 can be made here: *'To take risks/to be courageous, taking action in different ways to open up opportunities to new learning. Explore and experiment with ideas, options, perspectives, methods, and tools'* (as opposed to being too safe with what one knows, with that works, or to be open to new learning). Such inclinations for risk taking and determination to explore can be suppressed, empowered, or somewhere in between, depending on the particular educational environment. This links to Florea and Hurjui's (2015) work that points out the importance of open relationships and dialogue that enable opportunities to take risks for critical thinking.

The detective role-play could be considered an empowering tool on its own, contributing to triggering a more knowledgeable self. This was achieved through, among others, adopting an expert mindset and behaviour, or the use and adoption of tools and procedures. Some children adopted the investigator's behaviour and physical posture. For example, Tim grabbed the magnifying glass from the resource table and come towards me and screaming:

> *'Investigating time!!!'* [Tim uses a serious voice whilst holding the magnifying glass]
> *'We have to find clues!'*
>
> *'I'm gonna take a picture of all of it, just wait with this one, ok?'* [Tim telling me to hold on while the picture is taken].

This could be seen particularly in relation to Dispositions 4 and 6, which are connected to empowering children. My findings in this regard connect to Heathcote's *Mantle of Expert* (MoE) work, where the power of role-play is seen as empowering children in their learning (Heathcote, 1991; Heathcote & Bolton, 1995). Developed in 1980, this work showed how children made use of drama to immerse themselves in and out of meaningful learning contexts when adopting the expert role (Heathcote, 1991; Heathcote & Bolton, 1995). A finding mirrored in this work is that the children engaged in detective impersonation and the broader activity required by the mystery contexts. The role on its own empowered children to do things, and think in ways they might have not otherwise done.

9.1.4 Engaging in collaborative learning

Curiosity and power were construed as useful for individuals, but engaging in collaborative learning opportunities was also found to be profitable when seeking to facilitate a context for critical thinking. Examples of various forms of collaboration were found across all four cases. In the *Snack Mystery,* for example, the children naturally worked together, and the communication between the children in this case was highlighted. The children enthusiastically informed one another about the clues they found, and discussed their interpretations and ways to continue. In this case, the children also adopted various specific roles to distribute the work, such as taking photographs of the evidence, writing notes down, or picking up the evidence with tweezers. They also engaged in delegating roles/tasks like in this example:

> *'Excuse me Lori… it was one of this dragons'. 'Take a picture of it, take a picture of it'* [Tim whilst leading the investigation is asking me to take a picture with the iPad]

Critical thinking dispositions 5, 9, and 10 could be considered as those behaviours triggered, developed, or exercised when engaging in collaborative learning:

- Disposition 5: *'To self-correct. To listen to, explore, and consider others' views and to have the ability to change one's mind (self-correct) when necessary'*,

- Disposition 9: *'To be open-minded, flexible and fair to different possibilities, perspectives, opinions'* and

- Disposition 10: *'To understand the value of and to communicate and collaborate with others (teaching–learning with others and what can be achieved with others) to listen to, respect, empathise, consider, and value others' contribution. To be concerned with the dignity and welfare of others'.*

Sills et al. (2016) found benefits of collaboration in 4-7-year-olds' cognitive development in the area of problem solving. In the present study, the collaborative work in the detective experiences was contextualised in an investigative problem-solving scenario, which gave an authentic meaning to the children's performance. Collaboration when resolving the different mysteries also gave opportunities for children to increase some of their thinking instances to a level that might not have been possible on their own, referring to that of the Zone of Proximal Development (ZPD) (Vygotsky, 1978). Detective play provided the context for independent but predominantly collective exploration and discovery, with the latter creating opportunities to scaffold each other's thinking (ZPD; Vygotsky, 1978).

Diversity in thinking within the group provoked some children to challenge each other's thinking through dialogue, helped extend others' thinking on various occasions, and provided opportunities to listen to diverse points of view and different ways of working during the detective investigation. For example, in the *Zoo Mystery,* the children worked in teams, and engaged in dialogue and decision making for the collective zoo design. Furthermore, this unified 'project' led to discussions and even disputes, which were considered opportunities that pushed the children into reasoning their perspectives and engaging in real-life negotiations in relation to decision making. This resonates with Murphy et al.'s (2014) findings where they conclude that discourse was a powerful tool that promoted critical thinking, therefore advocating for creating a 'culture of dialogic enquiry' for critical thinking in school and home contexts (p. 574) in which children would engage in talk and experience taking alternative perspectives, making and evaluating claims, for example. This is shown in the following children's comments:

*'**Maybe not that,**'* *Mia:* disagreeing with her peer's option (Session 1, Aspen Primary School).

*'**Not the ostrich because the ostrich lives in the hot place**'* John (Session 1, Aspen Primary School).

The collaborative environment prompted thinking to be manifested in a way that was not necessary when working independently in order to keep others in the loop of the investigation. This collaborative nature provoked the need to communicate what was assumed private and internal at first, and which became articulated into words or gestures later. This meant opportunities to develop thinking by sharing in the act or moment, and also to extend and develop a new language for expressing thinking. This was prominent in the *House Mystery* since, due to limitations of space, the children naturally took turns and this slowed the pace, facilitating children to contribute their own thinking and listen to other perspectives. However, despite expressing some agreements and disagreements as well as providing their own views, the children did not engage in deep and long debates. Encouraging more discussion might have been of further benefit to the *House Mystery*.

Not all children showed collaborative skills in the same way; some worked in a much more individual and independent manner. In these cases, as in various *Mystery Box* examples, the question of whether thinking was individual or collectively formed was raised (Wegerif, 2015). For example, could an individual's question forming in the *Mystery Box* be solidly attributed to the individual, hence isolating them from the prior group contribution? It was apparent that in some cases, like Ava's, it was a mixture of both: the thinking could be attributed to her own virtue but was inherently constructed by and benefited from other children's input. When observing children's thinking in play-based activities like this, then, this blurring of attribution needs to be noted.

9.1.5 Listening to young children's thinking

Listening to and learning from the various ways children manifest their thinking was seen as pivotal when seeking to intentionally and explicitly facilitate a context for critical thinking. Listening with an open mind and envisioning with all the senses was necessary to capture,

explore, and understand the diverse forms of children's thinking manifestations. Listening this way involved being open to understanding different views and children's own agendas even when it was not part of the original research plan.

> *'I'm gonna have my notebook'* [Tim takes a pen and the detective notepad]. *'We could, we could put that somewhere and then make it hide and then I'll write a missing crocodile in my book'.* [Tim seems takes charge and presents his own agenda].

For children, the play context presented a natural way of communicating, relation building, learning, thinking, and overall being. As an adult, my active involvement in play (Devi et al., 2018) provided opportunities to build relationships with the children, understand in depth the nature of thinking and performance, influence and, to some degree, control, and co-construct with children. My adult role shifted as needed in the different stages of the detective experience, which was a research tool in itself requiring in-situ reading of the dynamics, needs, and overall environment.

Despite the importance of the listening adult to assess, support, and understand children's thinking and the world, listening was equally fundamental for the children. By sharing and listening to one's own thinking, the abstraction of ideas becomes more real and concrete. Furthermore, by listening to each other, the children were able to learn from other children's ideas as well as from others' ways of doing. To create a context where listening is valued and facilitated, for the teacher and the children, seems to be an important aspect of the pedagogy; however, to see it as an active process that is productive of critical thinking is something new to be considered.

9.1.6 Recognising and acknowledging thinking in relation to the child (experience, maturity, level of knowledge of the topic, context, etc.)

Despite identifying listening, recognising children's thinking, interpreting, and identifying opportunities to support thinking when they appeared as fundamental steps to follow, the adults' open-mindedness in terms of recognition and acknowledgement of children's thinking and their contributions were key when seeking to facilitate a context for critical thinking. This is an underlying factor that involves a degree of understanding and clarity in advance around what critical thinking skills and dispositions are and what can be 'expected'. Having said that,

little clarity was found in the literature to aid early years professionals specifically. Acknowledging children's thinking to the children would also involve making it explicit, and hence visible to them. This can be related to the development of Disposition 13 (Facione, 1990):

'To be attentive in identifying opportunities to engage with particular knowledge content and critical thinking skills according to goal and context. Overall, to be attentive to identify opportunities for critical thinking. To value skills and use them (helpful to make it explicit to become a conscious thought), to value critical thinking.'

Furthermore, in 5-6-year-old children, it is particularly important to learn how thinking may be manifested in the numerous forms and ways that young children communicate.

Despite the vast amount of literature on critical thinking, a certain ambiguity remains in the context of teacher perceptions of the teaching of critical thinking skills in educational practice (Burke, 2007), even greater in the context of young children. I have argued that children's critical thinking needs to be looked at in relation to where children are (in their development, knowledge level, and experiences) in place and time. Burke (2007) found that, when consulting teachers' perceptions regarding their teaching of effective thinking (including critical thinking), no significant difference across ages was found. This came as a surprise, as Burke had foreseen developmental differences in teachers' beliefs. Even though Burke suggested that it could be attributed to teachers' lack of understanding of what effective thinking entailed, I suggest that such a result might have been obvious if the evaluator was the constant across the ages, rather than the assessment made by each individual teacher. If this had been the case, I assume that the teachers of each age group would have interpreted and envisioned the skills and dispositions, in this case of effective thinking, in relation to where the children were, too. Additionally, young children's thinking can be unique at times. The adult should flexibly recognise and attempt to explore its nature. Sometimes, this requires a distance from the adult-centric view in order to truly acknowledge its unique value (Donaldson, 1987).

I acknowledged variations in sophistication of skills in practice, and diverse constancy in behaviours related to critical thinking dispositions. In other words, I recognise that the capacity to, for example, analyse, theorise and infer; or the degree and ability to persist and to seek evidence, reasons, and explanations varies across the group of children, time, and situation. In spite of this, I identified and coded them within the same category. Richard Paul (1995) noted a diversity of levels in critical thinking (Paul, 1995) This acknowledgement of differences in depth is positive in terms of 'recognition', and it, therefore, can be useful for teaching and learning purposes (successful if recognised and applied in classrooms). Despite this positive appreciation, Richard Paul makes a distinction between critical thinkers/thinking and weak critical thinkers/thinking. Despite accepting Richard Paul's contribution in the educational context, and particularly in the context of early years teaching, this wording is neither a fair description nor productive in practice.

In practice, asking children questions, being interested in their thinking and praising their thinking and actions was useful. Praising comments like **'good idea/guess/question'**, repeating after children or pointing out what was interesting specifically made the learning opportunities more visible and productive for children's realisation too. An example of this can be found in Section 5.4.1.2, where Bruno reflects about his own thinking process in relation to the hair brush item with pride (Section 5.4.1.2. Alternative use of strategies).

Finally, it is important to note the connection between listening to and recognising children's thinking within the context of play. It was important for me as an adult to be an 'inner' partner in play, rather than a mere observer. The play was a rich context full of opportunities to explore and learn from children's critical thinking, and opened countless opportunities for co-construction and potential development. Listening carefully from this position and maintaining it meant new opportunities to recognise and build on moments of thinking.

9.1.7 Guiding and scaffolding

Playing with children rather than taking an external, observer position, as mentioned above, provided the possibility to understand the children's thinking world, assess, and interact as an insider, and influence without involving additional disruption. It provided opportunities to recognise and select 'moments' and jump onto opportunities when it felt appropriate.

Despite not researching on-site for a long time to test the following, as an early years teacher myself, I imagined that these play opportunities and shared experiences could be used potentially as the link for transference into other contexts/disciplines (e.g., 'When we did x and I did y you said z…' 'What did we do?'). Overall, play was, therefore, a fruitful experience full of potential to both learn and teach for both adults and children. Guiding, supporting, extending, modelling, and scaffolding children's thinking was seen as useful when seeking to facilitate and support a context for critical thinking and the detective experience provided the space to do so. For example, asking hypothetical *'What if…'* questions such as, ***What happens if I put the iceberg in here* [with the tiger]*?'*** was useful to elicit awareness and reasoning. The detective experiences naturally triggered opportunities to talk, ask questions, and share one's own thinking and aspects of one's performance with others.

The detective experiences provided the adults and children with opportunities for scaffolding. On some occasions, collaborative exchanges triggered the children's thinking further. It can also be useful for developing Dispositions 12 and 13:

- Disposition 12 *'To be mindful and aware of self, performance, goal, and process and to be able to use this awareness productively (to plan for change, to modify, change action…)';* and
- Disposition 13 (Facione, 1990): *'To be attentive in identifying opportunities to engage with particular knowledge content and critical thinking skills according to goals and context. Overall, to be attentive to identifying opportunities for critical thinking. To value skills and use them (helpful to make it explicit to become a conscious thought) to value critical thinking.*

At other times, it was the visual-manipulative and catalytic tools (Baumfield et al., 2009) and resources, made accessible to young children, that enabled adult-independent work and supported children's performance. These tools were chosen taking children's competencies and possible limitations into consideration, and provided some time for engagement and discovery. Some of these tools served to scaffold, catalyse, support, and extend children's thinking. For example, 'photo wall suspects' (used for memory aid, building connections, mapping, information extracting, etc.) were considered to be catalytic tools that pushed thinking and overall performance further.

9.1.8 Summary of contextual and relational findings

It becomes apparent that when placing these seven pedagogical moves (contextual and relational) alongside the 13 critical thinking dispositions considered in this thesis, some clear connections emerge (see Table 9.1). It could be concluded that these 13 critical thinking dispositions can be cultivated and further developed through the use of those seven contextual and relational moves. Alternatively, in a different light, the children's inclinations related to the critical thinking dispositions listed were exercised and made visible. This shows that the context provided appropriateness for triggering those inclinations and their expression, providing the necessary time and space to do so. Overall, this demonstrates that playful detective experiences were useful for exploring children's critical thinking dispositions.

The exploration of the seven key contextual and relational findings has shown there is value to facilitating critical thinking in 5-6-year-old children's detective play across the four case studies. The children's individual curiosity and interest were found to be central elements that complemented the value of engaging in collaborative investigative enquiry and problem-solving experiences. Moreover, it was found to be fundamental for the adult to listen to young children's thinking in various ways and forms, to recognise and acknowledge thinking in relation to each individual at the time, and to guide and scaffold their thinking during play when it was thought to be appropriate.

Table 9.1: Links across contextual and relational findings to facilitate critical thinking and desired children's critical thinking dispositions.

Contextual and relational findings	13 critical thinking dispositions
Sparking curiosity and dazzling interest	Disposition 1: 'To be curious and willing to find the answer/truth'.
	Disposition 2: 'To be aroused to the process of enquiry and discovery. The focus, engagement, and flow' (also, engaging in investigative enquiry and problem solving).
Empowering children	Disposition 4: 'To be confident in one's own competence (reasoning and abilities). To autonomously act and use those abilities and to be confident to request help of others when needed'.
	Disposition 6: 'To take risks/to be courageous taking action in different ways to open up opportunities to new learning. Explore and experiment with ideas, options, perspectives, methods, and tools'. (As opposed to being too safe with what one knows works or to be open to new learning.)
	Disposition 7: 'To be prudent when considering views, evidence, decision making… And to accept uncertainty when given the situation (without identifying this as failure).
	Disposition 8: 'To be persistent when confronting difficulty or frustration and to understand the value of effort'.
Engaging in collaborative learning	Disposition 5: 'To self-correct. To listen to, explore, and consider others' views and to have the ability to change one's mind (self-correct) when necessary'.
	Disposition 9: 'To be open-minded, flexible and fair to different possibilities, perspectives, opinions'.
	Disposition 10: 'To understand the value of and to communicate and collaborate with others (teaching–learning with others and what can be achieved with others). To listen, respect, empathise, consider, and value others' contributions. To be concerned with the dignity and welfare of others'.
Engaging in investigative enquiry and problem solving	Disposition 3: 'To investigate/ to be investigative (to enquire and inquire). To seek information, evidence, reasons, explanations (including challenging views) and use those (product of enquiry) to form and provide views (e.g. reasoning based on evidence)'.
	Disposition 11: 'To be resourceful and creative in relation to the goal/question (purposeful creativity). To be alert to possible opportunities, views, situations, solutions, methods, strategies, and use of tools when appropriate'.
Listening to young children's thinking	Voice and empowerment
Recognising and acknowledging thinking in relation to the child (experience, age/maturity, level of knowledge in the topic), context	Disposition 13: 'To be attentive in identifying opportunities to engage with particular knowledge content and CT skills according to goal and context. Overall, to be attentive to identifying opportunities for CT. To value skills and use them (helpful to make it explicit to become a conscious thought), to value CT'. (Guiding and scaffolding).
Guiding and scaffolding	Disposition 12: 'To be mindful and aware of self, performance, goal, and process and to be able to use this awareness productively (to plan for change, to modify, change action)' (Recognising and acknowledging).

However, it was apparent that although all those these findings can be generalised across the different contexts, each one had specific benefits and constraints. These will be addressed by answering Research Question Two:

> *2. What are the benefits and constraints of the four different detective mystery play cases to facilitate—and investigate—young children's critical thinking?* (Key design ingredients and implications).

9.2 Exploring variations in methodology across the four detective cases (Research Question 2)

The four cases were designed to have some fundamental differences with the intention of exploring the potential 'impact' of each case's methodological differences for teaching and research purposes. All the differences provided advantages and disadvantages. Consequently, the variations of key elements within the orchestration of each case can be viewed as offering a richer, or poorer, context depending on the intention and particular focus of the adult (teacher or researcher). I will now discuss the implications of these elements based on this study's data and in relation to the relevant literature.

All the detective play experiences were, to some degree, semi-structured, providing flexibility to co-construct and influence design. This could be considered in regard to the nature of the objective, structure, outcome, adult control and influence, nature of collaboration, requirement for and role of physical manipulation, need for verbal skills and content knowledge. The mentioned variations were identified as potentially significant and examined. Figure 9.2 uses a series of 'continuums' to visually compare the degree of each of the identified key elements across the *Mystery Box, Zoo Mystery, Snack Mystery,* and *House Mystery* cases.
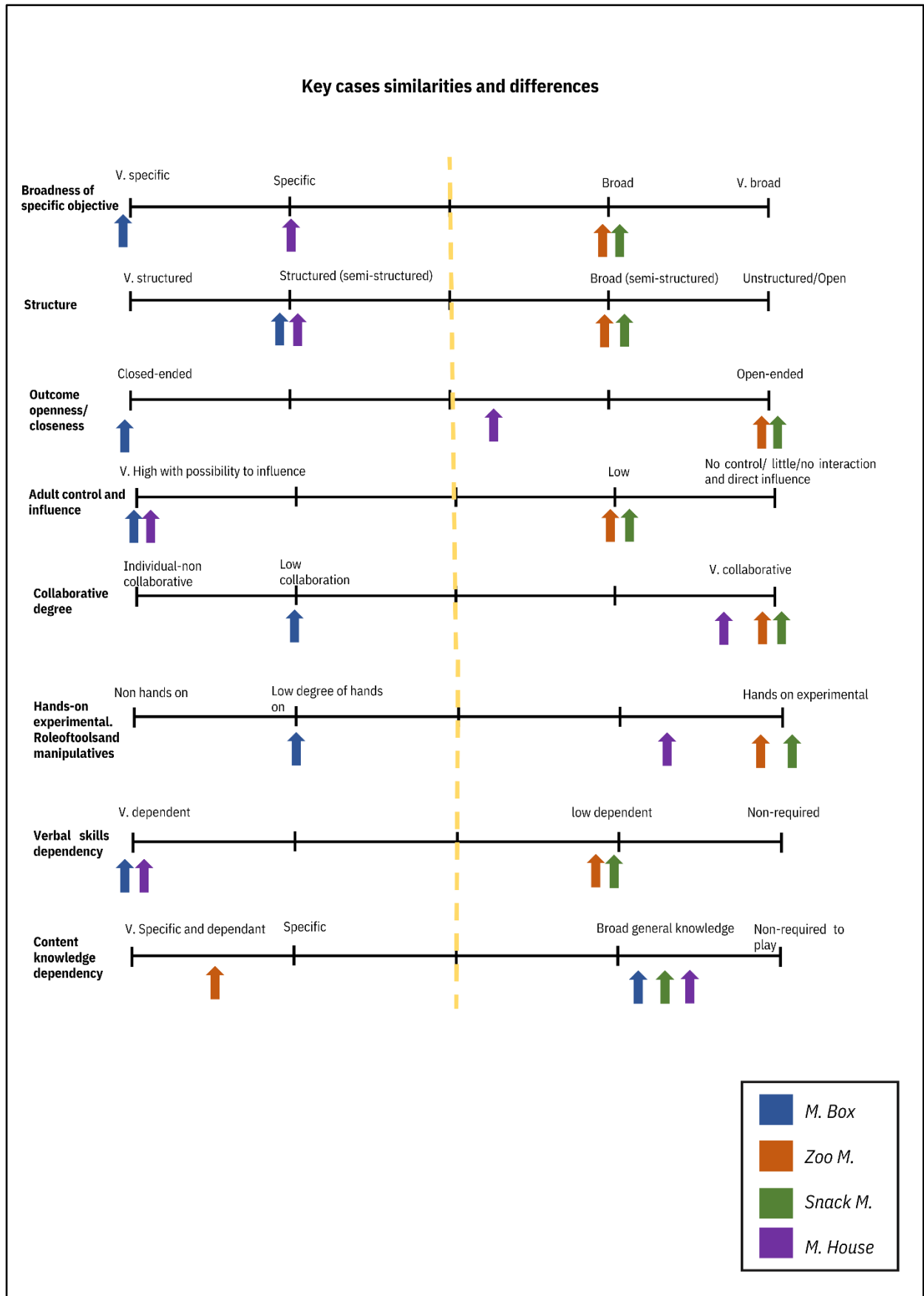
Figure 9.2: Key similarities and differences across the four detective cases

This figure shows eight elements that are considered worth exploring in connection to children's critical thinking and investigation performance. The list of elements in Figure 9.2 was narrowed down from a larger pool of elements (first identified), some of which were discarded as they were not found significant for critical thinking. For example, 'opportunities for physical activity' (movement and fine and gross motor skills) was discarded, as in the *Snack Mystery* and the *Zoo Mystery* the children had space to move around in comparison to the *Mystery Box* and the *House Mystery,* where the children were spatially more constrained, but no impact was found on the critical thinking manifesting. I could have designed something really restricted—not pedagogically appropriate—to find out whether this worked, but my intent, on the contrary, was to aim for contexts that facilitated critical thinking based on my prior knowledge of practice and aligned with other studies in the field.

The visual presentation of these elements in Figure 9.2 gives an overview of where each detective experience was considered to lie (each distinct arrow being a case) in relation to the element and allows comparison to the other detective experiences. The dashed yellow line divides the two descriptive poles of each continuum. For example, the second element represents the structure of the case, and the yellow line signposts the middle ground between more structured and unstructured or open experiences. Additionally, the position of each case (left or right) has been selected and sorted in relation to pedagogies that are described with characteristics that are more stereotypically 'traditional' on the left and more 'contemporary' Western free play-based characteristics on the right.

According to this sorting, the *Mystery Box* (7/8) experience gravitates towards the left positioning of the line, the *House Mystery* (4/8) stands somewhere in between and on the contrary the *Zoo Mystery* (7/8) and the *Snack Mystery* (8/8) towards the right. These differences need to be considered proportionately, since all four cases were play-based experiences with a degree of openness, semi-structured (rather than structured or unstructured), collaborative, hands-on manipulative, had certain verbal skills dependency, certain content knowledge dependency, and mutually (adult and child) directed. However, in this thesis, due to its methodological focus, understanding the role and meaning of each element and associated relationships, and reflecting upon potential implications in facilitating a context for critical thinking was of primary concern. Using the continua as a tool to facilitate

visualisation and raise awareness of the elements incorporated into educational research design practice made this process more intentional. The process enabled me to identify the elements, assess where cases are located, make comparisons across cases, and find patterns in potential influences and the associated impact of such decision making on children's experiences and learning.

The eight key elements identified had both beneficial and restrictive implications. Generally speaking, these would be considered beneficial or restrictive in relation to this study's specific aim of young children's critical thinking. Therefore, this qualitative analysis is not interested in non-directly related implications. Table 9.2 provides an executive summary of key variations across the four detective cases. The table includes the cases detective experience description, general outcome, and details of the key elements that were visually presented in Figure 9.2. I will now talk about each of the continua and compare the affordances and constraints offered by each of the cases in regard to eliciting critical thinking.

Table 9.2: Executive summary of key variations across the four detective cases.

Executive summary of key variations across the four detective cases	
Cases	**Description**
Mystery Box	**Detective experience description:** In the *Mystery Box* children adopted the specific 'detective trainee' role. The experience consisted of enquiring, remembering information, and later making educated 'good' guesses to figure out what the secret item in the mystery box was. It was not considered an authentic investigation.
	General outcome assessment: -**Restrains and does not facilitate CT performance in itself. It is therefore not the most profitable for an open-natured CT exploration**. -It is, however, **useful for the training and modelling of specific areas of interest**. These were considered valuable for CT. These include question formulation, general strategies for guessing, thinking of specific concepts and vocabulary, specific material and characteristics' vocabulary, and memory skills. -Useful for CT dispositions. -Useful for detective role adoption and as a trainee preparation for the next experiences. -For the adult, there were natural opportunities to listen and capture and scaffold these specific skills, which were not necessarily coded as CT. (Easy to put in research practice and analyse).
	Key elements: Very specific intended objectives (narrow/specific); structured; closed-ended; very high degree of adult control; low collaboration; low degree of hands-on experimentation; verbal skills dependence; and non-content specific dependence.
Mystery House	**Detective experience description:** In the *Mystery House,* the children adopted a 'traditional Sherlock' detective role. The experience consisted of resolving various brief mystery challenges in the context of a small-scale dollhouse in which various physical clues were set up to aid the children's investigation. It required observation skills, identifying and analysing clues, meaning, and link-making, theorising, alternative seeking and drawing reasoned conclusions.
	General outcome assessment: -Focused on the exploration and development of **very specific CT skills and dispositions**. Skills such as observation skills, identifying and analysis of clues, meaning, link-making, theorising, and alternative seeking and drawing reasoned conclusions.

	-Certain restraints were obvious as if they were perceived to be close-ended, even though they had the potential for more openness (if further challenged through PCTM). -Collaborative and easy for adults to have opportunities to listen and scaffold.
	Key elements: Specific intended objectives (mentioned above); structured; semi-open-ended*; very high degree of adult control; very collaborative; high degree of hands-on experimentation; verbal skills dependent and required non-specific content (broad and very general knowledge).
Zoo Mystery	**Detective experience description:** In the *Zoo Mystery* children adopted a 'researcher/zoologist detective' role. The experience consisted of designing a zoo that would be functional for both animals and visitors. The children needed to consider diverse animals' needs (food, drink, climate, etc.) for mapping out the design, sorting the animals across diverse spaces, seeking and 'researching' various information sources, and reasoning their decision making within the group level. It required information-seeking skills, skills to use and interpret resources, analytical skills, meaning and link-making, predicting, theorising and alternative seeking, reasoned decision making and collaborative negotiating skills. Additionally, it required some basic skills of crafting, such as drawing and pasting.
	General outcome assessment: -**Profitable for open exploration and development of CT skills and dispositions** -**Specific content knowledge dependent**. To counterbalance this, various information resources were available and the children were supported when using resources. Some material handling instructions were therefore required in the beginning due to the wide range of materials at hand. -Plenty of **PCTM opportunities** -**A less playful** feel. **(Emotional response needs adding)** -The adult's role of listening and managing was more challenging than in the more structured and focused detective experiences with more diverse events happening simultaneously. These broader experiences provided greater opportunities to explore CT, but such broadness sometimes meant children needed greater support and guidance to focus on the objective, narrow down, analyse certain information, and remember (cognitive load).
	Key elements: Broad intended objectives (mentioned above), broad semi-structured; open-ended; low degree of adult control; very collaborative; hands-on experimental; low-verbal skills dependence and very specific content dependence (natural science and animal life knowledge).
Snack Mystery	**Detective experience description:** In the *Snack Mystery*, children adopted a 'forensic scientist detective' role. The experience consisted of investigating a real-scale 'crime scene' with the objective of identifying who was the animal responsible for the snack's disappearance. It required observation skills,

	identifying, and marking of clues, organisation of clues, analysis, comparing and contrasting, testing, discarding suspects/evidence/ideas, meaning and link-making, theorising, documenting, generating, and narrowing down ideas and alternative seeking, decision making and drawing reasoned conclusions. It also required collaborative skills.
	General outcome assessment: -**Most profitable for open exploration** and development of CT skills and dispositions. -Plenty of **PCTM opportunities.** -Open structure. Very productive for open exploration. -Listening and managing was more challenging than in the more structured and focused detective experiences in the *Mystery Box* and the *House Mystery*, in which more diverse events were happening simultaneously. These broader experiences provided greater opportunities to explore CT, but **such broadness sometimes meant the children needed some support and guidance to focus on the objective, narrowing down, analysing certain information, and remembering (cognitive load).** - To help in the analysis of the clues, the first part of the *Snack Mystery* focused on the prints in isolation (preparation). -**Emotional response**
	Key elements: Broad intended objectives (mentioned above); broad semi-structured; open-ended; low degree of adult control; very collaborative; very hands-on experimental; low-verbal skills dependence but not only limited to and non- specific content dependence (broad general knowledge).

9.2.1 Broadness of objective

Whether the objectives of the case were specific or broad was of significance when researching young children's critical thinking. As is shown in Figure 9.2, the *Mystery Box* and the *Mystery House* had a narrower set of objectives, and this corresponded to the data stimulating only a few skills and dispositions. In comparison, the *Zoo Mystery* and *Snack Mystery* had broader objectives and elicited a greater diversity of skills and dispositions. It can therefore be suggested that the broader the objectives of the experience, the more prospects there were to engage with, and, arguably as a result, a higher probability to arouse and manifest a wider range of critical thinking skills and dispositions. This is important in regard to the methodology of research exploring critical thinking: the more focused, structured, and therefore restrictive the activity, the more restrictive the response is likely to be. This means the researcher's intent is important.

Having said this, even though the *Mystery Box* and the *House Mystery* included a much more specific and narrower set of objectives in comparison to the other two cases, which might be considered a disadvantage or limitation, it was more likely that those objectives were met and a successful conclusion to the task was achieved. This was motivating for some children. Additionally, in the *Mystery Box,* where there was less possibility for free or creative contribution to the process or outcome, this did not mean the children offered no moments of diverse or unexpected strategies and outcomes (which may or may not have been examples of critical thinking), but rather it was less likely in comparison to the other three, even more in comparison to the *Snack* and *Zoo Mystery* at the opposite end of the continuum. Bryman (2016) mentions loss of spontaneity as a potential flaw of close-endedness design. In this study, the nature of the objective was therefore influential in regards to the type and nature of the critical thinking manifested but should never be seen as pre-emptive: the nature of young children means they can surprise.

These findings can relate to other types of research design such as those involving interviews. The intent will guide the researcher into planning and designing those questions and approach. Bryman (2016) raises awareness of the issues involving structure, open and closed ended questions and the advantages and disadvantages of both types of question design

which in a similar light resembles the experienced and outcome from the mystery cases. Depending on the objective and broadness of questions this could potentially elicit more diverse, fluent and fruitful responses or more focused, organised and restricted (Bryman, 2016). The choice will be made according to the intent and circumstances.

9.2.2 Structure

All four experiences were semi-structured, but both the *Mystery Box* and the *House Mystery* were significantly more structured than the *Zoo Mystery* and *Snack Mystery* (see Figure 9.2). Such a structure, alongside the objective of the task, might have naturally placed some external order and limitation in terms of children's creative contribution to the design and action. From an open explorative research interest, the *Zoo Mystery* and *Snack Mystery's* broad structure provided a wider range of opportunities for diverse manifestation and action in relation to critical thinking. Despite this benefit, such a broad structure, in addition to a broader range of objectives, naturally carried a risk for the children to lose the plot, forget information, focus only on a particular area, such as generating information, and avoid the process of analysis and convergent process of making sense of the generated ideas. Lechelt et al.'s (2020) study found that 'cognitive guidance' was useful to support children's critical thinking when working on their own. They argued that it was an approach that balanced the advantages and disadvantages and tackled those limitations that aroused when children worked freely. Similarly, Vincent-Lancrin et al. (2019) advocate for a balance between freedom and structure as this remains a consistent element in pedagogies for facilitating critical thinking.

9.2.3 Adult control, influence, and level of difficulty

In general, the more specific the objective and the narrower the structure of experience, the easier it was for me, the adult, to listen, recognise, support, and scaffold children's thinking and 'control' the overall pragmatics of the research scenario (*Mystery Box* and *Mystery House*). Additionally, the data for these two cases was more comparable (less divergent), and it was easier to organise and analyse, which is also a familiar outcome to those observed in other more structured and higher degree of researcher controlled qualitative studies, such as close-ended interviews (Bryman, 2016). On the contrary, in the *Snack Mystery* and the *Zoo*

Mystery, a broader structure and open objective provided a picture of children working independently on diverse aspects of the investigation in different spaces simultaneously. This made it harder for the adult to reach every action and thinking manifestation and assist directly when children requested help.

Freedom and active participation has been highlighted as an important characteristic of pedagogies for critical thinking in the literature (e.g., Karin-Hognestad, 2010; Powel, 1987; Florea & Hurjui, 2015; Vincent-Lancrin et al., 2019). Despite acknowledging that adult presence and too much input might restrict children's thinking and overall performance, a balance would have been beneficial in the *Zoo Mystery* and *Snack Mystery* experiences. These two cases provided many potential critical thinking opportunities that could have been scaffolded or taken further if I had only had the opportunity to stimulate or assist. Similarly, the children on their own might have been more focused on specific objectives if presented with fewer stimuli. Powel (1987) in the same way suggests creating challenging but achievable problem solving scenarios whereby adults support and guide children when needed.

Similar to Pyle et al.'s (2017) review of 168 articles, I also endorse that polarisation in regard to contexts for critical thinking and the role of the adult in pedagogy could be lacking if only considering academic and developmental outcomes and they should be seen as complementary to one another, rather than an either/or decision. Data showed each approach had usefulness for certain broad goals; therefore, integrating these diverse roles for the adult and how they fit within the play practices, flexibly in situ, is fundamental to aim for a more authentic holistic development of the child (developmental and academic) (Pyle et al., 2017), and in this case the development of critical thinking.

9.2.4 Open/close-ended

The *Mystery Box* was the only case that was considered to be strictly close-ended, which entailed only one correct answer, despite many ways of getting to that answer (see Figure 9.2). This significantly limited the children's performance. The open-ended nature of the *Mystery House, Snack Mystery,* and *Zoo Mystery* investigations made the experience more productive, providing endless opportunities that required critical thinking as well as possibilities to play again. However, despite the *Mystery House* being an open-ended

experience (different ways of making sense of the evidence), certain restraints remained as children tended to incline towards the more 'obvious' answers when looking at the limited evidence. Vincent-Lancrin et al., (2019) insist in the importance of emphasising process over answers and encouraging risk-taking when targeting spaces for the facilitation of critical-creative thinking. In the *Mystery House* children's answers could have been further challenged, and I suspect that the children would have realised and pursued those opportunities and provided further alternatives and explanations if time had allowed. Therefore, it is important to note the implications of the perceived as well as the actual nature of tasks for potential critical thinking: how the task is developed, how it is experienced, and how it is perceived by all the participants (adult and child) may influence the nature of the thinking that manifests.

9.2.5 Collaboration

Despite all four experiences being collaborative in nature, the *Mystery Box* provided the lowest degree of collaboration in comparison to the rest (see Figure 9.2). The data suggested that collaboration enriched and on many occasions pushed children's thinking to a different level as has been similarly found by other experts like Florea and Hurjui (2015). As discussed in the previous section, the children manifested concrete thoughts when needing to communicate with one another (both verbally and with body language) and engaged in productive discussions. Furthermore, collaboration provided opportunities to develop reasoning, listen to different points of view, challenge one another and scaffold each other's thinking, all important in CT. These observations relating collaborative interactions and the development of critical thinking have already been discussed by Wegerif (2010), Quinn (1997) and Murphy et al. (2014).

Despite evidence in this study showing that the *Mystery Box* was less collaborative, it is fundamental to mention that the experience took place within the group context and therefore some children's thinking was affected by others' contributions. Consequently, it is problematic to think that the thinking was purely individual. This links to the work of Wegerif (2015, 2010) and thinking around dialogic thinking. Collaboration is fundamental to early childhood pedagogy, especially play-based, as within the contexts developed for this thesis. Therefore, a pedagogical fit with practice is likely to include some element of collaboration,

so maybe it is the extent to which collaboration is authentic in pursuit of the goals of the activity that might be useful to consider in relation to critical thinking.

9.2.6 Hands-on experimental: Role of tools and manipulatives

The *Zoo Mystery, Mystery House* and the *Snack Mystery,* as illustrated in Figure 9.2, were considered to be hands-on experimental. This means that the children made use of manipulatives that aided them with useful information, experimented with tools and resources that enhanced their performance, and overall served to scaffold thinking during the process of enquiry. For example, in the *Snack Mystery* the children were able to discard information physically by testing the provided tools and materials. This appeared to help critical thinking manifest. Similarly, in Lechelt et al.'s (2020) study, artefacts worked as prompts for critical thinking. Lechelt et al. (2020) argue that this was because the experimentation of artefacts elicited critical thinking about the topic in question by enabling the transition from the concrete to abstract thinking and the opposite.

As mentioned in Table 9.2, the *Mystery Box* was not an authentic investigation and did not rely on much experimentation. In Figure 9.2, the *Mystery Box* is located in 'low hands-on experimentation' although the children did manipulate the materials, for example, handling and moving the box to 'feel', hear, and weigh the item to aid in their question formulation and guesses, for example.

9.2.7 Verbal skills dependence

The *Mystery Box* and the *Mystery House* relied substantially on verbal skills in comparison to the *Zoo Mystery* and *Snack Mystery*. In general, those with less vocabulary might have been at a disadvantage. Murphy et al. (2014) argues that language skills are precursors to critical thinking and that verbal interaction supported the development of critical thinking skills in early years. Despite this, all the experiences provided opportunities to express themselves through body language, utilisation of materials like Playmobil® figurines in the *House Mystery* and *Zoo Mystery,* or other tools such as those used to express through drawing and writing. Hence, a crucial layer of data across the cases was visual and obtained from the video footage.

9.2.8 Specific content knowledge dependent

The *Zoo Mystery* was the only experience that required specific content knowledge related to the area of natural sciences and animal life. In order to engage in critical thinking focused on the topic of this experience, the children needed to know some very general information and facts related to the topic. Certain differences came to light related to the degree of the children's natural sciences knowledge, which I can only assume might have been different if the target topic had been different. The level of specific content knowledge could have limited the performance of some children in comparison to others, as previously discussed in the *Zoo Mystery* chapter. This is because critical thinking is considered content knowledge (formal and informal) dependent (Lai, 2011; Facione, 1990; Coles & Robinson, 1991; Ennis, 1963), and despite critical thinking skills are argued to be transferable across contexts by some critical thinking experts (e.g., Cottrell, 2011; Halpern, 1998; Fisher, 2001), the lack of content knowledge at the time can limit the thinking performance.

In order to tackle this issue, the children had access to a variety of resources to research the 'unknown' and enable engaging in reasoned decision making. This was consequently useful to analyse, stimulate, and develop relevant critical thinking dispositions, too. It is important to remember that the focus and emphasis was not set on making comparisons across children, but rather critical thinking was viewed according to the individual, group and contexts.

9.2.9 Summary of benefits and constraints

In this section, I have discussed the benefits and constraints in relation to the chosen key elements of the four cases. I have used the idea of a continuum to explore how each detective play context might facilitate a context for critical thinking. Overall, the cases with tendencies towards the right side of the continuum were more productive than those on the left for providing a wider range of opportunities for the use of critical thinking skills and dispositions. Despite this, for stimulating specific critical thinking skills and dispositions and for easier assessment of their occurrence, designing an experience with the elements tending to be in the left part of the line was reasonable, as it seemed more likely that the teaching or research objectives would be met. For example, the *Snack Mystery* was probably the most productive in fulfilling the more open explorative aims of this study to learn about young children's

critical thinking. This experience has provided further evidence to reflect on which critical thinking skills and dispositions were visibly 'used' by children and which could require further stimulation and development. The latter could be benefited by a more structured, controlled, objective-specific designed experience, for example, the *Mystery Box*. Therefore, the use of detective play activities in combination, either to build skills and dispositions or to target gaps in children's knowledge, would be a productive approach for teachers to consider.

Overall, the use of a series of continua, as in Figure 9.2, could be a useful tool to visually enable the intentional design of critical thinking contexts. The practice of planning and decision making when considering pedagogical choices for supporting the development of critical thinking is more complex than a simple binary might suggest. Tools such as this could also be used in the assessment to amend aspects that require further stimulation and development (skills and dispositions), supporting adults' professional practice development in the long run.

It is important to remember that, as was mentioned in Chapter 3, variations across the detective experiences are greater than what has been discussed here. These results, therefore, need to be looked at with caution as these benefits and constraints in this particular detective case are contextualised in this very particular scenario. These elements in isolation might bring different outcomes in a different context and even 'similar' detective experiences. Additionally, the majority of participants in this data set had participated only once in each of the experiences. I would assume that thinking during detective play could become more 'sophisticated' and 'skillful' with experience or continuous 'repetition' of these tasks or similar kinds of tasks. Despite this, the evidence in children's detective performance suggests the role of novelty and surprise in a stimulating children's critical thinking performance context was crucial and, therefore, the question lies in finding novel ways and experiences to stimulate children in intellectual activity throughout time (maintaining the core goal).

The next section will address the third and final research question.

> 3. How do young children's critical thinking skills and dispositions manifest and
> what do Critical Thinking Moments (CTM) look like in 5-6-year-olds' detective
> play?

9.3 Observations of Critical Thinking Moments (Research Question 3)

The previous sections focused on the discussion of the seven key contextual and relational findings that were found useful for facilitating critical Thinking in 5-6-year-old children's detective play. It also discussed, alongside the literature, the benefits and constraints of key variations across the four detective cases. Sections 1 and 2, therefore, provided a range of methodological and pedagogical insights based on the evidence of this thesis that could be potentially considered when designing a context that is aiming for the facilitation of young children's critical thinking in the context of play. Despite the usefulness of this, there was insufficient research literature that provided a clear articulation of specific examples and an examination of what critical thinking could look like in the context of 5-6-year-olds' play. This is key, as providing data with recommendations for enabling the recognition of critical thinking in very young children is as crucial as acquiring the practical knowledge to facilitate the space for it. Consequently, in this section, I will discuss findings related to 5-6-year-olds' critical thinking during detective play. More specifically, I will discuss how it manifested in the detective experiences, focusing on both skills and dispositions, and secondly, I will examine what Critical Thinking Moments (CTM) looked like as a whole.

9.3.1 Critical thinking manifestation

The children's thinking, including critical thinking, was reflected in and interpreted from observations of the children's doings (behaviours), sayings (verbal utterances), and attitudes. The verbal expression could be considered the easiest and most convenient to identify, interpret, assess, and use as evidence, but it was only part of the puzzle rather than the holistic data frame used in this thesis. The children played, role-played, discussed, sang, wrote, drew, gestured, and demonstrated using their facial or full body expression in many varied and playful forms within the contexts, providing a range of ways to manifest thinking. Supporting the former vision, it has been widely acknowledged, and found specifically important in early years pedagogy, to recognise, as Malaguzzi (1920-1994) put it, 'the hundred languages' (1998) of children. Thus, the many forms of expression the person, in this case the young child, chooses to use to manifest thought all had to be considered. It was,

therefore, crucial to listen to, capture, and study these various forms of children's expression when exploring critical thinking in the context of play. Ignoring them could mean overlooking fundamental information that would put young children and their competencies at a disadvantage. Despite this, I was also aware that there were possibly inaccessible remaining pieces of the puzzle involving research with someone else.

In this thesis, I selected and interpreted manifestations related to critical thinking skills and dispositions using Critical Thinking Moments (CTM) that I could 'empirically' select from my data, interpret, and defend to a reasonable extent. For example, during the four detective investigations, there was evidence related to children's diverse knowledge of and progressive learning, behaviours, verbal utterances, and attitudes related to critical thinking skills and dispositions. However, I sustained an agnostic view, recognising that I could not possibly capture all inwardly occurring Critical Thinking Moments that might have happened.

For the children engaged in the detective experience, the tools and materials were the vehicle for making meaning, analysing, and drawing conclusions. In this context, it was not productive to try to fully separate what was purely cognitive from what was done, as is similarly the case when looking at the relation of body and mind, which is related to the theory of embodied cognition, for example, the process of analysing an idea versus the process of analysing a piece of evidence, first at a physical, and then at a more abstract level. It was evident when interpreting the observations of some of the video footage that in certain moments, some children were creating and developing their thoughts (thinking while doing or talking) through the detective doings and sayings rather than a mere afterproduction of the thought itself. Therefore, the children's diverse expressions, physical interaction with materials and tools, as Reggio Emilia's 'third teacher' (Malaguzzi, 1998) and other actions in the environment, were considered essential to capture and learn about young children's critical thinking and its diverse manifestations. This practice and type of observation are common, engrained, and well-founded theoretically, as well as well acknowledged in Western early years pedagogical practices. However, it requires the practice of listening and tuning in with the many ways in which children express themselves beyond the means of verbal expression (Blaisdell et al., 2019). Despite skilfulness in the above, I argue that this 'listening' to various contextualised forms of thinking expression requires intention, readjusting, and attunement. If the aim is to

capture young children's critical thinking in addition to strategic moments in which critical thinking can be stimulated or facilitated, we have to ask what exactly we are intending to achieve and what we are trying to search for.

9.3.2 Connecting Critical Thinking Moments

Flanagan's (1954) Critical Incident Technique (CIT) was a valuable tool for researching critical thinking, and more specifically for identifying what I have termed children's Critical Thinking Moments (CTM). It provided a more holistic and descriptive picture of children's critical thinking processes, which was complementary to what the focus on dispositions and skills on their own would have been. Critical Thinking Moments, therefore, became diverse, valuable, productive communicative exchanges within collaborative interactions. This could have been with the self, others, the environment, surrounding tools, and objects, which linked to Wegerif's (2015, 2010) concept of 'dialogic thinking'. Instead of the focus on verbal dialogue (logos) alone encapsulating the idea of children's diverse modes of manifestations, these CTMs were unique, playful, creative, unexpected, multidisciplinary, 'unorganised' and spontaneous eureka narratives, which offered open-endedness for a variety of possibilities for learning as well as a potential path for continuity.

These Critical Thinking Moments involved the use of information related to the children's world, including experiences and what they already knew, and their use of this information to fulfil their investigative needs. To illustrate this, I will spend some time focusing on the fox's narrative below. This was extracted from the *Snack Mystery* case, and illustrates in detail the value of connecting moments of critical thinking and gives an insight into how the process allowed the building up in children's thinking.

9.3.3 "Fox's narrative": Critical Thinking Moments (CTM)

-This is a bird, and this is a duck. And this is a bird, and this is a bird. This isn't a bird. Mia

-Why? Me

-Because this is a duck, because I have seen a duck's foot (makes the gesture of the feet with the hand on the table as if a duck is stepping on a surface)*, because I have seen a duck footstep at the farm, because I lived in (on) a farm* (a farm in a foreign country. She told me about her family origins at some point).

-I'm gonna see if it has any clues (she gets close and observes with the magnifying glass). Mia

-This one is a /hei/ (Holly is pointing at a photograph of the animals I hung on the wall)*. Holly*

-Can you show me? (I ask her to show me because I don't know what a /hei/ means. It might be a local word that I am unaware of, or it could also be that it is not a real word.) *Me*

She goes on and says:

- Look! (and points at the chicken/rooster) *Holly*

-Wow, how did you know that? Me

-Because I watched a video about them. Holly (*5 months later, I discover that /heihei/ is the rooster from the movie *Moana*).

-I know whose footstep is that. I will show you. (She stands and goes to the photos. Points at the cow and looks at the feet with the magnifying glass) *Mia*
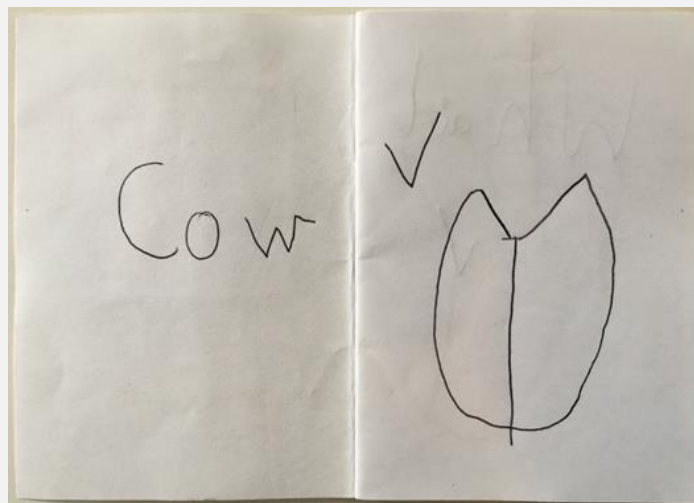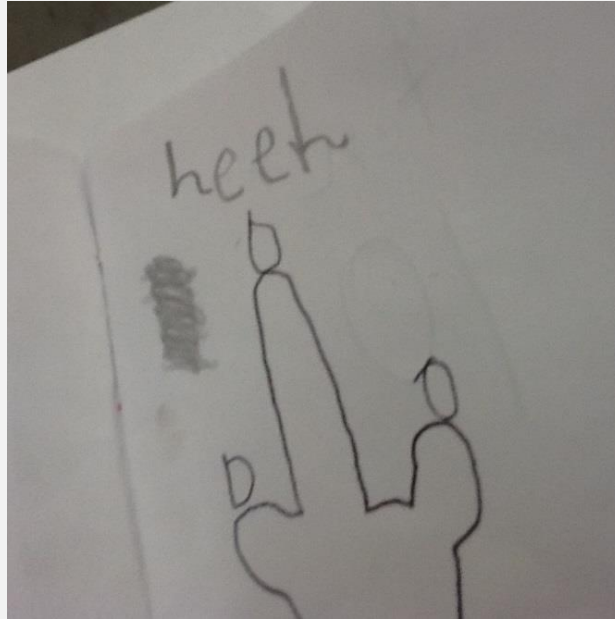
-Why? Me

-Because I can see the same foot. Mia

-Can I make a note? Mia

-Yes. Holly

-I have a note. Mia

Detective note 1: Mia's note. She has evaluated her finding by 'ticking it', which indicated she has matched them appropriately.

Holly. This is the word she writes heeh sounded slowly by herself phonetically /hei/ /hei/

Extract 9.1: Fox's narrative, Part 1 of 4. Detective 'training' stage.

This first part of the narrative (Extract 9.1) shows Holly and Mia starting to interpret the animal prints naturally as soon as they saw them. Mia and Holly seemed to be initially confident about the ones they had first approached. When I asked the children why, they made reference to their past experiences. Mia explained that she had already seen one of those prints, as she has experienced animals and farm life in her family's country of origin. Due to her lived experiences, she seemed convinced it belonged to a duck and she continued to explore the prints to *'see if it has any clues'* adopting a detective/researcher role. For some children, figuring out whose print that was (analysing the print) was the investigation. For Mia, however, the investigation (driven by motivation) was to analyse beyond what was 'obvious' to her (further clues).

Holly also made a connection with past experiences, in her case, a film. I asked her to point at what she meant by /hei/ as I was not able to recognise what that was. By looking at how sure she felt about it, I thought it could be a local word to refer to chicken/rooster, but I knew there was also the possibility of it being a 'made up' word that had meaning to her or her

immediate environment. Five months later, I was able to find out that /heihei/ was the name of the rooster in the Disney film *Moana*. She had learnt about roosters through the film and correctly identified the rooster, but she gave the fictional proper noun rather than the noun. Both children could clearly recognise their identity without much effort and made references to where they learnt it.

Mia then continued to identify other prints that she wanted to show me by pointing at the similarities between the paw print and the photo. She later asked whether she could make a note, as she probably thought her thinking and doings were worthwhile. Holly responded to her by saying she could make a note, taking some leadership in the investigation rather than waiting for an adult (in this case, me), which indicated a degree of ownership and power. Mia then made Detective Note 1 (above), in which she showed she had additionally evaluated her finding by 'ticking it', which indicated she had matched them appropriately (Detective Note 1).

Overall, this section of the narrative shows that the children naturally and positively engaged in the activity as well as in the adoption of the detective role. They showed voice and confidence in what they said and did. This section of Part 1B of the activity did not appear to cause much uncertainty to them, and they seemed to enjoy explaining what they knew to me. They both showed knowledge regarding animal track recognition, which they had learnt from very different contexts. My role in this section was mostly to listen as well as to ask the reason behind their statements. This was a valuable time for me to learn about them (how they worked, their behaviour, and what they knew, among others). Similarly, for them, it was also probably useful to find out about me and how I behaved with them.

After exploring animal prints in isolation, as seen in Extract 9.1 we started the snack mystery play where children needed to analyse evidence from the 'real' 'crime scene' to figure out who ate the snack. Extract 9.2 shows that the children's engagement had changed from positive but calm to a much more physically active and excited state. The process of searching and finding around the space (not necessarily hidden) seemed to be thrilling for the children, and it was obvious by their self-expression (including facial gestures, movement, screaming their discoveries, and calling on each other to check things out). The excitement, however, appeared to fire up the children's inner curiosity, and their focus and energy was put into

thinking and resolving the task rather than getting distracted with something else (Extract 9.2).

-Hhhaaaaaa I just found some more footprints. (screaming, excited, children are very into it and active) Mia

-So where is that coming from then? Me (in order to start a narrative of the direction of footprints)

-From there!!! From that box. Mia (direction)

-And also I can see something there (pointing at a completely different area) (children go there)

Screaming footprintsssss (children)

Those are duck footprints (she runs to point at the duck photograph on the wall)

I'm trying to tell Katia not to move the clues. Do you remember what it was? So that way, if possible, we could look at the overall tracks

-More footprints Mia

-Look Holly

-Maybe the squirrel (pointing with the magnifying glass to the small prints) its pooed here (pointing and observing through the magnifying glass at the poo in its right) Looking at both prints and poo.

Mia found some prints on the top right shelf and looks at them with the magnifying glass and says:

-Wait there are the same as here! (Pointing at the prints seen on top and under (comparing prints and noticing they are the same), it then jumped from here to here and from there to here and then here Mia. She is linking clues with one another as to the possible animal track

-Yes they could have jumped that way Me

-How about these things here? Me

-Chickmunk, squirrelll, ehhh!

-What is this? Me

-Pooppp! Holly

-But it's a little one Me

-Iuuuuu

-Maybe it's the squirrel's poo. Mia

Holly follows but picking up the marked as evidence worm and says *Thisss's*

-It's squirrel's poo Mia (she doesn't think the worm has made that poo)

-Detectives come hereeee Me (gathering the children as to try to wrap up some ideas) *Let's plan and write some notes before we forget it. If you want, you can tell me and I can also write it down* (in case they don't want to write as it is difficult for them and they have done it with motivation before. Not to feel forced.)

-How many feet? points at feathers. Oohhhh I found another clueeee Holly

They are writing in their notebook a list of the clues we had found, there is sounding. *I've seen some*

---

pee Mia*, worm Me, Blood (they might have interpreted ☺ (Making a list to document, recall, and organise information.)*
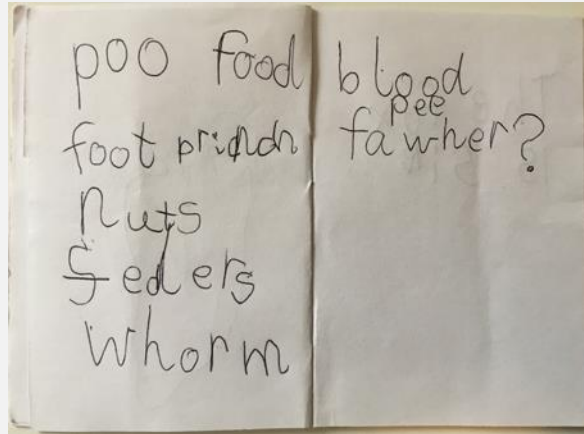
Detective note 2: Mia's list of evidence: Poo, food, footprint, nuts, feathers, worm, blood, pee, feather (it appears that she has written the word feather in two different ways. The child's writing is phonetical and therefore as words are written by sounding and not internalised/memorised. That is why there are inconsistencies when writing the same word).

-I wonder who has eaten this? Mia (Thinking generally about scenario)

Holly is cutting red tape to mark more evidence

Extract 9.2: Fox's narrative, part 2 of 4.

A large number of clues were placed around the room. The children were loudly describing what they saw, running around, and observing the space. I took a moment to ask Mia where the footprints she found came from, so she could start paying attention to specific details and characteristics in order to make a general sense of the animal tracks rather than focusing on an individual print. She showed comprehension regarding the direction as she pointed out and explained where. She then identified an animal print and made use of the tools on the suspect's wall to support her thinking.

As I saw Katia moving some clues, I reminded her about the importance of maintaining the evidence in place: extracting the clue from the context might have lost the value of connecting prints to tracks or other clues. The intention was to keep the children from moving the clues away as long as possible in order for them to notice evidence in relation to context and between clues. They were encouraged to use tweezers to get into the expert detective role, to slow the process down, and to experience the use of a scientific tool (careful manipulation

of small items, to prevent contamination). Ordinarily, in preschools, these jumbo tweezers are used with a different intention to exercise fine motor skills, often accompanied by category and sorting trays.

Mia started to wonder whether the prints could be a squirrel's, and stated uncertainty by saying '**maybe**'. With the use of the magnifying glass, she was observing the prints in detail and connected them to a dropping she found nearby. She continued to look further at the surroundings and then realised, by comparison, that the prints were the same by saying, "**Wait, there are the same as here!**". In addition, she re-enacted the possible scenario that explained how the animal had moved in order to justify the theory of the track: "**It then jumped from here to here and from there to here and then here**". Mia's thinking shows that she was able to analyse parts of a whole and to make links to create the representation of the whole.

There were a large variety of clues that led to various alternative possibilities for interpreting, analysing, explaining, and evaluating the scenario. It required effortful thinking compared to analysing the tracks in isolation. Finding and marking meaningful evidence, remembering, understanding, analysing, and connecting those to a sense of the whole were all important skills. The generation of clues and connecting ideas was therefore more chaotic, similar to organising and coding a set of research data and making sense of it. Therefore, to facilitate organising some of the intentional chaos, I called the rest of the detectives for a meeting. When working on tasks 'independently' in practice settings, teachers often 'interrupt' children's work to share an outsider's relevant message or give further directions. Being a participant myself, I was able to make use of my position in the game, using insider information and context, and make a natural extension rather than an artificial 'interruption' of play. We gathered around the table and took a few minutes to review and remember what we had found so far. Together, we went through the process of generating a list of the evidence we had generated (see Detective Note 2). These processes are intended to synthesise, organise, (re-)focus and start to narrow down thinking. Documenting might not have been used in the same way by all, but as we were sounding the words aloud, it was an opportunity to recall, share what we had done before, generate ideas, encourage roles within

the role-play and create habits and strategies for thinking as well as understanding real-life purposes of literacy/numeracy within context.

Mia seemed to be wondering about ideas. She was engaged in playing detectives and focused on the overarching objective, showing motivation and effort. She then said aloud with curiosity what she seemed to be thinking: "***I wonder who has eaten this***". It could have been that a level of challenge sparked uncertainty towards emerging information and moved her into the next level of thinking driven by her motivation to find out 'who has eaten this'. The question could have triggered critical thinking dispositions, or her dispositions triggered her question. Something similar could also be inferred in the first narrative (Extract 9.1) (SM P1B), where the mystery was to figure out prints in isolation. In this sense, critical thinking moments differed in the individual moments rather than in the specific post-question or stage of task.

In Extract 9.3 Mia visually documented, with the iPad, the footprints, which to her eye were fundamental evidence in the investigation (Video capture 1 and iPad Documentation 1). Something inside the animal dropping had also captured her attention. It was not clear who introduced the item in the dropping, and the possibility that she could have done that herself also existed. Regardless, Mia said, *"**Miss Lorri. I need to see if the poop has something disgusting inside it**", "**Because the animal can be sick**", "**Can I see?**"*. Here, Mia demonstrated she was very observant. She was taking the detective role seriously and explored the clues in detail, making use of the magnifying glass (see Video capture 2). She showed an understanding of how illness could be reflected in animal faeces and suggested that the animal who produced it could be sick. She gave details such as *"**When is green is very very bad**"*. She was aware that the colour of faeces could mean that someone's health could be at risk. It makes me think that she knows these details from her home experience. When I asked her how she knew, she said that her cat was sick, and was able to describe some of the cat's behaviour with both verbal and body language. Mia was transferring and making use of previous knowledge in the detective mystery context.

Mia seemed to be thinking and looking for further answers. She then approached the photo of the fox (suspect on the wall), looked at it with the magnifying glass (see Video capture 3), and said with a eureka realisation expression: *"**/hhhhhh/ it's the fox's!**"* Holly shared her expression of discovery by saying, "***The fox's!!!!***" She then continued to say, *"**Yeah, is the**

fox's poop!!! Andddddd that means (slowing down) *that the fox is sick*". This realisation seemed to be a moment of emotion for both children. Mia's expression (see Video capture 4 and Video capture 5), with wide open eyes and mouth and putting her hands up on her head, is somehow the reflection of enlightenment. The process of thinking during the activity had slowly evolved from a single isolated animal print into an interpretation of it in the wider context. The children took the time to observe, explore, analyse, and evaluate what they had found and make sense of it based on what they knew and their past experiences, and this helped accomplish the given task.

Mia's and Holly's thinking pointed to the fox as the primary suspect, which created a new problem that did not previously exist, which was that the fox was sick. Mia took this further by saying *"/Hhhhhhhh!/ We need to take her to the doctor!"* Extremely excited, she continued creating an imaginary narrative in which she needed to help the fox. Her role play started to extend creatively into a new problem-solving scenario.

-*Miss, can I take pictures of footprints?* Mia

*I give her the iPad to take photos. She takes photos.*

Video capture 1: Mia is documenting the prints in the scene by taking photos with an iPad. Holly is doing detective work on the left.

iPad documentation 1 and iPad documentation 2: Sample of footprint evidence recorded by Mia

-I know the poop now I know what's inside it now. Because I saw the poop…

(Someone has put something inside the playdough poo, some potpourri I think. She wanted to insert an actual clue within the clue to make it more interesting.
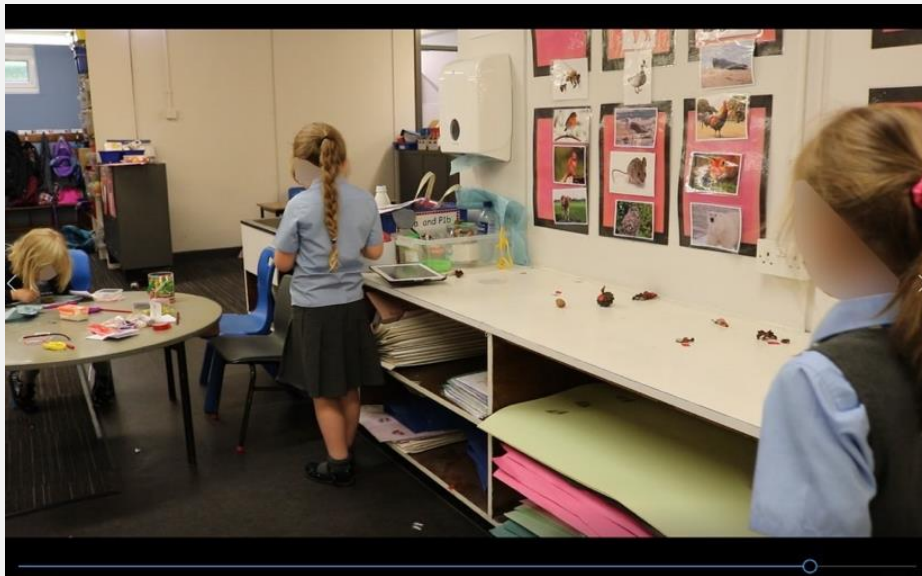
Video capture 2: Mia looking at the animal dropping with the magnifying glass. Katia and Holly are also engaged in the investigation.

-Miss Lorri. I need to see if the poop has something disgusting inside it. Mia. ☺ (Was it she or Katia who put something inside the clue?) Either way, this idea and what comes from it is interesting. *Because the*

animal can be sick, Mia*. Can I see? Wanting to observe it further. 'When is green is very very bad'* Mia

*(*Mia *is showing some previous knowledge from some experience; she is aware that the colour of poo could mean that someone's health could be at some risk)*

-How do you know that? Me

-Because my cat was sick Mia

-Really? Me

-It was sick? Oh noooo Me

-It was yawning and yawning and yawning all day and night (making the gesture of scratching claws up to down imitating the cat)

Was it in x? (name of child's family origin, as she has told me she came from elsewhere)*

No it was in Scotland Mia

Ohhh Me

(Mia is transferring previous experiences knowledge to this new but 'similar/poo' context)

Video capture3: Holly and Mia working together. Mia is looking at the photograph of the fox with the magnifying glass.

They do so, and suddenly, Mia says:

hhhhh   it's the fox's! Mia (realisation)

The fox's!!!! Holly

Yeah, it's the fox's poop!!! Andddddd that means (slower) that the fox is sick. She realises how she put it

all together and puts her <u>hands up with a surprise</u> sound*! Hhhhhhhh! We need to take her to the doctor!* Mia Imaginary play solution to a new problem as last problem was to find which animal was there. She did, however, figure out that it was a fox and that the fox was actually sick.

Video capture 4: Mia and Holly had made a discovery. Mia's mouth is wide open with surprise.

Video capture 5: Mia bringing her hands to her head whilst they have made the realisation

Extract 9.3: Fox's narrative, Part 3 of 4.

Even though Mia continued to insist that the fox should be taken to the vet (see Extract 9.4 below), Holly did not want to continue in this new direction and stated, "***No, we need to write it in the book***" (meaning the detective book, see Detective note 3). Mia had started a new

conversation that could have redirected the role play; however, Holly appeared to have a plan she intended to stick to and as a result, regulated her doings as well as finally persuading Mia. Holly maintained focus on resolving the task and persevered to achieve it. I did ask Mia some time later whether the prints were from a squirrel to see what she would say, but she stood by her work, saying, "**No, this is that one. That's the fox's; he is sick.**"

Mia finally decided to "**see if in the camera there is any more clues**" referring to the iPad photo library where children had documented many of their findings. Both Holly and Mia sat at the table, passing around and commenting on the iPad photos (see Video capture 7). They both seemed very proud of the documentation supporting and confirming their detective actions.
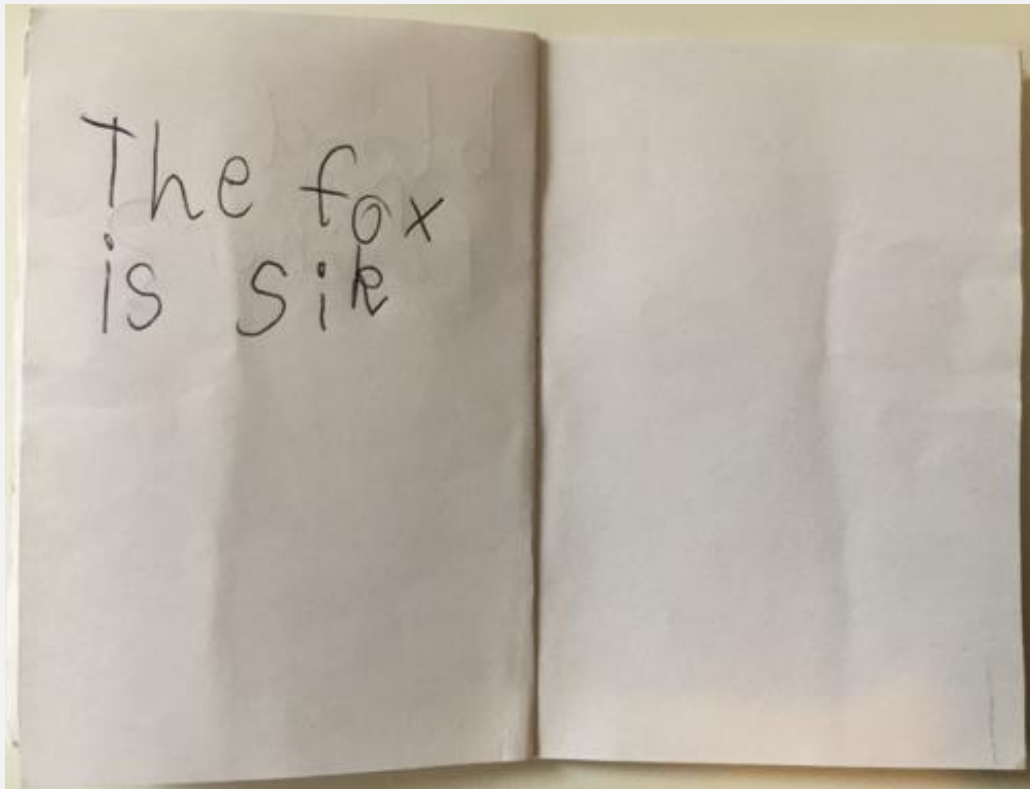
Detective note 3: Mia's concluding notes: 'The fox is sick'

I need to look for the fox now, I need to look for her! (jumping with emotion and motivation, she is calling the fox a "she", personalising the fox further as she believes it is actually the fox through inference from the given and created evidence).
She had taken the fox figurine from the animal box and she decides to put it in a corner and says:

Guyssss the fox is here! (Mia points at the fox figurine that she has put herself and says:

<u>*The fox is here and is feeling sick!*</u> (enthusiastic tone) *Mia*

Is this the fox's print? (Pointing at the print next to the fox figurine she had put in the scene.) *Me*

-Yeahh and he (now it is a he) is sick. Look (brings the figurine closer to me with the magnifying glass)

because is the fox's print (showing the print track) *and he is sick, Mia.*

-Well done! (Me)

Video capture 6: Mia looking at the fox's figurine with the magnifying glass while she is explaining to me the above (see conversation above), Holly is doing her detective work.

<u>*-Let's take him to the vet,*</u> Mia."

(…)

-This could be the squirrel? Me

-No this is that one Mia (she doesn't agree with the idea) That's the fox's, he is sick

-Why is its poop here? Holly

-Because we are going to explore it. Me

(Holly and the camera)

Mia *takes the iPad and says:*

-I will see if in the camera there is any more clues (looking at all of the evidence pictures taken with the

iPad as to review what they have found) she comments:

-This is the owl (pointing at prints in one image taken by her) They pass the iPad around they are both

commenting on the images (need a close transcript from audio as there is a lot of noise around) Holly

says:

-*This is my booklet Holly.* Mia leaves to check put something with the and Holly continues proudly taking the iPad and browsing through the photos and says *Look, this is my booklet. Holly*

Video capture 7: Holly and Mia reviewing and commenting on what they found.

-*It is the fox's! Mia*

-*The fox's! Holly*

-*Yeah, is the fox's poop!!!!* **And that means…** (a bit slower) ***that the fox is sick!!!***

Extract 9.4: Fox's narrative. Part 4 of 4.

The fox narrative is a section of the *Snack Mystery* that shows how young children's critical thinking moments were connected during play activity. It shows how Mia and Holly thought and worked together until they reached their goals. They collected clues and interpreted and analysed them, making sense within the context of the investigation. This narrative gave a sense of what the process of thinking was like during the investigation. The children's thinking made several references to past experiences and showed the ability to transfer knowledge to help resolve the mystery task.

The children showed autonomy, competence, and natural immersion in their detective/researcher role. They made use of the available detective tools to support the investigation, as well as the adoption of the role itself. The children's expressions during mystery play showed engagement, emotion, and focused motivation towards achieving the goal as well as satisfaction and pride in what they had achieved. Once we were done playing detectives, Holly approached the camera again and said '***no stop time'*** in order to say that it was not turned off. She showed an understanding of its purpose and took responsibility for it.

The majority of the data in this thesis has focused on individual Critical Thinking Moments, but in the discussion above, I have tried to show how these moments connect and build over a sustained period of detective play. Although there is no more space for this in the thesis, further analysis might be appropriate to explore how these connected moments might work to push children into sustained or connected higher-order thinking.

9.3.4 Potential Critical Thinking manifestation

Apart from children's Critical Thinking Moments (CTM), it is also useful to discuss the occurrences coded with *Potentiality* for Critical Thinking, which I have labelled as a Potential Critical Thinking Moment (PCTM).

The idea of potentiality was aroused through post-detective play 'activity' reflection and predominantly kept reappearing during the analysis of the data. In all four cases, certain crucial and productive instances with such 'potentiality' were identified. A Potential Critical Thinking Moment (PCTM) refers to a particular identifiable prospective thinking opportunity within interaction (dialogue, interaction with object, etc.) that was not pursued further, regardless of whether this was a deliberate or an unintentional decision. In other words, it refers to those productive but potentially 'missed opportunities'.

Overall, there were diverse situated reasons behind those missed opportunities in practice. For example, not being able to pursue every moment; other children needing my immediate attention; not wanting to interrupt or become intrusive; not realising that the opportunity happened, as it was only retrospectively observed through the scope of the camera; not

wanting to provide or influence solutions; or even because I was not able to recognise the opportunity until the process of analysis. Irrespective of the reasoning behind why the PCTM was not pursued from a professional teaching practice perspective with a particular methodological interest, it is not only interesting to reflect upon which elements are useful in stimulating Critical Thinking Moments (CTM) but also which elements and cases in general lead to more PCTMs.

Overall broadness, flexibility, and opportunity for children's own doings in the detective experiences provided a potential window of what something could become, providing unlimited possibilities to co-construct, in which novel things could keep happening. For teaching and learning purposes in early years, experiences that provide open access for those PCTM are powerful in the classrooms, and attention should be given to these.

9.3.5 Critical thinking skills and dispositions

The data across the cases showed that the children were involved in key actions and processes that were considered a foundation for or useful and directly connected to critical thinking skills. These included skills such as exploring, meaning making, analysing, suggesting, and explaining, challenging, clarifying, brainstorming, offering alternative perspectives, evidence seeking and providing, theorising, questioning, testing, inference making, documenting, evaluating, reflecting, scaffolding, negotiating, requesting evidence, and seeking advice and help while immersed in investigating each mystery problem (see Table 9.3: skills adapted from Facione (1990)).

Table 9.3: Skill key identification codes

	Key identification 'codes' for making critical thinking skills and dispositions visible.
Skills	**1. Exploring** (scenario, ideas, objects, etc.), Observing, exploring with the use of tools, exploring with process aloud, **searching beyond**
	2. Meaning making (interpreting, guessing, speculating, predicting, remembering, and connecting). **Transferring knowledge** (recalling and using knowledge from past experiences)
	4. Analysing (identifying and exploring the part from the whole, categorising, comparing/contrasting, connecting/relating information or evidence)
	5. Explaining, challenging, suggesting (ideas, solutions, options, strategies, etc.), demonstrating, clarifying
	6. T**heorising** (building theories from what is known, speculating, predicting)
	7. Brainstorming generating ideas, organising. **Creativity** and the creation of new imaginary paths
	8. Requesting help (information enquiry, **further information**, tools, instruction, explanation, verification of answers/performance, permission…)
	9. Questioning something, self, or others. **(Wondering)**
	10. Knowledge awareness (realisation of eureka enlightenment moment, fact fallacy (despite not knowing), knowledge awareness (knowing or not knowing), error awareness disequilibrium/realisation and cognitive conflict, indicating certainty and uncertainty)
	11. Testing (discarding method or used as supporting evidence)
	Inferring (organising, link making and drawing conclusions)
	12. Documenting: Marking and gathering evidence, organising evidence, revising documentation (notes, pictures, evidence).
	13. Evaluating: Evaluating self or others (performance, claims, etc.) in relation to investigation, performance, praising self or others, evaluating relevant/irrelevant clues,
	14. Reflecting (Thinking while immersed/focused in a task, or thinking about something that has just happened, 'reviewing' after…). This is an interpretation but could be challenged.
	15. Teamwork (Scaffolding ideas, others; collaboration, negotiation)
	16. Problem-finding and solving

It also showed children's behaviours that were related to the 13 dispositions (Table 9.4), such as being curious and willing to find the answers, being aroused to the process of enquiry and discovery, risk taking, being persistent when confronting difficulty, to self-correcting at the realisation of fallacy or not knowing, among others.

Table 9.4: 13 Critical thinking dispositions and sample behaviours descriptors

13 Critical Thinking dispositions	Sample behaviour descriptors:
1. To be curious and willing to find the truth. (desire to learn about and become well informed)	• The child observes and moves to a certain area, touches/ picks up an object to look at closely, with interest. • The child's body language and facial expression show expressions such as excitement, surprise, eureka expression, and expressive smile, in connection to the mystery investigation/question. • The child verbalises willingness to explore and discover what happened or through body language, such as sitting down. • The child asks questions about it. • The child shows determination and invests time in the specific task.
2. To be aroused to the process of enquiry and discovery. The focus, engagement, and flow.	• The child shows focus, investment, and flow on task. • The child verbally expresses interest and pleasure throughout the process. • The child expresses the above through body language.
3. To investigate/to be investigative (to enquire and inquire). To seek information, evidence, reasons, and explanations (including challenging views) and use those (product of enquiry) to form and provide views (e.g., reasoning based on evidence). To be observant, to question, to request reasons and to provide reasons with claims; to make predictions; to compare/contrast, connect; to be analytical, e.g. notice the part of the whole; find complexity, etc.	• The child observes what is under investigation carefully and with attention. • The child engages in investigative skills, such as comparing by putting two items next to each other and looking at the similarities and differences. • The child chooses resources and tools and uses those to observe, compare, contrast, and look for information. • The child asks questions to respond to her own wonders. • Verbal expressions, such as giving explanations regarding what they are looking for or doing.
4. To be confident in own competence (reasoning and abilities). To autonomously act and use those abilities and to be confident in requesting the help of others when needed.	• The child shows autonomy when investigating the mystery. • The child shows initiative during mystery solving. • The child expresses confidence through talk as well as signs, such as body position. • The child asks for help through body language (e.g., tapping my or another's arm and giving a sign with the hand to call me and point at what they want to know) or verbal utterances.

5. To self-correct. To listen to, explore, and consider others' views and to have the ability to change one's mind (self-correct) when necessary.	• The child shows a change in behaviour, action and discussion argument after feedback or in the light of new information. • The child understands feedback. • The child engages in a self-evaluation process, for example, when using playdough, comparing, and contrasting.
6. To take risks/to be courageous taking action in different ways to open up opportunities for new learning. Explore and experiment with ideas, options, perspectives, methods, and tools. Opposed to being too safe with what one knows works or being open to new learning. In early years, taking risks to experiment with ideas even when embryonic (does not need to be mastered or ready) and opportunities to rehearse thinking should be stimulated and prioritised by adults above expectations of clarity. Clarity will proceed from and throughout such a practice. Thinking for growth. However, one should be striving for that as well (e.g. 'thinking and communicating with clarity and precision' Costa & Kallick, 2000).	• A child/children has an alternative idea/method differing from what was suggested or what others were doing and decides to try it out/ experiment in a different way or with a different method.
7. To be prudent when considering views, evidence, and decision making, and accept uncertainty when given the situation (without identifying this as failure). **Prudence can be reflected with words; the use of speech regulators; clarity and preciseness, etc.**	• The child utilises speech expressions and tentative language such as maybe, I don't know, could be, definitely, or body language such as shrugging. • The child takes the time to think or consider before answering, drawing conclusions, or making decisions. • The child evaluates (directly or suggested in body language) someone else's argument and asks further questions for clarification.
8. To be persistent when confronting difficulty or frustration and to understand the value of effort. For teachers, this input should not be taken to extremes, such as pressuring a child into finishing a task or getting to the bottom of every task or idea. However, encouraging as well as modelling appropriate behaviour is important when overwhelming frustration is identified in the child, for example, 'Well done you put in lots of effort', 'shall we leave this for now and take a look at it with fresh eyes tomorrow?' or 'When this happens to me, I take a break and search x and see if that	• The child invests time in the same task, attempting to reach clarity/success. • The child focuses on finding alternative ways to find a solution. • The child asks questions with the intention of finding some clarity.

helps. This is often easier when…' (offering strategies to cope with and ease difficulty…)	
9. To be open-minded, flexible, and fair to different possibilities, perspectives, and opinions.	• The child listens, respects, and accepts others' and different views, agreeing and disagreeing, challenging, praising, or evaluating others' work or comments. • The child shows the ability to consider and change views while talking. • The child is able to look at a problem from different perspectives.
10. To understand the value of collaboration and to communicate and collaborate with others (teaching/learning with others and what can be achieved with others). To listen, respect, empathise, consider, and value others' contributions. To be concerned with the dignity and welfare of others.	• The child engages in discussions, agreements, disagreements, and negotiations (challenge and scaffold one another). • The child consults others and is interested in others' views and contributions. • The child collaborates with others. • The children call one another and share what they know or find. • The children share and delegate jobs, such as some taking notes, others looking for evidence and others taking pictures, for example, with a unified goal.
11. To be resourceful and creative in relation to the goal/question (purposeful creativity). To be alert to possible opportunities, views, situations, solutions, methods, strategies, and use of tools when appropriate.	• The child engages in unexpected actions and ideas outside the box. • The child engages in exploration and makes use of resources and tools during the experience.
12. To be mindful and aware of self, performance, goal, and process, and to be able to use this awareness productively (to plan for change, modify, change action, etc.).	• The child exteriorises inner thoughts regarding self, for example, what they know and do not know. • The child reflects and explains ideas about his or her own performance. • The child explains the plan and what will happen next to achieve the goal. • The child is able to express what worked and did not work.
13. To be attentive in identifying opportunities to engage with particular knowledge content and critical thinking skills according to goal and context. Overall, to be attentive to identifying opportunities for critical thinking. T to value skills and use them (helpful to make it explicit to become a conscious thought) to value critical thinking.	• The child uses appropriate skills and previous knowledge and experience which were relevant to accomplish a goal. • The child asks what or how to do something in a certain situation.

These are valuable key findings for this study as it facilitates the visibility of young children's capabilities in engaging with these processes that involved critical thinking skills and

dispositions during the detective role-play investigations. Some of these could be perceived as desirable, and others even as undesirable behaviours in relation to critical thinking. Nevertheless, the visibility and identification of both desirable and undesirable behaviours related to critical thinking in young children were positive and crucial for assessment and future action purposes.

Overall, it was more common to see the children involved in actions identified as exploring, meaning making, evidence seeking and providing, analysing, suggesting, and explaining, challenging, clarifying, brainstorming, theorising, testing, documenting, negotiating, requesting evidence, advice, and help. There were fewer instances of reflecting, evaluating ideas (not on self or performance) and reviewing, remembering all evidence and drawing conclusions using all the available information. This does not mean that these latter actions did not happen, but rather that they were coded less frequently. This could mean different things, independent of capability. First of all, some of these processes might have been harder to capture due to a relative inwardness, and secondly, it could be that the detective experiences facilitated some processes over others. Further guidance could have been helpful in supporting the children at these moments. These were clearly demonstrated in the *Snack Mystery,* in which the context and setting up of the clues prompted children into looking for the evidence, generating ideas and drawing conclusions about the overall scenario. Due to my involvement in play, I managed to mitigate this by making new use of tools (for example, the *Snack Mystery* peg sample in Figure 7.24 and Figure 7.25).

Additionally, among all 13 dispositions, curiosity and willingness to find the answer; process arousal and motivation; resourcefulness and creativity; risk-taking; investigative behaviour; and collaborative behaviours were the most observable ones within the detective experiences, whereas 'being mindful and aware of self, performance, goal and process' was less common. A reason for this may be relative inwardness, and such thinking and expression could have been facilitated without the challenge of time constraints. Finding the time at the end of each case to specifically reflect on thinking, performance, and task could have potentially facilitated metacognitive talk and behaviours. The original plan was to finish the cases with a reflective session using the video-stimulated recall dialogues (VSRD) technique

(Morgan, 2007). This technique is a useful tool for stimulating talk about self and learning in classroom contexts (e.g., Cutter-Mackenzie et al., 2015; Morgan, 2007; Tanner & Jones, 2007).

9.3.6 Reconsidering rights and wrongs

Differences in the level of sophistication regarding the above processes were visible across children and in particular moments. The degree and depth to which some children engaged in exploration, analysis, and alternative seeking, for example, would vary. In addition, the stability of behaviours related to critical thinking dispositions could also be considered as a variable. Assuming that there are differences across children, I would argue that the level or degree should be considered when identifying critical thinking in relation to the individual's needs, knowledge, competencies, and overall experiences. For example, some children were more informed about specific facts that were useful in detective cases than others. On some occasions, this could have facilitated more in-depth engagement with the issue at hand, for example, by deepening or expanding a topic or idea that another child could not have done without this knowledge and might have overlooked.

It was also observed that even when some children showed fallacy in the facts provided, it could be evidence of skills or behaviours related to critical thinking, despite the premise being wrong. Overemphasis on whether the fact was right or wrong may lead to undermining the process of thinking and the use of skills and dispositions for critical thinking. If the aim is critical thinking, I argue that there needs to be consideration of the thinking process and not whether the outcome is correct. This does not mean that adults are not to value and comment on rights and wrongs at the appropriate time, but rather that one thing (assessment) differs from the other (the development of dispositions). Assessment may not result in being fully productive if the aim is to assess critical thinking and contribute fairly to its development.

Some very interesting and valuable insights related to critical thinking skills and dispositions came from fact fallacies. For example, as previously seen in the examples of the detective cases, some children offered fake 'facts' while believing they were right and used that information as evidence, relation making, meaning making and drawing conclusions. Those processes of thinking and the use of skills and dispositions were considered valuable in this thesis, as the outcome was not the main focus. This would require a change in orientation for

practitioners, either a changing or opening of their mindset, with a greater focus on the overall idea of assessing and facilitating critical thinking, not just the rightness or wrongness of facts. To do so would take advantage of all valuable thinking moments rather than excluding those that do not fit with preconceived ideas (Donaldson, 1987).

9.3.7 Thinking about the progression and development of critical thinking

The four detective cases, as discussed in Section 9.2, were different in nature and were more or less useful in relation to whether there was a specific or more explorative objective:

- The *Mystery Box* focused on children's strategic question formation and goal-oriented use of strategies and using derived information to make informed guesses.
- The *Zoo Mystery* focused on animal life and habitat research, and asked children to prioritise resource searching, using new information and previously acquired knowledge for the strategic planning, decision making and design of the zoo.
- The *Snack Mystery* used an experimentation hands-on scientific method for enquiring, evidence seeking, meaning making, making connections, theorising, testing, and drawing conclusions based on the evidence.
- The *Mystery House* focused on observation, evidence seeking, relation making, and particularly theory building.

When looked at in isolation, all cases were productive in different ways, with the *Snack Mystery* and the *Zoo Mystery* being the most productive ones for generation and open exploration and the *Mystery House* and the *Mystery Box* the most productive for focused exploration of how children theorised and how children used strategies for guessing. As a collection of experiences following the given order, it was concluded that the sequencing was favourable for the detective experience. This sequencing gradually guided the child from one experience to the next, starting from the *Mystery Box* 'detective training' on the first day until the *Mystery House* investigation*.*

The manifestations in which 'skills' and 'dispositions' were reflected and identified in this thesis were diverse across these cases. For example, a child 'exploring' in the *Mystery Box* experience or 'exploring' in the *Snack Mystery* experience may have entailed very different

actions. Despite this, it was visible that children were learning across the experiences and transferring some of the skilfulness from one to the next detective experience. However, this does not mean that all used skills would be automatically transferred from one experience to the next or from one subject to the next. It was, however, identified that this was key for adult input. In other words, the experience could be strategically utilised by the adult for reference making and helping children to create relations and transfer across activities, disciplines, and contexts. Practitioners should therefore consider issues of continuity in relation to their experience of different play contexts and how they might build skills and dispositions when progressing from one to the next.

9.3.8 Summary of observations of critical thinking

This section has discussed the various ways in which children manifest critical thinking in the context of detective mystery play, more specifically, the many different ways and forms of expressions from children's playful doings, sayings, and behaviours. Acknowledging those manifestations has enabled visibility and a more accurate picture of young children's thinking, their capabilities, as well as a window to assess what was desirable as well as undesirable. This is something that practitioners are already doing while carrying out observations in early years' practice and links to the listening pedagogy and Malaguzzi's (1998) work within the Reggio Emilia educational philosophy, but gives a nuance and more specific focus to critical thinking as something that is possible for young children.

Across the detective investigations, children engaged in key processes related to critical thinking skills, as well as demonstrated behaviours related to critical thinking dispositions. In addition, Flanagan's (1954) critical incident technique (CIT) was a key tool to identify and select children's critical thinking moments (CTM). It allowed the capture of a more contextualised, holistic, and descriptive critical thinking process account. This technique differed from and complemented what the focus only on specific skills and dispositions alone provided. Critical thinking Moments were unique communicative exchanges within collaborative interactions. In addition to this, children's critical thinking moments were unique, playful, creative, unexpected, multidisciplinary, 'unorganised' and spontaneous eureka narratives that offered open-endedness and opportunities for continuity. (Such

uniqueness requires openness and flexibility for identification as well as creativity and situation-specific fitness for purpose strategies for facilitation).

Differences across children and or moments (time) were found, some being identified as contributing to more Critical Thinking Moments than others. Additionally, some showed a further degree of sophistication in the related skills as well as a stronger tendency towards behaviours related to dispositions. Despite differences, the children were shown to be capable of critical thought in relation to where they were, hence, the importance of assessment in relation to the individual child rather than a universal model for all. It was possible to do so by adopting a common starting point (skills and dispositions) and 'decentering' (Donaldson, 1987) from our adult selves from that to reach and capture the uniqueness of each individual and the specific Critical Thinking Moment in time. Despite children learning from one experience to the next as well as using knowledge from past experiences, the idea of exploring something, meaning making and analysing differed from one task to the next. These could be potentially important moments for adults to identify in order to help build links and aid in enabling transference. This would involve embracing the uniqueness of situations and building explicit connections. The sequence of the experience was important.

Having discussed the findings across the four cases in relation to the three research questions, in the next and last chapter I will draw some final conclusions, limitations and recommendations for early years educators, researchers, and policy makers.

Chapter 10 Conclusions and Recommendations

10.1 Final conclusions

This thesis explored the relational and contextual characteristics intrinsic to facilitating young children's critical thinking using specifically designed detective play. It explored the benefits and constraints of four different detective play experiences in relation to the opportunities provided for critical thinking. This involved the exploration of the key influential design elements and the possible effects of those in practice in relation to critical thinking. It also sheds some light on how 5-6-year-olds' critical thinking (skills and dispositions) manifests in an early years detective mystery play context. The following summarises the key findings in relation to each research question.

1. *What are the relational and contextual characteristics inherent in facilitating critical thinking using detective mystery play?*

   - Detective mystery play experiences were productive for facilitating critical thinking in 5-6-year-olds. Role-play and adopting a detective role were found to be particularly useful tools to stimulate children's intellectual engagement in a task and for them to 'articulate' such thought in the collective context. This articulation took various forms (RQ3).

   - Seven pedagogical moves (contextual-relational) were found to be of key importance when facilitating children's critical thinking, including design and planning:

     1. Engaging children in investigative enquiry processes and problem solving (play and exploration);
     2. Dazzling children's curiosity and interest;
     3. Empowering children (detective play empowering, power autonomy);
     4. Engaging children in collaborative learning experiences;
     5. Listening to children;
     6. Recognising and acknowledging children's thinking (explicitly mention and value); and
     7. Guiding and scaffolding children's thinking.

- Contextually, the investigative enquiry process of detective play facilitated problem solving in the children, an important facet of critical thinking (Halpern, 1997). The mysterious and novel nature of the contextual design dazzled children's curiosity and interest, which triggered (intrinsic) motivation and intellectual engagement in the task. To take on the role of detective, and the support of strategic and accessible detective tools, meant the children were empowered and could have autonomy within the play episode (inclusive and empowering).

- Engaging the children in collaborative learning experiences meant they engaged in discussions, learnt from one another's perspectives and collaborative decision making, and had opportunities to scaffold each other's thinking, which is particularly important considering, from an educational point of view, young children's critical thinking as a phenomenon occurs and develops (existent as it is and developing).

- Relational factors include the teacher's role in listening to the children and supporting their curiosity and interest. Listening, recognising, acknowledging, and valuing children's thinking was important and provided opportunities for me as an adult to understand as well as support, guide, and scaffold children's thinking.

- The sense of value motivated children to contribute, take responsibility, and make decisions with a sense of belonging, empowerment, and ownership, all of which were important for facilitating authentic participation, voice, and critical thinking.

2. *What are the benefits and constraints of the four different detective mystery play cases to facilitate and investigate young children's Critical Thinking?* (Key design ingredients and implications)

- Elements such as the breadth of objective; amount of structure; openness of outcomes; opportunities for children to influence and control; collaborative and hands-on experimental nature; and the need for 'familiar' content were found to be important elements to consider when intending to enhance opportunities for critical thinking.

- Selecting different design elements when creating an experience to facilitate critical thinking is key in relation to the aspect of critical thinking to be facilitated or developed. For example, the 'cultivation' of very specific behaviours or exercising a

specific skill might require a more structured approach and limit the design of the experience. But also, by not limiting and keeping outcomes open, a wider range of critical thinking skills and dispositions might be captured.

- Different detective play scenarios could be used in combination or alternate ways to orchestrate diverse experiences for the children to build capacities for critical thinking with the cumulative and holistic development of critical thinking sought.

3. *How do young children's critical thinking skills and dispositions manifest and what do critical thinking moments (CTM) look like in 5-6-year-olds' detective play?*

- Young children, in this context as young as 5, demonstrated the capability of critical thought by manifesting signs of both critical thinking skills and dispositions through diverse forms of expression when participating in detective mystery play. The children drew, wrote, and sang, and used strategic tools, body language, and verbal utterances, including direct and private speech, to express thinking and communicate with one another within the collaborative investigative experiences.

- Young children's thinking can be unique at times, and the practice of the teacher in 'decentering' (Donaldson, 1987) from the adult self was important for a deeper understanding of young children's thinking, including critical thinking. Through proximity and adult involvement in play, the adult could engage in intellectual dialogue with young children, listen, and recognise children's Critical Thinking Moments.

- Children's performance during detective play also showed emerging signs and Potential Critical Thinking Moments (PCTM). Hence, valuable opportunities for potential intervention and scaffolding were found.

This study contributes to knowledge in four fundamental aspects. Firstly, the findings from this thesis contribute to the knowledge in the field of critical thinking. Secondly, it informs the field of early years education and the field of cognition, as well as the teaching and learning of thinking in the early years. Thirdly, methodologically it provides insights into innovative methods, approaches, tools, and key contextual and relational aspects for facilitating early years critical thinking and its research. Lastly, this thesis contributes to the knowledge in research ethics, and more specifically to matters of ongoing informed consent with young

children in research. It is worth restating that this qualitative study was not conducted to be generalised but to examine in detail the critical thinking phenomena and their facilitation in the context of early years mystery play. Further quantitative and qualitative research continuation would be required to further understand in depth young children's critical thinking and its facilitation in the context of early years.

Acknowledging children as rights holders throughout the study was important from an ethical practice point of view, but also in the context of facilitating critical thinking. The reason behind this is that enabling opportunities for the practice of rights and opportunities for research influence implied that children were empowered. This empowerment, including responsibility taking, acknowledging children as competent thinkers and motivation for participation was found to be of key importance for facilitating children's critical thinking practice. This thesis draws on the strong relations between ethics, children's positioning in research as right holders, methodology and pedagogy and critical thinking.

Based on the understanding formed from the present study's findings, I propose the following recommendations for early years practitioners, policy makers, and researchers. I additionally include related prompting questions to support the initiation of the practitioner's reflection.

10.2 Recommendations for practitioners

Thinking and critical thinking should be valued in young children's classrooms, and such value should be explicit or otherwise visible in daily practice (e.g., Ritchhart & Perkins, 2008). This value can take the form of modelling (Costa & Kallick, 2019), encouragement, explicit articulation (Tobey, 2019), dedicating time to facilitating it and designing experiences for this explicit purpose, among others. Indeed, a combination of these different strategies is important for children to develop critical thinking holistically.

Reflective practice (Appleby & Andrews, 2012), in addition to professional reflexivity (Cunliffe, 2016, 2004) will support practitioners in reflecting upon and assessing whether critical thinking is present, and whether its value is truly reflected in daily classroom life. I include

some prompt questions below to support this professional learning (and will do the same with each point in this section).

> *Prompt questions:*
>
> *What occurrences in your practice/setting reflect the value of thinking and critical thinking?*
>
> *How might practice supporting critical thinking be improved? What actions might you take to improve your critical thinking practice in your setting?*
>
> *Do you talk about thinking and quality explicitly (with colleagues/with children)? In what cases?*
>
> *Do children show evidence of valuing critical thinking skills and dispositions? If so, how?*

The young child needs to be seen as both a competent thinker (being) and, simultaneously, a developing thinker (becoming) (Uprichard, 2008). Consequently, it is key for the practitioner to provide opportunities to facilitate moments where critical thinking can be demonstrated by the young child as well as supporting and designing experiences targeting its further development. Understanding an adult's responsibility and the importance of their role as rich experience providers is essential. This involves clear intent, planning, assessment, allocation of space and time, and orchestration of available resources.

> *Prompt questions:*
>
> *How well does your practice position the child as a competent thinker? What evidence do you have to hold that view?*
>
> *How does your practice support building children's confidence in relation to self and thinking skills and dispositions? In what ways can you support this further?*

The adult should focus on engaging in the practice of 'decentering' (Donaldson, 1987) when necessary. This is key to obtaining a better and more accurate understanding of young children's critical thinking. This thesis showed there were different ways young children's critical thinking can manifest; therefore, tuning in and listening (Blaisdell et al., 2019), keeping an open mind and being able to engage in the practice of decentering are essential. The data also showed that young children's thinking was unique at times and varied not only across

children but also from what an 'adult-centric' perspective of critical thinking might look like. The practice of decentring was important for identifying Potential Critical Thinking Moments (PCTM) (opportunities) and identifying signs of emerging critical thinking skills and dispositions in young children. Consequently, decentering, open-mindedness, and flexibility were necessary to study critical thinking in young children across contexts, as it may manifest differently in different contexts.

Prompt questions:

What assumptions do you hold in relation to critical thinking and young children?

Do you believe young children's thinking differs from that of adults? If so, in what ways?

How do you perceive children's thinking? Can you see differences in views among the practitioners in your setting?

Do you think your early years professional identity and experiences influence your perception of children's thinking?

To what degree do you consider yourself to be open-minded, flexible, and able to decenter from your adult self when working with young children?

How do you tend to respond when faced with unconventional/ unexpected thinking and decision making that does not fit with your preconceptions? When thinking about your own specific experiences, is there anything you learnt from those more 'surprising' moments of children's thinking?

These prompts might be useful to facilitate reflection upon self as a professional, pedagogical practice and relationships in relation to facilitating critical thinking in the classroom. The adult should consider appropriate pedagogical moves and contextual decisions when aiming to facilitate critical thinking in their early years practice. Seven key pedagogical moves and contextual decisions were found to be useful in this study and could be used as guidance for professional learning around the facilitation of young children's critical thinking. The pedagogical moves that were identified as useful included listening, recognising, and valuing children's thinking. This was important to support children's curiosity and interest as well as to find opportunities to guide and support thinking and assist in its development. This included being alert to Potential Critical Thinking Moments (PCTM) and considering the

adult's role in supporting this process. Valuing children's thinking and work is important. The children in this thesis were generally proud and confident, empowered, and took responsibility and ownership of their work, showing a sense of belonging and voice, which was fundamental in stimulating thinking and facilitating its expression. Creating those spaces to freely contribute relates to what was found useful in the literature in relation to pedagogies that facilitate or inhibit critical thinking. Ffor example, in relation to rights, freedom of speech, power balance and respectful relationships, and active and meaningful participation in children's own learning (Karin-Hognestad, 2010).

Prompt questions:

How do you facilitate critical thinking in your group/ settings?

What instances are most productive in relation to critical thinking in your daily routines in your group or setting? Why? What commonalities do those instances have?

What kind of activities, tools, methods, relationships, etc. are involved in these most productive instances? Why, and what aspects do you think are helpful or unhelpful?

What design elements in your practice do you consider important in this facilitation?

What do you need to do to make it better?

To what extent do you dedicate time to listening, recognising, and valuing children's thinking in play? What are the limitations?

In what ways does your practice offer opportunities for children to influence, guide play, and make decisions?

How much flexibility, time, and space do you have for children to engage with their own investigations?

How does your practice promote opportunities for children's autonomous investigation?

How do you support students' thinking individually or collectively?

To what extent do you offer opportunities to engage in collaborative work?

To what extent do you offer opportunities for children to engage in dialogue, freely discuss, debate, and share their thinking?

This study found it to be important to focus on both critical thinking skills *and* dispositions. This is because there was a tendency to overestimate skills on their own. Critical thinking

dispositions were seen to be as critical as their skills, and in agreement with Nieto and Saiz (2011), dispositions require more presence in the teaching and learning of critical thinking. In young children, the tendency to behave and think in certain ways can trigger the use of key skills in the thinking process, but mastering skills on their own does not guarantee critical thinking (Facione, 1990). Behaviours related to dispositions in this study were particularly insightful in the context of young children's detective play and critical thinking. Connections between pedagogical moves and critical thinking dispositions were found, as well as a relationship between critical thinking skills and dispositions in practice. Consequently, reflecting upon and identifying what behaviours are related to critical thinking dispositions we want to observe in children is important. To raise children's awareness, it is also recommended to explicitly mention this by drawing attention to and modelling the behaviours related to critical thinking. Ffor example, recognising and valuing children's effort and persistence when trying to find answers to a challenging problem. Finding answers to open-ended tasks/questions can be challenging, and there may be no straightforward and definite answers; hence, being inclined to be persistent in confronting complexity is a crucial disposition that may allow further resistance and engagement in tasks and provide opportunities for the use of critical thinking skills in the future. Cultivating and praising such behaviours to make them visible in the thinking process should be encouraged (Costa & Kallick, 2019; Tobey, 2019; Ritchhart & Perkins, 2008).

Detective role play on its own pushed children into behaving and modelling characteristics found important for critical investigative work, which also pushed children into exercising critical thinking skills.

Prompt questions:

How much attention do you give to children's critical thinking dispositions?

How do you model the behaviours and dispositions you want to see in children?

Can you think about examples where you have supported the cultivation of behaviours related to critical thinking?

In your context, what behaviours do you think are key for critical thinking and what behaviours would you like to see further in the future? In what ways can you hone this?

Play was an effective and meaningful method in this study for providing rich experiences that facilitated critical thinking. It is already a valued and useful pedagogy in early years learning, including for research (e.g., Arnott & Wall, 2021) and as such played an essential role in this thesis. However, evidencing how it can help identify and contribute to the development of critical thinking in young children is important. Role play was shown to be a particularly powerful tool. In this thesis, detective role-play experiences were a successful method for facilitating critical thinking, as they served as catalytic for thinking. It pushed children to immerse themselves in the process of inquiry, triggering inner drive and interest, and empowering investigative thinker behaviours which were linked to critical thinking dispositions. Critical thinking skills were triggered while the child imitated his or her role-play character. This finding resembles Dorothy Heathcote's mantle of the expert approach (Heathcote & Bolton, 1995), which demonstrated the powerful role that drama can play in learning.

Prompt questions:

How is play viewed in your group/setting and community? What different purposes does it fulfil in relation to critical thinking?

How often do you design play experiences for specific learning purposes?

How do you use play? What does it look like across the day?

Who guides play? In which circumstances?

Adopting the role of play partner can enable rich opportunities for shared experiences between the adult and child during play. It can strengthen bonding and relationships, trigger shared thinking, engagement in dialogue about thinking and task execution, and at times also means the adult and child engage in critical thinking together. The role and proximity of adults facilitate assessment/evaluation of thinking, enable the identification of opportunities for critical thinking, provide moments to model critical thinking skills and dispositions, and scaffold the adult to articulate their own thinking and questioning. This study has found this to be important because it has enabled me, the researcher, to explore children's thinking and particularly critical thinking at first hand while being involved in play and with opportunities to be supportive along the process. Additionally, it also facilitates the identification of

Potential Critical Thinking Moments (PCTM) and children's emerging critical thinking, which will be valuable for influencing and planning further development.

Adults working with children often adopt a variety of distinct roles within a short time, including numerous roles simultaneously. Additionally, there are times when it is most beneficial to take a position of distance and observe only. However, thinking about the level of self-involvement in play and reflecting on the type of role adoption is useful. In other words, it is useful to be aware of the benefits that these play relationships, the adults' proximity to the activity, and the role they take can have when facilitating, identifying, and supporting emergent critical thinking.

Prompt questions:

What are your involvement and degree of proximity in play?

For what purposes or intentions do you regulate the degree of proximity?

How does proximity affect the outcome of the assessment? What do the different scenarios look like?

To what extent do you get involved as a partner in play? Does it have any effect on your relationships over time? If so, in what ways?

What roles do you adopt throughout the day? Why?

What would young children's thinking assessments look like from proximity in comparison to distant observation? In what ways are these different approaches useful or present limitations?

It is important to consider the intentional design of experiences for critical thinking and the particular choice of elements made. Despite not identifying 'a way' that suits all for facilitating critical thinking in this thesis, the following elements in general were found useful to increase opportunities. Among others, the broadness of objective or 'task', a free structure, an open-ended outcome, children's freedom to influence and make decisions, collaborative and hands-on experimental nature, verbal communicative skills, and familiarity or content knowledge dependency were all influential in facilitating moments of critical thinking. Openness and space for children to influence and surprise us with their contributions were of key importance when researching a complex phenomenon like critical thinking.

More structure and design control were useful for facilitating talk around very specific areas of research interest, for example, understanding how children formed and used questions to retrieve valuable information or how children interpreted, linked, evaluated, speculated, and drew conclusions from the given evidence. Hence, it is advised to select and design activities while considering these design parameters in relation to the desired aim. Ideally, balancing a rich variety of experiences to cater to different goals and needs in context is important, so practitioners are encouraged not to consider tasks in isolation.

Figure 10.1 shows a blank visual reflection template using a continuum to be used in the design stage or while planning. This does not mean that using these elements will be factually effective in achieving critical thinking goals, but rather that these elements can be helpful in making informed, more intentional, and thoughtful choices. In other words, it is an awareness-planning tool for intentional choices while being aware of each choice's potential limitations and possible implications.
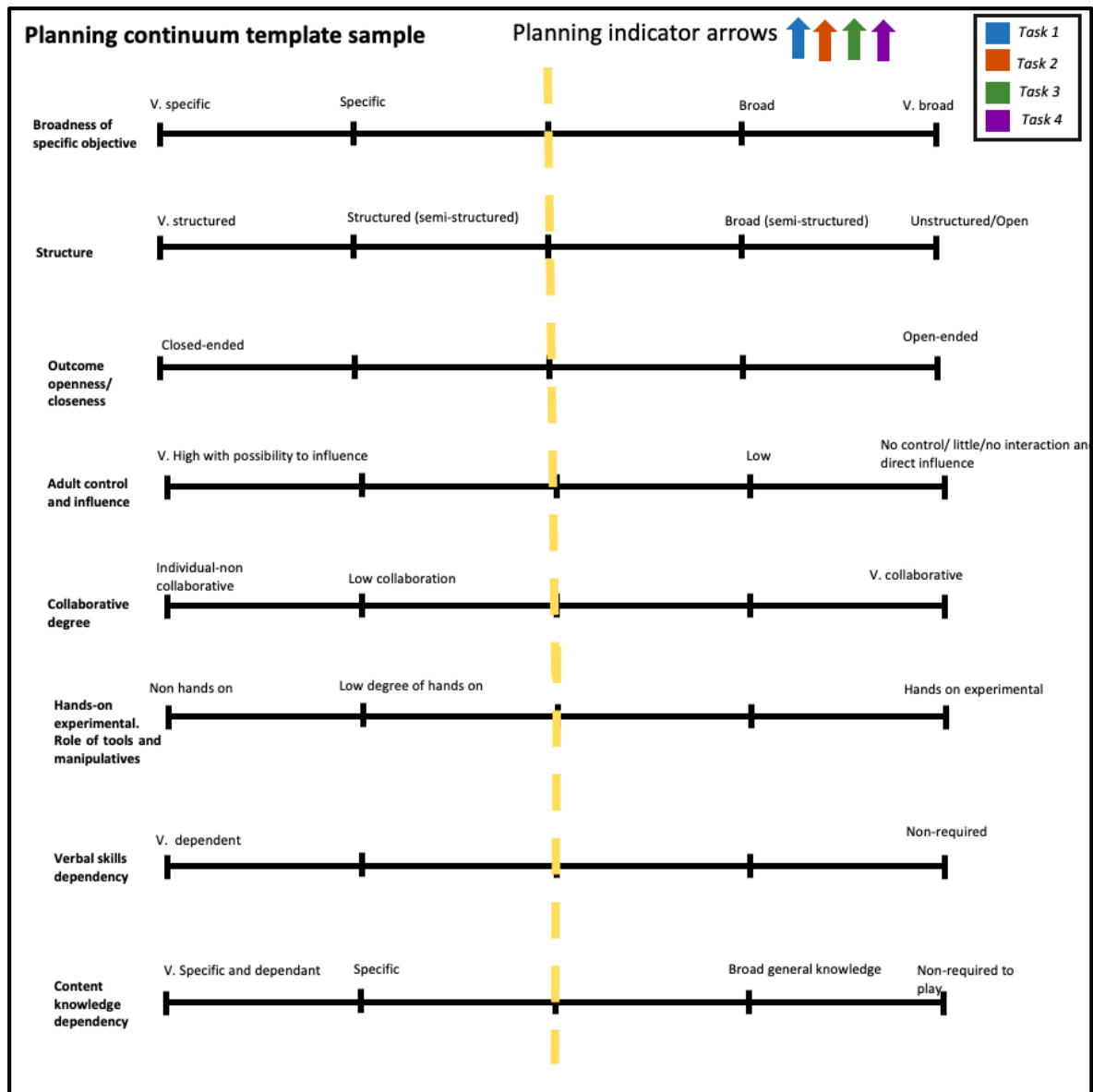
Figure 10.1: Planning continuum template sample.

Prompt questions:

Where in the continuums would you position your most common activities?

When planning an activity/experience, how intentional are your element choices? Do you take element choices into account when planning an activity or experience?

How did those choices influence performance/outcome in relation to your main critical thinking goals? Would you change anything?

What are the benefits and constraints of these choices? And in which contexts could they differ?

How does your planning enrich children's opportunities for critical thinking?

> *How does your practice offer a range of opportunities to express and develop critical thinking skills and dispositions?*

Assessment and evaluation of critical thinking are essential within a pedagogy. It is recommended for the practitioner to assess and follow up children's critical thinking and its development, as this will serve to inform future planning and the design of new opportunities to facilitate further development. Assessment of thinking, including critical thinking, involves certain complexities due to the inward nature of the thinking process; however, as demonstrated in this thesis, it is possible to capture by observation and assess what is manifested, either in the form of utterances or behaviours, while children themselves are attempting to accomplish a challenge/goal/problem. This means that observation techniques regularly carried out by professionals in early years can capture the many different ways children express thinking and hence are useful for critical thinking, too. Both children's dispositions and the use of thinking skills should be identified and assessed as equally important and influential in progression. Engaging with periodic detailed analysis of critical thinking moments would be a useful activity for practitioners, possibly using Facione's (1990) skills and dispositions framework as a lens to focus attention on thinking. This is particularly useful in the early stages of assessment and will become intrinsic/natural with professional skilfulness. As important as it is to identify critical thinking, it is also valuable to identify those times in which children are being 'uncritical', as this will help future planning and development. Hence, these moments are transformed into useful learning opportunities.

It is key to consider that skills and dispositions develop and emerge from concrete experiences, for example, those occurring in the context of manipulative play may shift to abstract thinking. Therefore, a key recommendation of this thesis is for practitioners to explicitly point out to children the behaviours that are related to critical thinking dispositions. This should help children be aware and make these into further productive opportunities. Similarly, modelling what we want children to do and making this explicit can be useful, too.

Previously, I provided tables to show critical thinking dispositions (Table 9.4) and skills (Table 9.3) alongside some illustrative samples for identification and assessment. These are not developed to be used literally; rather, they are provided as a guide for beginners to help

initiate the identification of signs to capture the use of critical thinking skills and dispositions. In other words, these tables only provide a few examples and can be further tailored to and developed on particular experiences and contexts. This can be seen throughout this thesis in far more contextualised, complete, and authentic ways.

Prompt questions:

How do you assess and document children's thinking? What kinds of methods do you use? Do you use visual tools to make it visible to children?

Does this assessment and mode of documentation fully capture the intended? What are the difficulties and flows? How can it be resolved?

How do you use children's critical thinking evidence and documentation? Do you follow up? Plan upon that? Share with families?

When thinking about examples in your group or setting, what does critical thinking look like?

How does it differ from case to case?

What aspects of children's thinking would you like to see and improve? How can you achieve this?

Due to its relevancy for pedagogical application, the findings and recommendations from this thesis intend to contribute to knowledge in the early years practice and to ultimately encourage teachers to recognise the value of their role as experience providers to facilitate critical thinking and its development in daily practice. It provides concrete visual samples of what young children's unique Critical Thinking Moments looked like in the context of 5-6-year-old detective play and the different ways children chose to manifest thinking, which can provide guidance and a concrete starting point for those professionals who wish to commence or continue the facilitation, observation, and assessment, and development of critical thinking in their classroom.

This thesis demonstrated how the specifically designed novel and pedagogically appropriate play methods could be used as powerful tools and contexts to facilitate meaningful experiences for critical thinking in the early years, honing investigative capacities, critical thinking skills and dispositions. Additionally, it provides concrete advice on what was found

useful for designing novel experiences for young children, including the relational and contextual moves that were identified as valuable for the context of critical thinking. Furthermore, it provides an insight into what elements were found useful in the methodological design of the experiences in relation to personal intent, for example, structure and openness, and their possible benefits and limitations for opportunities for critical thinking.

Overall, this thesis's findings showed that it is possible to create spaces and experiences for children to exercise and develop thinking and encourage professionals to include the presence of Critical thinking as a teaching and learning goal in every stage of the children's educational stage, including early years.

10.3 Recommendations for researchers

Young children are rights holders in their own right, and therefore when involving them in research, researchers need to ensure appropriate ways to enable these rights to be exercised. Considering pedagogically appropriate methods when providing very young children with information about the research and considering ways of creating opportunities for meaningful ongoing informed consent is a start. Despite not being free of complexities, this thesis has shown that children can discuss matters related to their involvement in research and participation when this information has been provided in an accessible manner. For this purpose, in this project, a shared picture book was specifically designed for accessible and meaningful information sharing and discussing consent with very young children.

Such practice, among others, is:

- Respectful: It shows ethical values and respect towards the individuals and their rights, including the right to express opinions and make choices in matters that affect them (see related Article 12 in Unicef, 1989), and facilitates a good start for forming respectful researcher-children relationships.

- Empowering: Knowledge with the ability to make informed choices and take part in decision making can be empowering. Children who are informed and feel respected

and empowered are more likely to feel ownership and take responsibility during research.

- More likely to increase motivation during participation. This process provides a higher probability of ultimately working with young participants who have the desire to do so. This is important since investigating critical thinking requires motivation, focus, and effort from the children's side.

For these ethical and methodological reasons, it is important to enable children to exercise their rights and to facilitate this by considering age and pedagogically appropriate ways to work with children in research. Table 10.1 shows my general ten tips to consider for working and researching with children and young people (Martinez-Lejarreta, 2022).

Table 10.1: Ten Tips for Working and Researching with Children and Young People (CYP).

10 Tips for Researching with Children and Young People	
Informed consent	1. Discuss accessible information in a meaningful context
	2. Seek ongoing voluntary participation
Co-researching partnerships and values	3. Build balanced and respectful relationships with others
	4. Acknowledge and value others' contributions
	5. Create opportunities for decision-making
	6. Be honest and manage expectations fairly
Methodology and tools	7. Place CYP's interest at the centre
	8. Use context-appropriate methods
	9. Consider the choice of space and its implications
Inclusion	10. Ensure accessibility and flexibility

Retrieved from Strathclyde Children and Young People Sustainability Hub blog post (Martinez-Lejarreta, 2022).

Since this thesis focused on very young children, all decision making was further contextualised and designed with 5-6-year-olds in mind to ensure that a fair chance was provided for children to both exercise their rights in relation to informed research participation as well as opportunities for exercising their voice and facilitating critical thinking, including data recording methods that captured the very many ways children expressed

thinking. I argue that a more attuned process of research to early years settings might get more information (fair and authentic data) to inform the critical thinking field.

This thesis has shown evidence of critical thinking in young children. The seven pedagogical moves identified, in addition to careful consideration of the key design elements of the experience, task, or activity and implications, give scope for further research. To do this, I have needed to carefully consider the appropriateness of methods for engaging with this age group to elicit evidence of critical thinking. In light of the findings that have emerged and the challenge they represent to the wider field of critical thinking research around young children's critical thinking capacity, there is a need for more researchers in the field to consider further innovation and experimentation with pedagogically appropriate methods. In this thesis, this kind of approach has been shown to enable the facilitation and capture of young children's thinking in a way that is sensitive to children's being, needs, and competencies. Methods like this provide data that a conventional research method may not capture. Mystery play experiences and adopting a role, for example, was a powerful and productive method to facilitate and manifest young children's critical thinking. Going forward, it will be important to strive for more meaningful contexts using comprehensive and accessible materials for young children.

Research in the early years that purports to facilitate young children's voices needs to be designed to allow at least a degree of openness and space for children to influence and surprise us. This is even more important when researching a complex phenomenon, such as critical thinking. This study has shown that children have unique perspectives and ways to look at challenges, solve problems, and express thinking. As a researcher, I have drawn extensively on my practitioner skills. I have attempted to show how open-mindedness and the ability to take the children's perspective and decenter (Donaldson, 1987) from the adult self can be key when researching in early years contexts. Such a position can bring us closer to understanding young children's thinking, including critical thinking. Consequently, the recommendation for further research is to keep an open and reflexive mind when confronting unexpected data and to try to understand alternative ways of thinking and doing things before unfairly interpreting or discarding these with rigid and adult-centric criteria.

In research that prioritises young children's voices, there is a greater need to consider methods that capture the various ways they express thinking (behaviours, verbal utterances as well as other forms of artistic expression), in line with Malaguzzi's "hundred languages of children" (1998). If research can acknowledge this nuance and flexibility of expression, it will enable a clearer picture of children's critical thinking. This thesis has shown the various ways children expressed thinking and how these were recorded. If it only focuses on researching verbal utterances, it might be restricting accessibility to some children's contribution only. Therefore, researchers should consider the aspect of accessibility and inclusion and provide choices for children to facilitate and express thinking as well as tools and techniques for researchers to accurately capture/record this choice of data.

Aligning with children as rights holders, a commitment to involve them in all stages of the research is needed. This means considering feeding results back to children in a meaningful manner, showing what has been learnt without dismissing the value of their contributions. Feedback a long time after data collection might make the process no longer relevant or productive. This is particularly so for very young children. Despite not always being an option, in long projects, a preview draft might be prioritised rather than waiting for a fully completed picture. This information can take the form of a leaflet, book, presentation, storytelling, role-play, and poster format, among many others.

10.4 Recommendations for policy makers

This study has found evidence of critical thinking in the early years in the context of semi-structured play experiences. Furthermore, it shows what 5-6-year-olds' critical thinking looked like in this study's context and the ways in which critical thinking can be facilitated and developed. Findings related to what was useful and more limiting were found across the four cases, which provides practical guidance on how to use and implement these findings in the early years classrooms with recommendations for early years practitioners. Despite this study's sample not being substantial as a foundation for a recommendation for general educational policy reform, I argue that if critical thinking is a value sought in citizens (present and future) to overcome unprecedented challenges, it is policy makers' responsibility to aim

for an education that targets and caters to the development of critical thinking. For this reason, it is fundamental that critical thinking takes an explicit presence throughout the various stages of the educational curriculum as a fundamental educational goal for the sector. According to The Delphi Report (1990), expert consensus "explicit attention to the fostering of CT skills and dispositions should be made an instructional goal at all levels of the K-12 curriculum" (Facione, 1990, p. 15), which includes the early years. This should help practitioners and teachers to keep it in mind as learning outcomes during planning and implementation of daily early years practice, since it is the curriculum that informs educational practice and change.

To enable this prioritisation of critical thinking as an important education goal and to view the child as a thinker in early years, it should have a presence in teachers' education and training curricula:

> *"For CT to infuse the K-12 and college curriculum, teacher "training" should give way to teacher "education." If teachers are to model CT, so must those who have an instructional role in teacher preparation or staff development. In all instruction, particularly in CT instruction, both faculty and leaders of faculty development should model CT. They should foster the students' confidence in their own powers of reason, rather than dependency on rote learning. They should nurture in students open-mindedness, attention to alternatives, and as much precision of thought as the subject and circumstances permit"* (Facione, 1990, p. 18)

Teacher education and early childhood programmes for practitioners should include providing the theoretical and practical knowledge, tools, and resources to ultimately translate and implement the recommendations of this thesis confidently into early years practice. Developing a toolkit for this purpose that aims to facilitate the teaching and learning of critical thinking, would be beneficial for those practitioners. Such a toolkit should include guidelines to support teachers and provide examples of good practice for facilitating critical thinking in the classroom, as has been provided in this study.

Critical thinking should have greater priority, not only for the training students themselves, but also for being taught as part of the pedagogy (didactics) when working with children.

Furthermore, increasing the number of qualified practitioners with bachelor's degrees in early childhood would further guarantee the workforce would be better equipped due to the necessary engagement with theory and practice for working with young children.

Given the widely recognised role of play pedagogy in early years as vital for the integral development of the child, a diversity of types and forms of play should be encouraged. Additionally, this study has shown that play can be a productive and stimulating context for young children's critical thinking and that young children can demonstrate critical thinking skills and behaviours related to dispositions in playful and meaningful experiences. Policies and practices that explicitly link play pedagogy to critical thinking are essential. This should include encouragement to consider how different types of explorative/innovative play might be considered methods for developing thinking and critical thinking. The power of play as a method should not be taken for granted, and adult involvement in play in the right circumstances should be encouraged through further development of the workforce.

Policy needs to create environments that encourage practitioners to innovate and experiment with methods and pedagogical practices. If a policy is too restrictive, then practitioners will struggle to find the space in which to develop rich diversity in learning (in regard to methods, tools, resources, activities, design elements more open and closer, more structure/less structure, etc.). A professional learning culture that facilitates openness and provides teachers with a degree of flexibility to tailor their practices within individual contexts is important. Critical thinking should not be narrowed down to a subject, but should rather be something that can be facilitated across topics, subjects, and contexts (Facione, 1990). Space and time are needed for developing ideas and to design play and learning experiences with opportunities for developing critical thinking and further development. This should be coupled with the prioritisation of professional reflection and an effort to find a healthy balance in relation to administrative work that enables quality practice.

Ultimately, given the unprecedented challenges faced economically, socially, and politically, it is crucial to better prepare for the present and future needs of citizens and the workforce to confront a yet unclear future. For this reason, it is important to invest and create genuine educational learning environments and a thinking culture in education (Tobey, 2019) with space, time, and opportunities to think and develop critical thinking for continuity.

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Appendix
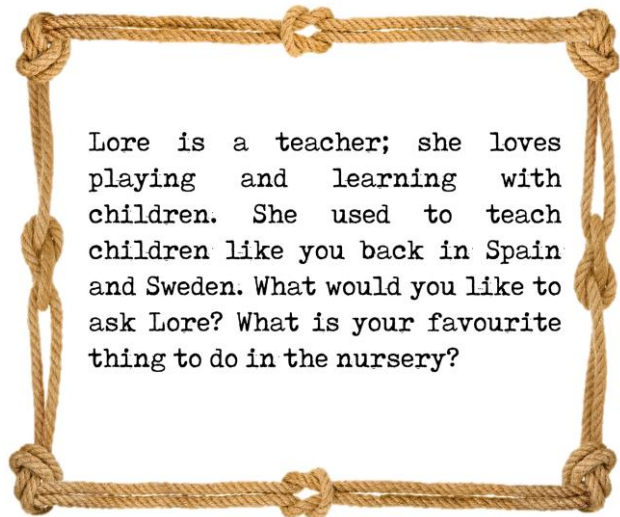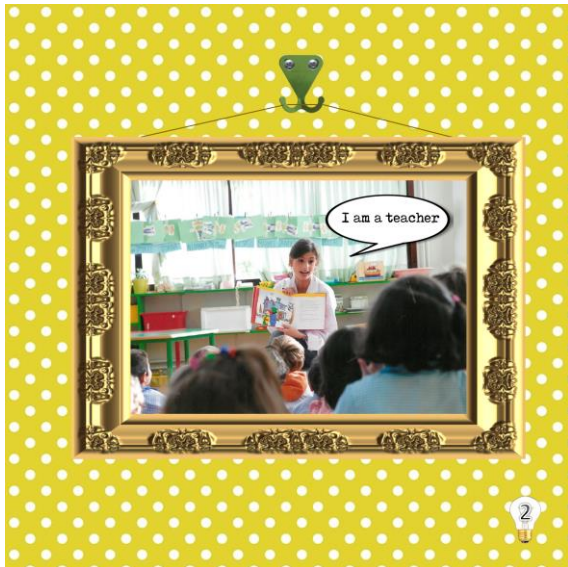
Appendix 1. Ethics Picture book/QR code for video

Lore is a teacher; she loves playing and learning with children. She used to teach children like you back in Spain and Sweden. What would you like to ask Lore? What is your favourite thing to do in the nursery?
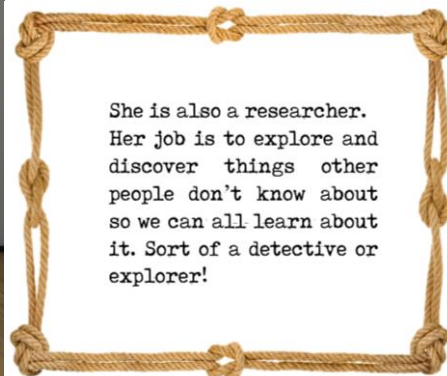
She is also a researcher. Her job is to explore and discover things other people don't know about so we can all learn about it. Sort of a detective or explorer!

Some researchers learn about which medicines are better for flu.

Others want to learn about people and their tastes like if they eat pasta or salad more often.

Also, some learn about how animals live in the desert. They find out where they sleep or if they live alone or with their family and how often they drink water for example.

Many researchers investigate how to built ships with different materials, shapes and sizes to make sure they don't sink. We can also investigate that by building small paper, clay and plastic ships and putting them in the water. Which one works better, and why?


Lore is now on a mission to find out how children solve difficult puzzles and has prepared a mysterious detective game to play with children. But... she has a problem! Oh noooooo!

She does not know any children here that could play her detective game! That means she might not find out how children solve difficult puzzles! Do you think we can help her? Do you know any child who would like to play?

Lore wants to find out how children solve mysteries. So she will come to our nursery to ask us if we would like to play super-detective/researchers and solve a mystery together!
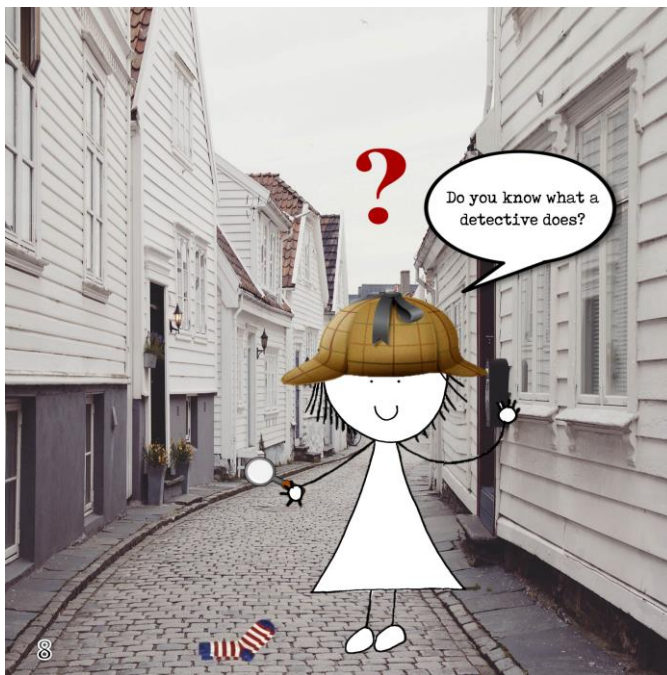

The game is about detectives!

Lore will come to our nursery and will set her activity in the classroom. It is about a mystery puzzle you will have to solve together. It is a group mission and you will have to pretend to be super-detectives to solve it!

Lore will use a camera that will record how you solve the mystery together with her help. That way you will be able to watch the film later and talk about it!

What do you think?

9
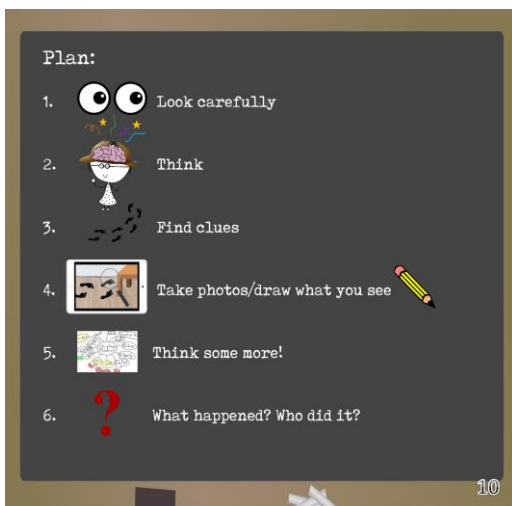
This is the plan for the super-detective team!

1. Look carefully

2. Think

3. Find clues

4. Take photos/draw what you see
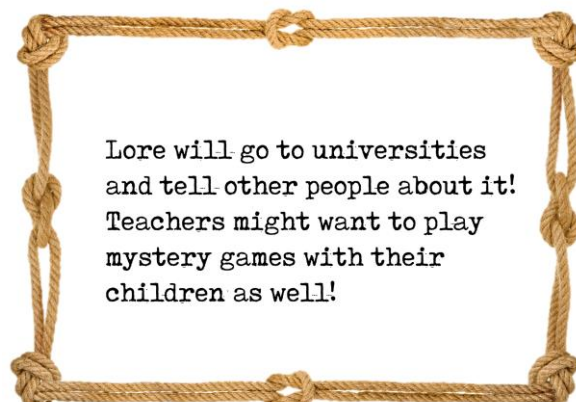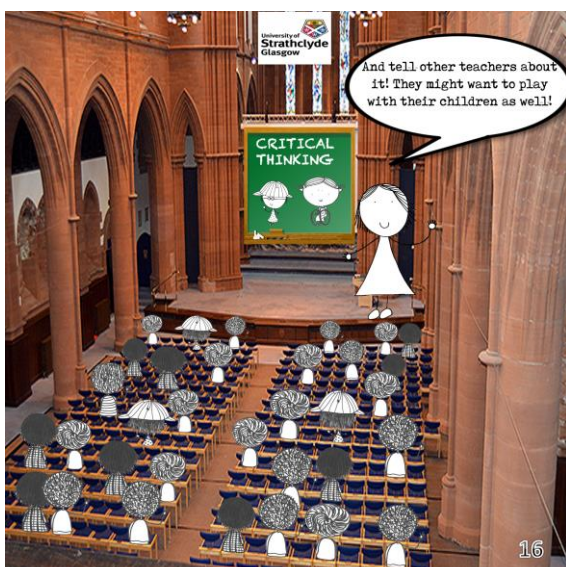
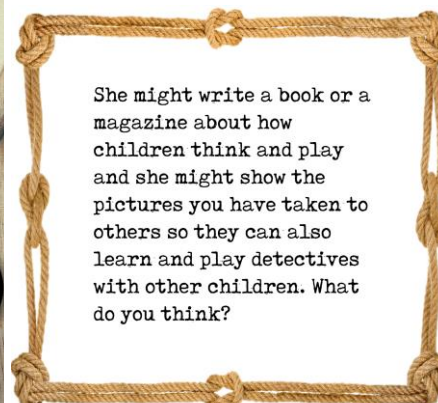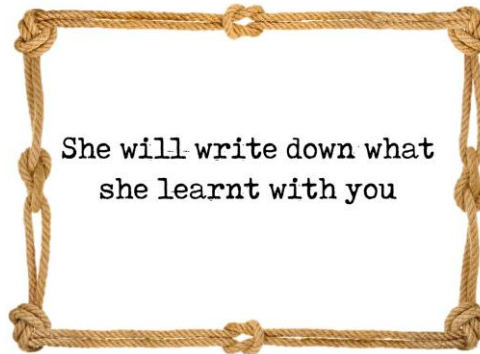5. Think some more!

6. What happened? Who did it?

10

We will need a detective gear. Are you ready?

We can hear and see what we have done!

After playing super-detectives we can watch the film about how we did the super-detective job together and you can talk about what happened. You will also look at the pictures you took with the iPad and remember the clues!
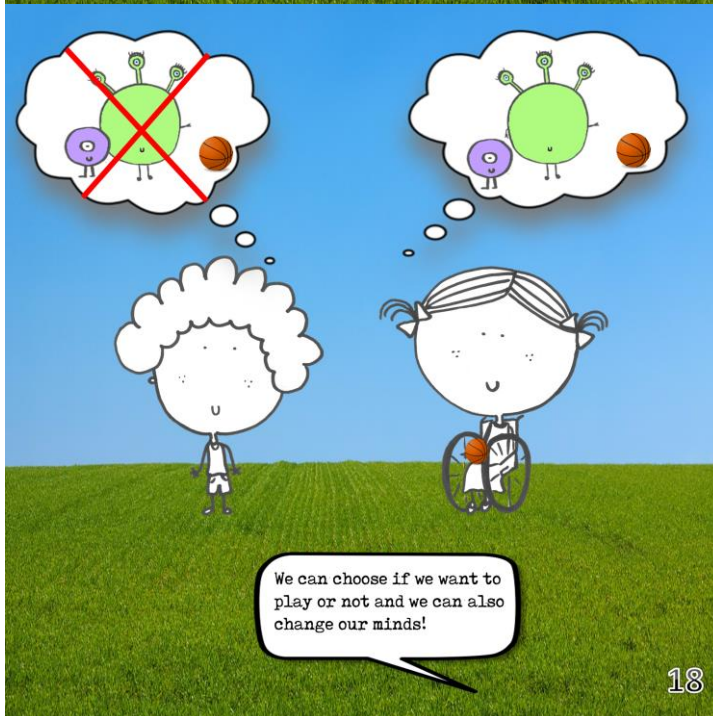

Thank you very much for your help! Bye bye...

Then Lore will need to go back to her work in the university (big people school) so she will tell us goodbye and thank you for playing detectives with her. Later she will go to her office in university and she will write down what she learnt with you.

She will write down what she learnt with you

She might write a book or a magazine about how children think and play and she might show the pictures you have taken to others so they can also learn and play detectives with other children. What do you think?

Lore will go to universities and tell other people about it! Teachers might want to play mystery games with their children as well!
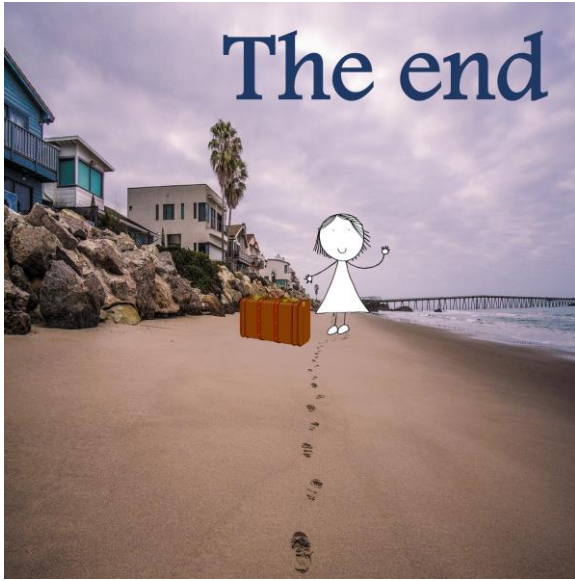
Appendix 2. Legal guardians' information sheet

WILL THE SUPER DETECTIVES SOLVE THE MYSTERY?

Developing young children's critical thinking skills through adult-child interactions in Early Years

Parent/Legal Guardian Information Sheet

Hello!

My name is Loreain Martinez Lejarreta, a former Early Years teacher and current PhD Education student at University of Strathclyde. At present, I am researching the development of young children's critical thinking skills through adult-child interactions. In order to investigate such skills and their development I will be providing a range of detective play experiences to be able to explore their thinking in a playful and enjoyable manner.

What will your child do in the project? Your child will be invited to participate in different play activities. The activities are planned to have the theme of detectives, however, the theme might be changed if the children do not find it interesting. Your child will be asked to work with a group of children and myself as guiding adult to solve several mysteries. The activities will be developed in full consultation with the practitioners/teachers. Having received a formal permission to do so, the play activities will take place in one of your child's setting classrooms within your child's regular attendance hours. To give you an idea, your child will be ask to think about a similar mystery:

   "Did you know that a piece of cake has disappeared from one of the classrooms? Who took the missing piece….? And the room is a mess… but look! Someone has left lots of clues! Will the super detectives solve the mystery?"

Does your child have to take part?

No. A formal consent form needs to be signed (see enclosed forms) by you and the child if you wish to take part. If you agree to give consent, your child will be informed about what will happen through a storytelling session and they will take a copy of the short picture book home. After that, if the children wish to take part they will sign the assent form with me in the setting. Participation will remain voluntary during the study and therefore you and your child will be able to decide to drop out at any point in the process up till the stage of data analysis.

What happens to the information in the project?

The activities will be video-taped and the actual recording will be used for research purposes only. Your child's and their institution's confidentiality and anonymity will be ensured at all times before, during and after the investigation. In addition, other recording tools such as cameras and iPads might be used by the children to take pictures of the evidence they found while "investigating the mystery". All data, including visual data (short video footages and pictures) will be treated in strict confidence and only published in the future, strictly hiding all parties' identities, if permissions are given. For this purpose, professional blurring tools will be used to ensure that participants are un-identifiable.

The information of this research investigation might be shared with the wider audience and published (e.g. PhD thesis, academic articles…) with the aim of sharing and contributing new knowledge to the field of early year's education strictly respecting at all times all parties' anonymity and confidentiality.
Every participant is entitled to receive a feedback letter with the obtained results after the investigation is completed. If you wish so, please, write down your email or contact information on the next page.
The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What happens next?

If you agree and your child is happy to be involved in the project, please kindly sign the enclosed consent form.
If you don't wish to take part on this project thank you for your attention.
A copy of my PVG Disclosure Scotland, a proof of research permission from the local authorities (Glasgow City Council) and the confirmation of the School of Education Ethics Committee approval can be shown under request.
Thank you and please do not hesitate to ask any questions!

Researcher contact details:

Loreain Martinez Lejarreta (PhD Education)

Chief Investigator details:
Professor Kate Wall:

This investigation was granted ethical approval by The School of Education Ethics Committee.
If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact Chair of the School of Education Ethics Committee:

Appendix 3. Legal guardians' consent form

Parent/Legal Guardian Consent Form

Name of department: Education

Title of the study: Will the super detectives solve the mystery? Developing young children's critical thinking skills through adult- child interactions in Early Years

Mark the boxes if you agree with the following sentences. All boxes need to be marked in order to participate in the proposed research.

☐ I, the legal guardian, confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.

☐ I understand that my child's participation is voluntary and that I and my child are free to withdraw from the project at any time, up to the point of completion, without having to give a reason and without any consequences. If I exercise my right to withdraw and I do not want my data to be used, any data which have been collected from me will be destroyed.

☐ I understand that I can withdraw from the study any personal data (i.e. data which identify my child personally) at any time.

☐ I understand that anonymised data (i.e. .data which do not identify my child personally) cannot be withdrawn once they have been included in the study.

☐ I understand that any information recorded in the investigation will remain confidential and no information that identifies my child will be made publicly available.

☐ I give consent for my child to being a participant in the project

☐ I understand that this research investigation might be published and shared with the wider audience strictly respecting at all times all parties' anonymity and confidentiality (including pictures/video footage that do not identify any person or institution personally). I therefore, give consent of images/video footage of my child to be published noting that my child's face will be blurred out.

☐ I give consent for my child to being audio and/or video recorded and/or taken pictures as part of the project

☐

CHILD'S NAME:

LEGAL GUARDIAN'S NAME:	
Signature:	Date:
Email address/ other preferable contact detail:	

Appendix 4. Participants' assent form (attached to legal guardians' consent form)

Child's Assent Form

NAME: (ALREADY WRITTEN. However, children will be asked to write their name in their own way wherever they can fit it in the form).

Verbal instruction: Use the finger paint to color the smiley face if you want to play detectives and color the sad face if you prefer not to or would like to do something else!

DO YOU WANT TO PLAY DETECTIVES?

YES

NO

Appendix 5. Section transcript sample/ Data transcripts

-I'm ready now (Marc)

(Looking at camembert bear …)

-Close your eyes as well (Marc)

-No, I don't need to (Child)

-No one peek (Marc)

-We are not peeking (Me)

-Open your eyes! (Marc)

-What colour is it? (Stella)

-Its, ok I'll give you one clue, its blue (Marc)

-It's a hairbrush (Bruno)

-How do you know that? (Marc)

-It's a blue hairbrush! (Marc)

-How did you know that? (Me)

(we though he could peek but...)

-I saw the blue hairbrush in the bag that how I know, I saw a blue hairbrush in the bag so that means, because I used my imagination (Bruno)

-That's a hair comb (Stella)

-Did you hear? So interesting! You were thinking, used your imagination so when y....

(Everyone is talking at the same time......)

-... you actually memorize and remembered. You remembered the first time. That was really well done

-Bruno you should peek (Marc) (Meaning he has cheated)

-I didn't peek (Bruno)

-No, maybe you want to explain again how did you find so fast? (Me)

-I was looking at camembert I was looking at camembert and looking at her and looking at everyone else but not Marc and then I found that in the box. (Bruno)

-No, you found it in the bag (Stella)

-I found it in the bag, maybe I'll take blue, and then ad then he said I said he said, I said what colour is it? He said blue and I just my imagination (I believe he is talking about memory and remembering) and that how I knew it was a hairbrush (Bruno)

-Well done (Me)

-My turn! (Stella)

-You used your brain and your memory to remember. Can I say something look behind (pointing at the clock) it's a bit later so it think other children also want to play the mystery box here, so maybe now.., I can come back on Monday and we can play again I have 3 mysteries the zoo mystery, the snack mystery and house mystery

-Can we play another game? Child (Children don't want to hear they enjoyed it)

-When I get home, I will play detectives... (Ava)

-Will you tell my teacher about the think about my imagination (Bruno)

-Do you want me to tell your teacher about your imagination? Why do you want me to tell your teacher about your imagination? (Me)

-I think she'll be proud (Bruno)

-It's a blue hairbrush! (Marc)

-How did you know that? (Me)

(we though he could peek but...)

-I saw the blue hairbrush in the bag that how I know, I saw a blue hairbrush in the bag so that means, because I used my imagination (Bruno)

-That's a hair comb (Stella)

-Did you hear? So interesting! You were thinking, used your imagination so when y....

(Everyone is talking at the same time......)

-... you actually memorize and remembered. You remembered the first time. That was really well done

-Bruno you should peek (Marc) (Meaning he has cheated)

-I didn't peek (Bruno)

-No, maybe you want to explain again how did you find so fast? (Me)

-I was looking at camembert I was looking at camembert and looking at her and looking at everyone else but not Marc and then I found that in the box. (Bruno)

-No, you found it in the bag (Stella)

-I found it in the bag, maybe I'll take blue, and then ad then he said I said he said, I said what colour is it? He said blue and I just my imagination (I believe he is talking about memory and remembering) and that how I knew it was a hairbrush (Bruno)

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-Can we play another game? Child (Children don't want to hear they enjoyed it)

-When I get home, I will play detectives... (Ava)

-Will you tell my teacher about the think about my imagination (Bruno)

-Do you want me to tell your teacher about your imagination? Why do you want me to tell your teacher about your imagination? (Me)

-I think she'll be proud (Bruno)

-Of course, she will be proud, she will be proud of all of you (Me)

-Bruno mom is a teacher (Marc)

-Super good congratulation to all detectives thank a lot! See you soon, can I have your badges please?

-Its 10:30 (Bruno)

-Its 10:10 ten past ten (Me)

-10 and 10 is 20 (Ava)

-That's true 10 and 10 is 20 (Me)

Very interesting part is when Bruno first told me 'Can you send the video to my mom?' and Stella also asked whether I can send the video to their parents so they can see also how they play detectives, Bruno was especially proud of himself.

Session 4 Bruno, Stella, Marc, Ava, Birch Primary School.

Appendix 6. Tips for working with CYP

Tips for working with CYP (Blogpost project) full reference

"1. Discuss accessible information in a meaningful context

Provide a clear explanation of your project and its implications for CYP's lives, their possible roles in the project and what your expectations are about their involvement. It is key to manifest the valuing of CYP's participation, contributions and impact. The project's aims and detailed objectives need to be comprehensively discussed in a context that is familiar and meaningful to CYP. Avoid using unnecessary jargon/technical terminology unless it is relevant - if the latter, these key terms should be carefully described using plain language and suitable prompts which can be easily understood by CYP. Provide a safe space for CYP to openly discuss, question, challenge and negotiate the provided information or plan of the project, because knowledge, along with the opportunity to influence its construction, can empower CYP, reinforcing their sense of belonging and potentially strengthen ownership of their work. Consider using an accessible and meaningful approach for information sharing and discussion. Virtual and physical tools like explanatory videos, storytelling, aiding leaflets, graphs, illustrations, demonstrations, prompt activities and providing other real-life samples can be alternative ways to facilitate an effective process of information sharing and discussion.

2. Seek ongoing voluntary participation

CYP's voluntary participation should be ensured, exclusive of any coercion. The freedom for CYP to participate and opt out at any time of the project is considered to be good practice in research ethics. CYP's circumstances and minds can change, therefore, creating a safe space for them to express consent without negative consequences is crucially important. Consider formally seeking ongoing informed consent when appropriate. For research purposes, some form of written consent like signing or other alternative symbolic ways of representing consent (and dissent) have been used when working with young children. Consider offering CYP different tools they can use to manifest unwillingness and willingness to take part. For example, a young person may wear a specific sign or assigned clothing/tool to confirm participation. Make sure you remind everyone involved about the voluntary nature and observe and listen to the very different ways CYP may manifest dissent, such as displaying a lack of interest or silence. Voluntary ongoing participation can increase the chances for CYP

to 'try it out' in the first place and those who remain are more likely to remain motivated. Do consult institutional and professional ethical guidelines. For example, local councils, university ethics committees, research councils' and professional associations' ethical guidelines, and school/setting guidelines. Request approval and seek permission when appropriate.

3. Build balanced and respectful relationships with others

Be mindful of how you approach CYP and think about the nature of the built relationships. Be aware that your behaviour and relationship dynamics (for example, adult versus child or expert in the field versus novice) may influence CYP's contributions. In some cases, such power imbalances may negatively affect CYP's input. Find ways to get to know the individual/group prior to any event and reflect upon the kind of work relationships and environment you would like to achieve.

4. Acknowledge and Value CYP's contributions

Value CYP's individual and collective contributions and remain understanding and respectful throughout. CYP's views may sometimes differ from adults'. Make sure to take this opportunity to recognise their views and learn from the differences. When teamwork is involved, consider nurturing trust and collaboration. In other words, consider yourself as an example of the working behaviours you want to see with CYP. Make sure you capture what CYP want to address. Keep an open mind to allow your perspectives be influenced by CYP. Consider providing financial subsidy for young people's time if they have to reduce their work time to participate in the project.

5. Create opportunities for decision-making

Encourage and create authentic opportunities for CYP to express, influence and take part in decision-making. Consider facilitating opportunities for CYP to influence the process and the development of the project. Openness and flexibility (of practice/project) is key to enable the space and opportunities for CYP to create and influence. For example, CYP could contribute to decision-making in relation to research aims, methods and dissemination. This level of involvement can increase motivation and active participation. Consider building a co-researching partnership through which CYP are supported to have a leadership role in more aspects of the project. Consider creative tools and alternative ways of stimulating CYP's

thinking and facilitating decision-making opportunities, such as brainstorming sessions to map out research priorities that are important to them and reflective evaluation sessions.

6. Be honest and manage expectations fairly

It is respectful practice to be honest when providing information about any limitations of the project, what factors may influence it and its possible impact in real life. Inform and explain what may not be able to change about the project's plan and the reasons such as financial and time limitations or research/curricular regulatory restrictions. Honesty and openness in practice may increase the chances for CYP to contribute with their own creative alternative solutions, engaging in critical thinking, taking further responsibility, ownership and possibly overall a more thoughtful involvement in the project.

7. Place CYP's interest at the centre

CYP's interests should be considered at the heart of the plan/ project. This can include starting from CYP's questions, concerns, choice of methods or a specific topic among others. Make unfamiliar concepts, practice or knowledge relevant to CYP by making links to their contexts and past experiences. In other words, create relationships with what you know they know. Consider requesting information about the individuals/group before completing a more detailed plan, such as through a preliminary consultation with the involved CYP. CYP's inquisitiveness and specific concerns can be set as the starting point.

8. Use context appropriate methods

Consider the adequacy of methods in relation to context, for example, pedagogically appropriate, age appropriate, sensitive to individual needs, diversity and culturally appropriate, among others. Consider experimenting with innovative methods for learning, producing knowledge for research and resolving problems by encouraging CYP's input when possible. Innovative methods may lead to surprising new ways of producing knowledge, as well as different kind of knowledge, and can spark curiosity and motivation in CYP. Consider providing choices for CYP to participate in different ways. For example, using some form of play, drawing, mapping, photo documentation and storytelling among many others. Consider requesting advice for assessing methods when necessary, for example, from professionals

working in nurseries, schools, youth centres, community centres and other researchers who have used a specific method before.

9. Consider the choice of space and its implications

Create an accessible, welcoming, and comfortable space for CYP to feel safe to express themselves and actively participate. CYP should feel that they have control in where and when they participate in research activities. Remain sensitive to CYP's feelings about the space. This consideration should be made regardless whether the space is virtual or physical.

10. Ensure accessibility and flexibility

Use common-sense language and keep in mind that different people may communicate in diverse ways. Consider selecting context appropriate resources, materials, and tools, for example, verbal, visual, manipulative and expression through art, among others. Be aware of the possible design barriers that may limit CYP's valuable contributions. Consider whether too much emphasis is set on literacy skills, communicative skills, specific subject knowledge, whether any specific sensory requirement is needed, background, cultural aspects and other additional support needs. To overcome unexpected design barriers, it is key to reflect upon practice and what is working and not continuously. Make sure there is enough flexibility to enable adjustments when necessary and try out with a diverse range of approaches and tools to enable CYP's participation". (Martinez-Lejarreta, 2022 *blog post).