Exploring the affordances of touchscreen technologies in early years settings in the West Midlands

By

Shannon Ludgate

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Abstract

Touchscreen devices are now the most-used technological hardware by young children at home in England (Livingstone *et al*., 2015). Touchscreens are also gaining popularity in early years settings. However, there is currently no policy and very little guidance available to support early years practitioners in using touchscreens. Information is in its infancy on how touchscreens are used and how to maximise their potential to support young children's learning. Therefore, this study explores touchscreen practice in early years settings to identify affordances in how they are used by children and practitioners.

Practitioner data was collected through an online survey and interviews. Observations of touchscreen use by children and practitioners were recorded and focus-group interviews were conducted with young children. Engeström's (1999a; 1999b) activity theory model was used as the tool for analysis to conceptualise touchscreen activity within four early years settings. Analysis of the data revealed that touchscreen activity was much more complex than children's or adults' general interactions with the devices, and therefore Bronfenbrenner's (1977) ecological systems model was also incorporated with the activity theory model to reflect the wider influences which guide or direct touchscreen play.

The data revealed three main themes: *Play*, *Authority*, and *Pedagogy*. First, the study found that there were differences in touchscreen intentions by children and practitioners, with children viewing the touchscreen as a toy (play resource) and source of entertainment, whilst practitioners viewed the touchscreen as an educational tool. Second, the study found that there were authority struggles amongst children and their peers, and adults and children through the rules or manipulation of rules regarding touchscreen play. Third, pedagogical approaches reflected limitations in touchscreen potential through practitioner rules. However, there was evidence of practitioners supporting children's learning through scaffolding and guided interaction, yet these were not frequent occurrences.

This research has produced strong conclusions regarding effective touchscreen practice and has the potential to be used to inform policy makers, practitioners and researchers to support enhanced touchscreen activity with young children. The research provides an insight into the challenges encountered when implementing touchscreens, or indeed any technology, within early years settings; as such, I emphasise the need for a greater awareness by policy makers of how they can best support early years practitioners in this area.

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Glossary of terms

Affordances – Values which arise from objects when manipulated.

Early Years Foundation Stage (EYFS) – English early years curriculum focussed on supporting the development of children from birth to age five.

Key Stage Three (KS3) – Term used to refer to three years of schooling in England where children are aged between 11 and 14.

Social interaction – A gathering of more than one person within a physical environment, whereby communication has the potential to facilitate the development of new ideas and/or concepts, and share knowledge, thoughts or feelings.

Touchscreen technology – Touch capable devices which may be portable or fixed, which detects and responds to input by a finger, stylus or voice command within the display area.

Applications

Drawing – An app which enables the user to free draw on the screen. The user can select the type of brush, brush thickness, colour, and can choose to erase drawings.

Google – A search engine.

Google Search – Search engine toolbar found installed within some tablet devices.

LEGO Ninjago – An app which features 'LEGO' characters in the design of ninjas. The user designs their character and completes a series of tasks which involve defeating characters in the game.

Matching Cards – An app whereby the user can select the number of matches (2, 4, 8, 12) and plays according to the rules to match pairs.

Mucky Bug – A programme whereby the user has to identify which hand holds the most bugs by counting. This is a mathematical game to help children learn less or more.

Peppa Pig: Paintbox – This app enables free drawing, where the user can select the thickness of the paintbrush, change colour and erase.

Silly Sounds – This programme plays a series of sounds in a sequence to help the user learn sounds to create words. This programme is designed for early years children.

YouTube – A video playing app whereby the user can search for videos using a toolbar.

List of abbreviations

AAP	American Academy of Pediatrics
ALP	Adult-Led Play
Apps	Applications
ASP	Aware Solitary Play
AT	Activity Theory
BB	Busy Bees
BBC	British Broadcasting Corporation
BET	Best Estimate of Trustworthiness
BERA	British Educational Research Association
BMI	Body Mass Index
C	Child
CC	Caterpillar Corner
CCN	Children's Centre Nursery
CHAT	Cultural-Historical Activity Theory
CGFS	Curriculum Guidance for the Foundation Stage
CM	Child Minder
CRAE	Children's Rights Alliance for England
CPD	Continued Professional Development
CSP	Communicative Solitary Play
DAP	Developmentally Appropriate Practice
DCAP	Developmentally and Contextually Appropriate Practice
DN	Day Nursery
eBooks	Electronic Books
ELG	Early Learning Goals
EYFS	Early Years Foundation Stage
FG	Forrest Green
GP	Group Play
ICT	Information Communication Technology
IW	Interactive Whiteboard
LD	Little Ducklings
NAEYC	National Association for the Education of Young Children

O	Observer (child)
Ofcom	Office for Communications
Ofsted	Office for Standards in Education, Children's Services and Skills
P	Practitioner
PAP	Parallel Aware Play
PCK	Pedagogical Content Knowledge
PP	Parallel Play
PS	Pre-School
PSED	Personal, Social and Emotional Development
SES	Socio-Economic Status
SP	Solitary Play
SSP	Supported Solitary Play
TPACK/ TPCK	Technological Pedagogical and Content Knowledge
UB	Unoccupied Behaviour
UK	United Kingdom
UNCRC	United Nations Convention on the Rights of the Child
ZPD	Zone of Proximal Development

Chapter 1: Introduction

1.1 Introduction

This thesis presents a mixed-methods study which explores the use of touchscreen technologies by children and practitioners within early years settings in the West Midlands region of England. Within this chapter, I establish a context and justify the need for the study, and subsequently locate my study within the field of touchscreens in early years settings. I compose a set of research questions and define four frequently used terms that I refer to: touchscreen technology, social interaction, affordances, and pedagogy. This chapter closes with an outline of the remaining chapters of the thesis.

The study focuses on the practices of early years settings within the West Midlands region of England. Children within this study are aged between three and four years old. The curriculum frequently mentioned throughout this thesis (the Early Years Foundation Stage (DfE, 2017)) is a guiding framework designed for practitioners to track children's development from birth to age five. The focus for this study arose from an increasing concern about how touchscreen technologies are used within early years settings. There are different perspectives currently held by parents, early years professionals and health professionals which often conflict when considering young children's access to and use of touchscreen technologies. There is a substantial anti-technology debate led by concerned professionals from a range of areas, which argues that touchscreens or technology are harmful for young children. Tabloid newspapers commonly adopt a scaremongering stance which highlights the negative associations of children using technology. There are concerns on how children are 'addicted' to iPads (Kucirkova and Littleton, 2016; O'Connor and Fotakopoulou, 2016), how touchscreens may be damaging children's eyesight (Knowland and Formby, 2016), and how children are

gradually becoming obese because of reduced physical activity, which is replaced by sitting down in front of a screen (Cordes and Miller, 2000; Cox *et al*., 2012).

However, studies also report how there are benefits for young children in using touchscreens, such as increased confidence (Flewitt *et al*., 2014), development of collaborative learning skills (Wohlwend, 2015) and that touchscreens promote mark-making skills (Price *et al*., 2015). There are also perceived benefits, with parents reporting they thought touchscreens enabled children to learn new skills (O'Connor and Fotakopoulou, 2016), and practitioners thought that children's literacy, mathematical, communication, and personal, social and emotional skills are enhanced during technological play (Gray *et al*., 2017).

It has been reported how the touchscreen is the most popular technological device used by young children in England (Chaudron, 2015; Livingstone *et al*., 2015) and touchscreens are now permanent fixtures within many home environments. Whilst this technology pervades society, guidance or advice on how to use these devices effectively is minimal, which raises further concern on how children are using touchscreens in educationally beneficial ways, when training opportunities are limited for early years practitioners.

It is widely acknowledged that practitioners and parents are unaware of how best to use touchscreens with their young children (Knowland and Formby, 2016; Marsh *et al*., 2015a; O'Connor and Fotakopoulou, 2016; Palaiologou, 2016), and this study is a starting point which explores a range of issues such as pedagogy, social interaction and children's play to become more informed about touchscreen practice. This information is urgently needed; it is one of the first of its kind and therefore can be used as a platform on which to build and extend aspects of this study to seek further understanding of touchscreen practice more widely. Previously, Yelland and Gilbert (2012) recommended more research needs to be conducted to support early years practitioners and parents in identifying the affordances that touchscreen technologies can

provide to support young children's learning. The Cohen Group (2011) suggested that raising awareness of the potential affordances of touchscreen technologies was an effective way to address the concerns regarding the use of this technology with young children.

In 2016, Burnett suggested that parents and practitioners alike "need to be alert to the affordances of digital technologies, intended and unintended, and the possibilities and barriers these present for learners" (Burnett, 2016: 36). This study intends to do exactly that, by exploring affordances of touchscreen technology by studying the use of these devices within early years settings.

1.2 Setting the context

The Office of Communications (Ofcom, 2017) have recently reported that young children's access to touchscreens in the home in England has risen from 28% to 65% between 2013 and 2017. In addition, Knowland and Formby (2016) report a 50% increase in under-five's access to touchscreens at home from 2012 to 2015 (23% to 73%). This increase in access is not limited to the home environment; early years setting-based studies report 58.2% of three-to-four-year olds had access to a touchscreen in 2015, an increase from 22% in 2014 (Formby, 2014a; 2014b; Knowland and Formby, 2016).

Marsh *et al*., (2015a) recently suggested "all early years settings and schools should enable children to access tablets in order that children who do not have access to them at home are able to develop relevant skills and knowledge" (p. 46). However, whilst studies reflect a general increase in touchscreens in both the home and early years setting, touchscreen use in early years settings remains under-studied. It is unknown precisely why this environment is under-researched; however, it has been argued that more studies are conducted in the home environment since this is where there is most concern about children's over-exposure to technology (Plowman, 2016).

There are few studies that investigate pedagogy, which, considering the recommendation by Marsh *et al*., (2015a), proves challenging for early years practitioners when considering how to incorporate technologies into a play-based pedagogy (Palaiologou, 2016). Furthermore, studies which focus on the social aspect of touchscreens are only recently emerging (for example Arnott, 2013; Arnott, 2017; Savage, 2011), so again this requires further attention particularly when researchers recommend the shared use of touchscreens rather than positioning them as a solitary-user device (Plowman and Hancock, n.d.; Marsh *et al*., 2015a). As such, there is a need to address these areas to explore the ways that practitioners position the touchscreen within their settings to determine general touchscreen activity. There is also a need to explore the social nature since studies report an understanding that touchscreens are solitary-user devices due to their small size, which contradicts Plowman and Hancock's (n.d.) recommendation (Edwards, 2013).

Currently, research concerning touchscreen technologies in the early years focuses on:

- Children's touchscreen activity at home (Marsh *et al*., 2015a; 2015b; O'Connor and Fotakopoulou, 2016; Ofcom, 2017; Plowman, 2016; Plowman, 2014; Plowman *et al*., 2011a; Plowman *et al*., 2011b);
- Children's digital literacy skills (Knowland and Formby, 2016; Kucirkova and Littleton, 2016);
- Children's social interactions around the touchscreen (Arnott, 2013; Savage, 2011); and
- Practitioner perspectives on touchscreens and its impact on pedagogy (Palaiologou, 2014).

Furthermore, studies are focusing on specific areas of learning such as literacy (Burnett, 2010; Dezuanni *et al*., 2015; Flewitt, 2014), communication and language (Billington, 2016; The Communication Trust, 2011), and creativity (Marsh *et al*., 2015a; 2015b; 2015c). However,

there is a deficit in researching touchscreen use more holistically to identify the potential affordances of its use with young children and in terms of what practitioners perceive to be the value of touchscreens in early years. Whilst some studies address the perceived benefits of using touchscreens with young children learning (see Blackwell *et al*., 2014; Gray *et al*., 2017; Jarvis *et al*., 2014), it is important to address the affordances of touchscreens considering there is still a substantial anti-technology debate that warns technology is depriving children of their childhoods (Palmer, 2006; Postman, 1992); technology promotes social isolation (Palmer, 2008); technology takes children away from healthy activities (Burnett, 2010); and is generally harmful for children in their early lives (Howard-Jones, 2011; Palmer, 2006). Exploring touchscreen affordances is a way to address these claims and identify positive (or indeed negative) associations of using touchscreens with young children, strengthening the research already conducted on touchscreens in the early years.

1.3 The current study

This study is exploratory in nature and intends to capture an insight into the practice of four early years settings when touchscreens are used, to identify potential affordances of touchscreen technology. To achieve this aim, the study is guided by three objectives:

1. To explore the ways that touchscreens are used by children during play;
2. To identify the pedagogical approaches implemented by practitioners when touchscreens are integrated into daily routines; and
3. To identify whether touchscreens support social learning when used by children.

These areas of focus were established to increase the likelihood of generating a holistic view of touchscreens when situated within early years playrooms. Exploring the ways that touchscreens are used provides an account of general touchscreen play. In 2015, Katz and Levine (2015) stated that more research needed to be conducted which focussed on how

children use digital technologies, and this study responds to this need. Whilst the study does not intend to monitor or assess children's development or aspects of learning, it seeks to explore practice to describe and analyse how touchscreen devices are used with and by young children as they engage in their daily routines within early years settings.

Identifying pedagogical approaches is another important element to this study; some researchers suggest integrating technology into a play-based pedagogy is challenging since technology is generally perceived as an operational tool to learn skills (Edwards, 2013; Lindahl and Folkesson, 2012). This contradicts the play-based approach adopted within child-centred settings, which is recommended in the Early Years Foundation Stage (EYFS) (DfE, 2017; Edwards *et al*., 2017). As such, exploring the ways in which practitioners position the touchscreen within their ideals of a play-based pedagogy will allow me to uncover how practitioners seek to use touchscreens with young children and to explore what practitioners perceive to be a benefit of this practice.

It is also claimed that the touchscreen discourages interaction and therefore promotes social isolation (see for example McLean and Edwards, 2016; Palmer, 2006). One aspect of what this study aims to achieve is to explore touchscreen activity in the social context of the early years environment, to determine whether the touchscreen affords social interactions, and how children react to their peers when playing with touchscreen devices. Focusing on this area allows for an exploration into the reality of touchscreens affording social learning, particularly as this area is frequently used within scaremongering techniques to warn parents about perceived dangers of touchscreen technology, and its associated isolating nature (Plowman and McPake, 2013).

To achieve these aims, social constructionist (socially-created understandings of reality) and social constructivist (knowledge constructed through interaction with others) perspectives have

been adopted so that I can explore whether constructions of knowledge and technological expectations have informed touchscreen practice (see Chapter 5). In addition, it allows me to explore from the constructivist perspective how children interact with each other when using touchscreens to assist in identifying potential affordances. This study takes the position that knowledge is generated through interactions with others (Berger and Luckmann, 1991), hence my approach of exploring the social aspect of touchscreen technologies. Through the social constructionist/constructivist approach, this study explores the touchscreen 'world' through interpreting interactions surrounding and concerning the touchscreen between children, children and their peers, and children and adults. It is important to explore practice from these perspectives since I use Engeström's (1999a; 1999b) activity theory model as a tool for analysis, whereby touchscreen play is of central focus to unravel the ways in which children interact with the touchscreen. This model allows me to focus on the ways that the touchscreen is used, and to identify intentions of touchscreen use determined by both practitioners and children. In addition, it provides me with an opportunity to explore touchscreen use in a social context, identifying the interactions between children and their peers and adults as they play.

Bronfenbrenner's (1977) ecological systems theory model is also used as an underlying theoretical/explanatory framework, which was developed primarily as a theoretical model to understand children's experiences of the world. Bronfenbrenner's theory enables me to acknowledge the wider influences which impact on and influence children's touchscreen play, through recognising the different systems he describes within his theory (see Chapter 3). Microsystems such as the child's home and the early years settings are proximal contexts where a child spends most of their early lives (Bronfenbrenner, 1977). Exploring the early years environment in relation to touchscreen activity acknowledges the importance of this setting in supporting children's development through their interactions with others (Bronfenbrenner, 1979a; 1988), which is well situated within the social constructionist perspective.

1.4 Connection to the study

To provide some context as to how this PhD developed, I have trained and worked within the Early Years sector over the past eight years, gaining Early Years Professional Status alongside my undergraduate degree in Early Childhood Education Studies. As a result of the training and experiences gained by working in various early years settings, I became aware of the ways in which technologies were used with young children, and how the type of technologies were changing to keep up to date with current trends in society. As such, this fostered an interest in the use of these devices within early years settings, being concerned by the general lack of knowledge which surrounded the touchscreen, and how practitioners often transferred their knowledge of the desktop computer to the touchscreen device, even when the devices were entirely different.

The PhD was an ideal opportunity to investigate further and to try to answer some of the questions that arose when briefly observing touchscreen activity. Although I had observed touchscreen technology used to stimulate children's interests in Special Educational Needs settings, I was curious about the uptake in mainstream settings, and how early years practitioners adapted to this change. Notably, was the social aspect of the touchscreen, since the touchscreen play I had observed was generally a single-user activity, led by an adult which directed the nature of children's play. Since this was prescriptive practice, I was curious about whether children were provided opportunities to engage in shared touchscreen play, and how practitioners adopted their play-based pedagogies to incorporate technology within this practice. These areas of interest helped shape the research questions within this study.

Subsequently, from my experience of working within early years settings, I position myself as an insider to this research, since I am well trained within the early years and contemporary issues. It is impossible to fully detach myself from the study since my experience and training

is embedded within this topic. Punch (2011: 45) reinforces this, stating "the researcher always comes to the research from some position", and my early years experience reflects this. However, I also consider myself to be an outsider, since I am not a practising early years professional working within a setting, thus my position within this environment does not wholly influence the data, from my professional distance to the settings who participated within this study. For this study, I subsequently adopted 'dual-roles' (Corbin Dwyer and Buckle, 2009) by recognising my insider knowledge, yet equally recognising my outsider position, since I was not researching within my own setting. Therefore, my knowledge of child development and of technology from an insider's perspective, is transferred to an outsider position from the recognition that I am not fully embedded within the early years environment, although there is an acknowledgement that this has potential to somewhat influence the data. A full discussion on my positionality and being a reflexive researcher can be found in Chapter 5.

1.5 Research questions

Since the aim of this study is to identify affordances that arise when touchscreens are used in early years settings by both children and practitioners, four research questions have been generated from an examination of existing literature and research:

1. Which early years pedagogies do practitioners implement when supporting children's learning when using touchscreens?

This research question is particularly pertinent within this study to determine the approaches implemented, when considering potential challenges in relation to a new technological device within early years settings. The literature discussed in Chapter 4 highlights the disruption in pedagogical practices with the implementation of a traditionally perceived operational tool, which contradicts the nature of children's learning within a play-based early years

environment. The extent to which these challenges disrupt or alter practice, coupled with an exploration into the approaches implemented, underpin the focus of this thesis.

2. What are the perceptions and reported practices of key stakeholders (practitioners and managers) on children using touchscreen technology in the early years?

Following on from research question 1, this research question was designed to explore the impact of perceptions on practice, and to explore the ways that these perceptions have the potential to guide or direct touchscreen play. Few studies focus on practitioner perceptions, the most notable in relation to this study from Palaiologou (2014), and therefore this guides the emphasis on obtaining practitioner perceptions in order to identify the rationale behind touchscreen use. This is in attempt to identify potential affordances. Obtaining perceptions and reported practices allows for the exploration of wider influences which potentially impact on touchscreen play, embedded through the pedagogical approaches implemented.

3. What opportunities for social and collaborative learning do touchscreen technologies offer for children aged three-to-four-years-old in early years settings?

Studying the opportunities for social and collaborative learning arose from the overwhelming concern that touchscreens promote solitary rather than shared play. In response to these concerns, this research question explores the opportunities provided to young children to determine the extent to which shared play is facilitated within early years settings. As such, this may enable the identification of potential affordances in relation to this, by framing the reality of touchscreen play around this theme.

4. How are touchscreen devices used in a range of early years settings in the West Midlands?

Finally, this research question addresses the broader aspect of touchscreen play to determine the range of ways that these devices are utilised within early years settings. This research question was important to consider as supporting information for this study, based on the many unknowns about the ways in which touchscreen devices are used within this environment.

Therefore, the exploration of touchscreen use enables the identification of the potential versatility of these devices, and the affordances that arise from such use.

These questions direct the exploration of practice to meet the research objectives already identified.

1.6 Defining key terms

Within this study I use the following four terms frequently: *touchscreen technology*, *social interactions*, *affordances*, and *pedagogy*. These are open to various definitions and interpretations, so for that reason I set out below how I understand and use these terms in this thesis.

1.6.1 Touchscreen technology

As technology changes over time, inevitably, different technologies provide different functions and therefore the classification or definition of technology requires adaptation. Arnott (2017) explains how varying definitions of technology makes achieving a universal definition challenging. Definitions of technology vary when considering the range of technologies available. These can be working and non-working technologies (Bird, 2017), and digital and non-digital (Arnott, 2017). Addressing technology in its simplest form, Plowman and McPake (2013: 27) suggest technology "refers to the devices – such as computers and cell phones – and to the products or outputs – such as DVDs, websites, games, and interactive stories – that are viewed, read, played, or created on these devices". Vittrup *et al.*, (2014: 1) define technology as "the use of tools and methods to create and produce", with electronic technologies including "television, MP3 players, video games, and computers". These two definitions focus both on the device itself but also the product that arises from the technology, as in Plowman and McPake's (2013) example such as games and stories.

When summarising Traxler's (2010) definition of technology, Palaiologou (2014: 3) explains "digital technology is used to describe not only desk top computers, but also includes portable mobile devices including smartphones, game consoles, digital cameras, media players, netbooks, in-car satnav and handheld computers". This definition of technology is different to that of Plowman and McPake and Vittrup *et al*., in that it encompasses handheld technology.

As such, the varied range of definitions outlines that achieving no single definition is straightforward. Instead, Arnott (2017) suggests focussing on the properties of the technologies, and therefore, for this study as a guiding framework to position touchscreen technology, technology can be defined as:

> "… anything that can create, store or process data – this could include digital toys or other devices such as computers or tablets (Palaiologou, 2016b); less tangible forms of technology such as the internet (Knight and Hunter, 2013); and imaginary technologies – such as those that appear in dramatic play (Edwards, 2014; Howard *et al*., 2012)" (Johnston and Highfield, 2017: 58).

Moving forward to touchscreen technologies, Neumann (2014: 110) defines touchscreen tablets by their properties: "touch screen tablets are light weight and portable, consisting of a flat, glass screen (17 cm-25 cm) interface that detects and accurately responds to stimulation by a finger within the visual display area". This definition, like Palaiologou's focuses on the portability of the device compared to other forms of technology.

For this study, I adopt Neumann's (2014) definition, however I omit that the device must be portable. There are touchscreen devices which are large and are fixed in position, and whilst this removes the portability, it does not take away their touchscreen functionality. As such, my definition for this study is as follows:

> Touchscreen tablets are devices which may be portable or fixed, "consisting of a flat…screen interface that detects and accurately responds to stimulation by a finger", *an input stimulus such as a stylus, or voice command* "within the visual display area" (Neumann, 2014: 110).

1.6.2 Social interactions

One aspect of the research is to focus on children's interactions surrounding the touchscreen device. Clarifying *social interactions* is important since other studies use different definitions. Parten (1932) once suggested the term 'social' is segmented since there are varying definitions of what constitutes as social. Although stated over eighty years ago, the issue remains since there are many definitions of social interaction, some of which are explored below. In line with Bruner and Vygotsky's theories of learning through social interaction, Wood (1999) suggests social interaction involves a more knowledgeable person teaching another so that learning occurs. As an extension to this definition, Driscoll and Carter (2009: 283) detailed elements of social interaction, including "appropriate or inappropriate verbal, vocal, or gestural behaviour either deliberately directed to an individual by the target child in response to a communication". More recently, Savage (2011: 6; Arnott, 2013: 98) defined social interaction as "two or more people engaging with each other and exhibiting norms, language, non-verbal behaviours or roles". From these three definitions alone, it is clear that there are variances in what constitutes as social interaction. Therefore, for clarification I have generated my own definition of social interaction that will be applied for the purpose of this research:

> A gathering of more than one person within a physical environment, whereby communication has the potential to facilitate the development of new ideas and/or concepts, and share knowledge, thoughts or feelings.

This definition has stemmed from other definitions and ideas within this concept, from Berger and Luckmann (1991), Parten (1932), and Lave and Wenger (1991). The influence of interactions with other people to support learning derives from a social constructivist perspective. Emphasis is placed on the importance of the experiences of others and the use of language to deliver instruction. This enables support to be provided by a more knowledgeable person (Berger and Luckmann, 1991; Vygotsky, 1978). The concept acknowledges interactions between people as reciprocal behaviours, whereby people share their experiences and skills to teach others (Parten, 1932; Siraj-Blatchford, 1999). This view on learning also recognises that within activity, learning, thinking and knowledge are united, which arise from a socially and culturally constructed world (Lave and Wenger, 1991: 51). Language is used as a tool within activity to translate knowledge and experience and to inform practices, which are shaped and reconstructed within the social world. For example, a child may teach another how to perform an action or overcome a challenge when using a touchscreen, based on the child's own experiences of overcoming the challenge him/herself.

1.6.3 Affordances

Another term which I commonly refer to in this study is *affordances*. For this study, I draw upon the work by Gibson (1979) in attempt to add clarification. Coined by Gibson himself, he stated "the *affordances* of the environment are what it *offers* the animal, what it *provides* or *functions*, either for good or ill" (p.56, emphasis in text). Affordances are the values which arise from objects within an environment. Everything is assigned a value, for example, the touchscreen may afford entertainment, yet equally it may afford learning. Gibson stresses affordances are not subjective to the experiences of the person, rather they are "*taken with reference to an observer*" (p. 60, emphasis in text).

However, Chemero (2003) argues Gibson's definition of affordances alters throughout his paper, and eventually it becomes challenging to accurately identify an affordance, calling them

"impossible, ghostly entities" (p. 182). Chemero (2003) takes Gibson's theory further by suggesting affordances are relative to a person's behaviour within specific environments. For example, an affordance of an object within an environment may provoke or stimulate certain kinds of behaviour.

In relation to technology, Hutchby and Moran-Ellis (2001) argue that affordances of technology can be questioned in terms of "how do children interact with [technologies] and… the affordances that technology have… [and] how do these affordances constrain these interactions?" (p. 3). Hutchby and Moran-Ellis (2001) consider it important to determine the "shapes and the outcomes of specific, situated encounters with children and technologies" (p. 3) rather than focusing on the impact of technology on children's learning. This is important to consider, particularly in a time where there are many unknown aspects of the ways in which children interact with touchscreens, in order to determine the potential affordances of such use in the early years.

For the purpose of this study, I stand by Gibson's theory and posit the following definition of affordances:

> Affordances are values which arise from objects when manipulated, either positive or negative.

As an example, Ernest *et al*., (2014) identify that touchscreens afford the opportunity to learn technological skills. Through manipulation of the touchscreen, a person may learn to navigate around the device and perform specific functions to make certain actions. For example, a tap on the screen may make a selection. This process is important for learning since children can interact with apps which may afford potential opportunities to develop skills and extend their learning.

However, it is important to adopt a neutral stance regarding the values which arise from objects, by recognising that affordances may not always be positive. Touchscreens may certainly afford learning technological skills, but, taking into consideration concerns regarding the touchscreen, they may in fact hinder children's social skills from the perceived isolating nature of the device. It is my intention within this study to determine the affordances of touchscreens as a way to become more informed about how to achieve best practice when touchscreens are implemented within activities in early years settings. Studying affordances is a way to encompass the breadth of aspects of touchscreen use that I explore within this study, which includes the social aspect of touchscreen play, children's general play opportunities, and the pedagogical approaches implemented by practitioners. It should be stated that my exploration of the affordances of touchscreens focuses on the touchscreen as a tool for learning, rather than on the pedagogical value of specific apps.

1.6.4 Pedagogy

This section focuses on the range of pedagogical approaches discussed within this thesis, including child-initiated, play-based, adult-led and digital pedagogy. A more thorough examination of these terms in relation to touchscreen play can be found in Chapter 4 Section 4.2, which includes a discussion on the problematic nature of these approaches in relation to the touchscreen.

Pedagogy can be broadly defined as:

> "[A] set of instructional techniques and strategies which enable learning to take place and provide opportunities for the acquisition of knowledge, skills, attitudes and dispositions within a particular social and material context. It refers to the interactive processes between teacher and learner and to the

> learning environment (which includes the concrete learning environment, the family and community)" (Siraj-Blatchford *et al*., 2002: 28).

Within early years settings in England, a range of pedagogical approaches are implemented to support young children's learning. The child-initiated approach focuses on "learning based on children's interests… [with] children's participation in decisions related to their learning" (Walsh *et al*., 2010 :7), whereas the adult-led approach involves adults planning specific activities for children to engage in (Siraj-Blatchford *et al*., 2002). Achieving a balance between these two approaches is generally said to enable children to develop in a wide range of areas, through activities designed to enhance learning and interest the children (Siraj-Blatchford and Sylva, 2004). Therefore, both adults and children contribute to the development of the child.

These approaches are commonly implemented through a play-based pedagogy, defined as an approach which:

> "promotes play and story sessions as the primary media for learning, offers children choices and alterative activities to encourage children's independence in learning, and advocates a balance between child-initiated activities and teacher/practitioner guidance" (Walsh *et al*., 2010: 4)

These definitions of pedagogical approaches have been developed and redefined over many years, particularly when a new tool or toy is positioned within the learning environment which challenges the nature of these approaches. One such challenge is the touchscreen device, or indeed any technological tool. These devices are traditionally perceived to assist children in learning operational skills (Edwards, 2013), contradicting the play-based approach in favour of adult-led pedagogies. This challenge has led early years practitioners to question their role in the early years playroom, and question how they implement technological devices within the pedagogical approaches already embedded within practice (Palaiologou, 2016).

Acknowledging these challenges, Fleer (2017) developed a 'digital pedagogy' as a way to challenge assumptions and add clarification to the ways in which technological devices are or can be used within the early years environment. In relation to this thesis, digital pedagogy is a term I frequently use as a way of achieving a common language when thinking about practice and approaches. I also use this term to reinforce the development of pedagogical approaches which effectively supports young children's interactions with touchscreen technologies. Fleer (2017) defines digital pedagogy as:

> "*Digital pedagogy* captures the special characteristics of how teachers use digital technologies for play, learning and development" (Fleer, 2017: 123).

This definition is further developed, with Fleer (2017) explaining:

> "*Digital pedagogy* captures both the children's perspective and the teacher's perspective as a relational whole. It is not possible to consider the actions of the children independently of the pedagogy of the teacher in an early years setting. Similarly it is not possible to conceptualise the teacher's pedagogy without thinking about the children's perspective in relation to what the teacher does" (Fleer, 2017: 123).

As such, for this thesis, I adopt Fleer's definition of a digital pedagogy, centred on taking into consideration both the children's and practitioners' intentions and perspectives to implement technological experiences of value to children which supports their learning.

1.7 Outline of the thesis

The structure of the thesis is as follows:

Chapter 1 – Introduction. This chapter establishes the focus of the study and identifies my theoretical perspective.

Chapter 2 – Policy and guidance. This chapter discusses the policy and guidance to date on the use of touchscreen technologies with young children. The chapter also identifies the scarcity of guidance, which provokes a call for more support.

Chapter 3 – Theory. This chapter discusses theories of social learning to identify possible outcomes of touchscreen use with young children. The chapter also discusses activity theory as a model used to analyse data, and Bronfenbrenner's ecological systems theory model to acknowledge wider influences which may impact on practice.

Chapter 4 – Literature review. Within this chapter I examine the literature to date which focuses on touchscreen use by young children. I explore pedagogy, touchscreen use at home and in early years settings, and I explore the anti-technology debate.

Chapter 5 – Methodology and methods. This chapter outlines the methodology I have adopted for this research. I also justify the methods I have selected to conduct the research, I discuss the range of tools I have utilised to analyse the data, and I discuss ethical considerations taken when conducting research with young children.

Chapter 6 – Survey findings. Within this chapter I present the findings retrieved from an online survey. I analyse these findings against current research and in relation to the activity theory model and make links where relevant to the ecological systems model.

Chapter 7 – Interview findings. This chapter analyses the findings from interviews with a range of early years practitioners within the four case sites. I also include an analysis of this data in relation to the activity theory model and make links to the ecological systems model.

Chapter 8 – Observation and focus-group interview findings. This chapter analyses the observation and focus-group data using a technology-based play scale. I also analyse this data according to the activity theory model adopted within the previous findings chapters and the ecological systems model.

Chapter 9 – Discussion and conclusion. This final chapter brings together the findings and the literature to answer the four research questions. I make recommendations for future research, and I acknowledge the strengths and limitations of the research design.

Chapter 2: Policy and guidance

2.1 Introduction

The last chapter introduced the study and discussed the approaches taken to researching young children's touchscreen uses whilst considering the recent uptake of touchscreen devices in young children's lives. This chapter will provide a discussion of the relevant policy and guidelines for children under five's use of touchscreen devices. Since the uptake of digital technologies has gradually increased in the lives of young children and in early education over recent years, and technology is now considered central to children's lives (Arnott, 2016a), there have been very few guidelines to support touchscreen use in meaningful ways.

Touchscreen use in both educational settings and the home environment is utilised in various ways at the discretion of whoever mediates its activity. However, there is a need to address this and to recognise what guidance and policy is currently available. A search for England-based policy guidance revealed very little and this reinforced the significance of this study, which sought to explore the current practice within early years settings for young children aged three-to-four-years within the context of the EYFS (DfE, 2017). Therefore, this chapter will discuss the small body of guidance and information on best practice of touchscreen use with young children.

2.2 Touchscreen technology within the Early Years Foundation Stage

The Early Years Foundation Stage (DfE, 2017), a statutory framework which identifies how early years professionals can support children's learning from birth to aged five, is the current framework implemented within England. Along with statutory guidance on promoting welfare and safeguarding children, and with an aim of supporting early years practitioners to promote

the healthy development of young children, the EYFS (DfE, 2017) is organised into prime and specific areas of learning.

Alongside guidance on how to promote the healthy development of children under five within this framework, early learning goals (ELG) are assigned to all areas of development. ELGs are targets which children should achieve by the time they are aged five and are assessed by early years practitioners. In relation to the use of touchscreen devices in the early years, technology is currently positioned within the *Understanding the World* area of development. Identified as an area of learning which proceeds the prime areas, the EYFS states children should be able to "explore, observe and find out about… different technologies" (DfE, 2012: 5; DfE, 2014), and "recognise that a range of technology is used in places such as homes and schools" (DfE, 2017: 12). The ELG for this area states "[children] select and use technology for particular purposes" (DfE, 2017: 12). The use of technology in the early years is mentioned within the EYFS yet does not discuss the educational value of technology within the developmental targets.

However, this inclusion of technology within the framework is significantly more than in previous frameworks dating back to the Curriculum Guidance for the Foundation Stage (CGFS) in 2000 (DfEE, 2000). Technology was first recognised as supportive to children's early learning experiences within the CGFS framework (DfEE, 2000), which stated children should by the end of the foundation stage (aged five), be encouraged to use Information and Communication Technology (ICT) to assist children for when they use technology in school. Programmable toys were acknowledged as supporting children's understanding of the world, and children were encouraged to share their learning experiences with others and identify different uses of technology. Early Learning Goals established within the CGFS (DfEE, 2000) recognised children should have opportunities to learn with technology in both educational settings and at home.

The subsequent framework, Birth to Three Matters in 2002 (DfES, 2002) did not acknowledge the use of technological toys for young children, however, five years later under the new Early Years Foundation Stage framework (DCSF, 2007), children were encouraged to use technology from birth. The complexity of the different forms of technology increased with children's age: programmable toys to be used with children from birth, and children were encouraged to use keyboards, cameras, photocopiers and computers as they grew older to age five. Revised versions of the EYFS in 2012, 2014 and 2017 positioned the use of technology within the 'specific' area of development *Understanding the World*, in line with early recognition within the CGFS (DfEE, 2000) that the use of technology can support children's understanding of the world in which they live. Whilst there are no significant educational differences between the various frameworks in regard to technology, what is needed is an acknowledgement of the changing trends of technology uptake in young children's lives and in society. A recent review on early learning goals (DfE, 2017) has concluded that *technology* requires revision in order to reflect current trends in young children's access to a wide range of technology in the early years (Rawstrone, 2017).

Touchscreen technologies have developed significantly since the first device over five decades ago. With an increase in the number of touchscreen devices created, and the new capabilities of touchscreen technologies, the use of technology is recognised as an educational tool which can support children's learning (Romeo *et al*., 2003). A range of technologies run programmes or applications (apps) specifically designed for young children to play and learn. There are an increasing number of apps designed for young children that are positioned as educational within app stores, many of which are free to download and require no expert input. Apps are designed and categorised according to children's interests, areas of development, and within age ranges, as a way of supporting children, parents or early years practitioners in selecting the most appropriate apps according to their needs.

With early years frameworks stating practitioners should be using different forms of technology with young children from birth and for a range of purposes, and app stores reflecting an increase of demand for entertaining yet educational apps for children to play on, it is important to consider the guidance and policy written for pre-school-aged children and suggested approaches to be taken when using these devices.

2.3 Guidance and policy on the use of touchscreen technology

For pre-school-aged children, guidance on touchscreen use is slowly increasing. Recent research by Marsh *et al*., (2015a; 2015b; 2015c) has begun to establish guidelines on effective touchscreen use for young children, with support offered in helping parents and early years practitioners to identify best uses of touchscreen devices. Marsh *et al*., (2015a) have identified features of high quality apps, which are intended to support parents and practitioners in selecting the best apps to support children's learning. They suggest apps should:

- Promote independence;
- Connect online and offline play, by encouraging children to play with physical toys too;
- Provide challenge, with opportunities to play at a higher level of difficulty;
- Provide an undo function to enable reflection and review; and
- Promote creativity through developing a sense of wonder, encouraging children to ask questions.

Marsh *et al*., (2015a) also suggest apps should allow children to build virtual worlds and have a save function to return to later to continue creating, alongside suggesting children be provided with opportunities to role-play when using touchscreens to develop empathy and care skills. In their report for early years practitioners, Marsh *et al*., (2015c) identify how apps can promote play and creativity, and the researchers offer suggestions of apps that practitioners could use

for different purposes, such as *My Story*, an app for encouraging children to create their own stories, and *Jelly Band*, which enables children to create their own music.

In their report for policy makers, Marsh *et al*., (2015d) recognise that more support needs to be provided for parents and practitioners who care for children under age five. They recommend early years practitioners receive training on how to use touchscreens effectively with young children, and guidance should be provided on selecting appropriate apps for different age ranges. It was also recommended that app designers consider the placement of advertising within apps, considering some children had inadvertently downloaded apps or made in-app purchases whilst playing (Marsh *et al*., 2015a).

Alongside guidance on selecting apps and how to promote learning, research shows that pre-school children are spending a significant amount of time accessing the online world. The Office of Communications (Ofcom, 2017) report pre-school-aged children are spending on average seven hours and 54 minutes online per week, a decrease from eight hours and 18 minutes in 2016. As touchscreen use in early years settings rises, so does the opportunity for children to access online content and explore the online world. Although online access has decreased in the last year, it is still a significant amount of time that young children spend online and therefore guidance and policy on online touchscreen use is needed for children of this age. Marsh *et al*.'s (2015a) recommendations from their study includes a call for greater awareness of online safety for pre-schoolers, considering the research found children were accessing online content and this was not always supervised by practitioners within early years settings.

With an increase in internet use with young children, Livingstone *et al*., (2015) and others have recognised that children's rights need to be protected if they are to access online content, and Livingstone *et al*., (2015) has therefore designed a new framework to ensure that all children

are able to access online content in an informed and safe way. iRights, a recent report aimed at promoting the practice of safe online access has established a series of rights (see 5Rights.com) that children and young people should be able to adopt globally, "regardless of their gender, race, disability, social-economic position or place of birth" (5Rights, 2015: 1):

1. The Right to Remove
2. The Right to Know
3. The Right to Safety and Support
4. The Right to Informed and Conscious Use
5. The Right to Digital Literacy (5Rights, 2015)

These rights, formulated from a series of 'Youth Juries' whereby actors role-played a range of scenarios that enabled groups of 12-17-year-olds to debate, allowed the child voice to be heard, recognising children's frustrations that the practices and rights in an offline world did not always translate to the online world (Coleman *et al.*, 2017). It was envisioned that the production of 5Rights would be implemented globally, recognising the need for one universal framework, rather than variations across the world. 5Rights also advocates that governments, parents, adults, children and corporations should use these rights to negotiate their online engagement, questioning whether the content and digital habits are designed for children and whether they are appropriate (5Rights, 2015).

Furthermore, an intention of 5Rights was to recognise the United Nations Convention on the Rights of the Child (UNCRC) (United Nations, 1989) and replicate these rights into the digital landscape. As such, the Children's Rights Alliance for England (CRAE) conducted a study seeking how the UNCRC rights are best translated into the digital world, and in addition, CRAE and Livingstone adapted Articles 1-54 to encompass digital rights, titled 'A digital convention' (Children's Commissioner, 2017). These adapted articles recognise that children's rights

should apply to the online world too; for example, children's digital identity should be protected (Article 8), data should not be collected from children without their permission (Article 16), and children should have access to the internet so that they are not disadvantaged in modern society (Article 27). Importantly, children should be informed of these rights, recognising that these apply in the online and offline world.

In regard to touchscreen use with pre-school-aged children, these rights have the potential to protect children as a starting point as they access online content within early years settings. Drawing upon Ofcom's (2017) findings of increased online access within the home environment, it is also possible that children are accessing the internet within early years settings. Increasing awareness of the digital rights may enable early years practitioners to be mindful of how to protect children. However, it must be noted that Marsh (2017) reported parents in her study did not seek to use parental controls when children accessed online content, as children were considered 'underage' for websites such as social media. Furthermore, parents reported that they generally knew what children were accessing when they did go online.

2.4 Advice on best practice

The British Broadcasting Corporation (BBC) has targeted advice towards parents in collaboration with Plowman and Hancock (n.d.) on best practice of using touchscreens, addressing topics such as screen time exposure, communication and learning through technology. Plowman and Hancock recommend pre-school-aged children be encouraged to communicate with others when using touchscreens, and they promote the need for shared activities through the use of conversation. Allowing children to take photographs using a touchscreen and subsequently talking about those pictures enables children to develop their communication and social skills, through interacting with various people who take an interest in their lives. The advice also draws upon Plowman's strategy on fostering guided interaction

when using touchscreens, supporting children through asking questions, playing together, encouraging children and praising their achievements (Plowman and Stephen, 2013). They also recommend providing children with activities in real-life that they engage in on-screen, to extend children's learning and to help children relate to the real world (Plowman and Hancock, n.d.).

The emphasis on interactive technology use is prevalent across guidance. When considering how touchscreens should be used with young children, Goodwin and Highfield (2012) have suggested how parents should carefully select open-ended apps rather than instructive apps which foster very low levels of creativity. Furthermore, additional guidelines have been published that are targeted towards parents regarding literacy (National Literacy Trust, 2017) and communication development (Communication Trust, 2011), offering guidance on how to choose apps and how to support children's development. In addition, Marsh *et al*.'s (2015b; 2015c) recent study has outlined a series of questions that parents and practitioners should ask when selecting and downloading apps. These include:

- Is the app designed for the age of the children;
- Are the aims of the app clear;
- Are levels of challenge included and can these be increased/lowered;
- Are there guides to assist children within games such as pointing arrows or hints;
- Are there any adverts;
- Can children modify apps to add their own features such as by taking photographs;
- Are children rewarded for their efforts;
- Are children challenged and are they encouraged to explore and experiment; and
- Do apps encourage children to reflect and ask questions?

The researchers explain that these features within apps promote play and creativity by allowing children to modify apps so that children are not inhibited by limitations within poorly designed apps, whereby children follow a series of instructions with little or no opportunities for deviation.

Although guidance in the United Kingdom (UK) offers supportive strategies in assisting parents and practitioners to make informed choices regarding touchscreen or technology access, the American Academy of Pediatrics (AAP) take a different stance with their advice. In 2016, the AAP reported how children younger than 18 months old should have no access to technology aside from using video call programs to communicate with family members. Their advice stems from the belief that young children need to spend their first years interacting with tangible materials rather than viewing two-dimensional images on screen. Children aged 18 months to two years are recommended to only have access to technology to view high-quality educational programmes, and when doing so, parents should sit with the children to reinforce the learning content. For children from two years to five years should have a limit of one hour to access programmes of a high-quality, and parents should be involved with this to support children's learning. These guidelines have been modified since 2011, when much more restricted guidelines were in place which stated that children under two should have no access to technology or digital media.

Aside from recommendations from the AAP (2017), other researchers in America have produced various sets of guidance aimed primarily at parents in supporting their children's use of digital technologies. For example, since Radesky *et al*., called for more guidance on digital technology use in 2015, Guernsey and Levine (2017) established an 'action agenda' for parents to support their children's use of technology, Culatta *et al*., (2016) generated guidance on selecting literacy-based apps, and Blum-Ross and Livingstone (2017) produced a list of recommendations for practice aimed at parents and their children's use of digital technologies.

Aside from these studies, in 2012 McManis and Gunniweg produced guidance on technology use for the NAEYC, and Geist (2014) identified strategies to select apps for children, also for the NAEYC. Finally, Daugherty *et al*., (2014) outlined guidance and advice to parents on their children's use of digital technologies. As such, it is clear to see that guidance is sought-after and is produced and refined frequently. However, the extent to which this guidance is distributed is unknown, alongside whether any of this guidance is easily accessible for parents and perhaps early years practitioners in the UK to be adapted in supporting children use touchscreen technology.

Whilst this guidance is apparent and has the potential to support parents and practitioners to make informed decisions on their practice, it is important to acknowledge that guidance also needs to be developed in the UK and made more accessible to support parents and practitioners alike. The guidance currently available is in its infancy and needs to be underpinned on a larger scale by empirical evidence or research studies. In addition, whilst there are recent guidelines on using touchscreens and selecting apps to use with pre-schoolers (see Marsh *et al*., 2015a) there now needs to be an emphasis on disseminating these findings with parents and educators. Although these guidelines on selecting apps may prove beneficial to parents and practitioners, more work is needed addressing how to implement these apps (once carefully selected) into daily practice, to enable an effective learning environment where children will benefit from the integration of touchscreens as an additional tool to support their holistic development. Furthermore, the impact and accessibility of these guidelines must also be questioned, since O'Connor and Fotakopoulou's (2016) survey of parents in the UK found that the vast majority of parents had not accessed any official guidance about best use of touchscreens and apps for under three's.

2.5 Conclusion

This short chapter has sought to identify the current guidance and policy available on supporting the use of touchscreen technology with young children. The fact that this chapter is short exemplifies the need to support educators and parents alike with further guidance on best practice, since the guidance published to date in England focuses on specific areas of development including literacy or communication skills, and some new research on selecting apps. The following chapter discusses a range of theoretical perspectives on supporting children's learning when they play with touchscreen technologies, designed to go in hand with this chapter.

Chapter 3 explores various social learning theories, taking to account that the EYFS (DfE, 2017) emphasises that children need opportunities to learn from their peers, develop social skills such as sharing, and develop communication and language skills through conversation. The use of activity theory (Engeström 1999a) and the ecological systems theory (Bronfenbrenner, 1977) are also explored as lenses in which to analyse touchscreen activity through the social learning perspective.

Chapter 3: Theory

3.1 Introduction

The previous chapter discussed the emerging but very limited policy and guidance aimed at parents and early years practitioners to support young children when they use touchscreen devices. Of the guidance that has been provided, there is an emphasis that the use of touchscreen devices should not be a solitary activity, and instead should be an opportunity where young children can share an activity, collaborating and communicating about their actions (Plowman and Hancock, n.d.). This is because there is a need to recognise the influence that peers and practitioners may have on children when they interact with touchscreen devices, taking into consideration learning goals as seen within the EYFS (DfE, 2017).

When considering how children learn, much research focuses on a social constructivist perspective (explained in Methodology, Chapter 5). I now consider the importance of a social learning environment when children learn and interact with new technologies, whereby children's peers can enable greater learning through their own knowledge of concepts. As such, this chapter will consider the impact of a social constructivist and social constructionist perspective on assisting children when using touchscreen devices in early years settings, as a way to acknowledge the potential interactions which may be observed or reported within this study. This chapter will first discuss various social learning theories, recognising the impact of a more knowledgeable other and collaboration between peers. Second, this chapter will explore activity theory in detail, as this will be the analytical approach taken to comprehend the data. Third, this chapter will explore Bronfenbrenner's (1977) ecological systems theory as a way to identify the wider influences that may impact on touchscreen activity.

3.2 Theories of learning through social interaction

Many theories on children's learning and development acknowledge the significance of others to support and enhance the development of young children's knowledge and understanding of the world around them (Stetsenko, 2004). Within the context of this study and taking into account the guidance on touchscreen use indicated in Chapter 2, early years practitioners may follow advice and encourage touchscreen use to be a shared rather than a single-user activity.

A number of studies have concluded that since people have their own experiences with technology, individuals possess their own skill-set and technological competencies (Alper, 2013; Flewitt *et al*., 2014; Prensky, 2010). In relation to touchscreen use in early years settings, children and early years practitioners also possess varying degrees of skills, confidence and competence (Summey, 2013). In regard to supporting children's learning as they use new technologies, it is the varied experiences of individuals which is of interest, particularly since children and early years practitioners can offer and provide varied experiences based upon their competencies and knowledge (Flewitt *et al*., 2014). Vygotsky's (1978) theory of the zone of proximal development (ZPD) recognises the varied experiences of others and suggests more knowledgeable individuals can support and extend others' thinking through tailored support according to individual needs (Tudge, 1990). Vygotsky (1978) explained the zone of proximal development, as:

> The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (p. 86).

Vygotsky acknowledged the importance of others within his social constructivist theory, recognising the significance of peers and the language that is used to develop children's

thinking and understanding. In line with supporting the development of others, Vygotsky (1978) considers language (a symbolic and cultural tool) to be an important element in assisting with learning. Building upon Vygotsky's theory, Tudge (1990: 157) asserts the use of language as a cultural tool when children collaborate to achieve their ZPD enables development "in culturally appropriate ways". Children may work together through collaboration, with one child demonstrating to another how to perform an action on a touchscreen device, whereby language is used as a culturally and developmentally-appropriate tool to support and reinforce the actions to help develop understanding. Tudge (1990) also believed the use of cultural language in this way helps children to "learn the meaning behind words in which some children already know" (p. 157). In the context of touchscreen use, children or adults can support others through speaking through actions, guiding activities, explaining consequence of actions and ask questions. The language that is used (in contextually appropriate ways) can support children to develop their understanding of touchscreen navigation and in-game expectations, alongside learning a wide range of concepts as they explore and interact with apps and others.

It is the social nature of touchscreen use which can be utilised to enhance the play experience when using these devices. Moll and Greenberg (1990) suggest that when peers work together they gauge the needs of others and the level of support required, in order to recognise the input needed from the more knowledgeable other to help their peers extend their thinking. The authors explain:

> It is when the content of the interactions is important or needed, that people are motivated to establish the social contexts for the transfer or application of knowledge and other resources (p. 326).

In regard to touchscreen use in early years settings, practitioners may recognise when a child needs support if they are unable to progress in a game, or children's peers may offer support in

the form of sharing their experiences of their previous interaction with a game to help a child progress. Through recognising the importance of transferring information from one person to another, children create the social context in which to facilitate the interaction.

In addition to working towards the ZPD when using touchscreen devices, collaboration is considered a fundamental element when supporting children to grasp new concepts. A range of studies have supported collaboration when children use technology (see Buckingham, 2003; Burnett, 2010; Cook and Finlayson, 1999; Eagle, 2012; Edwards, 2013; Summey, 2013), identifying children's developing sense of achievement and confidence when they work with others, subsequently enhancing children's "social, emotional, intellectual and linguistic development" (Jarvis *et al*., 2014: 56). Collaboration supports both the more and less knowledgeable child in different ways; the less knowledgeable child extends their understanding of a concept, whilst the more knowledgeable child has the opportunity to refine their linguistic skills to be able to effectively translate the process of learning to another child. How far this occurs in early years settings is one of the aspects that is explored in this research.

Research has demonstrated that when children collaborate, the partners that they select to collaborate with are not without careful thought; children build a community of learners, making deliberate use of their peers within the social context to develop their knowledge. Labelled 'cognitive apprenticeship' (Mortimore, 1999), children actively seek to make use of and draw upon peers within the environment in which they are placed, to assist in their learning or achievement of tasks. Dewey (1966) concurs, suggesting learning occurs as a social process,

> …where children use their abilities to meet the demands of participating as a member of a group, conceiving of themselves from the standpoint of the welfare of the group, and understanding their activities in social terms (Dewey, 1897: 77; Meckley, 1997: 11).

As a strategy to support children in reaching their ZPD, scaffolding recognises the influence of a more knowledgeable other to support a child to reach higher levels of development (Bruner, 1977). Scaffolding can be defined as a "process that enables a child or novice to solve a problem, carry out a task, or achieve a goal which would be beyond his unassisted efforts" (Wood *et al*., 1978: 90). Within the context of touchscreen use in the early years, a child may play on an app which requires a level of skill in counting. A child who is not well-skilled in counting may struggle to perform the actions required to progress to another level in the app. An early years practitioner who watches nearby may recognise the child finds this aspect of the app difficult, so assists the child in learning to count and teaches the child a strategy to remember when counting.

As the child learns and practices this strategy, they develop their skills in counting. The practitioner gradually removes the level of support given to the child until no longer required, when the child has mastered the skill of counting. The intention of this is to provide support of varying degrees, first offering substantive support, and slowly retracting this until the child can become an independent and competent learner (Bruner, 1977). Rieber and Robinson (2004) stress the importance of the more knowledgeable other in order for children to progress within activity; children require a social environment whereby they draw upon the skills of other members of their community to support their learning needs.

Bandura (1977) suggests an additional strategy which supports learning in a social environment. Through observation, children can observe actions performed by another in order to develop and progress within an activity. For example, a child may sit nearby their peer and watch them play on an app when using a touchscreen. Observing how the child navigates around the device, selects an app and works through the levels on the app, the observing child may learn certain skills or functions that the playing child performs. The child may also learn though observed touchscreen uses by practitioners when modelling how to use technology.

Bandura proclaims, “modelling is an indispensable aspect of learning” (Bandura, 1977: 12), and that through modelling, children can learn through imitation and develop their own competencies based on how children have observed others performing actions. Bandura (1977) further suggests that all learning is a result of observing people’s behaviour and their actions, taking note of the successes and consequences of these and learning from them. Without the opportunities to observe and imitate, children require longer periods of time to develop and refine their skills.

In conclusion, this section has discussed several relevant theories in relation to the social dimensions of how young children learn, which underpin the conceptual basis of the research design for this study. Pedagogical approaches such as scaffolding provide children opportunities to extend their learning, reaching new levels of development that were previously unobtainable, to help children reach their zone of proximal development. Using touchscreen devices may be a new experience for many children within early years settings, and the ways in which children begin to use these devices and the support that children receive or seek is important to begin to understand children’s intentions when they use touchscreen technologies.

The notions of learning with the support of others is an important aspect to consider, when research indicates that touchscreen use can be perceived as a single-user activity (Alper, 2013) (see Chapter 4). It is important to move away from these traditional ideas about learning and acknowledge that peers and practitioners may be supportive partners in enabling children to learn through their shared knowledge. The following section of this chapter introduces a central organising theory and framework of analysis for this study, which integrates the aforementioned theories and develops them further.

3.3 Activity theory

The intention of discussing the social nature of interaction and learning as a precursor to introducing activity theory was deliberate. The study has adopted a social constructivist and constructionist perspective on the formation of reality by young children, since there are claims that hand-held touchscreens are perceived as a single user activity because of their small size (Alper, 2013). Palmer (2008) reports extreme solitary technology use, defined as 'splintered households' whereby family members isolate themselves in separate rooms of the home and use technology alone. Both McLean and Edwards (2016) and O'Connor and Fotokopoulou (2016) report how parents are concerned touchscreens discourage social interaction. I intend to explore this area to determine whether or not solitary touchscreen use is the reality in early years settings. Having already considered the social constructivist approach in the previous section of this chapter, it is equally important to discuss the social constructionist approach, in order to make strong connections with the intention of this study.

Activity theory is a useful analytical tool when seeking to understand "complex human learning situations that can be observed in natural settings" (Yamagata-Lynch, 2010: 23). For this reason, activity theory was utilised as an analytical tool to help understand and explore the nature of children's interactions with touchscreen devices in early years settings. Activity theory has been developed over time by Vygotsky (first-generation), Leont'ev (second-generation), Engeström (third-generation) and others. Engeström's third-generation activity theory in particular (see Section 3.3.3) enables researchers to understand and analyse social interactions within activity, which can lead to identifying opportunities for potential development within systems. This is particularly relevant to this study, since activity theory can be utilised to explore touchscreen practice from the child's and practitioners' perspective to determine the connection between practitioner and child intentions when touchscreens are involved within activities and play.

Since Engeström (1999a) suggests third-generation activity theory in particular is a useful tool to create interventions, exploring touchscreen activity using this lens will enable the identification of differences, otherwise known as aggravations or contradictions, to seek to improve or enhance the quality of touchscreen practice within early years settings. In line with one focus of this study to determine potential social interactions, activity theory and the systems that are created to analyse data enable researchers to interpret the influence of the social environment in which activities occur (Rogoff, 1990). Therefore, analysing the data in this way will enable a clear identification of the influence of the community on touchscreen activity.

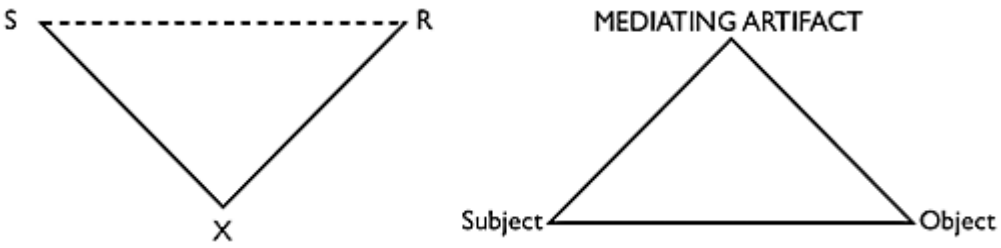
Activity theory as developed by Vygotsky (1978) for the use of studying activity as a socially-connected action rather than one of individual action, focusses on activity as the means for analysis. Activity theory consists of a triangular model with the following components: tools (artefacts), objects and subjects. Within this model, the tool is seen as any artefact which facilitates action, the object refers to the activity to be executed, and the subject is a person who interacts with the tool to create the object (Hasan, 1998). It is from these three components that an outcome is produced, focussing on the relationship between each component in a triangular model. There are many variations of activity theory, however, for the purpose of this study, it is important to recognise the developments of activity across three generations and to consider the implications this may have when analysing children's interactions with technologies.

3.3.1 First-generation activity theory

Activity theory (AT) was a term coined by Russian psychologist Vygotsky (1978), who identified that with activity as an object for reference, tools (or artefacts) were a mediating object which drove activity towards goals or desired outcomes (figure 1). Vygotsky focussed on the relationships between humans and objects as mediated through culture, tools and signs (Daniels, 2006). Vygotsky suggested within his model that mediated action is central to AT,

whereby activity is mediated by the tools within the environment and through the interaction between the subject and object (Kaptelinin and Nardi, 1997).

Figure 1. First-generation activity theory model (Vygotsky, 1978)



Within his first-generation activity theory, Vygotsky (1978) adopted a cultural-historical stance, otherwise known as Cultural-Historical Activity Theory (CHAT) and suggested that human behaviour should not be considered as biological actions and instead seen as culturally meaningful actions. He believed actions are rooted within cultural and historical beliefs and experiences, and Vygotsky created his model of activity based on this notion. Vygotsky's notion of activity theory is based on individual action and is not rooted in an understanding of how that action impacts the wider socio-cultural environment. He said the object, and subject becomes a formula, "where both object and subject are historically and culturally specific" (Kozulin, 2005: 104).

Mediated action was depicted within the first-generation of activity theory as the influence of the subject on the object which was mediated through tools (artefacts). Vygotsky (1960, 1978) defined the function of tools, to:

> …serve as a conductor of humans' influence on the object of their activity. It is directed toward to external world; it must stimulate some changes in the object; it is a means of humans' external activity, directed toward the subjugation of nature (p. 125).

According to Vygotsky, tools can be either physical material tools (e.g. a touchscreen device), or psychological tools (e.g. knowledge obtained from past experience, questioning, communication). Physical tools afford mediation of the object of action upon the subject (e.g. touchscreen devices can be used to support children's understanding of how to write, by a child using a drawing app). Kozulin (2005) suggests physical material tools are externally oriented; humans manipulate the tool with an object in mind (e.g. entertainment, learning). Cole (2005) and Kaptelinin and Nardi (1997) explain material tools are modified over time; they have historical facets in that the way in which tools are manipulated are refined in order to support goal-directed activity. Alternatively, psychological tools – otherwise known as signs – are internally oriented; they are aimed at "mastering oneself" (Vygotsky, 1978: 55). Vygotsky labelled the notion of inwardly understanding the external experience as internalisation. Through internalisation, humans generate knowledge.

The manipulation of tools through external actions, and the practice of manipulating those tools to become familiar with them enables learning through internalising the process which was externalised (Engeström and Miettinen, 1999; John-Steiner and Souberman, 1978). Internalisation is not necessarily a conscious action; the interplay between internal thought upon action and externalisation occurs through practice and repetition of action to become secure in a child's knowledge. The child may subconsciously internalise the learning process through external action which becomes embedded within their memory. In other words, through a child using a touchscreen device to initially understand how to function the device, a child will, over time, learn how to function the device with ease through experience. Through memory and physical lived experience, a child will develop the capability of knowing how to turn on a touchscreen, how to select apps, and how to play on those apps according to pre-set rules. Marx and Engels (1953) suggest this symbolisation of activity through manipulation of tools is for one reason: production.

In relation to touchscreen use, some early years practitioners have reported that they intend for young children to use touchscreens so that children learn to develop technological skills (Plowman and Stephen, 2013). From Vygotsky's perspective, it is the act of engaging in activity and the internalisation and externalisation of those actions which enable learning, greater understanding, and in time, enable a child to teach another how to perform those actions as seen within the zone of proximal development.

Vygotsky's externalisation could therefore be extended in that a new form of production may occur through the zone of proximal development and social play. Viewed in this way, Vygotsky's production then takes on new meaning as in order to achieve this outcome, children go through the social processes of learning with support of others as reflected within his theory of the ZPD. This process of learning and developing within activity is socially and culturally embedded (Cole and Scribner, 1978). For example, children may learn how to navigate touchscreen devices when they are in early years settings, and they may choose to support their peers by teaching them how to use the devices too. Children may also have experience in playing on certain apps, and this knowledge that they have may be passed on to other children, through initially showing children how to play, to slowly reducing the level of support required so that a child can competently play on the app with ease.

3.3.2 Second-generation activity theory

Vygotsky's theory of activity was later interpreted and extended by his student Leont'ev. Leont'ev identified limitations in Vygotsky's activity theory, including "the singular focus on individual action, not grounded in an understanding of the social structures that impact on the activity" (Kinsella and Fautley, 2016: 28). The idea of activity focusing on individual action is antithetical to Vygotsky's views on learning in a social manner. In his earlier writings, Vygotsky (1930) wrote "it is through the mediation of others, through the mediation of the adult that the child undertakes activities. Absolutely everything in the behaviour of the child is

merged and rooted in social relations. Thus, the child's relations with reality are from the start social relations" (Ivic, 1989: 429). Vygotsky acknowledged the importance of the social influence on children's behaviour, and through mediated action, children learned how to behave and act within society. In line with Vygotsky's (1978) ZPD, Leont'ev believed that children's actions were influenced by the support or input from another, and it was those others who acted "as a mediator of meaning" (Kozulin, 1998: 18).

Recognising the differences between Vygotsky's theories, Leont'ev, with the influence from Luria (another of Vygotsky's students), adapted Vygotsky's theory by acknowledging the social, cultural and historical functions embedded within human action (Eilam, 2003). This led to what is now known as the second-generation activity theory. Leont'ev extended Vygotsky's ideas and introduced motives as driving forces to achieve goals. He explained it is "the actions that realise activity [that] are aroused by its motives but appear to be directed toward a goal" (Leont'ev, 1981: 116-117). He went on to say, "motives thus belong to the socially structured reality of production and appropriation, whereas actions belong to the immediate reality of practical goals" (p.117). For Leont'ev, he recognised that activity was a social act, and he noted the impact of the community and how multiple people within a community may work towards achieving the same goal (Daniels, 2006).

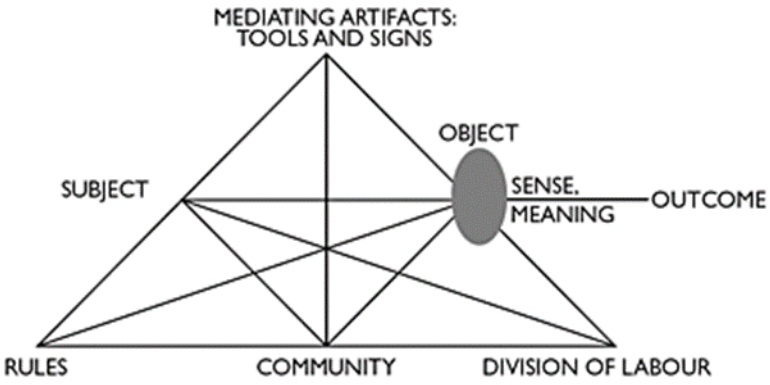
Leont'ev introduced object-oriented action as a motive to achieving goals. Object-oriented action involves the mediational processes by an individual or group of people which is driven by motives to achieve goals (Yamagata-Lynch, 2010). He explained how actions are mediated by tools, which are "performed in conditions of joint, collective activity" (Leont'ev, 1981: 208). By this, he suggested that through the tool, interactions are made possible. The tool therefore functions as a communicator, opening up relations which in turn enables the subject (human) to interact in collective activity. Subsequently, the tool becomes the mediator of action, which contributes to the division of labour within activity. In line with earlier work by

Vygotsky, Leont'ev recognised that the influences of others and their interactions are culturally and historically embedded, and it is through those interactions that learning occurs. He suggested that the division of labour is therefore present from the offset of an activity, which is mediated by both tools and society (Leont'ev, 1981). This is pertinent to this study, since the division of labour which is culturally and historically embedded subsequently becomes levels of experiences and expertise, which in turn impacts on the nature of the division of labour.

3.3.3 Third-generation activity theory

Engeström recognised the limitations of Vygotsky's and Leont'ev's activity systems, as there was no real connection with the social nature of learning through activity. Whilst Leont'ev acknowledged the division of labour, he did not make the distinction that activity is rooted much deeper than surface level role-assigning. Leont'ev's work has been criticised for its restricted view on the community and the social aspect of activity, alongside the heavy emphasis on tools to produce objects. Vygotsky's view on mediation through signs (internalisation) was also neglected within Leont'ev's AT, and Engeström acknowledged these weaknesses (Kozulin, 1984). Noting that Vygotsky's triangular model did not recognise the social world in which mediated-action takes place, Engeström altered Vygotsky's triangular model of activity by adding a series of additional triangles (Cole, 2005; Daniels, 2016), subsequently positioning activity as both an individual and social act (Kinsella and Fautley, 2016). Engeström created a third generation of activity theory, including new components such as rules, community and acknowledged the division of labour in a more central view than Leont'ev.

Figure 2. Engeström's (1987: 78) structure of a human activity system



The third-generation of activity theory acknowledged the social influences upon activities. *Rules* refer to those established through which restrict action within an activity system, the *community* refers to other members who work towards the same object, and the *division of labour* refers to object-oriented action assigned to members within the community (Cole, 2005). These components influence each other; they are not perceived as separate and they go through processes of refinement and change throughout an activity. In relation to this study, the tool is the touchscreen, the subject is the child who seeks to use the tool, and the object is the child's intentions, whether to play, explore, learn, create or entertain. Each of the social influencing nodes of activity theory (rules, community and division of labour) are explored below in line with the research agenda.

3.3.3.1 Rules, community and division of labour

Engeström's activity theory acknowledged the social aspect of activity which was represented within the bottom layer of the diagram. Comprised of rules, community and the division of labour, Engeström reinforced how these components influenced activity through the socio-cultural aspect of activity. Within a Key Stage Three classroom context, Kinsella (2014) defines the rules as "codes of law which regulate teaching and learning" (p. 123). Rules therefore mould or shape the potential of the activity through the restrictions imposed. In the early years setting, the child's interaction with the touchscreen is confined by rules which are set by other children, early years practitioners, and the limitations of the touchscreen which the

child uses. The child can choose to share the touchscreen with one or more children (with the same or different intentions) and they can work together to complete a game, correctly match pairs, identify missing objects and more. Rules are also influenced and determined by governmental expectations, such as the Early Years Foundation Stage (DfE, 2017) framework which guides early years practice. The inclusion of technology within the *Understanding the World* area of learning may influence the decision to provide children with technology.

The division of labour consists of the roles that are assigned during activity, and this provides scope to determine the ways in which practitioners or children seek to control or monitor touchscreen activity. Through the division of labour, the child may assign roles; their object-oriented action is mediated through the different participants within the activity. Children may negotiate roles during this activity or seek different outcomes through changing an app. This process of negotiation and change as children interact with the tool is bounded by cultural and societal expectations; associated 'norms' on interacting with touchscreen technologies may be explicitly identified, and children may (under the confinement of rules) only be allowed to engage in touchscreen activity for certain periods of time. They may be required to share, or they may be encouraged to use the devices on their own.

These expectations are historically accumulated; early years practitioners' experience of using the touchscreens, their knowledge of children's past interactions, and their pedagogical beliefs on touchscreen use could potentially influence the way in which young children can use a touchscreen device. These expectations are refined as children are introduced to new technologies and new apps, and as practitioners begin to observe children's behaviours and their interests when they play.

Since activity is considered a social action it does not solely focus on the individual. The community is formed from the social relations and minds of others who are involved within

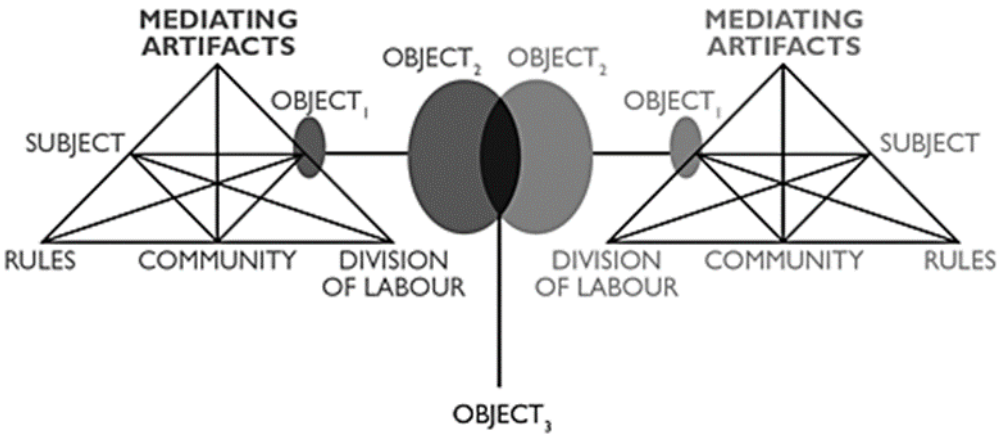
activity as they interact and work with each other. The community posits activity as social, as reflected within social learning theories such as Vygotsky's (1978) more knowledgeable other and reaching the zone of proximal development through the influence of others within activity. Through the community, rules are established, and the division of labour is assigned.

Engeström (1999c) identified five principles of his third-generation of activity theory for clarification:

1. The first principle is that a collective, artefact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis… Activity systems realise and reproduce themselves by generating actions and operations.
2. The second principle is the multi-voicedness of activity systems. An activity system is always a community of multiple points of view, traditions and interest. The division of labour in an activity creates different positions for the participants.
3. The third principle is historicity. Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history.
4. The fourth principle is the central role of contradictions as sources of change and development. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems.
5. The fifth principle proclaims the possibility of expansive transformations in activity systems. Activity systems move through relatively long cycles of qualitative transformations. As contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms. (p.4-5)

Engeström's principles identify his distinctions from earlier generations of the theory, such as contradictions and aggravations, the multi-voicedness of activity and network relations. He suggested having multiple activity systems which can interlink (Nikolaidou, 2011). Due to the multi-voicedness and networks of relation, Engeström (1999a) suggested that there was a requirement of at least two activity systems as a minimum in order to represent the third generation, as both objects from the systems join to create a third object. The third object is the product of two interacting systems which creates an overall outcome. He represented this pictorially for clarification (figure 3).

Figure 3. Two interacting activity systems within third-generation activity theory (Engeström, 1999a)



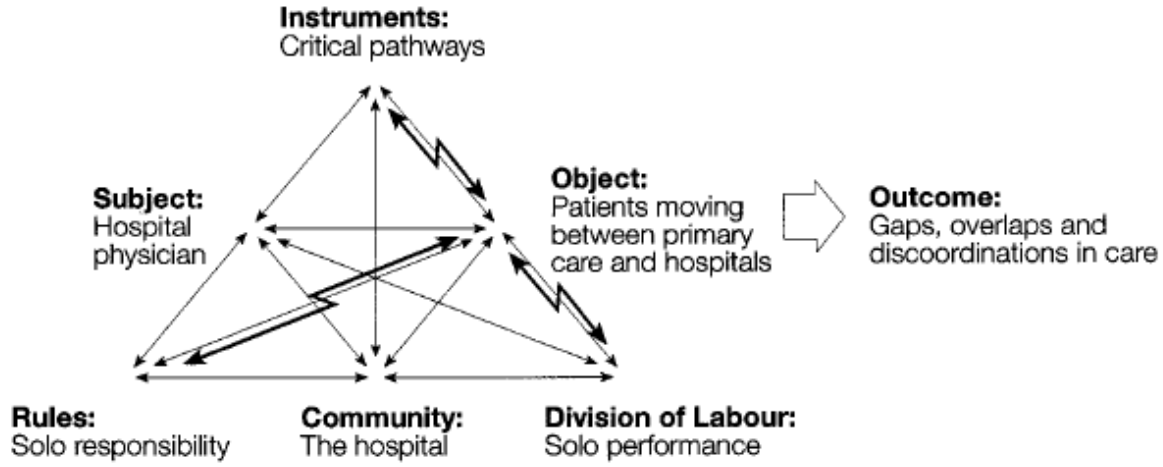
On defining an activity system, Engeström (1987) explained an activity system "integrates the subject, the object, and the instruments (material tools as well as signs and symbols) into a unified whole. An activity system incorporates both the object-oriented productive aspect and the person-oriented communicative aspect of human conduct" (p.67). Connectedness was a central element of Engeström's theory; he reiterated the importance of the connection between each component of activity systems (Daniels, 2016). Engeström (1999a) believed the connected nature of AT was a result of the division of labour within a community, since the knowledge humans possess are manifestations of historical and cultural information that have been adapted over time (Tolman, 1999).

In line with his third and fourth principles, Engeström (1999a), recognising the connectedness of all components within an activity system, acknowledged that tensions occur over time. Labelled as contradictions, he explained these were not seen as problems, rather tensions which are formed within and between activity systems that are historically accumulated (Nikolaidou, 2011). Engeström (1999a) suggested the need for contradictions to occur in order for activity systems to work harmoniously; activity systems require development across the different system components until tensions are no longer present. Expanding on this further, he said this model of change through contradictions was:

> a spearhead of the zone of proximal development of the activity systems involved, a vehicle for traversing 'the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions' (Engeström, 2000: 967; Engeström, 1987: 174).

Explained within his books with an example of working at a children's hospital, Engeström's example acknowledges internal contradictions within activity systems (figure 4), to indicate that tensions occur within systems provoking change to enable effective working in the future. External contradictions across systems and internal contradictions within systems were "motive forces of change" according to Engeström (Engeström and Miettinen, 1999: 9), indicating the need for continuous development and 'transitions' across systems. These tensions were driving forces of evolution, whereby not only the subject (human) changes, but so does the environment in which the activity takes place (Daniels, 2016).

Figure 4. Internal contradictions within an activity system (Engeström, 1999a)



With historically accumulating tensions, components within activity systems change over time. For example, consider the practice of allowing children to use computer technologies within early years settings. As years pass and practice is developed with increasingly valuable strategies planned to support children's learning, a tension occurs as a new technology is introduced. The touchscreen device, which now permeates children's lives at home (Ofcom, 2017) is introduced into an early years setting. The tool has therefore changed, which disrupts who the subject may be. Early years practitioners may be reluctant to allow children to use the devices for fear of breaking the device (Flewitt *et al*., 2014), so touchscreen use may therefore become an adult-led activity whereby children's interaction is minimal. The adult subsequently directs who the community are, they define rules and they also have control over the division of labour. Ultimately, the object changes; children no longer need to use a mouse and keyboard, so the intention of learning technical skills such as those become void. Children now need to learn new skills, so practitioners need to change their planning or their intentions for the use of touchscreens.

This exploration may enable me to observe activity systems in action, acknowledging any tensions as they occur or have occurred over time, and to establish the social nature through addressing who the community is and by identifying the division of labour. The process of

change (as with the old and new technology example) spans across different activity systems. There are at least three. The first, and possibly the driving force, is children's touchscreen use at home. Children's use of these devices at home may have influenced practitioners' motives to introduce them in the early years setting (see Chapter 7). The second system is the activity of using the touchscreen itself, as identified earlier. The third is the practitioner perspective; not all practitioners may agree with touchscreen use with young children, they may not feel competent in learning new technology skills themselves, and they may not feel confident in using them with young children (Billington, 2016). These tensions which arise could impact on the overall practice of allowing children to use touchscreen technologies.

Tensions within systems such as conflicting views, confusion over how children should be using the devices and how practitioners should implement these with a group of thirty children has the potential to provoke change to enable practitioners to devise the best way to use touchscreens with young children. This is to be explored within my research, since it is unknown the extent of tensions within the early years settings under study. It is also unknown the pedagogical approaches that each setting takes in using touchscreens with young children, alongside practitioners' opinions on touchscreen use with children of pre-school age. Engeström said the "reflective appropriation of advanced models and tools [were] ways out of internal contradictions" (Cole and Engeström, 1993: 40), and those reflections were the driving forces in the creation of new activity systems.

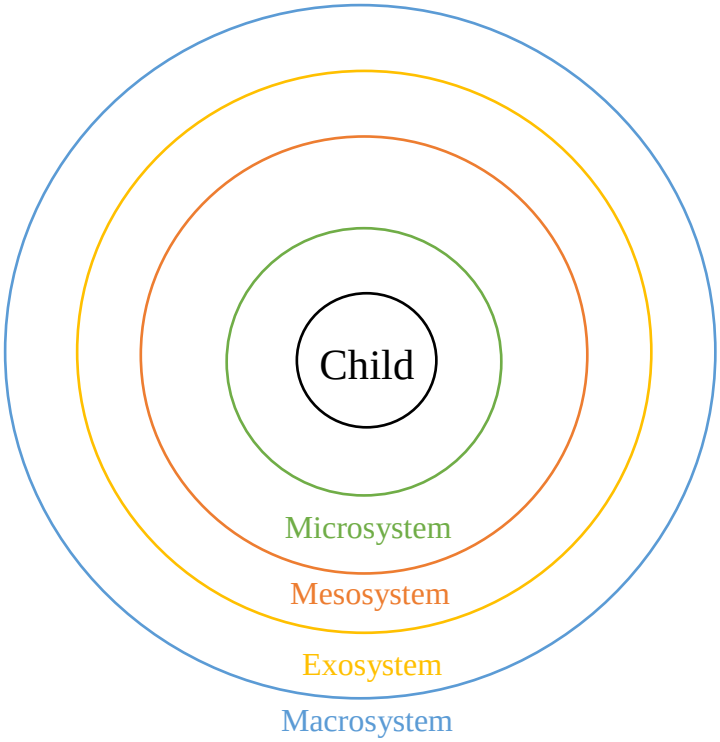
3.4 Bronfenbrenner's ecological systems theory

Alongside the use of activity theory to determine touchscreen interactions, Bronfenbrenner's (1977) ecological systems theory allows for a greater understanding of the contexts which influence and impact on a child's touchscreen experiences. Bronfenbrenner's theory is relevant here to consider whether external influences such as policy, perspectives and previous

experience direct the nature of children's touchscreen play. Bronfenbrenner's (1977) theory is based upon acknowledging the environments which surround a child which impact upon development. Described as "a nested arrangement of structures, each contained within the next" (Bronfenbrenner, 1977: 514), Bronfenbrenner acknowledged different contexts or systems which surround the child: micro-, meso-, exo-, macro- and chronosystems. He referred to the need to conduct research which acknowledged both the characteristics of a person and their surroundings, such as the home or early years setting, coupled with an acknowledgement of the different environments which surround the child that they are directly in, or indirectly impacted by. As such, Bronfenbrenner's ecological model allows for a representation of these contexts or environments through recognising the systems surrounding the child, as displayed in figure 5.

Bronfenbrenner (1976; 1977; 1979a; 1979b; 1988) described the microsystem being the "immediate setting containing the learner" (p. 12). It was recognised how the child's experiences within the immediate setting such as the home facilitated development. The mesosystem contained different microsystems, such as the home, early years setting, and grandparents' houses and so on. Within the mesosystem, Bronfenbrenner (1986) acknowledged the interrelations between the microsystems. For example, a child's touchscreen experiences in the home may impact upon their touchscreen experiences in early years settings, and vice versa. In addition, exosystems consisted of environments which impact on a child's development that the child is not directly a part of. For example, Bronfenbrenner (1977) referred to parents' places of work and the neighbourhood as being external to the child.

Figure 5. Bronfenbrenner's ecological systems theory model



His final system, macrosystems, referred to the institutional patterns inherent within a culture or subculture in society (Bronfenbrenner, 1977: 515). These included educational systems and social systems, and encompassed micro-, meso-, and exosystems. Macrosystems are based upon ideologies prevailing in society, which determine the activity and implementation of practices within environments surrounding the child. For example, this could refer to pedagogical ideologies of how to utilise touchscreen technologies based upon the ideals dictated within governmental expectations such as the EYFS (DfE, 2017) framework. Chapter 2 of this thesis has already described current expectations in regard to technology access in the early years.

Chronosystems was a context later added to the systems model through Bronfenbrenner's identification that human development occurs over time and is not an immediate action, so chronosystems reflect the ongoing nature of the impact of the other systems on a person's development (Bronfenbrenner, 1986). Categorised through normative and nonnormative transitions, normative transitions refer to general transitions such as going from home to

nursery, or nursery to school, whilst nonnormative transitions refers to unexpected changes within life. The implementation of the touchscreen in early years settings could be referred to as a nonnormative transition. The transition from older technologies such as a computer, to a hand-held touchscreen device requires change in practice as already identified within the activity theory section of this chapter. This transition may have been unexpected, and responses to such a transition is an aspect which this study explores within interviews, to uncover the response to change within early years practice. Bronfenbrenner (1986) defines these transitions as "a direct impetus for developmental change" (p. 724), and this study focuses on the affordance aspect of touchscreen technologies to determine what these devices may provide for young children as they interact with and engage in activities with this new technology.

Aside from human development through the systems discussed, Bronfenbrenner (1979a) also refers to the importance of the social environment in fostering development, explaining "if there is no setting in which the child can exercise newly acquired capacities without intervention by more competent others, the developmental process remains incomplete" (p. 845). In similarity to Bruner and Vygotsky's theories, the social context is fundamental in assisting children with learning new concepts and extending development. In relation to this study, whilst not specifically tracking development, it is worthwhile to determine whether the early years environment is such a setting which affords children to test new knowledge and competencies when using touchscreen devices, to identify children's touchscreen play opportunities.

In his earlier writings, Bronfenbrenner (1976) states the need for researchers to acknowledge the social system which is embedded within the research setting. He declares this as a requirement to recognise "functional social system[s] in the setting" (p. 39), since the influence of others around a person under study impacts on potential development. For example, Bronfenbrenner (1979b) refers to the impact of others in speaking to a three-year-old child in

fostering the development of language skills and subsequent talking abilities. It is this aspect, in Bronfenbrenner's words that "active engagement in, or even mere exposure to, what others are doing often inspires the person to undertake similar activities on her own" (p. 7) which I focus on within this study, to determine the impact of children's peers and practitioners on touchscreen experiences.

Whilst it could be perceived how there are many similarities between Bronfenbrenner's and Engeström's theories in terms of the community aspect of learning and activity, and how rules are created as a result of societal ideologies, it was important to incorporate the two theories in this study since Bronfenbrenner's systems theory extends Engeström's third-generation theory. Bronfenbrenner's theory does so by separating the influences on child development through systems, whereas activity theory reports on activity and influences as a relational whole. The ecological systems theory adds a separate dimension to Engeström's additional layer within the AT model. The various systems within Bronfenbrenner's model clearly establishes both a layering effect and the interconnectedness between each system, all of which impact on child development. Whilst AT does not specifically focus on child development, it could be argued it does so from the connectedness of all areas within the model in order to produce an outcome. Bronfenbrenner's model portrays much more clearly the influences both internal and external to a child's life which impacts on a child, compared to Engeström's activity theory model which demonstrates the connectedness directly within activity from various influences.

Bronfenbrenner's model portrays that immediate environments such as the home and early years setting impact on child development, yet also acknowledges the wider influences such as governmental expectations through the Early Years Foundation Stage (DfE, 2017) which guides practice. Whilst AT could also show this through the community and/or rules, Bronfenbrenner's model separates these influences, in what could be considered in a hierarchical way as these influences funnel into a child's life and development. This therefore

allows for a clear representation of influences both immediate and external to a child's life, influenced by cultural and societal expectations and ideologies, in a way that encompasses a child at the centre of the model.

3.5 Conclusion

This section has discussed social learning theories in relation to the activity of children using touchscreen devices in early years settings and has recognised Bronfenbrenner's (1977) ecological systems theory to identify the influences from a range of contexts which have the potential to impact on children's early years experiences. Whilst this review of theory has attempted to include the use of technology with young children, theories do not necessarily consider children's social interactions in connection with the use of technology in the early years because this area is relatively new, but current research is beginning to include this, as discussed in the following chapter. The study takes the position that the art of playing and interacting with touchscreen devices may be influenced by the social interactions between children. It is my position that children's conceptions of play and learning may determine the ways in which children seek support and allow the influence of others to engage in their play. As such, I believe children's knowledge can be shaped from the interactions of others around them.

There is a growing body of research that is beginning to focus on touchscreen use in early years settings, and the starting point, as in my earlier example of conflicting activity systems, is the home environment, because studies suggest that children's first experiences of using touchscreen devices is generally at home (McPake *et al*., 2013). The next chapter in this thesis discusses the research to date which focuses on touchscreen use in early years settings, practitioner perspectives, pedagogical approaches, touchscreen use in the home, and a range of perspectives on why touchscreens should not be used with young children.

Chapter 4: Literature review

4.1 Introduction

The previous two chapters have explored the policy and guidance in relation to touchscreen use with pre-school-aged children (3-4 years old) in England, alongside theories on social learning which is positioned within this research. In addition, the previous chapter explored activity theory as the basis for analysing the data and made the connection between social learning theories and activity theory, since activity is considered a social event rather than a solitary one (Vygotsky, 1978). Bronfenbrenner's (1977) ecological systems theory was also acknowledged in the previous chapter as a way to reflect the systems which impact upon a child's life, which I extended to touchscreen activities within early years settings. This chapter presents and critically discusses existing research in the area of touchscreen use with young children, exploring various perspectives on touchscreen use and approaches to its integration within early years settings.

The research undertaken for this study focuses on pre-school children's use of touchscreen technologies within early years settings in England, however, a review of the literature to date has shown few studies conducted in early years settings, with more research conducted in the home environment (see McPake *et al*., 2013; Plowman, 2016; 2014; Plowman *et al*., 2011a; 2011b; 2008). Therefore, this review of the literature discusses studies based in early years settings, identifying the gap and justifying the need for my study, but the literature review also addresses some studies conducted in the home environment. This was done deliberately as an effort to reflect the micro contexts Bronfenbrenner (1977) discusses, and to show how children's experiences in a range of proximal contexts may influence activity within other environments.

This literature review also discusses early years practitioner values and perceptions of technology, as these practitioners are gatekeepers to children's access to resources within early years settings. An account of touchscreen use within early years settings can be achieved through interviewing practitioners on their beliefs on the integration of touchscreen devices, their pedagogical values, and issues such as barriers of touchscreen integration within early years settings. This therefore enables the positioning of my research to explore practitioners' perceptions of the use of touchscreens within early years settings. It is also important to explore pedagogical values and perceptions as the use of technology is included within the Early Years Foundation Stage (DfE, 2017). With the integration of technology into the EYFS (DfE, 2017), it remains as an independent area within the *Understanding the World* area of learning. Technology is not considered as a tool that can be embedded within a range of activities, with the only guidance on its use stating that children should be provided with opportunities to use a range of technologies before age five (Edwards, 2013). Therefore, this warrants further discussion on how technology is integrated and how this is supported through pedagogical approaches implemented within early years settings.

Within the body of research conducted on touchscreen use with young children, there are a growing number of studies which warn of the negative side-effects for young children when they use these devices (see Cespedes *et al*., 2014; Cox *et al*., 2012; Duch *et al*., 2013). It is not possible to conduct a literature review of touchscreen use without acknowledging this very present debate. Therefore, a wider account of these effects is addressed from studies across the globe, with the intention of providing a balanced argument of touchscreen use on concerns regarding its use, combined with studies also portraying positive side-effects. It is argued by Loveless and Ellis (2001) that practitioners and parents need to accept the educational benefit of technology and reduce their concerns over the negative effects on children. However, it is also important to acknowledge that concerns on touchscreen use are prevalent with some

parents and practitioners, and researchers report more effort needs to be made to support parents and practitioners on making informed choices regarding touchscreen use (Blackwell *et al*., 2014; Kucirkova and Littleton, 2016; Marsh *et al*., 2015a).

In order to fully examine the context on the use of touchscreen devices in early years settings, key themes are scrutinised which focus on the touchscreen debate:

- Pedagogical values – areas of contention
- Pre-school-aged children's touchscreen use in the home environment
- Touchscreen use in early years settings
- Touchscreen technology as a contested tool for young children

Literature is drawn upon from sources globally including Europe, America and Australia, however the predominant focus is on studies conducted within the United Kingdom. Whilst focusing primarily on studies of pre-school-aged children, other studies are included where they have specific relevance to the study. The chapter concludes by justifying the need for my study within the context of previous research.

4.2 Pedagogical values – areas of contention

Pedagogy, defined by Watkins and Mortimore (1999: 3) as "any conscious activity by one person designed to enhance learning in another" is inherent within early years settings, through the teaching and learning activities and schemas of learning. A range of pedagogical approaches are implemented in early years settings in England, including the child-centred approach, whereby children learn through play and are in control of their own learning, where adults scaffold children's learning through carefully planned support strategies (Stephen, 2010).

Whilst the child-centred approach is generally adopted within the UK, the incorporation of technology within a play-based pedagogy has been challenging for early years practitioners. An Australian study found early years educators perceived technology as a tool for learning that did not facilitate play, which therefore meant technology did not fit into practitioners' ideas of a play-based pedagogy (Edwards *et al*., 2017). In addition, Bird and Edwards (2015) explain "a significant problem for early childhood education has been how to understand the pedagogical use of technologies in a sector that values play-based learning" (p. 1149). This can be understood when Lindahl and Folkesson (2012) suggest the idea of learning through technology contradicts the 'norms' of learning through play for very young children, hence the reluctance to accept technology and incorporate its use into activities for children. It is important to note that before expecting technological play to be integrated into the curriculum, play needs to be understood in digital terms first (a recent development in current research), in order for practitioners to consider its implementation (Blackwell *et al*., 2014; Edwards, 2013; Prensky, 2010).

Noss and Pachler (1999) explain there is an issue that the use of technology within early years pedagogy can become misunderstood, by viewing technology as a tool through which to access information in a quicker fashion than educators can provide, therefore making educators redundant bodies. Viewing technology in this way could limit its potential for effective use, and therefore not support the development of the learning environment to be one which supports the use of technology to facilitate learning. Additional views have also surfaced, of children's opportunities for social interaction being reduced as a result of technology replacing human contact (McLean and Edwards, 2016). For example, parents within McLean and Edwards' (2016) study thought that touchscreens may reduce interactions between children as they are a single-user device. However, "it is important to remember that technology is a tool

rather than a solution. Technology does not replace human interactions" (Saracho and Spodek, 2008: 13).

Traditional views of technology have been perceived as a skill to acquire, rather than as a tool to enhance children's learning experiences (Edwards, 2013). Given the rise in touchscreen ownership rates across all sections of society, and the increasing usage rate by children under five, there is a growing need to shift in direction the thinking of how touchscreens can be integrated into early years practice (Arnott, 2016a), by identifying its affordances and the opportunities for learning that the devices can provide.

It has been argued that adaptation is required from early years practitioners to foster the use of touchscreen technology in effective and meaningful ways with young children. However, Stephen and Edwards (2018: 63) argue that often when technology is included within practice, practitioners often overlook how children and practitioners may learn with technologies, since the focus is directed to the technology itself. Practitioners require technological skills in order to support children's use of touchscreen technology, and practitioners need to assess where they place touchscreen technology use within the EYFS for young children (Falloon, 2013). It is argued that by doing this, it enables practitioners to consider how best to use touchscreen technologies with young children (ibid.). It is unknown how often practitioners are presented with this opportunity to reflect on their perceptions of touchscreen use, since very few studies address this area. There is therefore a need to investigate this area more, and I do this within my study, to explore why touchscreen devices are integrated into daily practice and the intentions behind their use.

Blackwell *et al*., (2014) report how conflicting opinions on touchscreen use with young children may impact effective use, because some practitioners may have traditional views on learning and therefore plan mostly adult-led activities with touchscreens, rather than enabling

children to explore on the devices during child-led play. In addition, the researchers also warn that practitioners who adopt traditional learning models such as the practitioner educating the child through adult-led learning, may only focus on developing operational skills in how to function the touchscreen devices, rather than allowing children to develop holistically by engaging with a wide range of apps intended to support various areas of learning. Blackwell *et al*., (2014) warn traditional values of learning such as the educator imparting knowledge to the unknowing child could hinder effective technology use, however, child-centred approaches will (in an ideal world) encompass the use of technology with creativity and meaning.

Livingstone *et al*., (2017) and Coyne *et al*., (2017) acknowledge that often restrictive mediation techniques are adopted by gatekeepers who consider technology a risk to young children, and whilst aiming to safeguard children, they also reduce opportunities for extending learning through this protectionist stance. However, Livingstone *et al*., (2017) argue that there is no 'right way' to achieve a balance of risk and opportunity, since increasing opportunities through fewer restrictions via enabling mediation increases a child's risk of accessing inappropriate content. In contrast, imposing restrictions on technology access through restrictive mediation prevents children from exploring via the internet to seek information to further knowledge. Siraj-Blatchford (1999: 40) suggests three areas of pedagogy that practitioners should regard with equal importance in the early years setting:

1. Instruction techniques;
2. Encouraging involvement; and
3. Fostering engagement.

Siraj-Blatchford considers the learning environment to be of importance, offering a stable atmosphere where children can receive guidance through scaffolding or direct instruction. She also maintains the role of the practitioner to be important – and this can be applied when using

touchscreen technology – in role modelling and responding to children's interests. According to Siraj-Blatchford (1999), adapting the three areas as stated above when considering the use of touchscreen technology enables children to see the value of their interests being supported in a new learning environment.

Prensky (2010) and Siraj-Blatchford (1999) suggest that children should work in communities with peers and adults when they use technologies, to support each other to help acquire new skills and develop competencies. The influence of others is considered of importance as indicated in Chapter 3 and has the potential to enable children to progress in their learning and their technological skills. This area is one of particular focus within this study; it is important to discover the ways that children are afforded the opportunity to interact with touchscreen devices in a shared environment, and the influences of their peers or adults within the touchscreen-based activities they engage in. This is because touchscreen use is perceived by some as a solitary-user object (Alper, 2013), and because the EYFS (DfE, 2017) states children should "work as part of a group… [and] play co-operatively" (p. 11), within the *Personal, Social and Emotional* area of development.

The integration of touchscreen technology into early years practice is something which requires careful thought and consideration; practitioners' values regarding touchscreen technology and their 'mission statement' for its use are of importance for touchscreens to be used effectively. This is because with carefully planned and thought-out touchscreen uses, it is reported that the devices can be used for meaningful ways which foster exploration, creativity and the development of new skills and knowledge (Marsh *et al*., 2015a). Palaiologou (2016) suggests there are conditions which affect the integration of technologies into early years settings, including "teachers' agency; the ambiguities of play-based pedagogy ideology; and concerns for the dominance of materiality and for children's safety and well-being" (p. 307).

Earlier discussions have addressed the first two of the three conditions. It is believed that the way in which practitioners perceive touchscreen devices has the potential to impact effective use when touchscreens are integrated into a play-based pedagogy. Limiting children to acquire new skills to operate the technology will not foster learning which is exciting and meaningful; whereas allowing children to explore and navigate, experiment and problem-solve, collaborate and play is argued to enable more meaningful and worthwhile play experiences.

There are concerns of touchscreen technology harming children's healthy development, taking children away from physical activity (Cordes and Miller, 2000), and more healthy, natural experiences that are considered appropriate for children of a young age (Burnett, 2010; Donohue, 2015; National Association for the Education of Young Children (NAEYC) and Fred Rogers Centre, 2012). Palaiologou's (2016) final point of concerns for children's safety and well-being needs to be addressed in a pragmatic way. As previously mentioned earlier in this chapter, it is argued that there is a need to consider how best to support children's use of touchscreen devices through accepting the educational benefit of touchscreen technology and reducing concerns of negative effects of technology on young children (Loveless and Ellis, 2001). This is an area which requires further attention, however practitioners first need support in establishing the educational benefits of touchscreen use, followed by recognising how best to facilitate its use within daily practice with young children.

It is suggested that practitioners need to be aware of how to use touchscreen devices and how to integrate them into the curriculum before they use the devices with young children (Blackwell *et al*., 2014), however a lack of training is a frequent concern expressed by many (Aubrey and Dahl, 2014; Blackwell *et al*., 2013; Edwards, 2013; Falloon, 2013; Marsh *et al*., 2015a). Although there remains no formal training available to practitioners at the time of writing, strategies have been advised, including adopting a focus on the following aspects rather than separating children's play and their use of technology as individual entities:

1. a focus on the Child;
2. the Content of technology;
3. the Context of the way technology is delivered; and
4. the Community supporting children's technological interactions.

These have been referred to as the 4C's approach (Guernsey and Levine, 2015), with the fourth C, *community*, added to the original Three C's established by Guernsey (2012). Guernsey and Levine (2015) suggest the four C's are of importance when considering allowing children to use technology. They dictate it is important to be mindful of the child's needs and interests, along with the content which children access on the technology devices. In addition, the researchers suggest parents and practitioners should pay regard to the ways in which technology (or media) is used so that it is of value to children, but also recognise the need to limit the use of technology to avoid over-consumption. Finally, they acknowledge that the community is important, because it is the community who determine the types of technology and the content available to children, so Guernsey and Levine (2015) suggest there is a requirement of good conditions for learning when using technology.

In addition, a recent theoretical framework, built upon Shulman's (1986) Pedagogical Content Knowledge (PCK), is aimed at supporting the integration of technology within educational settings. Technological Pedagogical and Content Knowledge (TPACK), formulated by Mishra and Koehler (2006) recognises the connectedness of the use of technology, with pedagogy and content knowledge of what educators teach. Although designed with teaching as a focus, TPACK has been applied to early years studies (see Basquill, 2015; Blackwell *et al*., 2016), focussing on early years practitioners' technological competence, confidence and skills, when supporting children's learning. Mishra and Koehler (2006) assert "knowledge about content (C), pedagogy (P), and technology (T) is central for developing good teaching" (p. 1025). By combining the three aspects when planning or implementing activities, considering children's

interests, prior knowledge, skills and competencies, practitioners may apply their own skills of using technology and design activities of value to each child, offering stimulation and challenge to support children's learning. Based on research conducted in higher education, but designed for teachers to apply from kindergarten to twelfth grade (age three to seventeen), Mishra and Koehler (2006) explain:

> TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (p. 1029)

Rosenberg and Koehler (2015) acknowledge that teaching and learning are inherent within specific contexts, and it is those contexts which impact upon how technology is used to support learning through the pedagogy which practitioners adopt. From this perspective, it is therefore essential that practitioners are aware of how to use the technology they implement during their daily practice and are also aware of how they intend to support children's learning, and what technology's role is within that.

In addition, Blackwell *et al*., (2016) suggest that practitioners' dispositions towards technology and its role in early years education may have the potential to impact on effective use with young children. In relation to the activity theory model, the historical and cultural practices and beliefs on technology use become embedded through prior experience and subsequently impact on future practice. However, the researchers argue that the integration of technology in pre-school settings is perhaps more important than in any schooling years, since children's first

encounters of technology are generally based on developing operational skills, and it is those skills required for future uses of technology in later years (ibid.).

Most recently, Fleer (2017) proposed a new 'digital pedagogy' which takes into account the child and practitioner voice when planning for digital play. On defining digital pedagogy, Fleer (2017: 123) explained "digital pedagogy captures the special characteristics of how teachers use digital technologies for play, learning and development". Influenced by case studies and observations of technological activities, Fleer (2017) noticed how digital toys promoted new forms of complex play through the differences in how children interacted with toys to learn.

Drawing upon concepts of children's development and the social aspect of children's learning, Fleer (2017) emphasised the need to take into account the perspectives of others when planning or implementing digital play. She asserted that it is not possible to plan or implement high quality digital play without taking into consideration the pedagogy practitioners adopt *and* the child's perspective on practitioners' actions. Therefore, a digital pedagogy encompasses intersubjectivity through a "shared understanding between [practitioners], children and technologies" (Fleer, 2017: 124); taking into account prior technological experiences; time and space (to interact with technology); the development of new concepts through shared learning narratives; and virtual worlds which foster imagination, allowing children to experience alternative realities within virtual worlds through augmentative technology to create new forms of play.

This section has examined pedagogical approaches to implementing touchscreen technologies within practice in early years settings. Barriers and challenges have been discussed, as developing practice to incorporate new devices - which may leave practitioners questioning the appropriateness of such change - is not so simple. The following section of this chapter addresses current research conducted in the home environment, since this is the first and main environment in which children play and learn before entering early years settings, and practices

at home may well relate to children's readiness and confidence to use touchscreens in early years settings. Examining pedagogical approaches in the home environment, and the opportunities children are provided to interact with touchscreens in this setting, provides an account of many children's earliest experiences of touchscreen technologies. This therefore allows a connection to be made from the home to the early years setting, by following on with an examination of early years setting-based research studies.

4.3 Pre-school-aged children's touchscreen use in the home environment

The use of touchscreen devices in the home environment has been presented before the use of touchscreens in the early years setting, as most studies researching the use of touchscreen technologies generally focus on home use since this is the location most concerned with over-exposure of screen time (Plowman, 2016). In addition, researchers assert the connection should be made from the home environment to the early years setting, since these are the two main environments where children may interact with touchscreen devices (Alper, 2013; McPake *et al*., 2013). Recognising the research conducted within the home environment prior to discussing the research conducted within early years settings provides an opportunity to examine the proximal contexts in which children spend most of their early lives and where technology may be most prevalent. In line with Bronfenbrenner's (1977) ecological systems theory, these sections within this chapter make connections between these contexts as a way to identify influential environments on children's learning and development. Therefore, I shall now discuss the studies conducted in the home environment on children's use of touchscreen devices, as a way of introducing the early years setting, which follows.

This section of the literature review focuses on seven large-scale UK-based studies conducted on children's media use, parental perspectives and parent-child interactions when using

touchscreen devices in the home environment. The studies are either funded research-based articles, annual reports, charity funded projects, or funded projects from companies. As touchscreen technology becomes more prevalent within households, an increasing number of studies have been conducted on children's technology habits. The age in which children are being studied has been lowered; because of the rise in touchscreens and its prominence in the lives of young children, Ofcom have recently started collecting data on children aged 3-4 years on their technology habits and parental perceptions collected on their young children's digital media usage (Ofcom, 2013; 2015; 2016; 2017).

Ofcom's (2017) recent UK-based study which questioned 677 parents of 3-4 year olds, reports 65% of pre-school-aged children use a tablet at home, with 21% of these children owning a device. Touchscreen tablet use has increased yearly in the home, from 28% of 3-4s using them in 2013, to 53% in 2015, 55% in 2016, and 65% in 2017. Records of children's technology habits reflect 48% of pre-schoolers use YouTube to watch television programmes of popular cartoons, with pre-schoolers more likely in 2017 than in 2016 to use a tablet device to watch a television programme or film (Ofcom, 2017). In addition, children are reported by parents to use digital devices such as a touchscreen tablet for creative activities, and parents (83%) generally feel children have a good balance of screen-based and non-screen-based activities. Tablet devices were the most popular device for children to play games (27%), but children are most likely to use a tablet to go online (71%).

Ofcom (2017) reports that parents state how pre-school-aged children are spending less time online in 2017 than in 2016, from 8 hours 18 minutes a week in 2016, to 7 hours 54 minutes in 2017. There has been a 9% increase in parents who are concerned about their children's online use from 2016 to 2017 (14% to 23%), even though 99% of parents report they implement at least one of four approaches to mediate internet use, including using technical tools, regularly talking to their children about managing online risks, supervising their child, and having rules

(about access to the internet and/or behaviour while online) (Ofcom, 2017: 234). Furthermore, whilst 66% of parents who allow their child to use broadband report they are aware of content filters on their technology devices, only 39% use them. Interestingly, over half of the parents (53%) report they would trust their 3-4 year old child to use the internet safely at home or elsewhere, an increase of 5% from 2016.

However, parents report many concerns of their children's technology habits, including the length of time their children spend online (23%), a 9% increase from 2016. 78% of parents feel they are knowledgeable enough in internet safety to help their child manage risks online, with 47% of parents believing the benefits of online use outweighs the associated risks, a decrease by 8% of parents. However, 23% disagree and restrict their child from accessing the internet (Ofcom, 2017).

In addition to Ofcom's report on children's technology use and media habits, other studies conducted such as charity funded projects from the National Literacy Trust (Knowland and Formby, 2016) and Book Trust (Kucirkova and Littleton, 2016) also report on parent's beliefs on their children's technology usage. Knowland and Formby's (2016) study, which addressed the use of touchscreen devices for developing literacy, gathered data from 1000 parents in 2015 through an online survey (Knowland and Formby, 2016). They found that 96.7% of parents own a touchscreen device at home, and of those 96.7%, 73% allow their children under five to use their touchscreen, an increase from 23% in 2012. 37.8% of parents report they use their touchscreen devices to read children stories for five to fifteen minutes per time, and parents report higher levels of confidence in doing so in 2015 than in 2014 (74% vs 63.7%) (Knowland and Formby, 2016: 9).

Challenges were reported by parents as to why they did not choose to read electronic books (eBooks) with their children, for reasons including the size of the device and fears of breaking

them, concerns of children's eye health and disturbed sleep. Parents also reported they chose to use touchscreens for other reasons, such as playing games that are interactive and for watching videos (Knowland and Formby, 2016), similar to Ofcom's findings. Some parents restricted their child from using touchscreens because they considered them inappropriate for the age range or did not agree with its use.

Similarly, in Kucirkova and Littleton's (2016) study on digital reading habits, of the 1511 parents who completed their survey, parents also expressed concern on children's touchscreen use. However, parents in this study were concerned with the amount of time their child spent using the devices in relation to addiction (36%), alongside concerns of children accessing inappropriate content (40%). Whilst 73% of parents reported their children were confident users of touchscreen technology, 48% of parents expressed they wanted guidance on how long they should be allowing their children to use the technology. Even so, 51% of parents reported they allowed their child to play on touchscreens alone on some occasions, and children mostly used their technology device for entertainment (60%).

There were also concerns that the use of touchscreen devices meant that children were being deprived from other experiences (34%), and this also meant parents were concerned children would want to stay indoors and play with their technology, rather than playing outside (27%). These fears are similar to other studies, which found how some believe children are being deprived of their outdoor experiences because of technology (see The Wild Network, 2016; Cordes and Miller, 2000), and that children should be engaged in more natural, healthy activities at this age (Burnett, 2010; NAEYC and Fred Rogers Centre, 2012). Parents report that the greatest challenge of owning touchscreen devices is their appeal to children, with 51% of parents asking for advice, support and guidance on how to use this form of technology, and how they should select apps or games to support children's learning.

Seeking guidance on best practice is a common request from parents within different studies. Marsh *et al*., (2015a) report from their survey of 2000 parents with children under age five, that parents would welcome advice on selecting apps and how to support their children's learning. The researchers have established questions parents should ask themselves when reviewing an app for its appropriateness for their child as indicated in Chapter 2. In their report for parents, Marsh *et al*., (2015a) identify the top ten apps which children under five were reported to play, and highlight apps which support learning, and promote play and creativity. Marsh *et al*., (2015a) explain that the touchscreen device is the most preferred form of technology that children under five now use in the UK, which correlates with Ofcom's findings on the increase of touchscreen use within this age range, and other studies which show pre-school-aged children prefer to use touchscreen tablets than any other technological device (Livingstone *et al*., 2015). However, whilst studies reflect an increase in touchscreen access, it remains that parents may be unaware of children's touchscreen access outside the home, since only 3% of parents said that their child had access to a touchscreen in their early years setting. It is worth noting that this percentage may now have risen, and/or parents may not be aware of children's touchscreen usage in settings (Marsh *et al*., 2015a).

Marsh *et al*., (2015a) report similar uses of touchscreen devices as with other studies discussed here, such as watching videos, listening to music, playing games and drawing and painting. Children also were reported to dress up avatars, engage in role play and play in virtual worlds. From birth to aged five, children's use of touchscreen devices ranged from an average of 1 hour 19 minutes on a weekday, to 1 hour 23 minutes on a weekend. These were similar average uses reported in Ofcom's report, which indicated an increased use during a week than in previous years.

Other studies which focussed on parental perceptions of their young children using touchscreen technologies found similar results to those already reported. O'Connor and Fotakopoulou's

(2016) survey of 226 parents of under three-year olds in the UK found two thirds used a touchscreen device (66%) at home. With similarities to Knowland and Formby's (2016) findings, children mostly used touchscreens for entertainment purposes to play games. Parents suggested the use of touchscreens at this age allowed children to express themselves, allowed children to learn new skills, and it kept them occupied. Findings from this study showed that only 6% of parents said that their child used touchscreen devices in early years settings, which is a similarly low percentage to Marsh *et al*.'s (2015a) findings that parents report touchscreen devices are only present within 3% of their child's early years settings, although this number may now have changed. This is in stark contrast to recommendations by McPake *et al*., (2013) that the home and early years settings need to make connections and support the use of touchscreen devices in both environments.

Mediation was a common theme within O'Connor and Fotakopoulou's (2016) study. 66% of parents sought to limit children's access to touchscreen devices, and 85% of those who limited access reported that they ensured children spent no longer than 20-30 minutes per day using the technology. This was for a range of reasons, which included a deficit in guidance which supports touchscreen use with very young children (and is a recommendation which arose from Marsh *et al.*'s (2015a) study). Parents also sought research-based evidence to support the use of touchscreens, and since this area is relatively new, there is little to base touchscreen use on. As with Kucirkova and Littleton's (2016) study, parents were also concerned that children may become addicted (26%), face developmental delay as a result of using touchscreens, access inappropriate content, and parents were concerned that touchscreen devices might replace traditional play. These concerns are not independent to this study. Plowman and McPake (2013) also found in numerous studies that parents believed children should not have access to technology, for fear of developmental delay and that technology takes children away from other physical activities (Plowman *et al*., 2010).

Touchscreen mediation was also a common theme within Kucirkova *et al*.'s (2017) study on children's balance of digital and non-digital media consumption in the home. Within their survey of 709 parents who had children aged birth to eight-years-old, Kucirkova *et al*., (2017) explain parents' routines, rules and their family values were the main challenge to achieving a balance of screen-based and non-screen-based activities (agreed by 41.7% parents), followed by their child's level of engagement with screen-based activities (24.6%). Parents explained there were varying factors which influenced the use of touchscreens, and control was a key factor. At times parents said the technology was in control, in that it appealed to the children and therefore was an inviting activity, whilst similarly, the child was in control because of their interest in playing on the touchscreen device. Parents suggested that their children's peers also influenced their child's use of technology, with comments from children such as "everyone else can" (Kucirkova *et al*., 2017: 10), which pressurised parents into ensuring their children had access.

Parents also maintained control over the level of access to technologies that children were given. They followed rules and had routines, so parents planned their child's day to ensure there was a balance of activities available to children where technology was limited. This was so to reduce children from being deprived of other activities, as highlighted in other studies (Kucirkova and Littleton, 2016; O'Connor and Fotakopoulou, 2016). Parents said they wanted children to maintain a "healthy digital diet" (p. 11) and ensure their children's use of technology facilitated learning and had educational value. Achieving a balance of screen-based and non-screen-based activities was in response to concerns of over-exposure to screen-based media. Parents with children under age two were concerned their child may become addicted, mirroring concern within the same age group as O'Connor and Fotakopoulou (2016) in their study. Also, in similarity with O'Connor and Fotakopoulou's (2016) study, parents explained

that technology devices were ideal in entertaining children and keeping them occupied, so that parents could carry out their domestic duties in the home environment.

Elsewhere, Palaiologou's (2014) study on children under-five's use of technology found that parents report 56% of 3-5-year olds access a touchscreen independently. Parents say that they want their children to learn whilst using touchscreens (58%) and be independent, in control of their actions (82%) and use higher-order thinking skills (62%). Consistent with other studies in this section, there is a need that parents require guidance in supporting their child's learning when using a touchscreen device. 73% of parents believed that the use of touchscreens and technology in children's early lives was changing the traditional notions of learning, and this can be understood when parents report children view technologies as part of their collection of toys (Palaiologou, 2014). An outcome of Palaiologou's (2014) study was the agreement from parents that early years practitioners need to take into consideration children's prior learning with touchscreen devices at home (64%), alongside their learning needs and interests. This was in order to enable practitioners to promote flexible and creative learning when using touchscreens (agreed by 78% of parents).

The connection between the home and early years environment is one that needs to be strengthened, and studies allude to this. The following section addresses research conducted in early years settings, making connections to the home environment where necessary.

4.4 Touchscreen use in early years settings

National surveys completed by early years practitioners have indicated an increase of touchscreen use within early years settings in recent years, from 22% in 2013 to 58.2% in 2015 (Formby, 2014a; Knowland and Formby, 2016). With a rise in touchscreen use within this environment, the number of studies researching young children's touchscreen use has also increased. Studies focussing on this area generally tend to focus on social interactions (Savage,

2011), literacy (Flewitt, 2014; Formby, 2014b; Knowland and Formby, 2016; McPake and Stephen, 2016), and creativity (Dezuanni *et al*., 2015; Marsh *et al*., 2015a; Price *et al*., 2015). There has been a shift in direction of the focus of these studies; now seeking not whether technologies are appropriate for young children, but rather focussing on how they can support and enhance learning, identifying the affordances of such use (Palaiologou, 2014).

However, there remains a deficit in research considering the ways that children are using touchscreens during their general interactions within daily practice. By conducting and focusing my research in this area will enable a greater understanding of children's typical touchscreen habits, which can be utilised to ensure apps are designed with increased value for young children's early education. In addition, studying within this area will assist early years practitioners in ensuring children's touchscreen uses are worthwhile experiences that children can benefit from. However, before addressing this gap, a discussion of the current research is provided.

The most recent large-scale study conducted in the UK within early years settings was by the National Literacy Trust in 2015, addressing the use of touchscreen technology in early years settings to support literacy development (Knowland and Formby, 2016). An online survey completed by 450 early years practitioners focussed on practitioner attitudes and beliefs of children's literacy behaviours and incorporated the use of touchscreen technology as a tool to facilitate literacy-based activities. Knowland and Formby (2016) found that 58% of practitioners said children have access to a touchscreen device in their setting, however only 26.9% of children used these for looking at or reading stories. Practitioners viewed technology as separate to books in early years settings, with 92% of practitioners reporting they enjoy reading print-based books with children, yet only 52% reported enjoying reading stories on a touchscreen device (Knowland and Formby, 2016).

Practitioners identified that factors restricting their reading of stories on touchscreen devices included the size of the device, which was too small for a large group of children to see in comparison to print-based books. Reported uses of touchscreens included playing phonics games with children, alongside reading eBooks which read stories in different languages, and fostering mark-making through drawing apps. Billington (2016) reported that touchscreens should be perceived as a tool to support learning and should not replace traditional print-based media such as books and paper when children learn. Practitioners have expressed this too in an earlier study conducted by Formby (2014b). Practitioners suggested children should have opportunities to practise skills such as turning pages of books, rather than swiping or pressing an icon on a screen. These experiences are what children need in their everyday lives, such as manipulating paper and developing their fine-motor skills to enable them to accomplish other tasks.

Other studies, although on a smaller scale, have reported on children's use of touchscreen devices to support literacy development. Story-based apps have been used to successfully facilitate collaborative and imaginary learning where children have taken ownership to create their own stories. Both Wohlwend (2015) in Australia and Flewitt *et al*., (2014) in the UK have reported successful use of touchscreens when supporting children's literacy development. Wohlwend's (2015) observations of pre-school children creating stories using a puppets app, saw children collaborating to animate characters, adding voice recordings, and sound effects. Using 'Our Story', an open-content app which enables children to design stories and to create images, add text and make voice recordings to tell their stories, Flewitt *et al*., (2014) observed children working together to create stories too.

Since young children's mark-making is perceived to be foundational to early writing and literacy skills, further research has been conducted addressing children's mark-making skills when using touchscreen devices. Touching the screen has been regarded as supporting sensory

functions, enabling children to learn the consequence of actions from simple mark-making movements (Price *et al*., 2015). In addition, mark-making on screens has been viewed as intuitive for young children when comparing the action to using a computer, since touching the screen directly with the finger (as would happen with paper), is more natural and responsive than using a computer mouse to create marks (ibid.; Merchant, 2015). Flewitt *et al*., (2015) also found that touchscreen devices were effective in fostering early mark-making through the immediate response from the screen which subsequently "enhanced children's enjoyment and engagement" (p. 112).

Studies conducted within this area such as Couse and Chen's (2010) study which observed 41 pre-schoolers found children's drawing abilities were much more skilled than expected when drawing on a touchscreen, in comparison to using traditional drawing tools such as pencil and paper. Children within this study identified they preferred drawing on touchscreens rather than on paper, as they were "easier to draw on", and that "you can run out of ink with markers and pen, but not the tablet, it doesn't run out" (Couse and Chen, 2010: 91). It is believed that drawing on a screen enables children to recognise the response of their actions (Crescenzi *et al*., 2014; Dunst and Gorman, 2009).

However, other small-scale studies have identified limitations to using mark-making apps. For example, children are limited in creative experiences such as mixing colours, since adding new colours on a screen creates a layering effect rather than combining colours together (Price *et al*., 2015). In addition, children are limited in the sensory experience and the ways in which they create; the single-touch compatibility from touchscreens prevents children from using multiple fingers to add different colours at the same time on the screen, and children cannot create handprints because of this limiting function (Price *et al*., 2015).

Aside from literacy-based studies on young children's use of touchscreen technologies, Arnott (2016b; 2013; Savage, 2011) studied children's social interactions when using touchscreens within early years settings. Arnott (2013) discovered that children engaged in complex social interactions, becoming involved in negotiations between peers, collaborating, sharing ideas and offering peer support. Children were described as 'social agents' within this study as they used technology, demonstrating varied levels of input within technological activities by assuming a wide range of positions or roles which subsequently guided their play.

Arnott's (2013) findings revealed the autonomy children have over their play, particularly when considering the roles that they assumed to direct their play episodes. These roles were dynamic as children reconstructed the nature of their play as other children left or entered the play area, or the play theme changed. In all, Arnott's (2013) study reflected that it was not the technology that determined technological play, it was in fact the children whose intentions or roles they assumed that directed their play. The roles that children adopted were used to influence the behaviour of their peers, such as taking the role as leader and assigning roles to other children, such as naming the 'part' they would play. Arnott's (2013) study is the first to recognise how the technology itself does not determine children's play, and this offers scope for consideration when observing children's touchscreen play episodes within this study.

Addressing touchscreen activity and learning more generally, in Northern Ireland, a recent study on five pre-schools identified that managers of settings believed the use of touchscreens had a positive effect on children's literacy, mathematical, communication, and personal, social and emotional skills (Gray *et al*., 2017). In addition, it was also reported by practitioners that the touchscreens stimulated children's attention spans and motivated children to engage in activities for longer periods of time, since touchscreens appeared to be more fun and inviting compared to a pencil and paper. In relation to children's social skills, initial concerns that the touchscreen would promote social isolation were not true, when practitioners discovered the

touchscreen had a positive impact on children's social development, with children presented with opportunities to collaborate when using the devices.

Elsewhere, there is an increasing focus when considering touchscreen use in the early years to determine practitioner perspectives on its use. Palaiologou (2016) conducted a survey of 920 practitioners who worked with pre-school-aged children to discover the role of digital technologies in supporting a play-based pedagogy. She found 65% of practitioners felt unprepared to use digital devices with young children, with 57% unsure of how touchscreens supported children's play. However, there was a strong belief that the use of digital devices could enhance a play-based pedagogy (80%), yet only 7.4% of early years practitioners reported integrating digital devices as part of a play-based pedagogy in their settings. Early years practitioners emphasised they were unaware of how to support children who had no prior experience of using digital devices, since training needs and guidelines are scarce.

4.4.1 Barriers of integrating touchscreen devices in early years settings

The integration of touchscreen devices in early years settings is a challenge for many, with reported extrinsic barriers (Ertmer, 1999) including financial restraints such as lack of funding and costs to replace or repair damaged devices (Aubrey and Dahl, 2014; Formby, 2014a; Flewitt *et al.*, 2014), alongside practitioners possessing insufficient skills and having minimal access to professional development (Blackwell *et al.*, 2013; Plumb and Kautz, 2015). In addition, intrinsic barriers such as practitioner confidence and identity are components which can affect if and how touchscreens are used (Billington, 2016; Howard, 2013). It is these issues, separated into practical (extrinsic) barriers and practitioner (intrinsic) barriers that I now discuss.

4.4.1.1 Practical (extrinsic) barriers

Practitioners have raised concerns regarding the minimal guidance and support provided to assist practitioners on how to use touchscreen devices with young children (Palaiologou, 2016). Taking into consideration earlier sections in this chapter noted an increase in touchscreen access for young children, Falloon (2013) states practitioners need to be aware of how to use the devices themselves before they begin to do so with young children. However, since it has been noted that there is currently a lack of training to assist practitioners in this, Falloon (2013) explains how there is a risk of misuse of the technology through ineffective strategies as practitioners may have a limited understanding of how best to use touchscreens or other technologies with young children. It is thought that having a limited understanding in the features and capabilities of the device may mean practitioners risk using new technologies in restricted ways without enabling the full potential which these devices may afford (ibid.).

Studies have concluded that training is required in order for practitioners to plan for informed and useful integration of touchscreens within daily practice (Edwards, 2013; Gray *et al*., 2017; Parette *et al*., 2013; Tanyel and Knopf, 2011). Research-based training may potentially influence the way in which touchscreens are used, and how practitioners can personalise the learning experience to the needs and interests of the child. However, without appropriate knowledge in touchscreen capabilities, practitioners might not have the capacity to support children appropriately (Tanyel and Knopf, 2011). As Summey (2013) states, people live in different digital worlds with ranging digital skills and capabilities. Early years practitioners' experiences of technology can impact on how they value the devices, and this subsequently impacts on how practitioners choose to use touchscreens with young children. It is argued therefore that practitioners need to know how to use the touchscreen devices and know how to integrate these into the early childhood curriculum for children to benefit from its use (Blackwell *et al*., 2014).

A way to do this suggested by Aubrey and Dahl (2014) is to assign a practitioner to lead the use of technology, whereby they can oversee the use of technology and support practitioners to develop skills and trial using touchscreens and other technologies before they use the devices with young children. Marsh *et al*., (2017) recommend continued professional development (CPD) training which enables practitioners to address barriers of integrating technology into the curriculum so that practitioners can adapt their practice to suit the needs of children in modern society.

However, some practitioners feel that the use of touchscreen devices for the age range of children is inappropriate, and therefore do not use them with pre-school-aged children (Ludgate, 2015). It is challenging to suggest practitioners should ignore their personally held beliefs, since everyone is entitled to an opinion, but some researchers believe that all children need to experience touchscreen technology before they start school so that they are not disadvantaged when learning amongst their peers (Marsh *et al*., 2015a). This is because technology is now considered by some to be a cultural tool (Bird and Edwards, 2015) which supports children's development, equipping children with skills to be able to develop in an increasingly technology-oriented society (Ernest *et al*., 2014).

Recommending that all children be able to experience technology in the early years before they attend school is a challenging request, particularly as the costs of the device is a barrier against integration. Whilst the costs of these technologies are said to have decreased and been made more affordable, some early years settings do not have the funding to provide them for young children. Formby (2014a) reports 38% of 362 early years practitioners in her survey identified financial reasons was a barrier of using touchscreen devices in their early years settings. Similar findings were reported in Aubrey and Dahl's (2014) study; the cost of purchasing and remaining up-to-date with technology was a challenge within some of the 15 early years settings which were studied.

4.4.1.2 Practitioner (intrinsic) barriers

In addition to extrinsic barriers, practitioners are also presented with intrinsic barriers including confidence in using touchscreen technology. It is reported how practitioner confidence has an impact on children's attitudes when using new technologies, which can influence how children value technology and perceive technology's use in assisting their learning (Blackwell *et al*., 2014; Eagle, 2012; Gray *et al*., 2017). Early years practitioners have been reported to express low levels of confidence in using touchscreens with pre-school-aged children (Knowland and Formby, 2016). Flewitt *et al*., (2014) found similar results in their study when interviewing early years practitioners, with practitioners explaining they did not feel confident to overcome technical issues, but also were unconfident for fears of damaging the devices. However, with prolonged use, Flewitt *et al*., (2014) found all practitioners towards the end of her small-scale study were more confident in using the devices, as they followed children's interests and responded to the children's enthusiasm for the touchscreens. Similar findings were also reported from early years practitioners in a small-scale American study; practitioners reported higher levels of confidence in using touchscreens once they had been trained on how to use the devices to support children's learning and by having the experience to explore the touchscreens during training sessions (Hoffman *et al*., 2015).

In addition, practitioners have also expressed reluctance in using touchscreen devices because of the need to adapt their teaching styles, which in turn threatens the loss of practitioners' teaching identities (Valentine and Holloway, 2001). Although not discussing touchscreen technologies, Valentine and Holloway (2001) explain people are "fearful of the way that these technologies [such as computers] may transform society and their own social relationships and identities, and are apprehensive about their own abilities to develop technological skills" (p. 59). This raises the question of how best to support reluctant technology users in early years settings, in order to provide effective use of touchscreens within children's activities. It is

important to acknowledge Blackwell *et al*., (2013) explain how in their study, personal opinions on the use of technologies and their use with young children resulted in affecting the ways early years practitioners used touchscreens with children. Thus, it should also be considered how issues of authority and knowledge hierarchies influence the uptake of touchscreens with young children in early years settings, with conflicting opinions on the integration of these devices.

4.5 Applying the theory to practice – research-based evidence

Although integrating touchscreen devices into early years settings may prove challenging with many intrinsic and extrinsic barriers that practitioners encounter, studies also emphasise the positive aspects of touchscreen use with young children. This section draws upon research-based evidence to indicate developmentally appropriate touchscreen practice. In addition, since the use of touchscreen technologies in the context of young children's lives has been perceived as a single-user activity (Alper, 2013), this section of the literature review takes into consideration the theories of social learning outlined in Chapter 3, to showcase the reality of social interaction as a method for developing knowledge when using touchscreen technologies. Some researchers suggest that technologies, including the touchscreen, could be used to facilitate interactions amongst peers (Marsh *et al*., 2015a; Saracho and Spodek, 2008; Zevenbergen, 2007). They also suggest technologies should be perceived as a social tool, whereby children can manipulate the devices to develop their learning through exploration and play.

Collaboration is considered an effective strategy to enabling shared learning experiences; children are presented with opportunities to trial methods and experiment with others when using technology. Through speech, children can talk through their actions and problem-solve, drawing upon the support of their peers who possess varying levels of expertise when using

technological devices (Buckingham, 2003; Burnett, 2010; Cook and Finlayson, 1999; Edwards, 2013). Studies have shown children's preference for shared learning when using technology, with children expressing they "enjoy working together when using technology that supports [collaborative] interactions" (Scott *et al.*, 2003: 223; Hughes, 1997). However, it was also noted by Flewitt *et al.*, (2014) that children often engaged in struggles for ownership of touchscreens, which "caused considerable friction" (p. 14), and frustration was caused for some children when multiple children tried to use the device at one time and content that was created was lost.

It is considered that interactions support children to learn more effectively than when engaged in solitary learning (DfE, 2011); through shared activity, children can benefit from instructional support (Eagle, 2012) and through observing their peers. McPake *et al.*, (2013) suggest observation greatly impacts learning when using touchscreen devices; children can observe actions and sequences performed by their peers, enabling learning through imitation and memory. Clements (1994) suggests to pair children in groups of two in order to facilitate collaboration when using technology, however, it is important to note that the intentions of collaborative activity do not always come into fruition.

4.5.1 Children's struggles for ownership

Studies have shown children seek to achieve their own goals rather than working towards shared goals when using technology (Kumpulainen and Mutanen, 1998; Romeo *et al.*, 2003). Previous studies in children's relationships when sharing have found that children's interactions are constructed on a basis of maintaining control, which involve struggles for power and negotiations (Cobb-Moore *et al.*, 2010; Corsaro, 1988). The studies show children actively seek ownership or leadership when working with peers; they either seek to maintain ownership of the device and therefore control their peers' access (Cobb-Moore *et al.*, 2009; Cook and Finlayson, 1999), or mediate the use of the device by assigning rules through the

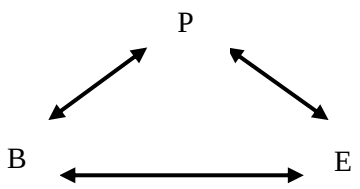
authoritative position they adopt. Drawing upon Bandura's (1977) theory of social interaction, he believes:

> …behaviour, personal factors and environmental factors all operate as interlocking determinants of each other… there are times when environmental factors exercise powerful constraints on behaviour, and other times when personal factors are the overriding regulators of the course of environmental events (p. 10).

Bandura demonstrated this as shown in figure 6, emphasising that social learning is therefore influenced by reciprocating measures of behaviour, the environment and personal factors.

Children's struggles for ownership and authority when using technological devices has also been shown in other studies; Flewitt *et al*., (2014) discovered children's behaviour when unsupervised using touchscreen devices resulted in many children touching the screen, which led to the device not functioning. This indicated that *how* young children use touchscreens is as important, if not more important, than *what* children actually do with them. Flewitt *et al*., (2014) recognised the impact of children's age and their control of their behaviour; young children in a nursery class in their study did not have the sophistication required to understand turn-taking on a fragile device. They reported children competed for ownership or the ability to have their touches on the screen recognised. Elsewhere, Smith and Green (1975) discovered an increase in conflicts and aggressive behaviour when children were required to share few resources, with most conflicts arising in a bid to gain and maintain possession.

Figure 6. Bandura's 'social learning view of interaction' (Bandura, 1977: 9)



However, in other studies, parental concerns of fewer social interactions from children gaining access to touchscreen technology were lessened when parents observed children's desires to interact with others when using technology (McLean and Edwards, 2016). Children were observed to engage in technological play with their peers and adults, and taught both their peers and adults whilst using the devices (ibid.). Through this collaborative activity, children are provided with affordances of trialling new ideas and sharing those with peers and recognising the contributions of others (Cook and Finlayson, 1999; Summey, 2013). Wohlwend (2017; 2015) discovered the use of film-making and story-telling apps fostered collaborative activity, by encouraging children who tended to engage in solitary play to participate in activities with their peers. Scott *et al*., (2003) assert that providing children with technology and tools which support shared learning and interaction has a positive impact on children's participation in activity, their enjoyment and their levels of engagement.

Tudge (1990) suggests the way in which children are paired during collaborative activity is of importance; pairing children with high and low levels of ability does not necessarily mean both children will develop in their learning. Tudge's study has shown that children of high-ability but with low levels of confidence may regress in their learning when paired with a child of lower-ability. It has also been suggested that children do not need a more competent peer in order to develop, particularly if children can receive feedback from the tool (or device) that they are using (Tudge, 1990).

4.5.2 Developmentally appropriate technology use

Various studies have offered their own suggestions to supporting the collaborative approach to learning: Prensky (2010) suggests 'partnering', by drawing upon the skills and expertise from an educator to work together, whilst Stephen (2010) suggests implementing 'guided interaction', whereby adults support children through either direct or indirect interventions. Prensky's (2010) partnering approach, based on the premise of children drawing upon others'

expertise to develop, has similarities to the scaffolding approach (Bruner, 1977; Wood *et al*., 1978). It has been suggested by Prensky (2010) that children use the technology under the direction of an educator, who guides children's actions to enable learning. Rogoff (1990) has similar beliefs in shared learning, suggesting the child and educator work together, empowering the child to build a bridge, "from children's present understanding and skills to reach new understanding and skills" (p. 8). The concept of the more knowledgeable other has considerable significance here; an adult (or child) has the potential to support the less knowledgeable child providing they are aware of the child's current level of skills and expertise.

Applied to the context of touchscreen use, a child using a touchscreen can receive the support from peers or adults in assisting in overcoming difficulties such as navigating around the device or assisting in learning new concepts such as reading letters on a screen. In addition, a child may have more experience of using an app than a practitioner. This was reported by Flewitt *et al*., (2014), when practitioners commented that some children were more skilled in using technology devices than the practitioners because of their experiences at home. This resulted in children teaching the practitioners, and this changed the power/knowledge relations within the setting by viewing children as 'experts'. The practitioners reported a noticeable improvement from children working with peers or adults, particularly regarding communication and language skills, as children were developing their skills in communicating to teach others.

Through planning activities to extend a child's current knowledge, drawing upon the use of language to support the transition, children can imitate actions and practise their skills until the skills have become embedded within children's expertise (Cook and Finlayson, 1999; Kolb, 1984; Vygotsky, 1978). Studies have shown the positive impact of peers on developing children's technological skills; O'Hara (2011) found older or more experienced peers can demonstrate actions and explain how to perform tasks. Brown *et al*., (1989: 32) assert

"learning… advances through collaborative social interaction and the social construction of knowledge". Children construct their own knowledge from the experiences of social interactions with their peers (Tanyel and Knopf, 2011), hence the type of interaction and activity is of importance.

Stephen (2010) refers to the need for guided interaction to facilitate learning when using technology, inferring that this can be achieved in two ways: proximal guided interaction, or distal guided interaction. Proximal guided interaction refers to the need for a practitioner to support children's learning, whereby the direct actions of an adult are considered of importance to support children with their acquisition of new knowledge. Stephen (2010) argues that this technique goes beyond the conventional language techniques associated with scaffolding children's learning experiences, through including emotional and social aspects of learning such as "physical actions, spoken language, touch, non-verbal gestures and emotional engagement" (p. 21). Proximal guided interaction includes demonstration, enabling children to learn through observation and imitation, alongside strategies including reading choices, helping a child to make a selection on a touchscreen, or "encouraging a child to try something new" (Plowman and Stephen, 2013: 18).

Alternatively, Plowman and Stephen (2013) also refer to 'distal guided interaction', whereby practitioners plan activities in order to support children's development and learning, similar to approaches in supporting children reach their ZPD (Vygotsky, 1978). Distal guided interaction is an indirect method to supporting learning, involving simple strategies such as providing a sand timer to support children to monitor turn-taking, or arranging the environment which includes selective resources to foster the development of skills (ibid.). Whilst these approaches can be effective in supporting children's learning whilst using technology, Plowman and Stephen (2013) acknowledge a barrier common within their studies that practitioners seek initially for children to develop operational skills on the devices, such as how to perform

actions. It is therefore important and a recommendation that practice develops to not only support children in acquiring the operational skills needed to use touchscreen devices, but that children should also be encouraged to be creative and innovative in their uses of technology too (Plowman and Stephen, 2013).

Developmentally appropriate practice (DAP), a term derived from the social constructivist perspective has increasingly been applied to thinking about supporting children's learning (Bredekamp and Copple, 1997; Siraj-Blatchford, 1999). DAP focuses on designing support strategies against different child developmental areas to enhance children's learning (Bredekamp and Copple, 1997). Children are supported in their cognitive, social, physical and emotional development. As Wiegel *et al*., (2009) suggest, whilst learning becomes more personalised to the individual, learning also recognises the need for the social element to facilitate this. Children build upon their own experiences and their social experiences to construct an understanding of the world in which they live (Cooper, 2005).

Learning is a social process, whereby peers can support children to work within their current level of skill, and increase this through scaffolding in order to support children to reach their zone of proximal development. Siraj-Blatchford (1999) explains the central aim of DAP is to "enhance development and learning" (p. 25), enabling children to draw upon the skills and expertise of others to develop. Cooper (2005) suggests that to provide DAP within a social environment when using technology, the layout of the environment is important. Children need to see that the physical environment supports a social environment, whereby the technology is not out of sight or out of boundaries where children can engage in free-play (Zevenbergen and Logan, 2008). It should be recognised that technology has a position within play; children should be encouraged to collaborate and engage in discussion (Clements and Sarama, 2002), practise operational skills such as functioning the device, and allow all children equal access to develop their skills and competencies (Appel and O'Gara, 2001).

DAP sees children as active learners, taking control of their experiences to support development (Bredekamp and Copple, 1997). As noted in other areas of this chapter, parents and educators have both asserted the need for children to use technology as part of developmentally-appropriate early years practice, as it is believed children will require technological skills when at school (Edwards *et al*., 2017; Finegan and Austin, 2002; Haughland, 2000; Judge *et al*., 2004). It is recommended that practitioners need to know how best to use technology in developmentally-appropriate ways for children to benefit from its use (Alper, 2013; Badgett and Snider, 1995; Haughland, 1992). Research suggests technology should be used for children to develop their social skills, collaborating with peers to solve problems (Bronson, 1995), alongside encouraging interactivity rather than promoting passive behaviour commonly associated with watching videos or television programmes (Judge, 2001).

However, for some, DAP has increasingly become a rejected term when considering supporting children's learning. When working within a DAP framework, it is argued children are not provided with opportunities for challenge and progression. Plowman (2016) has stated that through planning activities on touchscreen use to be in line with children's current level of development and thinking, children are not being challenged. Children therefore sit at their current level of development and are not being encouraged to progress, disregarding the importance of the ZPD in extending learning. Limiting children to technologies or apps because of their claims of developmentally-appropriateness "may mean inhibiting [children's] potential for learning by restricting their creativity and curiosity" (Plowman *et al*., 2010: 4). Instead, the term Developmentally and Contextually Appropriate Practice (DCAP) (Papatheodorou, 2010) has been coined, which recognises the impact of culture and social groups which influence learning (Hyun, 1998). DCAP acknowledges that children's learning is influenced as a result of the societal, cultural and environmental factors which are embedded within their lives.

In addition, the scaffolding of children's development when using technological devices is becoming problematic. Digital scaffolding is inherent within many interactive devices, whereby programmes or apps are programmed to remember the child's ability and skill level and slowly increase the skill requirement over time. However, Radesky and Zuckerman (2017) indicate that scaffolding is more than just increasing the level of challenge; children also need to be supported in their "reaction to and persistence in learning" (p. 16), emphasising the need for support from a person, rather than support solely within apps. DAP can be applied when considering the level of skill and challenge required within apps or games, however there is still a requirement for the physical presence of a person to determine the child's abilities, and to provide emotional support rather than skill-based support.

Plowman (2016) explains there is a tendency to over-estimate children's capabilities of becoming familiar and competent in using new technological devices, when there is the presumption that all children are digital natives (Prensky, 2001). There is a common rejection in the use of the term 'digital natives', since there is acknowledgement that not all children have gained technological skills, and that the uptake of learning to use technological devices is not a natural occurrence for all children (Alper, 2013; Buckingham, 2006; Livingstone and Helsper, 2007). DAP therefore becomes moot when considering the digital scaffolding embedded within games, when children still require emotional scaffolding to support them firstly, to learn how to operate the devices, secondly, how to extend their learning from using these devices, and thirdly, to learn how to take turns and not be overly possessive or selfish with touchscreen devices.

In conclusion, researchers assert it is important to recognise technology as a tool; it does not replace other materials, rather, technology is another medium from which children can learn (Alper, 2013; Cooper, 2005; Finegan and Austin, 2002). Researchers also reinforce technology should not become a single-user activity; technology needs to be positioned as a social tool,

whereby children can work with their peers or adults to support their learning, through open-ended games and programmes which foster creative thinking, exploration and learning (Alper, 2013; Cooper, 2005; Judge, 2001; Marsh *et al*., 2015a; Saracho and Spodek, 2008; Zevenbergen, 2007).

4.6 Touchscreen technology as a contested tool for young children

Previous sections of this chapter have acknowledged that the integration of touchscreen technology in early years settings has not been a straightforward transition; barriers including pedagogical values, time, and financial resources have impacted upon touchscreen integration. In addition, varied opinions of the use of touchscreen devices for children under the age of five is a predominant concern for parents, practitioners and a range of professionals from health and educational disciplines. This section of the literature review acknowledges a range of concerns expressed, mostly by health professionals, warning parents and practitioners against the use of touchscreen devices with young children. However, in order to provide a balanced argument, alternative studies are also drawn upon to showcase positive aspects of using touchscreen devices with pre-school-aged children.

The integration of touchscreen technology in young children's lives has raised concerns and initiated many debates over its appropriateness. There is a consensus amongst some that technology is harmful for children's development (Howard-Jones, 2011; NAEYC and Fred Rogers Centre, 2012), and children are subsequently at risk from dangers which technology pose. Palmer (2006) once warned of a 'toxic childhood', a result of childhoods changing to include malignant factors such as technology. Building on Postman's (1992) argument in relation to television consumption by young children, Palmer (2008) later asserted that the line between childhood and adulthood was slowly diminishing with children being exposed to more 'adult-like' content, which in turn provoked aggressive behaviour. Palmer's view on childhood

becoming toxic is not on its own; fears have surfaced that children are slowly being corrupted from the influence of technology (Buckingham, 2003), and children are exposed to content which affects their behaviour, with children becoming less respectful of their elders, to 'answering back' and becoming hostile.

The development of touchscreen technology and its uptake within society and childhood has provoked questioning on whether or not touchscreen devices are appropriate for young children. As a result, the anti-technology debate is fuelled, but does not, however, address how children can be *supported* by technology (Arnott, 2016a). With most claims that address the negative impact touchscreen technology can have on children's development, there is research-based evidence to counteract these claims, indicating a positive contribution that technology can provide for children's development.

Frequent concern and much debate of touchscreen technology arises from America. With the American Academy of Pediatrics (AAP) (2016; 2011; 2001) releasing statements regarding the use of technology and screen time, considerable research has been conducted in America to highlight the negative impact technology can have on young children's development. It has become apparent that some literature and research focuses on a deficit model when addressing technology use, rather than addressing how technology can be used to support children's development (Savage, 2011). An exploration of frequent areas of concern are explored below.

4.6.1 Screen time

The American Academy of Pediatrics released guidelines in 2016 stating children aged 2-5 years should have no more than one hour per day of screen time access. The AAP also recommend that children under 2 should have no access to screen-based media, but technology may for 18-24-month-olds, be used constructively to communicate with relatives using apps such as FaceTime and Skype (AAP, 2016). This guidance to American parents justifies its

decisions through a series of studies addressing the negative effects on children's health and development that technology has, including:

- Obesity (Cox *et al*., 2012; Wen *et al*., 2014);
- Sleep deprivation (Cespedes *et al*., 2014; Vijakkhana *et al*., 2015);
- Communication and language skills (Duch *et al*., 2013; Zimmerman *et al*., 2007); and
- Social skills (Connors-Burrow *et al*., 2011).

Studies within the UK and America have evidenced an increasing use of technological devices within young children's lives, subsequently increasing their exposure to screen-based media. For example, in 2011, Plowman *et al*., (2011a) reported pre-school-aged children were exposed to up to 12 hours of screen time a week within their study on 94 children, and in 2014, Formby (2014a) reported children were using touchscreen devices daily. The increase in digital devices which permeate into households and early years settings has reflected the increase in screen time exposure for young children.

One study in America on 104 families reported 17.5% of parents say they would introduce a technological device to a child under one, whilst a quarter of parents would introduce the devices to children aged 1 ½ to two years. 19.4% would introduce digital technologies to children from 2 to 2 ½ years (Wood *et al*., 2016). These parents mostly believed that by not introducing children to technological devices such as touchscreens it would do a disservice to children, depriving them of these experiences and the opportunities to develop technological skills before attending school. Whilst the concern on screen time access prevails, Blum-Ross and Livingstone (2017) assert that "the historical focus on screen time has been at the expense of supporting parents to assess the contexts in which their children use screens (where, when, why and with what effects), the content they are accessing (a minority of content is objectionable while the majority is innocuous or indeed positive), and the connections they are

fostering through screens" (p. 27). This therefore raises the question of how children's touchscreen or technological play is limited or restricted because of the concern over screen time and the need to ensure children are not 'over-exposed' to digital media.

4.6.2 Obesity

With increased access to technological devices which appeal to children's interests, there are concerns raised that the uptake in technology use has increased the number of young children who are obese (Cox *et al*., 2012). However, most studies conducted on childhood obesity which correlate to increased technology use focus on older children (see Taheri and Arora, 2015), and studies which focus on pre-school-aged children address television viewing habits rather than touchscreen technology use (Pagani *et al*., 2010). One American study released alarming results showing 2-year-old children's body mass index (BMI - a value defined by combining height and weight) increased for every hour per week that media was consumed (Wen *et al*., 2014). The increase in BMI at a young age was said to set a rate of weight gain and obesity later in childhood (Suglia *et al*., 2013). In contrast, Robinson *et al*., (2017) and Paudel *et al*., (2017) report how there are inconsistent findings across studies which state the effect of screen time on obesity and BMI, and therefore the researchers cannot reach the conclusion that there is a negative association of screen time and obesity.

What is also important to note is most of these studies are conducted in America, and they do not address the relation between obesity and touchscreen technology use. Obesity is a concern frequently expressed in the UK, however more research needs to be conducted to address these claims, since television-based studies focus on the sedentary behaviour associated with television viewing, whereas the touchscreen offers more opportunities for interaction based on the portability of the device (Reilly, 2008). Touchscreen devices afford the portable nature of entertainment, since they are lightweight and easy to use in a range of environments, which

encourages less restricted activities (such as television watching) whereby the use of the devices is confined to one area (Falloon, 2013).

4.6.3 Sleep deprivation

Additional concerns have emerged that increased exposure to screen-based media is affecting children's sleep patterns. Whilst LeBourgeois *et al*., (2017) explain that currently it is unknown the effects of screen exposure and sleep patterns on children's development, studies have shown that the use of light-emitting screens before children sleep has led to disrupted sleep patterns and less sleep per night (Cespedes *et al*., 2014). It is believed the content which is viewed is a disruptor to sleep (Vijakkhana *et al*., 2015), alongside the blue light which is emitted from screens, which supresses the levels of endogenous melatonin that assist the body in falling to sleep (Salti *et al*., 2006). In addition, Garrison *et al*., (2011) found evening use (after 7pm) of screen-based media was associated to increased sleep problems in pre-school-aged children. This included difficulty sleeping, increased arousal to content and anxiety, nightmares, waking frequently during the night and children experiencing difficulty waking the following morning. As such, the AAP recommend prohibiting the use of screens at least one hour before bedtime to prevent these issues (AAP, 2016).

4.6.4 Decreased social interaction and communication

Additional concerns involve decreased social interaction and fewer opportunities to communicate with family members and peers from increased use of technological devices within the home environment. Palmer (2008) refers to this lack of communication and interaction as "splintered households", explaining family members with personal devices entertain themselves in separate rooms of their house. Whilst this is an extreme perspective of the current family household, and should not be considered commonplace due to lack of evidence, there are concerns expressed by parents on children's uses of touchscreen devices

and the implications this may have on children's interactions with their peers. In a study that sought to obtain parental perspectives on their young children's uses of touchscreen technology, O'Connor and Fotakopoulou (2016) reported parents were concerned that the use of touchscreens would reduce the amount of time children could learn social skills, with one parent suggesting "I believe it discourages social interaction" (p. 10). In another study which also captured parental perspectives of technology, some parents in Plowman *et al.*'s (2011b) study explained they preferred their children to interact with others in face-to-face situations to learn social skills, rather than be entertained by technologies, in a bid to "protect … children from becoming socially isolated" (p. 35).

However, with an increase in concern from parents that touchscreen technologies are being enjoyed as single-user activities, a range of studies focussing on touchscreen use in an early years environment - where children are able to interact with a wide range of peers - have shown positive interactions of shared touchscreen use. Flewitt *et al.*, (2014) reported early years practitioners observed increased collaborative activity, communication and interaction amongst children through a range of activities that children were engaged in when using touchscreen devices. In another study focussed on children's touchscreen use in early years settings, Arnott (2016b) reported that, as a result of few devices to use, children were observed to share the touchscreens and support their peers during technological play.

In line with parental perceptions and children's use of touchscreens in an early years setting, McLean and Edwards (2016) conducted focus-group interviews with parents at a day-care centre before and after implementing touchscreen devices in daily practice. Initially, parents expressed concern which questioned the place of technology in early childhood and in young children's lives. After observing children use the touchscreen devices, parents reflected that touchscreens were a tool which could enhance their child's learning and development and enabled social interactions. Children were observed to interact with their peers more than what

parents initially predicted and were observed to engage in a range of interactions, such as playing with peers and adults, and children taught their peers and adults during touchscreen play (McLean and Edwards, 2016). In addition, recent research in England has suggested there is currently no evidence to distinguish whether young children's social development is negatively impacted from using touchscreens, particularly because of the device's light-weightiness and portability (Bedford *et al*., 2016; Falloon, 2013).

4.6.5 Decreased outdoor play time

Another contributor to the anti-technology debate is that increased use in digital technologies is preventing young children from playing outdoors. There has been an increasing emphasis on encouraging young children to venture outdoors and explore, in a bid to ensure children are not deprived of these experiences. The Wild Network, a community organisation founded from their film Project Wild Thing (which aimed at connecting children with nature), encouraged children and parents to be more aware of the outdoors environment. On their website, The Wild Network (2016) reported findings from their survey that increased screen time use with young children was believed to be the largest barrier to encouraging children to play outside. They advocate parents should turn off digital devices, socialise and play outside rather than spending time using devices for entertainment indoors.

Research-based studies, such as one conducted by Plowman *et al*., (2010) found that parents thought children would benefit more by spending time outdoors playing rather than being indoors playing with digital devices. Parents reported they worked to achieve a balance between screen-based and non-screen-based activities to ensure children had a wide range of activities to engage in. However, in contrast to popular concern, in America, Vandewater *et al*., (2007) found there was no correlation between screen-based activities and reduced outdoor play in children under the age of six, which is the opposite belief of this influence.

4.6.6 Physical versus technological play – separating between the platforms

The last area in this section is separating physical versus technological play, but this does not mean to say the areas discussed here are the only concerns prevalent on touchscreen use with young children. There has been a growing concern that children are spending long periods of time engaged in play-based, virtual activities on touchscreen and other technological devices, and children are being deprived of more natural and healthy, physical activities (Howard-Jones, 2011).

The AAP (2016) report that children under the age of two have difficulty relating on-screen content to the real world, and children should therefore spend their first years playing with physical toys which they can manipulate. In addition, there is also concern on children's play habits with virtual and real-life physical worlds. However, when addressing how children see these worlds, Brooker and Siraj-Blatchford (2002) found that children do not separate screen-based and non-screen-based media in the way that adults do. Children see the technological device as just another platform to their play. This is the same for both online and offline worlds; children do not distinguish the difference of these in the ways that adults do, rather they move flexibly between these domains (Ito *et al.*, 2010; Third *et al*., 2014). Marsh *et al*., (2015a: 46) identify some "children move across the online/offline, 'real' and virtual, digital and non-digital boundaries with ease", portraying children's competence and ability to determine how they play. Children exhibit their control and independence, just as they do for other activities in selecting what to play and how to play in virtual and physical worlds.

4.7 Conclusion

The literature review conducted to date has identified that there is a lack of research focussed on the ways in which pre-school-aged children interact with touchscreen devices when in early years settings. Researchers have argued that there should be a connection made between

touchscreen use in the home and early years setting (Edwards, 2013; Plowman *et al*., 2008; McPake *et al*., 2013), however, most research conducted with children aged 3-4 years is in the home environment, leaving little focus on the early years setting. Therefore, this study seeks to address the gap through exploring children's touchscreen technology use when in early years settings. This chapter has explored pedagogical approaches to begin to address the barrier of perceiving play-based learning as separate to incorporating technology within play, and this has been supported in previous chapters, which addressed theories of learning in a social environment which supports the social nature of interacting with technology.

The study explores children's interactions with touchscreen devices and children's interactions with their peers. This is firstly, to explore how children can be supported when using touchscreens by identifying affordances of its use, and secondly, to explore how children use touchscreen devices in a social manner, in an attempt to reduce concern over touchscreens' solitary-user reputation and become more informed on practice. The following chapter explores the methodological decisions made regarding how this study was implemented.

Chapter 5: Methodology and methods

5.1 Introduction

The previous chapter reviewed the body of literature on touchscreen technologies in young children's lives. This chapter will discuss the methodological approach to the research, justifying the research design and the methods selected to answer the research questions. My epistemological and ontological stances will be examined, and ethical considerations are presented. Issues such as validity, robustness, trustworthiness and bias are also discussed, offering a thorough consideration to these matters within the research.

The aim of the study was to explore young children's touchscreen technology experiences in early years settings, with an intention of identifying potential affordances of touchscreen use. Within this broad theme, topics such as children's social experiences have been considered, alongside practitioner perspectives in providing children aged three and four years access to this form of technology. To study this area, research questions have been generated, and are presented below.

5.2 Research questions

It has been identified that many novice researchers find they want/aim to investigate 'everything' within research (Yin, 2003). However, following Hays' (2004) advice that areas of focus should be limited, the following research questions were generated from the literature which the study sought to answer:

1. Which early years pedagogies do practitioners implement when supporting children's learning when using touchscreens?
2. What are the perceptions and reported practices of key stakeholders (practitioners and managers) on children using touchscreen technology in the early years?

3. What opportunities for social and collaborative learning do touchscreen technologies offer for children aged three to four years old in early years settings?
4. How are touchscreen devices used in a range of early years settings in the West Midlands?

5.3 Research paradigm

The aim of the study was to explore the affordances of touchscreen technologies within four early years settings. The settings included a Day Nursery, Child Minder, Children's Centre Nursery and Pre-School. To achieve this, I aimed to discover and analyse practitioners' reasoning and beliefs on the use of touchscreen technology and therefore an interpretive approach was considered appropriate.

A positivist approach was initially considered, however I concluded that positivism is generally concerned with investigations of the natural world, where "there is an assumption that there are patterns and regularities, causes and consequences", as noted by Denscombe (2011: 324). Within this approach, research takes the form of searching for these patterns and regularities, something which was not necessarily the focus of my study. Cohen *et al*., (2007) further support my decision to not follow a positivist approach, through explaining:

> Where positivism is less successful, however, is in its application to the study of human behaviour, where the immense complexity of human nature and the elusive and intangible quality of social phenomena contrast strikingly with the order and regularity of the natural world (p.11).

A range of other paradigms such as pragmatism and post-positivism were considered which were suited to the mixed-methods approach (Tashakkori and Teddlie, 2003). However, these were not considered the most appropriate for this study and instead the interpretivist approach was favoured as I intended to discover children's experiences. This was further supported by

Denscombe (2011: 94) who suggested the interpretivist approach is antithetical to positivism, where the study "generally deals with… people's attitudes and beliefs [and] people's feelings and emotions". Further reading identified that since this was a mixed-methods study which weighted more on qualitative research, the interpretive approach was most suited to analyse the data. A range of research texts outline distinguishing features of this approach, including but not limited to;

- How the social world is actively constructed by people (Becker, 1970; Garfinkel, 1967);
- Events within qualitative research are unique and generally non-generalisable; and
- That "the social world should be studied in its natural state, without the intervention of, or manipulation by, the researcher" (Cohen *et al*., 2007: 20; Hammersley and Atkinson, 1983; Smith *et al*., 2009).

Interpretation within qualitative research can be argued as subjective (Peshkin, 1988) in that an interpretive approach can be viewed through the lens of social constructionism, as meanings are identified as a result of subjective reasoning (Creswell, 2013). This forms the discussion for the research paradigm.

5.3.1 Ontologies and epistemologies

Tashakkori and Teddlie (2010) suggest that within methodology, ontological and epistemological stances are closely connected to the theoretical perspectives of a researcher, and as such, an examination into my ontological and epistemological stances is given.

My ontological stance was identified through my understanding of social reality and its connection to the topic of study. Social constructionism "reflects the notion that the world that people create in the process of social exchange is a reality *sui generis*" (Denzin and Lincoln, 1994: 127). Here, knowledge is generated as a result of social interactions and focuses on generation of meaning, rather than the activity in which meaning is created, which is applied

within social constructivism. This position reflects that meaning and theory of knowledge can be generated through social exchange and interactions, and as such was a focus within the study. A second ontological stance was identified within the research, considering the activity of interaction is also of importance, and therefore an element of social constructivism is present.

Creswell (2013) suggests social constructivism can be considered a 'worldview', which Guba (1990: 17) defines "a basic set of beliefs that guide action". Constructivism, often closely related to constructionism, refers generally to understanding, multiple meanings, social and historical construction, and the generation of theory (Creswell, 2009: 6). Creswell (2013) further suggests that constructivism relates closely to interpretivism, in that understanding is sought of the world and as a result, subjective meanings are generated based on one's experiences. Meaning is generally applied to objects, and in this study, relates to the meaning behind social interactions when engaging in activity with touchscreen devices. As a result of this 'worldview', reliance is on the participants within a study to develop ideas and their views of situations to generate meaning in relation to their thoughts, values and understandings (Ogden and Richards, 1923), which is then interpreted loosely by the researcher.

My epistemological position refers to interpretivism, acknowledging the emphasis on qualitative study within the mixed-methods design. A generation of knowledge was accumulated as a result of interpretation based on my understanding of children's touchscreen experiences. Gray (2014: 57) defines the interpretive approach as one that "seeks to uncover people's views and perspectives". In this study, I followed the assumption that social reality is different to that of natural reality, and therefore I seek understanding of the actions of individuals to answer the research questions. This approach resonates with the aim of the research; children's experiences are under examination to understand how touchscreen technologies are used and to identify the affordances that arise from such experience.

Crotty (1998: 68) summarised “our interest in the social world tends to focus on exactly those aspects that are unique, individual and qualitative”. To gather information on the social world, observations and interviews were conducted with children and practitioners, two methods which allowed the generation of data “which gives an insight into people’s experiences” (Silverman, 2009: 91). Investigating in this way provides the opportunity to generate meaning from touchscreen activity. This strategy was further supported through the adopted research design.

5.4 Research design

Accepting Berger and Luckmann’s (1991) theoretical claim that social reality is constructed and shared with others through language, my position aligned with the theoretical framework adopted (Activity Theory, see Chapter 3). This framework resonated with Vygotsky’s (1978) social constructivism, reflected in the systems of activity. Language is a psychological tool, which is “oriented outward, toward the transformation of the physical and social reality” (Blanck in Moll, 1986: 45). Children develop the capability of problem-solving through readdressing their focus; once oriented outward to seek support, children internalise problems, and develop their own strategies and behavioural methods in order to problem-solve (Vygotsky, 1978). Children associate social behaviour to this action, observed through play or interactions with other children or adults.

Vygotsky (1978) identified that language (a ‘sign’), once internalised, stimulates behavioural transformations throughout a child’s development. According to Vygotsky these signs are a method to social contact with others. When communicating through language, this function then “become[s] the basis of a new and superior form of activity in children” (Vygotsky, 1978: 28-29). Through this internalisation, children develop the capacity to extend their

communication through activity. The application of language within the social nature of touchscreen experiences has been addressed as an integral factor of social learning.

Within this study, I accepted that learning and development in an organisation is underpinned by values, understanding, interactions and actions of participants. In line with the notion of a socially-constructed reality, practitioner 'realities' were established through capturing multiple perspectives and through shared interpretation. I acknowledged that practitioners and children have their own interpretations regarding the social organisation and activities within each setting, and therefore four methods were utilised in order to capture these interpretations. It has been acknowledged that "the most important experience of others takes place in the face-to-face situation, which is the prototypical case of social interaction" (Berger and Luckmann, 1991: 43). This social interaction was particularly of focus when addressing children's shared touchscreen experiences, and the face-to-face element has been studied to discover the affordances that arise from such interaction.

Berger and Luckmann (1991: 33) explain "everyday life presents itself as a reality interpreted by men (sic) and subjectively meaningful to them as a coherent world". I acknowledged through the methods implemented that an element of subjectivity is present; interpretations are meaningful to the individual and therefore an unbiased account cannot be achieved. To answer the research questions, I sought to understand personal experiences and attitudes, and therefore the reality of children's and practitioners' everyday life as reported by them and observed by me was a focus for this study.

5.4.1 Mixed-methods research

The study adopted a mixed-methods approach which combined both qualitative and quantitative research methods (Creswell, 2013). This approach challenges the view that research should be conducted using a single method. Arguments against the single method

consider mixed-methods research as an effective strategy to proving triangulation (Creswell and Plano Clark, 2006). For this study, data was collected in a sequential manner, and both qualitative and quantitative data was retrieved within each method used. The data collected within the study had a qualitative emphasis, hence epistemological and ontological positions identified underpin the nature of qualitative research.

The justification to conduct a mixed-methods study was supported by Stake (2006) and Creswell (2013), who suggested that mixed-methods data supports the answering of the research questions, particularly as the strengths of one method outweigh the weaknesses of another, enhancing the robustness of the study. Where mixed-methods research is employed, Johnson and Onwuegbuzie (2004: 15) identified this as a "third researcher paradigm"; a new dimension to research, which allows the researcher to understand multiple perspectives, and where multiple methods complement each other in their strengths (Creswell, 2009). This contests previously held notions that dual paradigms are incompatible or that they should be approached with caution (see Bazeley, 2004; Giddings and Grant, 2007). The use of a mixed-methods approach has been successful in a range of early years studies (for example Siraj-Blatchford *et al.*, 2002; Sylva *et al*., 2003) which supports its use within this study. The use of mixed-methods data was utilised to develop research instruments (Denscombe, 2011); quantitative data from an online survey developed interview questions with early years practitioners, to ensure the questions were topically appropriate. This strategy was implemented since Creswell (2013) suggests that for mixed-methods research, there should be a combination of pre-determined and emerging methods.

A mixed-methods approach was favoured, since qualitative data enabled the development of meaning through interpretation, and quantitative data provided a context in which to build upon, where rich data was generated as a result of quantitative foundations. The combination of both methods increased validity and robustness of the methods, alongside strengthening

triangulation between methods and the multiple case study approach, as discussed in the following section. The approach selected enabled the identification of 'unique moments' (Stake, 1995) arising from the data, and these moments are therefore an overarching theme of the study.

5.4.2 Case study

Multiple case studies were selected as the methodology for this research, since I sought to explore the uniqueness of each early years setting under study (Yin, 2009). Four case sites were identified (Day Nursery, Child Minder, Children's Centre Nursery and Pre-School) who all implemented a play-based pedagogy, which supported the nature of the multiple case study approach. There was an equal divide of settings who had low and medium socio-economic status (SES), and the multiple cases were designed to achieve 'theoretical application', through the replication of methods within each case (Yin, 2009: 54-55). This replication allowed the identification of differences and similarities across the four cases, taking into account SES and pedagogical approaches. The decision to conduct several case studies arose from the nature of each setting's approach regarding touchscreen use, and allowed for an exploration into each setting's approaches of their implementation of touchscreen devices.

Yin (2009: 102) explains how case studies can draw upon the following six sources of evidence:

- Documentation;
- Archival records;
- Interviews;
- Participant observations;
- Non-participant observations; and
- Physical artefacts

As case studies provide an "up-close, in-depth understanding" of each site (Bromley, 1986: 1), a range of sources were required in order to understand the complexities of each early years setting. Taking into consideration that Yin (2009) suggests more than one source of evidence is required to achieve triangulation, three sources were selected: physical artefacts, interviews and non-participatory observations. An initial source of evidence was in the form of an online survey.

Yin (2009) and Stake (1995) conceptualise case study differently. Differences between the researchers concerned the 'focus' of a case study; Stake (1995) recommends focusing on the specific rather than the general, however Yin (2009) opposes this, explaining focussing on the specific in any research would then deem all research a case study. Further reading identified that Yin (2009) and Stake (1995) also had differing views on the types of case study to be implemented.

Yin (2003: 6, 30) identified three different designs when seeking to build theory: *explanatory* (focuses on causal investigations), *exploratory* (to develop a hypothesis and propositions for further inquiry), and *descriptive* (focuses on the purpose of the descriptive effort, the range of topics which may provide a complete description of the phenomena, and the likely topics that will provide the description of the phenomena). Upon examination, the *exploratory* design appeared most appropriate for my study, since the study is new, and literature is sparse.

In comparison, Stake (1995: 3) identified three other forms of case study: *intrinsic* (often to learn about a particular case), *instrumental* (often used to accomplish something, to understand something else) and *collective* (to study in multiple, e.g. multiple schools). Upon examining these, it was decided the study was most suited to the *collective* approach, since multiple cases were studied to develop a collective understanding of the research focus (Stake, 1995). Therefore, a collective and exploratory case study design was chosen. Case studies allow for

the research topic to be studied in-depth, allowing for interpretation of action in order to understand the real-life context, whilst allowing the researcher to become self-reflexive (ibid.) (see 5.8.4 for reflexivity).

Caution has been applied when following this approach, acknowledging Denscombe's (2011) warning that criticism is often applied to the credibility of generalisations. I acknowledge how this study cannot be generalisable as it is a small-scale research project, however, Bassey's (2001) 'fuzzy generalisations' offer scope to enhance the aspect of generalisability. Acknowledging the concept of a fuzzy generalisation – that in the words of Bassey (2001: 5) "x in y circumstances may result in z", the repetition of the research methods across four different early years settings offers the opportunity to make these fuzzy generalisations. I accepted that, for example, by conducting five days of observations in each setting that studied the use of touchscreens with young children, I may be able to begin to understand what children's touchscreen technology experiences may entail. Bassey suggested this occurs through making a 'best estimate of trustworthiness' (BET), which he considers to be a professional judgement based on the evidence supplied. This considers the value of the generalisations to the person to whom it may be most useful. Further criticism of the case study approach takes the form of lack of rigour, since it could be argued research of this form produces 'soft data' (Denscombe, 2011). However, this has been reduced as four methods (online survey, interviews, observations and focus-group interviews) have been utilised to collect data and have been triangulated with literature to add rigour.

Supporting the decision to adopt the case study approach, other early years studies have used case studies (for example Marsh *et al*., 2015a; McPake *et al*., 2013). Within these early years case studies, multiple methods were employed by the researchers, including interviews and observations of children's digital activities within a familiar environment. The use of case studies and methods within other relevant studies supported the justification for selection.

5.5 Participants and sampling strategy

For the purpose of the study three sampling strategies were utilised. Participants were initially selected through a stratified sampling strategy (Opie, 2004). This strategy focuses on dividing the population into groups, such as female and male, and randomly selecting the participants from those groups (ibid.). This strategy allowed a representative sample to be identified from an online survey. An event sampling strategy was also implemented, a strategy often used to mark a tally or note each time an event occurs (Cohen *et al.*, 2007). In this instance, each time a child used a touchscreen device, observations begun. An opportunistic sampling strategy was also implemented to select interview participants. This strategy was utilised as it allowed the opportunity to interview participants based on their attendance in the setting on the day of interview (Cohen *et al.*, 2007). All participants involved in the research had provided their consent prior to the selection of participants in all forms of data collection.

5.5.1 Online survey

The aim of conducting an initial survey was to gather broad data and descriptive statistics on the type of settings that were using touchscreen technology, to explore the pedagogical purposes for introducing touchscreen technologies and to identify any barriers on introducing the technology. A further aim of the survey was to identify participants for the second stage of the research. A range of criteria was identified to select participants: the participant must use touchscreen technologies with children; the setting must be located within the West Midlands region of England; and the participants must have provided contact details for further communication. Although there were three criteria to identify the sample, I was conscious that the sampling strategy should be simple and straightforward, and that too many criteria would complicate sampling (Cohen *et al.*, 2007). Through a stratified sampling technique, a representative sample was generated based on the number of respondents of the survey

(Creswell, 2008). Four early years settings were identified: Child Minder, Day Nursery, Children's Centre Nursery and a Pre-School.

5.5.2 Observations of young children

An event sampling strategy was implemented when carrying out observations of children (Cohen *et al*., 2007), since observations were recorded as and when children engaged in touchscreen activity. This allowed all children the opportunity to be included within the study, as an initial aim was to generate an overview of average touchscreen use in the setting. I chose not to focus on children as 'case studies', however preferred opportunistic sampling to add to the naturalness of the observation technique. This strategy was discussed and approved by early years practitioners in each of the case sites, as it was agreed that a wider representation of general touchscreen use could be recorded by focusing on the touchscreen rather than on specific children.

5.5.3 Interviews with practitioners

When selecting participants for interviews, it was essential that the key stakeholder for the setting was interviewed, such as a nursery manager or deputy manager. It was most likely that this person had completed the online survey, so it was important to expand upon the survey data through interview. Other participants were selected according to their knowledge of the children, such as the room leader and other early years practitioners who worked directly with the children. A specific sampling strategy was not utilised here, rather the participants were selected for certain reasons, such as their knowledge of children's daily activities.

5.5.4 Focus-group interviews with children

The children were selected through an opportunistic sampling strategy (Cohen *et al*., 2007) with assistance from practitioners, who informed me of children who used touchscreen technologies in the setting. The actual selection of children was achieved based on children's

attendance on the day of the focus-group interview, and those who had obtained consensual agreement from parents and carers. Supporting the selection of children, I was aware that children should be selected with the support of practitioners in friendship groups, as this generates a safe peer environment when children are with others who they know (Greene and Hogan, 2005; Mauthner, 1997). Mayall (2000) suggests that having a friend present can be a supportive method to increase participation within group discussions, as it may assist children who are shy or less confident to contribute.

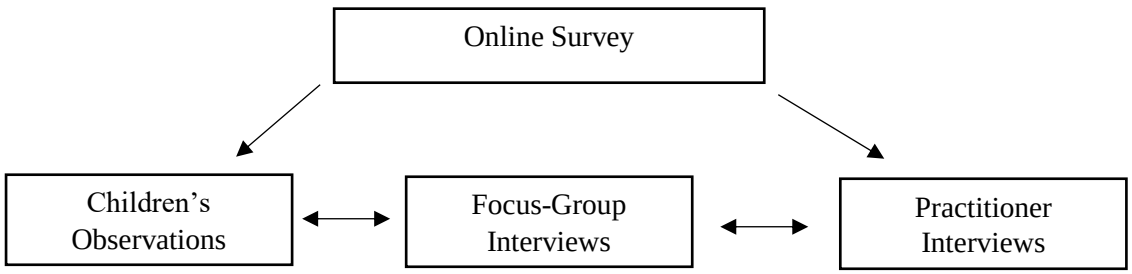
5.6 Data collection methods

Denscombe (2011: 139) advised that researchers address their questions from a range of methods, as exemplified by the following comment:

> … [Researchers should be] prepared to use methods that come from different philosophical traditions, provided their use produces findings that are of practical value for addressing the research problem.

As such, four methods were selected in order to answer the research questions and the justification for each method is presented below. The data collection methods were designed to influence others to support triangulation. The ways in which the methods interact are displayed in figure 7.

Figure 7. Data collection methods and how they interact



5.6.1 Online survey

An online survey was designed for the initial stage of the research (see appendix i) in order to generate an understanding of typical touchscreen use across the West Midlands. The use of a survey was important, since surveys can accumulate data from a range of subject specific questions (Denscombe, 2003). By doing this, an understanding of touchscreen use was formulated, which helped develop a basis to elaborate in the second stage of the study. Through the use of the survey, a second aim was to identify settings to participate in the study, and as such, four early years settings were selected.

Online surveys are beneficial for a prompt turnaround in responses (Teddlie and Tashakkori, 2009). In appreciation of the significant workload of busy practitioners, the survey was designed to take no longer than five minutes to complete. This was partly achieved through the use of tick-box style questions. The survey sought to explore children's typical touchscreen use, so closed questions were designed to gain specific answers. Upon making this decision, I considered Burke Johnson's (1997) caution that closed-style questions may reflect researcher bias, so the questions were trialled with two early years practitioners and were rewritten in order to eliminate the risk of bias. The wording of the questions was also reviewed through a piloting stage with seven other early years practitioners.

Open-ended questions were included in the survey to elaborate on the closed-style questions. These questions were utilised when seeking information on the different technologies that were used in each setting. They also allowed where appropriate, for respondents to explain why they did not use touchscreens in their setting. Open-ended questions were less frequent than closed questions, and this was partly chosen as Opie (2004) warns that these style questions are more challenging to analyse. As this survey was designed to provide an overview, elaborate questions were considered unnecessary, as the opportunity to expand and develop understanding on the closed questions was provided in the second stage of the research.

The survey was piloted with seven participants who worked in the early years, to test whether the wording of the questions was appropriate to the target audience (Cohen *et al*., 2007). In order to achieve a high response rate, a range of other factors were piloted: question responses, robustness, usability of the survey programme, identifying any omitted questions and layout of the survey. Oppenheim (1992) explains how essential piloting is, since a survey is not created as complete; revising is required to develop maturity. Chenail (2011) explains piloting is particularly beneficial in understanding if the data collection method will achieve the researcher's aims or whether the research has the potential to fail, and provides an opportunity to redesign or develop data collection methods. As a result of piloting the survey, changes were made including adding a legend so that based on a question response, the participant was redirected to the end of the survey (see appendix ii). A period of one week was allocated to revise the survey, which provided sufficient time to make necessary changes (Cohen *et al*., 2011). The revised version was then approved by my supervisory team before being launched to the wider community.

5.6.2 Interviews with practitioners

The data retrieved from the online survey was expanded upon through interviews with early years practitioners within the four case sites. Interviews were identified as a valuable method in gaining personal opinions as they provided the opportunity to develop my understanding on 'realities' through personal accounts of touchscreen use in each setting. Interviews provided an exploration of practitioner beliefs and opinions on children's access to technology, and this information was triangulated with the other research methods. Interviews also provided the opportunity to further examine survey responses, through asking more in-depth questions which acknowledged feelings and attitudes (Opie, 2004).

Upon designing the interview structure (see appendix iii), a semi-structured style design was considered most appropriate, since it allowed the opportunity to probe for further answers and

to ask additional questions (Opie, 2004; Teddlie and Tashakkori, 2009). When conducted in this way, the interviews offered the opportunity to respond to participants' responses, through being flexible and developing ideas further (Roberts-Holmes, 2014). This style of questioning was selected as an appropriate method, since I sought for practitioners to acknowledge their feelings and I aimed to understand their viewpoints on young children using technology, as it was unknown whether the opportunity for reflection had ever been offered (Teddlie and Tashakkori, 2009).

Being flexible was a skill I developed whilst continuing to fulfil the aims of the interview (Ritchie *et al*., 2014). Other methods such as structured or unstructured interviews were not favoured as I was aware that the interview aims might not be met; I had an agenda which I sought to explore. The need for flexibility was recognised, so structured interviews were not employed. Through unstructured interviews, there was a risk that specific areas might not be approached. In addition, I sought to explore practitioners' opinions of touchscreen use with all twelve participants, however it was unknown whether each participant would approach the topic, hence why the unstructured method was not selected.

The interview schedule consisted of fifteen questions for practitioners, and ten questions for managers of early years settings, so I estimated the interviews may take approximately thirty to forty-five minutes. As these were semi-structured interviews, I was mindful that this approximation may not be accurate, however as there were no time restrictions, the interviews continued based on each participant's willingness to contribute. The semi-structured nature of the interviews allowed the opportunity to discuss the interview questions and digress to other areas that were not on the agenda (Gray, 2014). The schedule provided the opportunity to meet the interview aims and achieve the desired outcome (Patton, 2002), which was to explore practitioner's touchscreen opinions and the pedagogical strategies they adopted when using touchscreens with children.

Audio recording was utilised for interviews to accurately capture the views expressed. Interviews were transcribed verbatim, and transcripts were shared with each participant to ensure their views were accurately represented. Oliver *et al*., (2005: 1) recognise the "pivotal aspect" transcription has in qualitative inquiry since the way in which audio recordings are transcribed can inform us about the participants and the information they choose to share. Whilst transcribing can be time consuming (Denscombe, 2011), it was important to do so in order to analyse the data. The transcription of data was more effective to analyse rather than the audio recording. Participants were given the opportunity to add to their transcript throughout the data collection stage.

The interview schedule was piloted with an early years practitioner in order to decipher the appropriateness of the questions asked, alongside the type of data the interview might retrieve (Opie, 2004). The interview schedule was also piloted to test the approximate length of time of the interviews and the topics raised. As this was a semi-structured interview, I was aware that other matters may arise, and as such the interview schedule identified questions I had omitted which were of importance (see appendix iv).

5.6.3 Focus-group interviews with children

Including the children's voice was an important aspect of this research; Alderson (2008: 287) explains children are "the primary source of knowledge about their own views and experiences". Considered as active participants in the study, the children's accounts of their touchscreen experiences assisted the analysis of data, which was triangulated against practitioner perspectives and observed uses of touchscreens. Children's realities were explored here, through communicating with them in focus-group interviews of no greater than four children. Focus-groups are a group interview, where discussion occurs between the participants rather from an interviewer asking the participants questions. Cohen *et al*., (2007) assert focus-group interviews are less intimidating to children than one-to-one interviews, so the importance

of selecting children within their friendship groups was important to ensure the children were comfortable in their surroundings. This approach was favoured over a one-to-one interview with children, as I intended for the children to feel at ease and willing to participate. The ways in which children used technology and their preferred ways of doing so were investigated. To assist in this, a framework was developed of questions and prompts for the children, which, like interviews with practitioners, were of a semi-structured nature (Teddlie and Tashakkori, 2009) (see appendix v).

I acknowledged when generating the structure of the focus-group interview, that there should be an element of organisation to foster high quality discussion (Greene and Hogan, 2005). It is acknowledged that children can become disinterested or uncomfortable with the other participants if appropriate steps are not followed when organising a focus-group interview (ibid.). As such, I appreciated the age of the children who were participating, and therefore limited the time of the interview to ten minutes, with the opportunity to continue based on children's verbal and non-verbal behaviours. This time limit was supported by Vaughn *et al.'s* (1996) suggestion that interviews with young children should be within forty-five minutes.

The focus-group interviews allowed for a discussion with the participants about their experiences (Greene and Hogan, 2005), which supported my understanding of the ways in which children could access and use touchscreen technology. The focus-group interviews also allowed the opportunity for discussion amongst participants, which promoted a conversational-style 'interview', taking the focus off the 'interviewer' asking the 'interviewee' questions. In this way, the participants were acknowledged as the experts, since their experiences were under study (Levine and Zimmerman, 1996). In relation to the power associations of the 'interviewer' and 'interviewee', the role of the adult within focus-group interviews is to be a facilitator, and this was a role I developed over time (Stewart *et al*., 2007). It is from this that a child may be

more inclined to participate in a focus-group discussion, since there is less pressure to contribute as the aim is to share experiences with others (Kitzinger, 1995).

Also of importance was the environment in which the focus-group interview took place, and further guidance from Greene and Hogan (2005) was followed: that the location must be selected before the interview, and that the environment must be one that is familiar to the children. To assist children in feeling at ease with their environment, they were invited to bring a transitional object with them. Children also chose a 'special cushion' which they would sit on. In addition, the touchscreen technology that children used in each setting was included to assist the interview discussion. In one setting where children used two forms of touchscreen technology, the children were able to take with them portable tablets rather than an interactive whiteboard (IW), as the children were observed to use tablets more frequently than the IW as a child-initiated activity.

Before the focus-group interviews were conducted, I was introduced to the children and I explained to them the purpose of the focus-group interview and asked for their permission to involve them within the study. Where possible, if children were identified prior to the interview, an effort was made to familiarise the children with me through speaking to the children, welcoming them, and engaging in their daily activities. I also observed the children using touchscreens in each setting.

I was aware of the challenges that focus-group interviews pose, particularly when a group of people are speaking at the same time (Denscombe, 2011). Upon transcribing the interview, it can be more challenging to effectively identify each participant's responses, particularly if there are participants who are more dominant than others (Teddlie and Tashakkori, 2009). Dominant participants, whilst they seek to have their views represented, outshine the views of others. Taking this into consideration, the choice of children in their friendship groups was

reflected upon by myself and the practitioners, in order to ensure the children were confident to participate in the interview.

The focus-group interview was piloted with two children in an early years setting with a practitioner present at the time. Since the focus-group interview followed the guidelines of a discussion, I had entered the interview with a set of questions which I used to encourage conversation. Krueger and Casey (2009) advise how twelve questions is appropriate for a focus-group, however as I was interviewing young children, the questions were halved to six. These questions were tested to uncover any ambiguity, and to ensure that they were written in a way which was appropriate for the age of the children. The questions were revised following Gray's (2014) advice on question structuring, to offer opportunities for discussion rather than retrieving basic response answers (see appendix vi).

5.6.4 Observations of young children

Observations were undertaken in order to identify the ways in which children and practitioners used touchscreen devices and the observed affordances which arose from the experiences. As a result of these observations I was able to develop an understanding of children's touchscreen play first-hand, rather than developing a second-hand account based on the survey and interview data. Observations also allowed greater understanding and contextualising of the focus-group interview data.

The observations were conducted using an event/incidence sampling method (Cohen *et al.*, 2007), where observations were taken systematically using a pre-designed proforma, which accounted for each time a child used a touchscreen device (Palaiologou, 2012) (see appendix vii). Quantitative data was collected through the proforma, including the type of touchscreen used, apps used, the age of the child and others present. Qualitative data was recorded in the form of field notes, which expanded on the codes entered on the proforma. Observing in this

structured way is considered somewhat subjective (Bell, 2005), however the criteria for children's observations were specific in order to focus on the agenda. The proforma assisted the data recording of all touchscreen events that occurred each day.

Bell (2005) and Foster (1996) warn of the need to focus the observation strategy before conducting observations. They recommend identifying the focus in order to gather most accurate data. Whilst the observations in this study focussed on children's experiences, both conversations and actions were recorded, in order to generate a full account of touchscreen usage in each setting. The observation schedule was piloted over a period of two days in a Child Minder setting to test the self-devised proforma. As I had designed the proforma, I was unsure of the suitability of the layout and the range of information that could be gathered. As a result of piloting, changes were made to include more information on the proforma, as copious field notes were taken to add detail and explanation. The 'day in the life' method was also piloted, and it identified that the proforma needed modifying in order to capture a detailed account of a typical day (see appendix viii), particularly as the proforma did not account for the wider context in which touchscreen activity was taking place.

The 'day in the life' method was selected to collect observational data, as it allowed a generation of all events in a day to be recorded. This method has previously been utilised in other early years studies (for example Gillen *et al.*, 2007) and was therefore used as a guide to support data collection within this study. The 'day in a life' method seeks to create an account of an average day, so therefore each time a touchscreen was used within each setting, observations were recorded. This allowed me to identify the range of experiences that were offered to children. Following the example from Gillen *et al*., (2007), notes were recorded during observations to indicate key changes, including; when a child changed game, when others entered the area, and conversations with children and adults. The observations were conducted over five days to add robustness to the method. As a result, an account was generated

of touchscreen use in four different settings on the ways in which touchscreens were used with young children.

The use of observations was selected as they allowed for the recording of social encounters in early years settings (Cohen *et al*., 2011). In order to reduce the risk of my presence affecting the data, I considered myself to be a non-interventionist (Stake, 1995), so that there was a lesser risk of the observer effect on the participants (Denscombe, 2011). I allowed two days of familiarisation prior to data collection to allow, somewhat superficially, my 'blending in' to the background. I must stress, the act of being blended in to the background is something which can never fully be achieved. The two days of familiarisation was an attempt to draw the focus from myself as a researcher and begin to settle into the environment where my presence was not of focal attention. It was of importance to introduce myself to all within each setting so that they were aware of why I was present, and also to stress the importance of my non-participation of their daily activities, as my role was to be an observer where interaction was not desired. Non-participant observations minimised the risk of intrusion on learning (Greig and Taylor, 1999), however I was mindful of the ethicalness of the observations being conducted in this way. Steps were taken to ensure all children participating in the research gave informed consent, which are discussed later in this chapter (see 5.10.1).

5.7 Data analysis

Using thematic analysis, the data was analysed to identify patterns or themes which arose from the data (Braun and Clarke, 2006). Thematic analysis was chosen as a suitable analytical method in order to code the data using specific data sets - interviews, observations, surveys, and focus-group interviews - to determine the common themes which arose from children and practitioners. It was my intention through coding to allow reality to be reflected through the codes generated, a method well situated within the social constructionist framework (Braun

and Clarke, 2006). To employ thematic analysis, NVivo 11 software was utilised to code both qualitative and quantitative data. Through a process of generating nodes from common topics which arose in the four data collection methods, NVivo enabled the identification of how frequently topics arose. Nodes were collated to identify common themes, through a process of organising the data and refining the number of nodes (Gibbs, 2002; Miles *et al*., 1994). Coding in this way was an essential aspect of data analysis since the process organises the data into manageable sections in which to analyse further (Basit, 2003).

Patton (2002) suggests analysing data is challenging since it involves "reducing the volume of raw information, sifting trivia from significance, identifying significant patterns, and constructing a framework for communicating the essence of what the data reveal" (p. 432). NVivo was selected as an appropriate computational software since it enabled the coding of data into relevant themes, identifying patterns in the data across the four different case sites (Berg, 2001; Gibbs, 2002). The data was analysed with a brief framework of what I predicted may arise from the literature, and as a result, 14 initial codes were created. After a process of refinement and generating sub-themes, the codes were reduced to eight (Aronson, 1995). These were separated where relevant in order to accurately convey touchscreen practice as described by practitioners, and through observations and focus-group interviews with the children.

However, NVivo had its limitations and therefore analysis continued away from the software in order to accurately understand and categorise the codes into themes. There were overlaps between codes and this created confusion when unpicking what each code meant. Also, since I intended to compare the four different types of data collected across the four sites, it was unclear how I could do so using the software with the guidance provided. An exploration into the quantitative and qualitative data is given below.

5.7.1 Quantitative

Quantitative data was collected through an initial online survey to display frequencies of children's use of touchscreen technologies. This provided statistical data from which to expand upon through qualitative methods. The quantitative survey data was generated through closed questions, for example, the touchscreen device used, the range of time children had access to touchscreen technologies, and the uses of touchscreens in early years settings. Additional quantitative data was accumulated from observations, which generated a small data set of descriptive statistics related to typologies of technology and social relationships with adults and peers during touchscreen play. These data sets provided an overview to touchscreen use, which was then developed through qualitative data methods in order to portray the reality of touchscreen activity in early years settings.

5.7.2 Qualitative

Qualitative data was collected through an online survey, interviews with practitioners, observations of young children and through focus-group interviews. This data was collected to interpret meaning behind actions and to expand upon the quantitative data collected. The online survey generated qualitative data through identifying reasoning behind non-touchscreen use. This allowed for greater understanding when considering why some early years settings sought not to use touchscreen devices. This information was purely informative and has therefore enabled the possibility of portraying reality in more detail. Further qualitative data were accumulated through observations of children's touchscreen use, which also noted conversations between child-child, and child-adult. Descriptions of children's touchscreen use was accounted for, including any interactions between children. Observational data also outlined the ways in which children played on the touchscreen devices.

Interviews with practitioners generated qualitative data through explanations behind their choices in terms of general touchscreen access and children's access to apps or programmes. An insight into personally held opinions was also generated through seeking practitioner perspectives on children using the devices when in pre-school settings. Finally, qualitative data was accumulated through focus-group interviews with children since their experiences were under study. This method allowed for an understanding of what children liked about using touchscreens and offered an extra level in which to examine practice.

5.7.3 Activity theory

Activity theory was utilised as an analytical tool within this study to explore in depth the interactions which surrounded touchscreens within early years settings. The decision to use activity theory was influenced by the use of the model within other studies which focus on technology in educational environments. These include Zevenbergen and Lerman's (2007) study on pedagogical approaches implemented when middle-school class teachers used interactive whiteboards during maths lessons, and Ladel and Kortenkamp's (2013) study on the use of multi-touch devices in supporting mathematical learning. Considering this study has social constructionist and social constructivist stances, Engeström's (1999a) third-generation activity theory model provided a useful tool in which to explore interactions and the influence of the community upon activity. Kaptelinin and Nardi (1997) explain "the basic principles of activity theory include the hierarchical structure of activity, object-orientedness, internalisation/externalisation, tool mediation, and development" (p. 158). This study recognises that children's touchscreen activity is impacted on or mediated by the affordances of the devices, by early years practitioners' preferences for children's touchscreen activity, and by children's intentions when they engage in touchscreen play. Activity theory was a suitable tool to analyse children's technological play because it provided a means to explore how activity was constructed, what practitioners' intentions of touchscreens were, how children

grasped concepts and how peers within a social environment may support children's learning or enhance play experiences.

Whilst this study aimed to identify affordances of touchscreen technologies, one of the objectives within this study was to explore the social potential of touchscreens when used by young children. Engeström and Miettinen (1999) explain "activity theory [is] a strong candidate for such a unit of analysis in the concept of *object-oriented, collective,* and *culturally mediated human activity,* or *activity system*" (p. 9). The connectedness of the community and its impact on object-oriented action is a component within this theory which is relevant to the study, through the explorations of others' knowledge and experiences in supporting or assisting children in their goals when using technology. Hedegaard *et al*., (1999) suggest for a reconceptualisation of activity as a social process, which depends upon interaction and communication (p. 18). In line with Vygotsky's (1978) social learning theory, the interaction between children and their peers is an area of exploration within this study, to determine the potential of touchscreens to support a social learning environment.

Kuutti (1995) explains how activity theory is a useful tool to explore human actions, but it is not possible to focus on one person alone; humans interact with others and therefore activity becomes a social process. Additionally, Palincsar (2005) explains it is not possible to separate a human from the social contexts within activity; a person is a part of a social context whereby the others within that context are central to the activity. Other people have different levels of knowledge, experiences and skills, and those aspects contribute to the learning experience which arises as a result of the activity. It is here that collective activity is present, and through which object-oriented action takes place through the division of labour between peers as they play (Vygotsky, 1978).

Engeström (1999b) outlined three characteristics of activity theory. It is:

1. Contextual and oriented as understanding historically specific local practices, their objects, mediating artefacts, and social organisation;
2. Based on a dialectical theory of knowledge and thinking, focussed on the creative potential of human cognition; [and]
3. A developmental theory that seeks to explain and influence qualitative changes in human practices over time (p. 378).

Engeström (2001) suggested that people bring with them diverse histories in activity systems, since people have a wide range of individual experiences. For example, early years practitioners bring their own experiences, knowledge and beliefs about the use of technology with young children, and this subsequently contributes to the shaping of practice. As such, the activity is socially constructed by the experiences and histories of a group of people, of which included myself as a researcher and my knowledge prior to observing the activity. Expanding upon this, the hierarchical structure of activity becomes apparent, through the knowledge/expertise levels which differ between the people within the activity system. Engeström's (1999a) 'local practices' and subsequent 'social organisation' is divided into roles which are assigned through the division of labour, whereby participants within the activity assume various roles which contribute to the object-oriented action.

5.7.3.1 Practical application of activity theory

In order to apply activity theory and analyse the data through this lens, Engeström and Miettinen (1999) suggest viewing the data or activity from a bird's-eye view perspective, and by recognising that others may view the activity differently. Within this study, whilst it was children's touchscreen activity that was primarily of focus, it was also important to acknowledge that early years practitioners had a significant role in children's touchscreen activity, and therefore, it was essential to explore touchscreen use from both the child's and the adult's perspectives. This was particularly important since the touchscreen was constructed in

different ways by both sets of people, and therefore touchscreen intentions by both children and adults differed. Exploring both perspectives allowed for a greater understanding of the complexity which surrounds touchscreen activity, and how the outcome for both children and adults are different. As such, the data was analysed according to the data collection methods and is reported in this way in the following three data chapters to separate the practitioners' and children's voices.

Activity theory was also a relevant tool for analysis particularly because of the contradiction element of the theory. Leont'ev (1978) and Engeström (1999a) explained how contradictions are internal tensions which are driving forces of change. Contradictions are historically accumulating and require adaptation to an activity for change to occur. In Chapter 3, I provided an example of a contradiction of new technologies within early years settings, but this study seeks to explore the contradictions of every-day practices, acknowledging the differences in touchscreen intention by different members of early years settings. Through the reflection of touchscreen practice within practitioner interviews, it may be possible to determine the contradictions which arise between touchscreen intention and touchscreen activity, which may call for a greater awareness of how children utilise touchscreens within play.

Aside from the contradictions, exploring activity theory through both the practitioner and child account allows for an in-depth understanding of the nature of interactions surrounding the touchscreen. Separate activity systems have been created to depict touchscreen activity from the perspective of the adults, based upon survey and interview data which show how practitioners intend for the touchscreens to be used within their settings. Additional activity systems have been created to reflect the reality of touchscreen activity through observing children's touchscreen play, and through focus-group interviews with children to determine their intentions of using the devices. Separating these two stances enabled me to firstly, identify contradictions between practice and intentions, and secondly, provide an additional means in

which to begin to explain and understand the approaches taken by both adults and children in the ways that the technology is used.

5.7.4 Ecological systems theory

Bronfenbrenner's ecological systems theory was incorporated with Engeström's activity theory as an analysis tool, as a way to reflect the wider influences which impact on touchscreen play. Within Bronfenbrenner's (1976) eighth proposition, he states,

> …the design of an ecological experiment must take into account the existence in setting of systems that include three or more elements and hence permit the indirect influence of any one of these on the direct relations taking place between others, operating as a subsystem. (p. 40-41)

Bronfenbrenner's assertion through this proposition that there are multiple factors within different systems which potentially impact on child development provides scope to consider the effects of wider influences such as policy or governmental guidelines which impact on the nature of touchscreen activity. As referred to throughout previous chapters, recognising the home environment as a proximal context whereby children spend most of their early years, and indeed, often encounter their first technologies, is important to acknowledge that a child's previous experiences within different environments may contribute to children's touchscreen experiences in early years settings.

Bronfenbrenner's ecological systems model allows for a greater *visual* representation of external influences across different systems which contribute to the shaping of touchscreen play, in a way in which activity theory does not allow. The activity theory model discussed in the previous section allows for a direct insight into activity as influenced by social relations and connections, yet Bronfenbrenner's model portrays in a clearer fashion the wider influences

at different levels, acknowledging that these influences either involve or do not involve the child directly, yet still contribute to practice. This is illuminated within the following quote:

> [It is important to recognise] the distal mechanisms through which features of the environment beyond the immediate setting can influence the power and direction of the proximal processes that affect development directly (Bronfenbrenner, 1988: 38).

The decision to incorporate this theory as an analytical tool within this study was enhanced by the significant number of studies who refer to this model when considering children's learning. In particular, technology-based studies use this model, such as Johnson (2010), who devised a technological sub-system as a way to outline the influence of technology on development, and Wang *et al*., (2010) who reconceptualised Bronfenbrenner's theory by portraying how children's technological lives travel through or are present within different systems, often facilitated by virtual worlds. Wang *et al*., (2010) concluded that technology allows children to connect with the wider community, through internet searches, email, video-call sites and more, and as such the ecology of children's learning is extended through technology itself and its potential affordances.

5.7.5 Technology-based play scale

I have created a unique technology-based play scale for the purpose of analysing children's interactions with touchscreen technologies within this study. The scale is an adaptation of Parten's categories of Social Participation Play (1932) and reflects current practice of the ways that children interact with technology. The need for a new scale of this kind arose from the observed interactions of children using touchscreen devices in early years settings, which highlighted that standardised play scales were not wholly relatable in this instance. Other social play scales such as Rubin's Play Observation Scale (2001), Broadhead's (2003) Social Play

Continuum, and Howes and Matheson's Peer Play Scale (1992) were also scrutinised and trialled but proved unsatisfactory tools due to the categories of play and inaccurate wording within the categories.

Subsequently, I searched for additional play scales which incorporated the use of touchscreen technology, such as Arnott's (2016b) Digital Play System framework and Social Status Roles (Arnott, 2013), Marsh *et al*.'s (2016) adapted version of Hughes' (2002) taxonomy of play, and Bird and Edwards's (2015) Digital Play Framework. Arnott's (2013) Social Status Roles provided scope to consider the type of roles children might assume as they play, and these influenced some of the play categories generated. This included the 'Interacting Member' role, which correlates with the supportive solitary play code created within the scale.

However, there were discrepancies in the types of play which I observed and those which were represented within these scales. Whilst no scale that I reviewed fully resonated with touchscreen play that I observed, I devised my own scale which was mostly influenced by Parten's (1932) play categories and was rigorously tested against 160 observations gathered within four different sites whom implemented different touchscreen practice. In essence, a selective approach was implemented whereby I selected the most appropriate play codes from various scales (Parten, 1932 for example) and adapted the wording of these to reflect technological play. Further codes were included, such as Adult-Led Play, to reflect other types of play observed within the four settings. This approach allowed me to synthesise the codes from various existing scales in a unique scale to reflect touchscreen play as observed in the four settings. Whilst I was aware that this scale may not be a representation of all touchscreen practice, it was developed as a way to portray the nature of touchscreen activity as observed within this study. This play scale is also a useful tool when considering the use of the scale as an observation method when tracking touchscreen or technological play, and when used to assess children's learning and the nature of their interactions when playing with these devices.

The nine categories are organised into Solitary Play categories: Solitary Play, Aware Solitary Play, Communicative Solitary Play, Supported Solitary Play, and Shared Play categories: Parallel Play, Parallel Aware Play, Group Play, and Adult-Led Play. Unoccupied Behaviour is coded separately.

The following tabl lists the devised categories which relate to technology-based play.

Table 1. Technology-based play observation scale

	Type of play	**Description**
Solitary play	Solitary play (SP)	Children are focussed on only their activity. They use touchscreen devices without looking up or engaging eye contact with others.
	Aware Solitary Play (ASP)	Children play alone on touchscreens but are aware of others around them. They may look up from the screen but do not engage in verbal communication.
	Communicative Solitary Play (CSP)	The child plays independently. Children may talk to another person nearby and show them what they are doing.
	Supported Solitary Play (SSP)	A child will use a touchscreen but may receive support from their peers or an adult. This may be in the form of a 1:1 activity, but is not an organised activity.
Shared play	Parallel Play (PP)	Two or more children use the same or individual touchscreen devices. If they use the same device, they do so independently and do not communicate with each other. Children using individual devices sit within 3 feet of each other but do not communicate.
	Parallel Aware Play (PAP)	As with parallel play but children may communicate with each other.
	Group Play (GP)	Children agree to play together when using the touchscreens. They may verbalise turn-taking and they play co-operatively.
	Adult-Led Play (ALP)	Children use touchscreens as part of an activity or session organised by an adult. This may involve children taking turns to touch the screen. There is an aim and an outcome to the activity.

	Unoccupied Behaviour (UB)	The child appears unfocussed on the screen and does not attempt to engage with apps. The child may become distracted by noise in the playroom and responds to the noise rather than play on the device.

5.7.5.1 Practical application of the play scale

Solitary Play (SP) is coded when a child is observed to be focussed only on their technology device. The child does not attempt to communicate with others either through verbal or non-verbal contact. The coding of SP ends when a child becomes distracted or looks up from the technology device. This may be when the child has finished playing, or when another person draws the child's attention through speech or their actions.

Aware Solitary Play (ASP) is coded when a child plays alone on the touchscreen device, however is aware of others around him/her. The child may look at their peers playing but does not attempt to make verbal contact. ASP is no longer coded when the observed child engages in other forms of play.

CSP is coded when a child is observed to communicate with others whilst using a touchscreen device. The child may verbalise their actions on-screen, or may seek the attention of others, such as peers or adults. For example, a child may turn their touchscreen device to show their peers what they are playing on, or share their success having completed a game.

The final category within the Solitary Play group is Supported Solitary Play (SSP). SSP is coded when a child uses a touchscreen device on his/her own, however receives support from others such as peers or adults whilst playing. The child may request support, or it may be given without being prompted. SSP is only coded when the child is playing independently; at any point where the touchscreen device appears to be shared, coding is ended.

Within the Shared Play group, children may be observed engaged in Parallel Play (PP). PP is coded when two or more children are observed to use separate or the same touchscreen devices, however do not attempt to engage in shared play. The children do not communicate with each other. To code PP, children must be within 3 feet of each other. When the same touchscreen is used, such as a large screen, children play for their own achievements independently.

Parallel Aware Play (PAP) is also coded under the Shared Play group. PAP is similar to PP, however in PAP, children are aware of others around them and may communicate with each other. For example, children may communicate verbally or non-verbally, however they do not attempt to play with each other. Where children play using their own touchscreens, children do not attempt to touch the screen of another child's device.

When children are observed to interact with each other, children may be coded as engaged in Group Play (GP). GP involves two or more children playing together. During GP, children may verbalise with each other that they are playing together, or acknowledge shared play through non-verbal actions such as a smile, or moving the touchscreen device. Children take turns whilst playing, and work towards a shared goal rather than an individual one. Children play co-operatively when sharing a touchscreen device.

The final code within the Shared Play group is Adult-Led Play (ALP). ALP is coded when an adult is observed leading an activity whereby touchscreen devices are used. The touchscreen device may be the focus of the activity, or it may support an activity. There is a clear outcome to the activity, and the use of the touchscreen device is clear. Children may be observed to take turns when using the touchscreen device, or the adult may use the touchscreen to support learning. ALP is also coded when an adult selects an app or programme which children are able to use independently. The adult therefore has identified an outcome through selecting an app or programme with the intention of following an agenda. For example, the adult may select

a ‘letters’ game with the intention of encouraging children to enhance their recognition of letters in order to spell their name.

Unoccupied Behaviour (UB) is coded when children appear to not focus on the touchscreen device. They may gaze away from the screen or appear to have an unfocussed appearance when looking at the screen, not moving their eyes or body. Children may also become distracted by noise within the playroom and choose to follow the noise rather than play on the device.

5.8 Role of the researcher

5.8.1 Interviews

Within interviews, I sought to gain an understanding of the topic under study, so it was essential that my role was to recognise the participant as the most knowledgeable person, since I intended to explore touchscreen use from practitioners’ perspectives. I acknowledged the sensitivities required; for some, children’s use of touchscreen technology was an issue for practitioners, since practitioner confidence was low when using the technology. For others, practitioners identified their competence and reported enthusiasm for technology with children. I sought here to be the less knowledgeable person, so that I could develop my understanding through each participants’ personal accounts.

There were certain skills in doing this: the tone of voice, body language and the way in which I articulated words all had the potential to influence the interview. Gray (2014: 392) outlines qualities to interviewing: “remain[ing] objective, professional and detached yet relaxed and friendly”. These skills that I developed whilst interviewing were adapted depending upon the setting and the person I interviewed (Oppenheim, 1992). For example, the way in which a participant dressed (in a suit) influenced my decision to ensure I articulated properly, remained professional and portrayed positive body language. When interviewing a familiar person, my use of language was more relaxed; whilst still maintaining a professional stance, I was more

relaxed and comfortable with the interview process. It must be acknowledged that in this instance, the practitioner identified their nervousness regarding the interview procedure, so quite possibly my change in interview techniques reflected the need to ensure the participant was comfortable and felt willing to participate. The use of body language here also reflected my desire to give feedback whilst the respondent was speaking, for example through smiling or nodding my head (Gray, 2014).

5.8.2 Observations

I have previously identified how my role within observations was to become a non-participant observer (Cohen *et al*., 2007). Through this method, I sought to establish a distance from the observed, to minimise the impact of my role on the children and practitioners (Gray, 2014; Watkins and Gioia, 2015). Stake (1995) recognises the need for a quiet entry, in order to allow for somewhat 'naturalistic' observations to be conducted. I sought to reduce the observer effect through spending time in each setting to familiarise myself with the setting and so that the children and practitioners became familiar with my presence. This period of familiarisation also allowed me to understand what I might observe, so I undertook my role as a non-participant from the offset.

5.8.3 Focus-group interviews

For the purpose of the focus-group interviews, I took on the role of facilitator. Cohen *et al*., (2007) identify the need to chair the interview, so that conversation does not steer off topic, and to be mindful of the directedness of the questions/discussion topics. Denscombe (2011) identifies this role as the moderator, whereby the role is to introduce stimulus, in the form of topics for discussion, images, or in this study, technology. Creating a comfortable atmosphere was also of importance to ensure the participants were at ease. Earlier discussions have outlined the steps taken to ensure this occurred. My role of facilitator also included audio recording the

interview, and children were included in this to add some control on their behalf, through allowing them to make short recordings, stop and playback, listening to themselves speak.

5.8.4 Reflexivity

Reflexivity is the action of "thoughtful, self-aware analysis of the intersubjective dynamics between researcher and the researched" (Finlay and Gough, 2003: ix). Reflexivity allows the researcher the opportunity to reflect on and address the ways that decisions, presumptions and behaviour impact on the research being conducted. It also offers a chance for self-reflection and critique to ensure the validity of the research. Banister *et al*., (1994) consider reflexivity to be a "defining feature of qualitative research" (Finlay and Gough, 2003: 5), since it provides an output whereby researchers can reflect on their role within the research process, and consider the effect that they may have on data collection. For example, Hertz (1997) suggests researchers are objective in that they select which questions to ask and which questions not to ask during interviews, and there is a risk that personally held conceptions within the research agenda may influence the credibility of the study.

Bonner (2001) suggests that to not be reflexive within qualitative research can threaten the research integrity, since the researcher is a central figure who maintains the role of designing the research agenda and tools, who selects certain data and interprets it. It is the subjective nature of the qualitative researcher whose previous knowledge and experience within the field of study that needs to be acknowledged. Maso (2003) explains subjectivity is inevitable in research, and Denscombe (2007) succinctly explains:

> …reflexivity suggests that there is no prospect of the social researcher achieving an entirely objective position from which to study the social world. This is because the concepts the researcher uses to make sense of the world are also a part of that social world (p.333).

Reflexivity was adopted in this study because of the nature of the research; I was studying the reality of touchscreen use, and therefore my own opinions and beliefs of touchscreen use with pre-school-aged children threatened to affect the objectivity of the research (Denscombe, 2007). It was important to make the position of the researcher known, hence my connection and interest to the study identified in Chapter 1 (section 1.4). Wilkinson (1988) identifies three forms of reflexivity: personal, functional and disciplinary. Personal reflexivity which depicts my connection to the study is addressed in the Introduction (and in more detail in section 5.8.5). Functional reflexivity, that of identifying power and roles of the researcher is addressed in this section of the chapter. Disciplinary reflexivity, of maintaining a critical stance against theory or methods, was achieved through a reflexive diary.

The reflexive diary was a platform to reflect on the occasions where decisions were made about the design of the research methods to reduce bias and maintain the validity of the study (Coffey and Atkinson, 1996). Along with the pilot of the study, the use of the diary provided a platform to consider the effectiveness of the data collection methods. Banister *et al*., (1994) recommend using a reflexive diary from the onset of research, identifying methods to be used, methods not to be used and to reflect on the effectiveness of those methods. In addition, the diary should be used during the process of data analysis, reflecting on the way the data was collected and what choices were made. This is to create a reflexive account of the research process (Ballinger, 2003).

Lynch (2000) discusses how reflexivity can be used to enhance objectivity, and this was the primary purpose within this study. To reduce researcher bias, it was essential to separate my feelings and presumptions on the data collected, so recording entries after each day of data collection was a useful strategy. In order to conduct a rigorous study, I acknowledged my own feelings and opinions, and how they must be kept separate from the research to reduce the risk of bias (Tashakkori and Teddlie, 2010). Bryman (2012: 393) and Finlay (2002) identify

reflexivity as the reflection of "methods, values, biases, and decisions for the knowledge of the social world [that researchers] generate". As such, I recorded entries into a reflexive diary, where I was able to reflect on my feelings and subjectivities in relation to the study (Peshkin, 1988).

5.8.5 Positionality

Punch (2011) asserts that any research conducted begins with the researcher; "all researchers come to their project from some sort of 'position'" (p.45). He further explains how it is impossible to come to a project 'position-free'. Thus, in line with reflexivity, it is important to make the position of myself as a researcher known. As discussed in Chapter 1 (Section 1.4), I position myself as both an insider and outsider in this study. The extent to which I am an insider is that I am an Early Years Professional studying practice in an early years environment. As such, I am an "embodied agent" whereby my "identity shapes [my] work" (Hammersley, 2015: 148). However, at the time of conducting this study I am not a practising practitioner, so therefore there is an element of being an outsider present. This study was created based on my own interests whilst working in early years settings, yet I am distanced from this through being employed in a University with the role of being 'researcher' rather than 'practitioner'.

This changing of positions ultimately ends with the question, 'who am I today?', which Asselin (2003) warns could lead to confusion of the purpose of my role. Taking this into consideration, the act of being an insider in this study is limited to the qualifications and experience of being an early years practitioner, rather than researching my own practice. For the purpose of this study, I maintained a greater emphasis on being an outsider, whereby I was the lesser-experienced and less-knowledgeable person seeking to learn from the participants within the study. This 'positioning' of myself within the study as advised by Creswell and Poth (2018) enables the identification of the role I took when gathering data within the case sites. Cohen *et al*., (2018) describe my position as being 'detached as observer' on the outsider/insider

spectrum (p.311), yet I acknowledge that there may be occasions when gathering data within the case sites that I may be perceived as having a different role. For example, upon physical appearance to the children, I may be viewed as another member of staff due to my being an adult and having the physical appearance properties of being a practitioner. Later in this thesis I discuss how my role as non-participant observer was challenged due to the children seeking my help, and in these moments, there was a requirement to consider whether my role changed to 'observer as participant' (Cohen *et al*., 2018: 311) as children required adult input. However, maintaining my position as non-participant observer was considered priority, except on occasion where safeguarding issues arose.

5.9 Robustness, validity and trustworthiness

As within any study, issues such as robustness, validity and trustworthiness must be addressed. Within research, validity refers to "the degree to which findings can be generalised to other settings", and trustworthiness refers to the rigour within research, through triangulation of methods (Cohen *et al*., 2007: 100). Robustness refers to the extent to which the data collection tools have strength and are appropriate to achieve the desired aims. I sought to achieve robustness of the data collection tools through initially piloting the data collection methods, to ensure the methods were transparent and interview questions were written in accordance to the target audience. Validity was addressed through internal validity by seeking to understand relationships between different variables, as opposed to external validity, which seeks to understand the generalisability of the study beyond the research context (Bryman, 2012).

Trustworthiness was ensured in this study through achieving credibility. Glaser and Strauss (1967: 225) refer to credibility as being 'believable' as opposed to 'validity', as credibility refers to obtaining the truth within a study rather than, in Cohen *et al*.'s (2007) definition, of

findings being generalisable. Glaser and Strauss (1967) identified criteria to achieve credibility within research:

1. Sufficient detail and description must be provided so as to allow the reader to feel as though they are present within the study;
2. Sufficient evidence must be given on the methods of gathering data and the process of analysis; and
3. A clear outline of the kinds of data from which interpretation occurs.

(Corbin and Strauss, 2008: 300).

Guba (1981) suggested trustworthiness involves credibility, applicability, and consistency. Applicability refers to being able to apply the findings to other settings (Krefting, 1990), and this has been achieved throughout this study through applying the same methods and retrieving similar findings in four different early years settings. Regarding consistency, Guba (1981) stated the findings should remain consistent if applied to the same subjects in another study. This study achieved consistency through the replication of methods to the same research participants across five days in each of the four case sites. Steps to reduce researcher bias were implemented to enhance trustworthiness, as discussed earlier in this chapter.

5.9.1 Triangulation

Considering the criticism of conducting qualitative data (Denscombe, 2011), in order to add rigour to the study, the methods were triangulated against each other (Gray, 2014). The triangulation of methods enhanced the accuracy of the study, through gathering a range of data which answered the four research questions (Creswell, 2008). Flick (2002) suggests triangulation is an alternative to validity, rather than a component of it. In this way, it could be argued triangulation of methods is therefore a strategy to ensure the methods achieve the accuracy of gathering data through different sources. Through adding rigour, the study

replicated the triangulation of methods across the four research sites, where an understanding of the study's focus was generated. Through triangulation, the risk of ambiguous interpretations was reduced since the four methods added strength to the data collected (Denzin and Lincoln, 2008).

5.10 Ethical considerations

Before any research was conducted with participants, a proposal was submitted to the Birmingham City University Ethics Committee (see appendix ix), outlining the scope of the research and its benefit to the participants. A thorough consideration of ethical issues was undertaken, identifying how the research may affect children, alongside how the research had the potential to support the development of practice. The British Educational Research Association's ethical guidelines (BERA, 2011) were consulted throughout the research to support my understanding and application of consent, ongoing assent and the right to withdraw. It was essential that these terms alongside confidentiality and anonymity were understood before engaging with the research participants.

5.10.1 Consent and ongoing assent

Strategies were implemented throughout the stages of the research to obtain consent and ongoing assent from research participants. As the participants were as young as three years old, I had a duty to ensure the children were protected from harm, and that the research would be of benefit to the participants (UNICEF, 2012). Consent was gained from a range of persons within the research: the lead of each setting, practitioners, parents and children. Upon informing each setting of the research project, information sheets were provided following Stake's (1995) advice that whilst a superior member of a setting may grant access, a written overview of the research aims should be provided to share with other professionals in a setting. It was important to ensure all research participants were fully informed of the research aims

before they could commit to participating. As a result, two information sheets were generated: one for the settings and one for parents and carers (see appendices x and xi).

To gain informed consent from parents, I recognised research participants needed to be fully informed of the research intentions, the benefits to the setting and participants, alongside participants' right to withdraw (BERA, 2011; Shaw *et al*., 2011; Stanley and Sieber, 1992). As such, parental approval was gained prior to gaining consent from children, as parents were the children's gatekeepers (BERA, 2011). However, it was important to remember that, as BERA (2011) and Hammersley and Traianou (2012) explain, whilst parents can provide approval for their child to be researched, they cannot provide consent on behalf of their children. Keeping this in consideration, age appropriate information was provided to the children, so that children could make an informed decision on their consent within the project.

Consent from children appeared in two forms: through verbal consent and through ongoing assent from lanyards. At the beginning of each day, I spoke to the children about my role and purpose of being in their setting. The children were informed that I was particularly interested in watching what children did when playing on the touchscreen devices, and that in order to understand this, I wanted to watch children play and take some notes where I could have a look at these later. I told the children that I would like to sit near to them and watch what they were doing, but I did not want to play on the touchscreens myself. Once presented with this information, the children, who were supported by the practitioner, were able to say yes or no to giving their agreement to be involved. It was important that the children understood the reasoning behind why the information was collected (Fraser *et al*., 2004). The children were informed that they did not have to agree; it was their choice and they could take the agreement away whenever they wanted. It was also acknowledged how consent may be given in different forms, such as through mark-making (Harcourt and Conroy, 2004). The children were

encouraged to provide their consent in the most appropriate way, which could have included verbal, pictorial, written consent, or through consent lanyards.

In order to record ongoing agreement to participation, I designed consent lanyards, which were given to children at the beginning of the day, or when children approached the touchscreen area. The purpose of the consent lanyards allowed children to make a decision on their participation, without the pressure of verbal consent. Recommendations from Fraser *et al*., (2004) and Flewitt (2005) were followed during the consent process, that children were able to give continual assent throughout the study. I had a duty to ensure the children were aware that they could make this decision, hence the design of the lanyards, which presented a 'happy' and 'sad' face (see appendix xii).

5.10.2 Right to withdraw

When researching with young children, Skanfors (2009) explains the need to be vigilant, since understanding children's assent can be challenging. Children may withdraw their consent through non-verbal means, so I became knowledgeable on ways in which consent could be withdrawn, for example: turning away, not being visible/ hiding behind others, being unwilling to answer, or being non-responsive (Skanfors, 2009). As focus-group interviews were conducted with young children, it was particularly important to understand and be aware of these signs of withdrawing participation, because of the environment in which children were placed. I also needed to be mindful of children withdrawing consent whilst being observed, so alongside verbal or lanyard withdrawal, I also monitored children's behaviour to determine their consent.

5.10.3 Confidentiality and anonymity

Confidentiality and anonymity referred to the storage of personal information and the right to privacy within this study. It was important to reinforce to participants that personal information

would not be shared with others, through non-identification of research participants in the write up of the data. The same procedure was adhered to for each setting, and each setting were informed they would be referred to by a pseudonym, and this would not identify them in the write up of the data. Pseudonyms were not used for the transcribing of data collected from children, as specific children were not targeted, so when field notes were written, each child was assigned a code (for example C1 for Child 1). Information sheets to both parents and practitioners disclosed that participants would not be identified by name.

Regarding confidentiality, the participants were reassured that responses to interview questions were not repeated to others within the setting, in order to encourage participants to speak freely without the risk of consequence. I also reinforced the matter of data storage; all data was kept on an encrypted, password protected computer file, and any physical copies of data were kept in a locked drawer. The deletion of data occurred when the data was no longer needed to progress in the write-up of the study. The audio recordings were deleted after transcribing, at the request of participants in the study.

5.11 Conclusion

This chapter has outlined my methodological position, alongside justifying the selection of methods in order to answer the research questions. The research design has been identified as an appropriate approach to collecting and understanding the data, and the methods identified have been critically analysed to ensure the best possible methods were selected. I have approached the idea of reflexivity within research and have identified the role of the researcher within this study. Ethical issues and steps taken to increase validity and trustworthiness have been identified and examined.

The following chapter outlines the initial data gathered which sought to answer the research questions via an online survey.

Chapter 6: Survey findings

6.1 Introduction

The previous chapter outlined the methodological approach to conducting the research and justified the selection of methods and data collection tools.

This chapter provides an insight to the findings from the online survey data taken from forty-one survey responses from early years practitioners in the West Midlands, which was conducted as the first stage of the research process. The survey addressed touchscreen use and technological access for children aged three and four years old.

6.2 Research question

The online survey aimed to address the following research question:

- How are touchscreen devices used in a range of early years settings in the West Midlands?

6.3 Analysis

The data was analysed initially at an *a priori* level to address the research questions, following which emergent themes were identified. Emergent themes supported the development of research tools for the second stage of the study. The majority of the survey data was analysed using statistical analysis, accumulating frequencies from responses to the questions. This descriptive data set informed the second stage of the study through identifying general touchscreen technology use, which was expanded on using qualitative data methods later on.

The data is presented in the discussion section of this chapter according to the activity theory model discussed in this thesis. Throughout the chapter, comments are made on aspects which

are not covered within the activity theory model but can be associated to Bronfenbrenner's (1977) ecological systems theory model.

6.4 Results

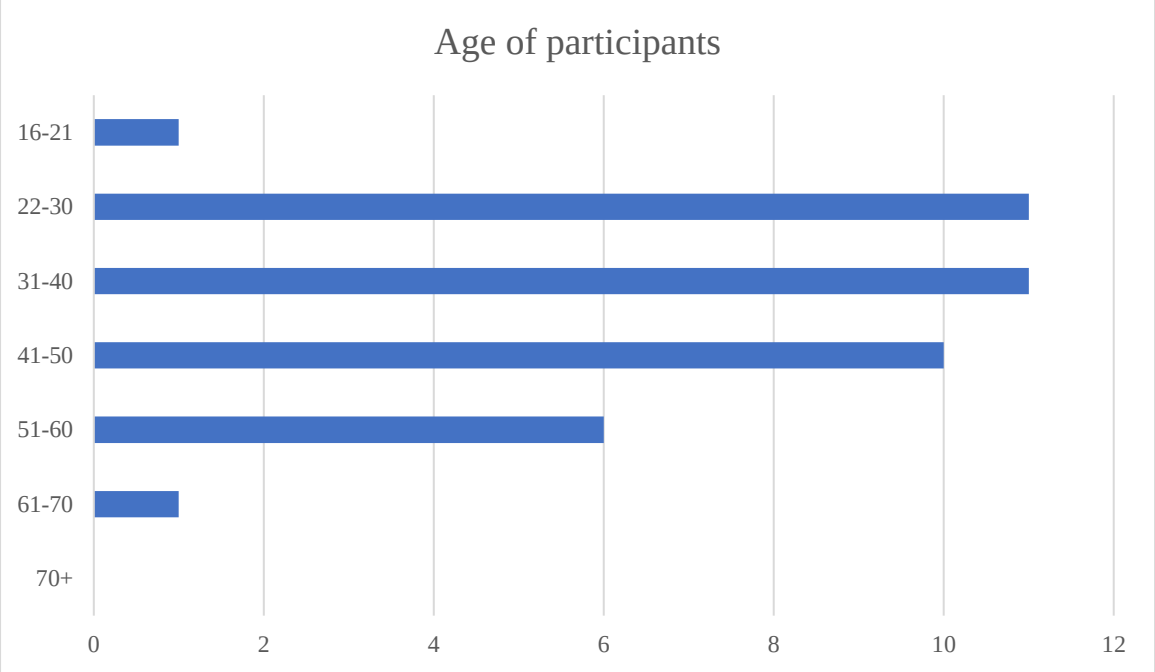
The online survey identified two themes: accessibility of touchscreen devices and children's touchscreen uses. The findings are presented to outline the accessibility of touchscreen devices in the first section of this chapter to distinguish the range of settings participating in the survey and the touchscreen devices that are used. The second section of the findings presents the ways in which young children use touchscreen devices in early years settings. The findings acknowledge influences on touchscreen usage such as availability of the device and supervision when using touchscreens. It should be noted that responses provided within the online survey may not reflect the reality of touchscreen use, rather it reflects what practitioners think they should be doing according to their personal and professional belief system, for example in regard to questions on the length of time children should be using the touchscreen devices.

6.4.1 Participants

Forty-three responses were obtained from the survey, however only 41 responses were from practitioners working in early years settings across the West Midlands. As such, the two responses were omitted from the data analysis as they were outside of the geographical area of the study. With 1349 interactions on the survey, 43 responses returned a low response rate of 3%. The majority of responses were from practitioners working in a day nursery and in pre-school settings for children aged 3-4 years. Of the 41 eligible responses, all respondents cared for children between the required ages for the study of three and four years. A range of roles were reported, including Manager (nine participants), Child Minder (five participants), Early Years Teacher (four participants), Deputy Manager (four participants) and Class Teacher (three participants) amongst others. Of the 41 respondents, 40 were female, and one was male.

Practitioners worked in either urban cities and towns (26 participants), rural villages (six participants) or rural towns (nine participants). Their ages are reported below in figure 8, and their settings in table 2.

Figure 8. Ages of respondents



The majority of survey responses came from practitioners within the 31-40 age range (11 participants) and the 22-30 age range (11 participants), followed by 41-50 (10 participants). There was one participant who was aged between 16 and 21, and one participant in the 61-70 age band. Six participants were aged 51-60. One participant did not disclose their age.

Whilst it cannot be assumed that there was a representative sample of all types of provision across the West Midlands, the responses did suggest a wide range of early years settings participated. The range of settings offered different types of care for children, such as pre-school day care, to parental support when looking after children. One practitioner identified she worked in a church hall, which formed a ‘pack away’ setting during the week.

Table 2. Number of response rates according to the type of early years setting

Type of setting	**Number of participants**
Day Nursery	15
Pre-School	8
Maintained Nursery	5
Nursery Unit of Independent School	1
Child minder	7
Nurture Nursery	1
Church Hall	1
Reception Class	2
Parent support worker	1
Total	**41**

The majority of the survey questions were closed in order to obtain a high response rate across all questions. However, not all respondents answered all questions and as a result, the data presented shows discrepancies in the total number of participants who responded. Additional questions allowed for multiple choice, hence some questions have higher response records than the number of participants. Participants were assured of their anonymity in the survey, however if they identified they would like to be contacted for the second stage of the study, they were requested to leave contact details.

6.4.2 Accessibility of touchscreen devices

In order to retrieve most accurate data to identify settings to progress to the second stage of the study, at the beginning of the survey, practitioners were asked "do you use touchscreen devices with children in your setting?". 23 of 41 practitioners (56%) responded 'yes' and were redirected to another section of the survey.

Table 3. Touchscreen availability according to type of setting

What type of setting do you work in?	**Do you use touchscreen devices with children in your setting?**			**Total**
	Yes	**No**	**No answer**	
Day Nursery	3	12	0	15
Pre-School	6	1	0	7
Maintained Nursery	5	0	0	5
Nursery Unit of Independent School	1	0	0	1
Child Minder	6	1	0	7
Other	2	4	0	6
No answer	0	0	0	0
Totals	**23**	**18**	**0**	**41**

There were more child minder and pre-school settings that used touchscreens with young children compared to day nurseries, where only one quarter of respondents used touchscreens in their settings.

For the remaining 44% of respondents who did not use touchscreen devices in their settings, practitioners were asked to explain why they were not used (table 4).

Table 4. Reasons why practitioners do not use touchscreen devices with children in settings

Reason	**Total**
Funding/finance issues	11
Practitioners want children to learn other things	4
Children have enough screen time at home	4
Inappropriate for the age group (3-4 years)	2
Parents might not approve	1
Concerned over skills lost by using touchscreens	1
Split opinions on its use in the setting	1
No internet connection	1

Practitioners reported funding issues or financial constraints as the most prominent reason why children were not using touchscreen technologies in their settings, which chimed with previous research by Formby (2014a) and Aubrey and Dahl (2014) that funding was a barrier. Further analysis showed that day nurseries were most likely to indicate funding issues (81%). Other practitioners were concerned that children were being deprived of other activities and experiences if they were to play on a touchscreen. One practitioner said

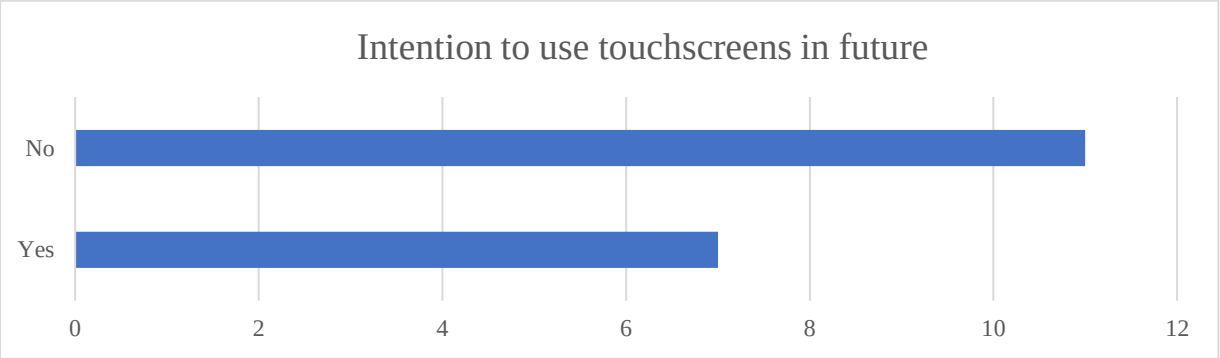
> *Pencil and scissor control, discussions and conversational skills cannot be learnt on a touch screen.*

The practitioner further commented that apps are generally seen by parents as a single-user activity and a source of entertainment rather than a shared activity, which was a common perception reported by Alper (2013). Another practitioner said

> *[I have] concerns that traditional 'early writing' will not be promoted as the fine motor skills which are used to hold a pen are replaced by a swiping motion - the 'click and drag' generation!*

In similarity to findings from Kucirkova and Littleton's (2016) study, practitioners felt strongly about other non-technology activities that children might not experience, to the extent where one practitioner said, *"we want the children to learn about the real world"*. There was a judgement by some that children would potentially miss out on other activities if they were to use touchscreen devices within early years settings, which was not uncommon, since Burnett (2010), Donohue (2015) and the NAEYC and Fred Rogers Centre (2012) report similarities in their studies. It was also commented upon that children gained enough experience of using touchscreen devices whilst at home, and therefore practitioners did not feel the need to include touchscreen activities within their setting.

Figure 9. Practitioners' intentions to use touchscreen technologies in the future



Practitioners who did not use touchscreen devices within their settings were then asked whether they intended to use touchscreens in the future. Of the 18 respondents who did not use technology, seven respondents identified that they wanted to use touchscreen technologies in the future. One practitioner, when asked of reasons why she did not use the technology, said *"[we] have not been in the financial position to purchase these for the setting although it is something we are looking at for future"*. Another practitioner referred to the budget resulting in not being able to invest in touchscreens for the setting. Practitioners were not asked to comment on their reasons, so further analysis was not possible.

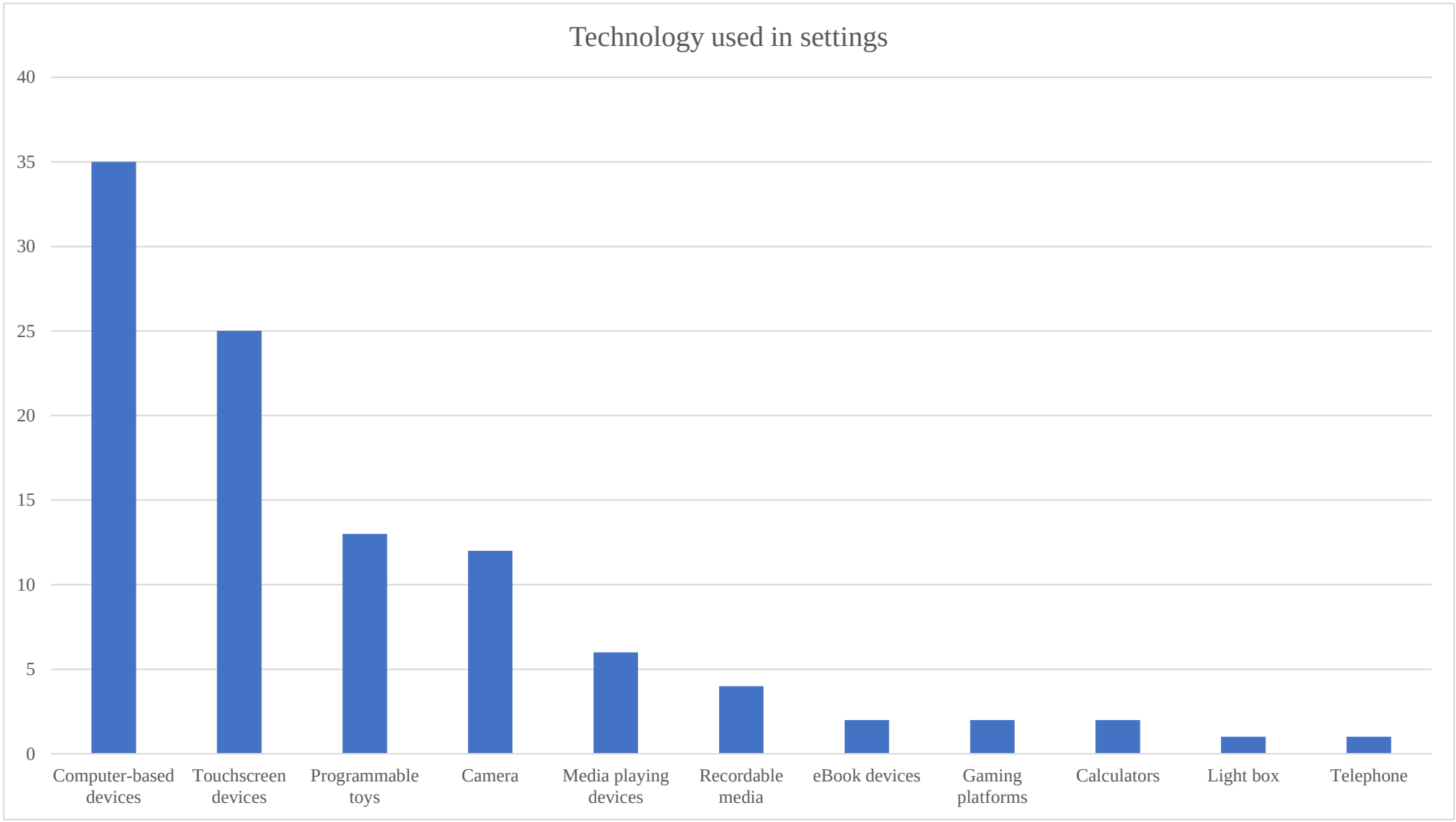
6.4.2.1 Technologies used with young children

Whilst it was acknowledged that all settings did not use touchscreen devices with children, practitioners were asked to comment (using an open question) on the type of technologies they currently used with young children (figure 10). Forty respondents commented on the range of technologies available in their settings. Most common was that computer-based devices (35) were used, followed by touchscreen devices (25), cameras (12) and programmable toys such as Beebots (13). Respondents also referred to non-digital technological tools, such as ovens, washing machines, a badge making press, cheese making equipment, woodwork tools and more.

Since identifying the range of technologies used within each setting, the 23 participants who reported they used touchscreen devices with children were asked to disclose the type of

touchscreens available. 18 participants disclosed their use of iPads and five participants commented they used Interactive Whiteboards/SMART boards. Other touchscreen devices used with children within the 23 settings included laptops (three participants), iPods (three participants), Leapfrog (two participants) and Leap Pad (one participant) devices, tablets (three participants), Kindles, phone applications, a Smart TV, large touchscreens, C-Touch screens and Hudls. Overall, there were 13 different types of touchscreen devices available for children to use across the 23 settings.

Figure 10. Technology used in early years settings across the West Midlands



In response to question 10 regarding touchscreen access, respondents were asked to identify the age at which children were allowed to use touchscreen devices in their settings. Table 5 below displays the responses.

Table 5. Age when touchscreen devices are available to children in settings

Age of children	**Number of respondents**
From birth	3
From two years old	6
From two and a half years old	2
From three years old	10
From four years old	2
Total	**23**

Touchscreen devices were most commonly available to children from the age of three years (ten participants), however the increase of accessibility at this age may be a reflection of the settings in which the 23 respondents worked. Six respondents identified children were able to use touchscreen devices from the age of two, whereas three participants noted children from the age of birth were able to gain access to the technology. Children's access from birth was indicated by child minders. Children's access from four years old was associated with practitioners working in primary schools (one participant) and a child minder setting (one participant).

6.4.3 Children's touchscreen uses

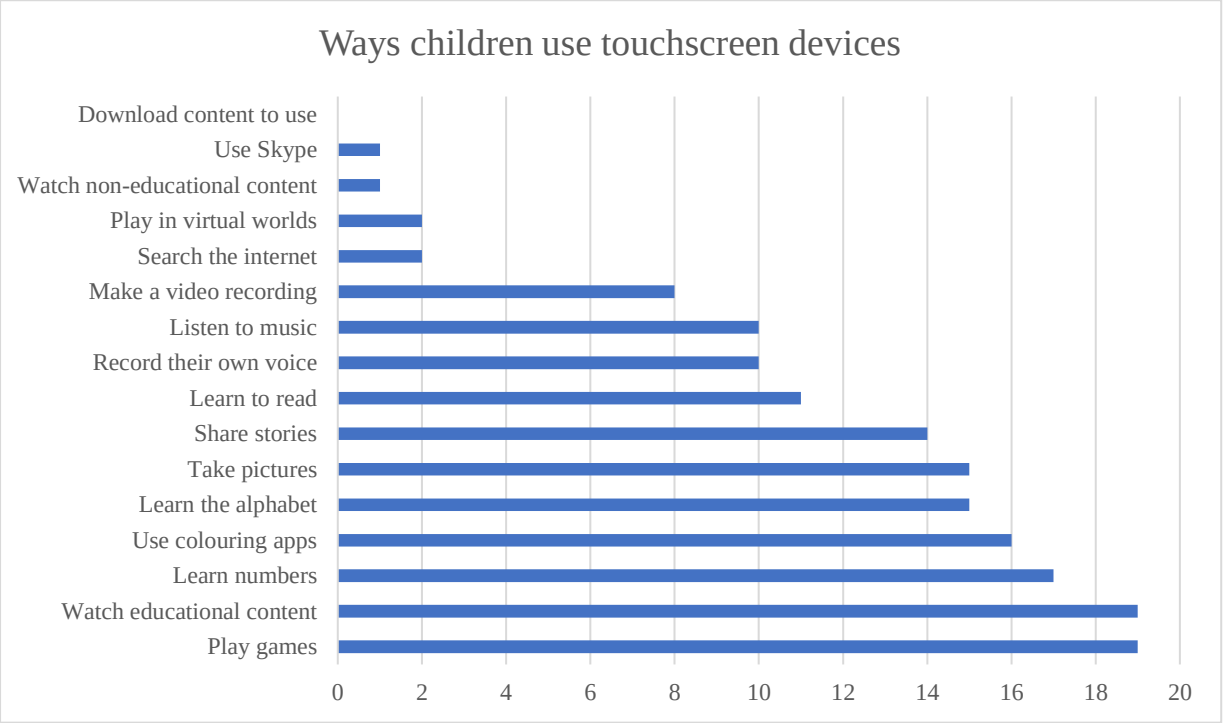
Further to practitioner's perceptions of touchscreen technology, children's use of the devices was explored.

6.4.3.1 Children's uses of touchscreen devices

Participants were provided with a range of suggestions for children's touchscreen use from which they could select those that applied to their setting (figure 11). Participants also had the

opportunity to suggest options for themselves in an open category, however no participants did so. Children were reported by practitioners to play games (19 participants) and watch educational content (19 participants) most, both of which were common reported uses of touchscreen technologies in the home environment (Knowland and Formby, 2016; Marsh *et al*., 2015a; O'Connor and Fotakopoulou, 2016; Ofcom, 2017). Additionally, children were said to learn numbers (17 participants), learn the alphabet (15 participants) and use colouring apps (16 participants). From the initial data regarding children's touchscreen usage, there was an educational emphasis on the ways in which touchscreens are used in early years settings. Other suggestions which may have educational benefit that were selected included sharing stories, to which 14 practitioners referred to, alongside learning to read (11 participants). Practitioners also identified children searched the internet (two participants) and used Skype (one participant), which shows different ways where the internet is used. Children were not reported to download content to use.

Figure 11. Children's uses of touchscreen devices



Other uses of touchscreens included taking pictures (15 participants), making video recordings (eight participants) and children recording their own voices (ten participants), all of which allowed a play-back option, to either watch, listen or view children's creations. Children were also reported to listen to music according to ten practitioners, a common use of touchscreens in Marsh *et al.*'s (2015a) Tech and Play study. It was acknowledged that children were allowed to play in virtual worlds (two participants) alongside watching non-educational content (one participant). Since practitioners identified 16 different uses of touchscreens, this outlines the versatility of the technology.

6.4.3.2 Touchscreen supervision

Children's supervision whilst using touchscreen devices was of interest to gauge children's freedom to make choices and lead the activity. Practitioners were asked whether children were supervised by an adult, unsupervised, or a combination of both when using touchscreen devices. No practitioner identified that children were left unsupervised when touchscreens were

used. 14 practitioners selected ‘supervised by an adult’, whilst the remaining nine participants selected ‘both’. Supervision did not indicate the balance between adult-led and child-led activities.

Table 6. Touchscreen supervision according to type of early years setting

What type of setting do you work in?	**When the children use touchscreen devices, are they? Please select one answer**			**Total**
	Supervised by an adult	**Unsupervised by an adult**	**Both**	
Day Nursery	2	0	1	3
Pre-School	2	0	4	6
Maintained Nursery	3	0	2	5
Nursery Unit of Independent School	0	0	1	1
Child Minder	5	0	1	6
Other (Reception class)	2	0	0	2
Totals	**14**	**0**	**9**	**23**

Children were most likely to use touchscreens when supervised at child minder settings, and were allowed to use touchscreens either supervised or unsupervised most commonly in pre-school settings.

6.4.3.3 Availability of touchscreen devices

Practitioners were also asked how frequently children were permitted to use touchscreen devices daily and each week. Each week, children were most likely to use touchscreens for ‘up to 15 minutes’ according to nine practitioners. Five practitioners allowed children touchscreen access from 31 minutes to an hour, whereas five practitioners allowed children to use touchscreens from 16 to 30 minutes. One practitioner selected the ‘1 and a half to 2 hours’ option. Three practitioners acknowledged children were allowed to use the touchscreens for more than three hours a week. Further examination of the responses indicated that children’s

time spent using touchscreens was most limited in child minder settings, however one child minder allowed children to spend the most time using the devices. The other two settings which allowed children to spend more than three hours using touchscreen devices were a pre-school and a maintained nursery.

Table 7. Children's weekly touchscreen access according to type of setting

What type of setting do you work in?	**Approximately, for how long do the children use touchscreen devices in one week?**							
	Up to 15 minutes	**16-30 minutes**	**31 minutes - 1 hour**	**1 – 1 ½ hours**	**1 ½ hours – 2 hours**	**2 – 2 ½ hours**	**2 ½ hours – 3 hours**	**More than 3 hours**
Day Nursery	2	0	1	0	0	0	0	0
Pre-School	1	3	1	0	0	0	0	1
Maintained Nursery	2	1	1	0	0	0	0	1
Nursery Unit of Independent School	1	0	0	0	0	0	0	0
Child Minder	3	0	1	0	1	0	0	1
Other	0	1	1	0	0	0	0	0
No answer	0	0	0	0	0	0	0	0
Totals	**9**	**5**	**5**	**0**	**1**	**0**	**0**	**3**

Regarding daily access, children were reported to spend from six to ten minutes using the touchscreens the most (ten participants), and five participants said children spent 11-20 minutes using the technology. Three participants chose the 'other' option, which included responses such as *'varies dependent on age*', technology is '*available throughout the session'*, and '*it depends on the children's concentration and whether it is an adult-led or child-led activity'*. Two practitioners selected '21-30 minutes', and a further two practitioners selected 'up to an hour'. There was one practitioner who selected '1-5 minutes'.

Table 8. Children's daily access to touchscreen devices according to type of setting

What type of setting do you work in?	Approximately, for how long do the children use touchscreen devices in one period? Please select one answer.						
	1 – 5 minutes	6 – 10 minutes	11 – 20 minutes	21 – 30 minutes	Up to an hour	Over an hour	Other
Day Nursery	0	2	0	0	0	0	1
Pre-School	0	3	2	0	0	0	1
Maintained Nursery	1	1	1	0	1	0	1
Nursery Unit of Independent School	0	1	0	0	0	0	0
Child Minder	0	2	1	2	1	0	0
Other	0	1	1	0	0	0	0
No answer	0	0	0	0	0	0	0
Totals	**1**	**10**	**5**	**2**	**2**	**0**	**3**

Children's touchscreen access varied throughout the different types of early years settings. Child minders reported children's access ranged from '6-10 minutes' to 'up to an hour' at a time, whilst pre-schools allowed children daily access from '6-10 minutes' to length of access dependent upon a child's concentration and the type of activity. Overall, children were found to use touchscreen devices most commonly for '6-10 minutes' daily, for a duration of 'up to 15 minutes' a week. In most extreme cases, children were said to use touchscreens 'available throughout the session' and some said it could be for 'more than 3 hours' per week.

6.4.4 Progression to stage two

Practitioners were asked at the end of the survey whether they wished to progress to the second stage of the study, which looked more closely at early years settings' practice of using touchscreen devices with children. Practitioners at this stage of the survey were asked to read the information sheet attached to the email or online site for further information of the study's

intentions and what the second stage involved. Of the 23 participants who were eligible to progress due to their use of touchscreen technologies, 15 participants indicated 'yes', and eight participants selected 'no'. Practitioners were then asked to identify the way in which they preferred to be contacted (through a multiple-choice question), with 14 participants selecting 'email', and two participants selecting 'telephone'. Eight participants did not respond.

Of the 15 practitioners who identified they wished to be contacted who left contact details, a stratified sampling technique was then used to select what was initially five different types of early years settings to progress to the second stage. Practitioners were emailed frequently in order to maintain a connection with each setting, however some participants who were selected did not return messages so therefore were self-excluded from the study.

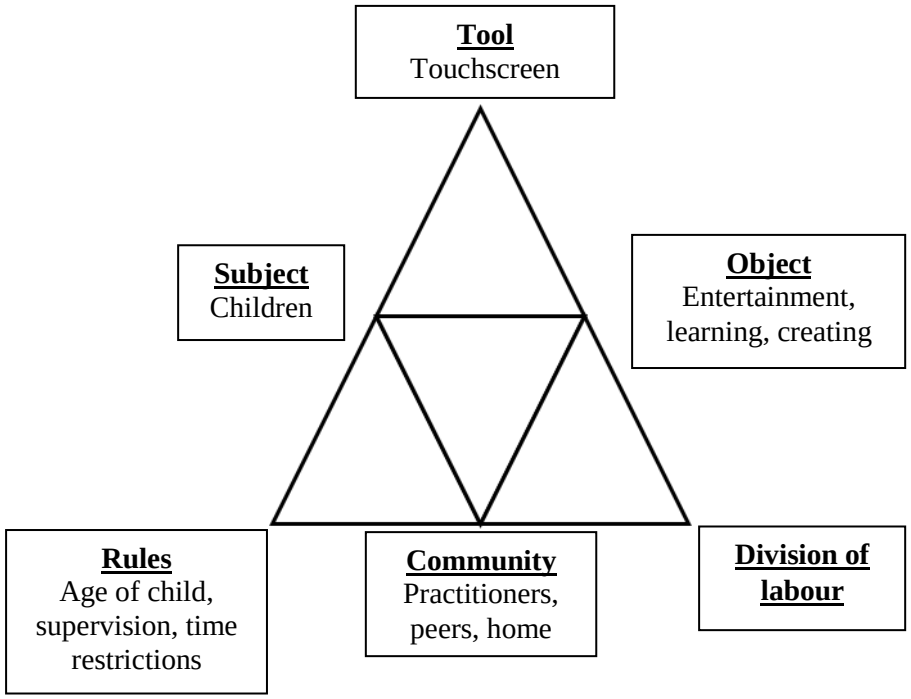
As a result of the survey findings, two child minder settings were identified, alongside a day nursery setting, a pre-school and a children's centre nursery. An initial intention to maintain contact with five different early years settings was unsuccessful, and therefore three settings were identified from the survey (child minder, day nursery, and children's centre nursery), and an additional setting was selected later on (pre-school). The second child minder setting withdrew their participation from the study. The four sites were provided with a pseudonym for their setting as a way to remove the possibility of being identified. They are named Caterpillar Corner (Child Minder (CM)), Forrest Green (Day Nursery (DN)), Busy Bees (Children's Centre Nursery (CCN)), and Little Ducklings (Pre-School (PS)). Both Caterpillar Corner (CM) and Forrest Green (DN) have a medium socio-economic status, whereas Busy Bees (CCN) and Little Ducklings (PS) have low socio-economic status. All four case sites implement a play-based pedagogical approach, with varying degrees of a combination of adult-led and child-initiated play available. An overview of the four case sites with further contextual information can be found in appendix xiii.

6.5 Discussion

The survey data was analysed using the activity theory model to situate the touchscreen as a mediating artefact within activity to determine the wider influences on children's play. Whilst the survey only sought to gain a general insight into touchscreen play, the activity theory model allowed for the identification of how practitioners conceptualise the touchscreen as an enabler for learning. The activity theory model also allowed for contradictions to arise from different data sets, so whilst no contradictions are indicated within this chapter, the data provides a base on which to build upon and compare in the following chapters. Figure 12 below has been created to portray activity theory as reported by respondents from the survey, on what they depict to be children's access to and engagement with touchscreens.

Drawing upon survey responses to questions six, nine, ten and fifteen, early years practitioners reported children used touchscreen devices in their setting, so the children were labelled 'subjects' within this activity system. Children's use of touchscreen devices was predetermined by practitioners who selected in question 15 of the range of ways children used the devices. Practitioners reported children used touchscreens for entertainment purposes such as playing games and watching videos, which is similar in findings of children's touchscreen uses at home (O'Connor and Fotakopoulou, 2016; Ofcom, 2017). Practitioners also selected educational purposes of children's touchscreen use, including learning the alphabet and numbers and reading stories, which mirror findings that touchscreen devices are used to read eBooks with young children (Kucirkova and Littleton, 2016).

Figure 12. Activity system reported by survey respondents



The ways in which children are reported to use touchscreen devices are bound by rules. Three rules were identified: supervision by practitioners; the age range that children can access the devices; and time restrictions. Children are initially limited in their use of touchscreens by their age. Whilst most respondents to the survey identified children from age three could use the devices, some respondents reported higher ages such as four or five, which correspond with the age children attend school. This goes against recommendations by Marsh *et al*., (2015a) that children should have some form of touchscreen experience before they attend school so that they are not disadvantaged compared to their peers, but the limitation of this survey is that it does not ask practitioners to report on children's touchscreen uses at home.

In addition, children are mostly only able to use touchscreen devices if they are supervised by early years practitioners, which, without exploration into actual practice, provokes questioning on how often these opportunities are available if children require adult presence in order to play. There are however, a number of practitioners who allow children to spend periods of time

unsupervised when playing with touchscreens, although they report that this is not common practice each time a child uses a device.

The final identified rule which restricts children's access is the length of time children spend per day and per week using touchscreens. Whilst the average daily use is reported to be six to ten minutes, children are also reported to use touchscreens for up to 15 minutes per week. It was not identified in the survey how often children used touchscreens, whether this was a daily occurrence or less, so the accuracy of reported weekly and daily uses is unknown.

Whilst the community was not specifically reported, it became apparent that practitioners are members of the community from inference of their reported supervision of touchscreen devices. It also may be possible that children's peers are members of the community as they all have access (within the confines of age ranges), although it was not mentioned whether children interacted with each other or with practitioners when they played. In addition, the home environment may be a part of the community, taking into consideration children's prior experiences with touchscreen devices. This limited information therefore means a complete representation of the activity theory triangle cannot be shown, as the division of labour was not reported. An exploration into this component of this theory will be made in the second phase of the study.

Whilst activity theory enabled the representation of touchscreen activity influenced by a series of factors including rules, the community and the object, there were other aspects which were not represented within the model such as the reasoning behind non-touchscreen use as reported by some survey participants. The wider influences such as personal beliefs on touchscreen appropriateness, the acknowledgement of parental beliefs, and the reality of funding and financial issues are not easily represented within the activity theory model. Instead, these influences are better situated within Bronfenbrenner's (1977) ecological systems theory. For

example, the varied perspectives from parents is situated within microsystems, and the acknowledgement of the wider governmental influences which impacts upon funding or financial issues is represented within the macrosystem level. The influences portray barriers or preventative measures by more than those directly involved with touchscreen activity, such as at national Government or Local Authority levels through the lack of funding or resources, a barrier common within other studies (see Aubrey and Dahl, 2014).

Parental beliefs which limit children's access to touchscreens within early years settings is another wider influence reflected within Bronfenbrenner's (1977) microsystems, which directly impacts on children's early experiences through the connection between the home and the early years setting in supporting children's learning. This therefore represents the importance of the influence of the mesosystem in making connections between microsystems when supporting children's learning and development. Survey respondents acknowledged that children have sufficient access to touchscreen technologies at home, so working together with parents in these moments was important to reflect a balance of touchscreen and non-touchscreen play across both environments. Achieving this balance was also essential since some respondents were concerned children would miss out on learning other things whilst in their care, which resonates with Formby's (2014a) findings that some practitioners believed touchscreens may damage children's development.

Overall, the survey data revealed general touchscreen access and use by young children, mediated by rules from practitioners which direct or guide touchscreen play. There were gaps within the closed questions in the survey which require further exploration in the second phase of the study. This includes identifying practitioner beliefs on the touchscreen in order to justify the responses made within the survey. Using mostly closed questions was selected for practitioner convenience, however it did identify barriers upon analysis when trying to investigate reasons behind actions, such as the age in which practitioners introduced

touchscreen devices to children. Had the survey been altered to offer options for comments, I may have developed a more secure understanding about the use of touchscreens in early years settings.

The closed questions enabled a faster response time, and some closed questions were written to expand upon in the second stage of the study with some practitioners, regarding their touchscreen usage and their approaches. The closed questions were more straightforward to analyse in terms of descriptive statistics, which supported the exploration of touchscreen use across a range of early years settings in the West Midlands region of England.

6.6 Conclusion

The survey findings have identified the range of technologies and touchscreen technologies available to young children in 41 early years settings in the West Midlands. The survey findings also identified a range of settings interested in participating to the second stage of the study, and as a result, four settings were selected and have subsequently been case studied.

Findings from the survey have provided initial data regarding the range of ways children aged three to four years old are able to use touchscreen devices in early years settings, and these have mostly been targeted towards educational reasons. Children have access to a wide range of technologies and are encouraged to use them for varied amounts of time according to each setting. The fact that each setting implements different approaches exemplifies the need to produce appropriate guidance on how touchscreen technologies can be effectively used, based on evidence from observing children's touchscreen uses, speaking to children and through speaking to practitioners. Therefore, Chapter 7 outlines perspectives from early years practitioners working with children within four different types of early years provision, to explore their approaches to integrating touchscreen technologies within daily practice.

Chapter 7: Interview findings

7.1 Introduction

The previous chapter addressed the analysis of online survey data obtained from forty-one responses from early years practitioners across the West Midlands. The findings from the survey were presented and discussed, and the chapter identified the selection of participants for the second stage of the study.

This chapter presents the findings from the interview data, obtained when interviewing three early years practitioners in each of the four case sites regarding their pedagogical approaches to integrating touchscreen technologies. A comparative approach has been utilised in order to distinguish differences in each setting's approaches.

7.2 Research questions

Interviews with practitioners aimed to add depth to the following research questions:

- Which early years pedagogies do practitioners implement when supporting children's learning using touchscreens?
- What are the perceptions and reported practices of key stakeholders (practitioners and managers) on children using touchscreen technology in the early years?

7.3 Analysis

Where results are presented, the responses from setting leads are identified as a way of outlining the different questions they were asked, in comparison to questions asked to room leads and practitioners who interacted with children on a daily basis. A range of touchscreen devices were identified during interviews with practitioners and were named by brand. Practitioners

named them iPads, iPad Minis, Hudls and Samsung tablets. For simplicity in this chapter and subsequent chapters all touchscreens are named ‘touchscreen devices’.

As with the previous chapter, it is important to note that the responses from interviews may not reflect reality per se, rather they reflect what practitioners consider to be what they should be doing based upon their personal and professional beliefs. For example, this is reflected in responses to the average length of time children have access to touchscreens per day and per week. The data is presented in the discussion section of this chapter in accordance with the activity theory model, similar to Chapter 6. Again, comments are made during this chapter where the data does not necessarily fit within the activity theory model but can be associated with Bronfenbrenner’s (1977) ecological systems model.

7.4 Results

The interview data produced six different themes which related to daily practice of using touchscreen devices with young children within each of the four case sites:

1. Introducing touchscreens
2. Children’s uses of touchscreen devices
3. Perceived benefits of touchscreen access
4. Perceived challenges and concerns
5. Restrictions on children’s uses of touchscreen devices
6. The role of technology in early years practice

The themes are presented below.

7.4.1 Introducing touchscreens

7.4.1.1 Approaches

All participants were questioned during interviews of their reasons behind introducing touchscreen devices into the early years setting in which they worked. Across the four case

sites, approaches to introducing the devices were underpinned by different rationales. Each site's approaches are presented in table 9. Within the first case site, Caterpillar Corner (CM), it was recognised by one practitioner that introducing a tablet device was:

> *Mutually agreed, we all recognised, it's part of the EYFS as well, that they [children] have access to technology through computers of some form, so it was something that is needed in this day and age.*

Table 9. Approaches to using touchscreen devices across the four case sites

	Caterpillar Corner (Child Minder)	**Forrest Green (Day Nursery)**	**Busy Bees (Children's Centre Nursery)**	**Little Ducklings (Pre-School)**
Type of touchscreen used	Samsung Tablet	iPad Mini	Four large touchscreens connected to laptops.	Ten Tesco Hudls, two Interactive Whiteboards
Age of children using touchscreens	3-4 years	3-4 years	3-4 years	3-4 years
Length of time touchscreens used	No defined time – "a short amount of time"	5-10 minutes	10 minutes when rule enforced	No defined time
Supervision requirements	All of the time	All of the time	Unsupervised	Unsupervised
Availability of touchscreen during day	During nap time (12.30pm – 1.30pm)	During day, not between 11am and 1pm, and after 6pm	During free-play (9.20am – 11.10am 1pm – 2.15pm)	IW during taught sessions (3) touchscreens when planned for
Ways children can use touchscreens	• Play games • Counting • CBeebies – holistic development • Drawing	• Play games • Learn phonics • Singing • Learn maths skills • Drawing letters	• Draw • Learn letters • Number recognition • Play memory games • View pictures	• Listen to and read stories • Sing nursery rhymes • Play maths games

		• Matching pairs • Watch videos	• Play sound lotto games • Listen to music	• Learn phonics • Record videos • Take photographs • Play games
Restrictions on independent use	Internet access YouTube	Internet access	Internet access YouTube	Internet access YouTube
Internet connectivity	No	Yes	Yes	No

The room lead from Forrest Green (DN), the second case site explained,

> *It was a gift from a child who left so it was nice that we'd got something that we could remember him by, and we know that the children are obviously going to gain from it.*

Forrest Green's (DN) integration of the new technology was a way of securing touchscreen use more regularly in the setting. The setting had identified a need to include touchscreens within their daily practice, through practitioners using their personal devices with the children. Practitioners had also explained their reasoning behind wanting to include touchscreens; they recognised that children are increasingly becoming familiar with the devices and noted the ways in which touchscreens could support children's holistic development (see section 7.4.3). Stephen and Edwards (2018) argue this perceived nature of touchscreens in supporting children's development is often a rationale or justification for using these devices with young children.

Within the third case site Busy Bees (CCN), the setting lead explained,

> *Well originally it was just so that we could access it [technology] in each room and it has been identified as something we needed to work on from I think it was about*

two Ofsteds ago… we decided that we wanted each room to have some kind of access.

The setting lead explained that previously, technology was only accessible in two of four rooms.

Within the fourth case site, Little Ducklings (PS), the setting lead explained:

It's very dated practice to just have an interactive whiteboard, which is great, I mean… it's about giving the children some kind of that control, and the range of choices there for the children.

Touchscreen implementation was for different reasons across the four sites, but it was apparent that the sites sought equity amongst children in relation to touchscreen access. This is discussed in the following section.

7.4.1.2 Providing equal opportunities

Participants within this study identified the need to recognise touchscreen use within the early years, acknowledging the digital divide prevalent across families in different communities. The digital divide was in the form of acknowledging that some children had previously not had touchscreen experiences and some children had. The digital divide therefore was the gap in children's access to touchscreens, which subsequently created a digital skills gap, which was apparent because some children were gaining technological skills and other children, not. One Caterpillar Corner (CM) practitioner explained,

This may be, certainly for the under 5's, their only chance before they get to school to access one [touchscreen device].

However, recent research shows that many children use touchscreen technologies at home. Ofcom's (2017) recent report shows domestic ownership rate for 3-4 year old children is 65%,

a figure which has increased 37% since 2013. The views from Caterpillar Corner (CM) may reflect a growing need to communicate with parents over technology ownership and touchscreen use, and particularly so since only 3% of parents report their child's early years setting uses touchscreens in Marsh *et al*.'s (2015a) study, and only 6% in O'Connor and Fotakopoulou's (2016) study. This highlights a potential difference in perception regarding technology access, and also raises the issue of educating early years practitioners around technological ownership and touchscreen use, to ensure children's use of touchscreen in early years settings is of value and supports children's learning. However, one practitioner in Forrest Green (DN) recognised children's access to technology at home as an integral reason to implementing the devices:

> *Some of them [children] have got them at home so it, sort of seemed natural to get one [tablet]*.

The practitioner suggested their practice of using touchscreens with young children was fairer now that they had a touchscreen device to use with the children, as they had previously brought in another practitioner's tablet sporadically which did not ensure all children could gain access. She explained,

> *Now it's here all the time, no one has to bring it in or anything, so we can access it, sort of every child can have a turn in all sessions like so it's fairer*.

The practitioner had identified that their use of touchscreens was fairer because of gaining a touchscreen device that was a permanent tool to use with the children. Previously, children were only able to use a touchscreen device if another practitioner brought in her personal touchscreen device from home. When the touchscreen was used, it was not used regularly, so practitioners were not able to monitor which children had been able to use the device. Since

introducing the new touchscreen, all children were then able to be able to use it on a more regular basis.

For children who came from backgrounds where technology was not present in the home environment, participants referred to giving these children the chance to be able to interact with different devices. This supported children's development and knowledge of technology and such practice reflects current requirements in the EYFS (DfE, 2017). Whilst it was agreed that all children should be able to access technology in order to develop technological skills, this suggests early years practitioners are adopting what researchers identify as traditional models of learning by using touchscreens to acquire skills (Blackwell *et al*., 2014). However, it has also been argued that it is essential for children to gain access to touchscreens before they start school (Marsh *et al*., 2015a), as operational skills of functioning technology are skills which are required in accordance with school-readiness (Blackwell *et al*., 2016). This theme is exemplified by the following comment from a practitioner at Busy Bees (CCN):

> *If they're coming from home where touchscreens aren't available, and they don't have [touchscreens], they don't have phones with internet connections, that they're getting the same experiences of the new technology that the other children are getting [is a good thing]*.

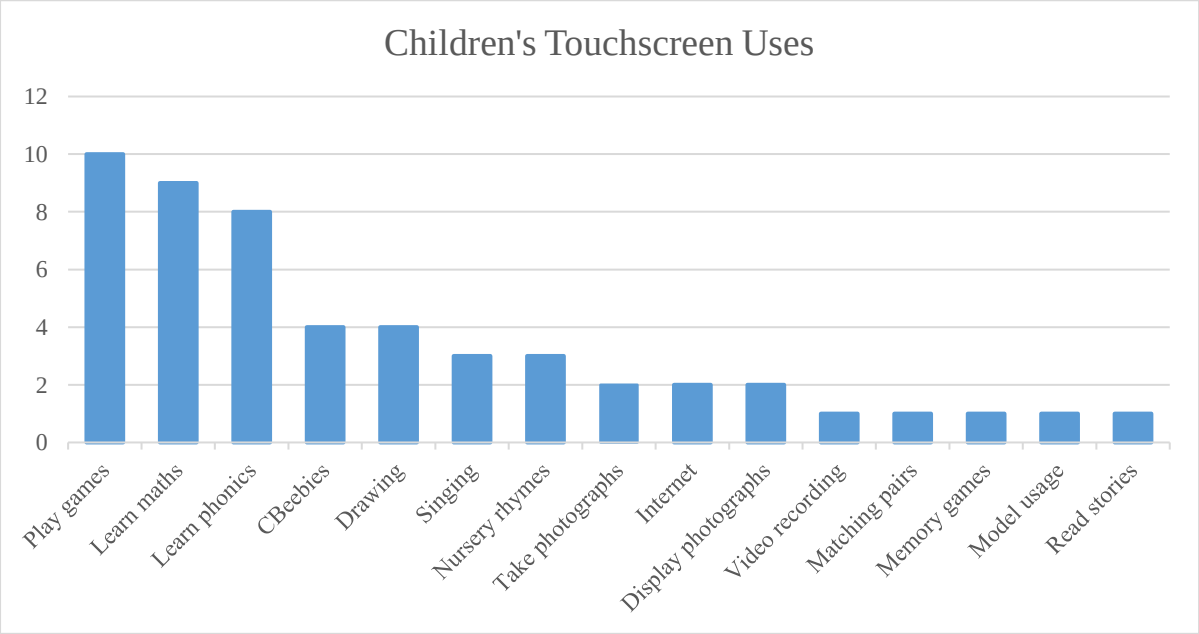
It became apparent to me that there should be equity in terms of touchscreen access regardless of children's use of technology at home from the range of comments raised by participants. Practitioners recognised that children should be able to access a range of technologies and programmes or apps, and these are discussed below.

7.4.2 Children's uses of touchscreen devices

7.4.2.1 Playing games

Participants reported a range of ways in which children could use touchscreen technologies across the four case sites (see figure 13). Most common was that children played games, followed by learning maths and learning phonics. These uses were common in a range of studies in both early years settings and at home, which showed app uses are generally consistent across environments (see Marsh *et al*., 2015a; Palaiologou, 2014). Participants did not clarify what they classed as the difference between educational apps and games, however they did identify the range of ways the children could use apps. For example, learning nursery rhymes appeared to have educational benefit according to practitioners (see 7.4.3.1.3), as did learning numbers and phonics.

Figure 13. Children's touchscreen technology uses reported by practitioners across four case studies



Practitioners reported children enjoyed playing games more than playing on apps to support specific areas of learning, which aligns with reported touchscreen uses at home in other studies

(Kucirkova and Littleton, 2016; O'Connor and Fotokopoulou, 2016). When asked whether children expressed preferences for using the touchscreens, ten participants who had various roles including setting lead, room lead, and room practitioner responded with children's enjoyment of games across the four case sites. Children's preferences in Caterpillar Corner (CM) were reported to be apps that children and practitioners were familiar with,

> *Obviously with things like CBeebies, Peppa Pig, that drawing app, those things first, and then there are some games as well we've downloaded.*

When a practitioner was asked of children's preferences, she replied, *"definitely to play games"*.

Within Forrest Green (DN), the room lead identified children's preferences, saying that she encourages children to play on:

> *more of the educational ones rather than the gaming side of it, but yeah, they've [children] all been asking for certain games and they've all enjoyed using it*.

She explained children had free choice on what app they chose to play on, and new apps were downloaded by request of a child after being checked by an adult, or if a parent shared information about what their child played on at home.

One Busy Bees (CCN) practitioner mentioned how touchscreens were used to support children's learning but admitted,

> *Usually when the children are using it [technology], it is just for games*.

Within Little Ducklings (PS), the room lead commented,

> *I think they play games on them the best, because when we've tried to take pictures with them [tablets], it's kind of put [the children] off.*

A practitioner in the same site confirmed her thoughts, she said, *"I think more than anything they love playing games on them".* This finding is in line with many other studies on children's touchscreen use, including Kucirkova and Littleton (2016), Marsh *et al*., (2015a) and O'Connor and Fotakopoulou (2016), who found that children mostly used touchscreen devices to play games.

The distinction between games and learning apps was unclear from analysis of participants' responses of children's app usage. Whilst participants across the four case sites identified children preferred to play games on touchscreens the most, participants also used the term 'games' to refer to educationally-focussed apps. Participants identified *"sound lotto games"*, *"games that help them learn"*, *"matching and number games"* and *"maths games and things like that"*, which portrayed the confusion between what is considered educational and what is entertainment. However, this also raises the question of whether there is a distinction between the two, considering children learn through play. The setting lead in Little Ducklings (PS) emphasised the use of touchscreen devices with the children, she said that whilst children played on the touchscreens, she ensured,

> *They've got that educational, kind of, you know, that they are educational and that there's an outcome to them so that there is some learning going on, it's not just playing on a game.*

Practitioners and those in a leadership role identified the need to learn and that activities had an educational benefit or outcome, which was also a similar intention for parents in Kucirkova and Littleton's (2016) study. In addition, it could be suggested that practitioners held this belief that touchscreens could enhance children's learning from the type of games they downloaded perceived to have educational value (Stephen and Edwards, 2018). The following theme addresses the perceived benefits of touchscreen devices as reported by practitioners.

7.4.3 Perceived benefits of touchscreen access

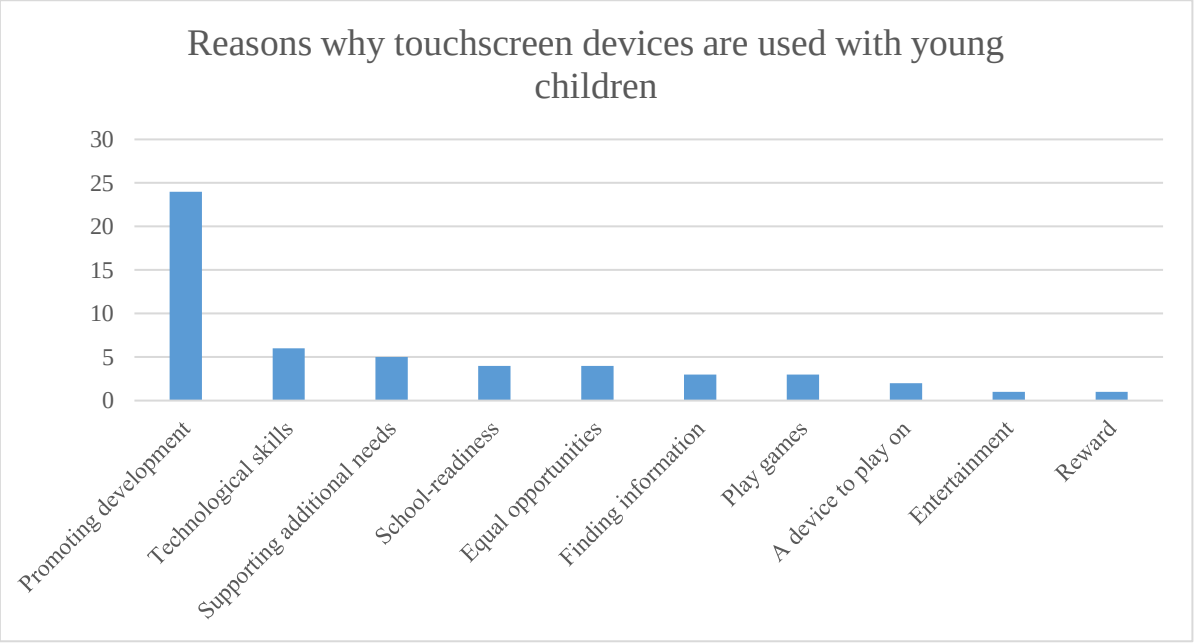
7.4.3.1 Supporting children's development

Participants across the four case sites identified positive aspects to using touchscreen devices in their settings. In Little Ducklings (PS), the setting lead acknowledged the benefit for both children and practitioners of being able to use touchscreens to support all children's learning. When responding to a question on the reasoning behind implementing touchscreens within the early years setting, the settling lead commented:

> *I think just knowing that when our children first come in to the nursery they are coming in at a very low starting point… so it's a language need, it's not just you know, it's the language but it's also speaking and listening, so it's that modelling for those children.*

Supporting children's development was recognised as the most common reason behind touchscreen use within the four case sites (figure 14).

Figure 14. Reasons why four case sites use touchscreens with children



Participants recognised the impact of touchscreen devices and the apps available to children, in supporting development within the prime and specific areas of learning across the Early Years Foundation Stage (DfE, 2017). These areas included Personal, Social and Emotional Development (PSED), Physical Development, Communication and Language, Mathematics and Literacy (DfE, 2017).

7.4.3.1.1 Personal, social and emotional development

Participants highlighted a range of ways in which children's PSED could be enhanced through using the technology and apps to support children's confidence and independence. It was acknowledged that using the technology itself was a strategy whereby children could become more confident and independent in learning technological skills to navigate around the technology devices, where an adult was not required. One practitioner in Little Ducklings (PS) elaborated:

> *Confidence – (speaking from the child's perspective) 'I know how to turn this on and I know what to go on'. It's confidence and, not a shock when they see them [tablets] so they will kind of be getting used to it. 'I know what to do with*

> *them' and probably because they've got used to it they can encourage another child to get used to it.*

As in Flewitt *et al.*'s (2014) study, this finding reflects the positive associations to touchscreen use in early years settings. This also reflects the changing nature of children's learning, in that peers can have a significant role in extending learning, adopting the role of more knowledgeable other (Vygotsky, 1978) and implementing scaffolding strategies to extend their peers' learning. Therefore, collaborative play opportunities have the potential to promote learning through the varied experiences of others, and by children being encouraged to share their knowledge with their peers.

Other participants in Little Ducklings (PS) further explored children's growing confidence and independence as a benefit for both children and practitioners. The room lead commented on children's ability to use the touchscreen devices and be able to navigate around apps. As a benefit for practitioners, she recognised the fewer demands on practitioners to support children continuously in their daily activities when using touchscreen devices:

> *They don't always, when they're playing a game which is teaching them something, they don't need that adult to give them feedback about how they're doing. They can figure it out for themselves.*

The fact that practitioners recognised the fewer demands on their time because they acknowledged the digital scaffolding inherent within apps meant that for practitioners they could prioritise other activities or roles within the setting. However, research suggests that digital scaffolding alone is not sufficient to support children's learning as they play with technologies, and children require emotional support alongside challenge, something which technologies cannot provide (Radesky and Zuckerman, 2017).

However, it was also noted how confidence levels ranged between boys and girls. The setting lead in Little Ducklings (PS) explained how on an occasion where children were observed, boys were seen to use touchscreen devices more than girls. The setting lead acknowledged the need to encourage more girls towards using the technology, after saying, *"it may be that the boys are more, you know, kind of pushed forward a little bit more than the girls to go and use them".* By contrast, the room lead within the same setting disagreed that boys were more likely to use touchscreen devices than girls were. She explained that whilst that judgement may have been prevalent on the day of observation, it was not *"typical of our environment".* The gender balance of young children using the touchscreens was not commented upon in the other three case sites. Chapter 8 explores the gender balance further through observations of children's touchscreen use.

7.4.3.1.2 Physical

Alongside supporting children's confidence and independence, participants referred to the physical aspect of using the touchscreen devices to support the development of children's gross and fine-motor skills. This was through developing hand-eye co-ordination to accurately tap icons, perform actions and to draw. Children's fine-motor skills were acknowledged in Forrest Green (DN) and Busy Bees (CCN).

One practitioner in Forrest Green (DN) commented on the touchscreen's ability to support hand-eye co-ordination through learning how to navigate on the device and to *"move things around",* for example, using a drag and drop action in apps. Children were reported to play on apps where they were encouraged to practise early writing to support phonics, recognising *"the finger movement of drawing the letters"* and *"writ[ing] the letters"* over outlines. Early writing was recognised as an area that was stimulated by using touchscreen devices, and studies are also reporting the use of drawing apps to support developing writing skills (see Knowland and Formby, 2016; Price *et al*., 2015). A room lead in Busy Bees (CCN) saw additional ways in

which hand-eye co-ordination could be supported, through *"the big sort of drawing things"*, recognising how in that particular setting, children were able to use large touchscreen devices and use the programme 'Paint' to draw on the screen. She commented:

> *[Having] the same opportunity to develop the skills that just drawing does… hand to eye co-ordination and… mark-making, [it] is a beginning to writing.*

Children's early writing was supported in all settings through providing apps that encouraged mark-making. In some sites, mark-making was extended through tracing letters and thinking about letter formation using guides in apps. A room lead in Forrest Green (DN) sought to clarify the use of letter-tracing apps. She commented that whilst some apps supported:

> *The drawing of the letters… we don't get them to trace letters with pencil and paper, it's just the finger movement of drawing the letters on some of the games, it's quite good, I like that.*

The room lead reinforced that whilst children could repeat activities in different ways, they were not expected to learn as some of the apps require, for example to trace letters or numbers to learn.

7.4.3.1.3 Communication and language

Promoting children's communication and language skills was referred to across Busy Bees (CCN) and Little Ducklings (PS). As with practitioners in Flewitt *et al*.'s (2014) study, interview participants noted how apps supported children's language skills, for example through displaying photographs of children to foster discussion, encouraging children to describe their actions as they play, and increasing children's speaking and listening abilities through nursery rhymes or stories. Where technology was used to display photographs, the technology was utilised to facilitate conversation through prompts from images and interaction with practitioners. In Busy Bees (CCN), one practitioner commented how children were

discussing fireworks, and, to support their interests, images of firework displays were sourced from the internet to encourage children to share their experiences of them. As such this approach enabled practitioners to follow children's interests rather than solely implement activities that were planned for the children. A room lead in Busy Bees (CCN) explained that she had displayed photographs on the touchscreen the following morning of children baking. Displaying pictures enabled children to share their experiences about baking on the previous day and speak to their peers and to practitioners about what they did.

Little Ducklings' (PS) approach to fostering communication and language development came in the form of supporting children's abilities to recognise intonations and different accents, where technology was used as an additional medium for teaching. Whilst children were taught phonics and numeracy during formal sessions, apps were available for children to use on the touchscreen devices. The setting lead commented:

> *If we are learning new nursery rhymes, it's good for them [children] to keep it so they get to know the words and things like that [from apps] …because [the children are] not just hearing the practitioner, you're also hearing it [language] through whatever they're accessing. So, they're hearing the different intonations, the different voices and the different sounds. It's a different way into it.*

Language development was recognised as *"the biggest impact to date"* according to the setting lead in Little Ducklings (PS). She commented how children could access apps in their own free-play time where they can make choices and talk about what they were doing with the touchscreens. It was moments like this where practitioners recognised the potential of touchscreen to support children in reaching their zone of proximal development (Vygotsky,

1978), by recognising that touchscreen and non-touchscreen-based activities could extend children's learning in certain areas through specific apps or activities on a range of platforms.

Interestingly, one of the concerns associated with touchscreen use within different studies is the impact on children's communication and language skills. Duch *et al*., (2013) and Zimmerman *et al*., (2007) both report concerns on the negative effects of technology use for children's communication skills, since the touchscreen is perceived to not facilitate communication or social interaction. What this study and Flewitt *et al*.'s (2014) study shows is that in fact, there can be positive associations with touchscreen use in relation to children's communication and language skills, particularly so when used to encourage conversation as with the examples provided within this chapter.

7.4.3.1.4 Mathematics

In addition to supporting communication and language development whilst using touchscreen devices, it was reported by participants that touchscreens also supported children's mathematical development. Participants identified how children could learn mathematical skills through counting, matching pairs, learning shapes and learning to recognise and write numbers. Across the four case sites, at least one participant in each site commented upon supporting mathematical development. It was recognised that children could learn quantities, count by rota, and at times, learning math skills was focussed on as a specific target within settings. Within Little Ducklings (PS), the setting lead commented, *"I think maths is one of the ones that we are looking at with a main focus at the moment because maths is an issue at the moment in the nursery"*. She continued to say that technology was used to support children's mathematical skills through using apps that supported maths development.

For maths it's not just counting objects, again it's that different medium that they're kind of accessing it through, and that means that it then becomes embedded for them in a different way.

The technology was recognised across all sites as being another medium in which children could learn, something which researchers encourage when supporting learning across a wide range of areas of development (Alper, 2013; Billington, 2016; Cooper, 2005; Finegan and Austin, 2002). Practitioners reported how children could replicate or participate in activities on and off screen which supported their development, and children could recognise that on-screen activities could be accessed through non-screen-based activities.

7.4.3.1.5 Literacy

The development of children's literacy skills was supported through different apps that included features where children could listen to stories and practise turning pages. Participants referred to the 'CBeebies Story Time' app that allowed children to choose whether they read an eBook themselves or selected the 'read along with me' option. In this option, the app would read the story, highlighting words as they were read to encourage children to follow. Children were prompted to turn the page and continue following the story. Participants recognised the educational benefits that apps such as CBeebies provided for children, noting children's familiarity with the characters and the range of ways which children's development could be supported. Interestingly, whilst practitioners in this study promoted the use of these apps, in Knowland and Formby's (2016) study, parents and practitioners reported a low uptake in using eBooks and instead preferred to use more interactive apps with children. Literacy development was also referred to in regard to nursery rhyme apps, where children were encouraged to follow the nursery rhymes as the words were highlighted at the bottom of the screen whilst the app sang the songs.

Busy Bees (CCN) referred to another approach to support children's literacy skills. Each week, a practitioner would focus on a new story, and the story would be read to the children in different forms. Alongside reading from a book, a video which included a walkthrough of the book would be shown on the touchscreens to allow the children to follow the story. The room lead explained,

> *[It] is helping them to understand the story and we can use that to go through together, and sometimes they act it out.*

The use of the technology was to create a more physical representation of the story. Children could follow stories in different ways, through recognising that stories can appear in physical copies, eBooks, or videos. This approach of using technology to foster the development of literacy alongside using non-technological devices is in line with recommendations from Guernsey *et al*., (2014) on the combination of technological and non-technological approaches to promoting learning.

The incorporation of literacy activities when using touchscreens is a common occurrence within other early years settings and practice at home. Studies show that children read eBooks with parents and practitioners (Formby, 2014b; Knowland and Formby, 2016) and studies also show the potential of touchscreens to support collaborative literacy activity when children create their own stories (Wohlwend, 2015). Touchscreens are now becoming more versatile for young children, as children can now access stories in a variety of formats to help develop their literacy skills.

7.4.3.2 Gaining technological skills

Gaining technological skills was closely related to supporting children in being ready for school, when participants reflected on the advantages of using touchscreen devices with young

children in each of the four case sites. For example, a room lead in Caterpillar Corner (CM) commented:

> *It gets them ready for, they've got a basic knowledge of using a computer or a tablet ready for when they go to school.*

The room lead recognised the need for computer skills, particularly from her own experiences of children being expected to know how to use technology when starting school. The setting lead also recognised the need to use touchscreens. As a benefit of using touchscreen technologies in the early years, she commented,

> *It gets them [children] ready for school as well.*

Preparedness for school was also referred to within Busy Bees (CCN). One practitioner recognised the importance of giving children access touchscreen technologies in the early years *"before they move on to school"* so that children could learn technological skills. Within Busy Bees (CCN), practitioners adopted a different way to encourage children to develop technological skills in comparison to the other three case sites. As this site provided large touchscreens that ran one programme with a range of games on, there was the function to 'lock' the game so that children would not be able to navigate away from it. A room lead explained her approach and the reasons behind it:

> *I would only have the drawing thing on and I would block it so they can't move out of it, so then you are actually getting them to look at how to use it [technology], because the other thing about our touchscreens is that you have to support them [children] to realise that if you all press it [the screen] at the same time, it doesn't work.*

This approach reflects the scaffolding inherent within touchscreen play through the recognised need for children to develop technological skills. Practitioners implemented certain strategies

to ensure children would learn skills alongside playing on the games, so playing was multifaceted in terms of playful touchscreen interactions which supported skill development. In turn, this has the potential to support children in reaching their zone of proximal development (Vygotsky, 1978) by recognising the need to extend children's development in the form of learning how touchscreen devices function, in terms of shared touchscreen and individual touchscreen use.

Another practitioner in Busy Bees (CCN) recognised children needed adult support in how to use the technology after identifying that all children had not previously had access to touchscreens. In addition, because the screens were of a large scale it could have meant to the children that a group of children could play at the same time. Viewing touchscreen use in this way is considered by some researchers to follow an operational-style approach to learning, since traditional views of learning with technology was to acquire operational skills to function technology (Blackwell *et al*., 2014; Plowman and Stephen, 2013). In addition, Burnett (2016) asserts how "education in a digital age is not just about ensuring children have digital skills, but supporting them to navigate and negotiate possibilities enabled by technologies" (p. 18), emphasising the need for practitioners to look beyond the operational skills-style learning approach often implemented in settings. However, a more recent study has showed the importance of learning operational skills at a young age to support children using other forms of technology in later life (Blackwell *et al*., 2016). Furthermore, Marsh *et al*., (2015a) support the use of touchscreen technology to learn new skills.

Little Ducklings (PS) recognised that children could experience using touchscreen technologies within their setting before the children moved on to school. As this setting was on a school site, some practitioners had previously taught in the school, so were aware of the technology approaches the school employed. A practitioner told me:

> *They get a little taste of it in here which is the [tablet] stage, and then yeah [they use more technology in school], but they do use the Interactive Whiteboard as well, just simply.*

Children could use the Interactive Whiteboards and touchscreen devices during child-initiated play; however, the Interactive Whiteboard was also used in a taught lesson-style, where practitioners controlled the use of the technology.

7.4.3.3 Supporting children with additional needs

Supporting children with additional needs was referred to as a benefit to using touchscreen devices within Forrest Green (DN) and Busy Bees (CCN). Both sites recognised the ways in which touchscreens could engage children in their learning. For Forrest Green (DN), one practitioner suggested the novelty and 'fun' element of using a tablet to engage children. In relation to children's motivation to learn through table-top activities, she said:

> *Some of them won't do it, but they will do it [on the tablet] because it's seen as a treat, I think obviously you know it's still educational, I think it seems more fun to them and they're more likely to do it.*

It appeared that touchscreen play was perceived by children as a reward, which calls into question the link between rules and rewards in relation to touchscreen activity, and the way in which the touchscreen is positioned to children within daily activities. For example, whilst this practitioner commented that children appeared more likely to engage in 'educational' activities using a touchscreen, it is important to consider the way that practitioners perceive the touchscreen in relation to the educational context, and whether children are aware of the educational emphasis or if they perceive touchscreen access as a general reward.

Relating back to additional needs, the same practitioner had said about technology use:

> *It's good for the children who lack sort of that little bit of attention [span] so if they won't sit down and don't want to look at numbers on a table and jigsaws and things like that, maybe they, because it's got that novelty about it, you know, because they get to drag and drop some things [it is more appealing].*

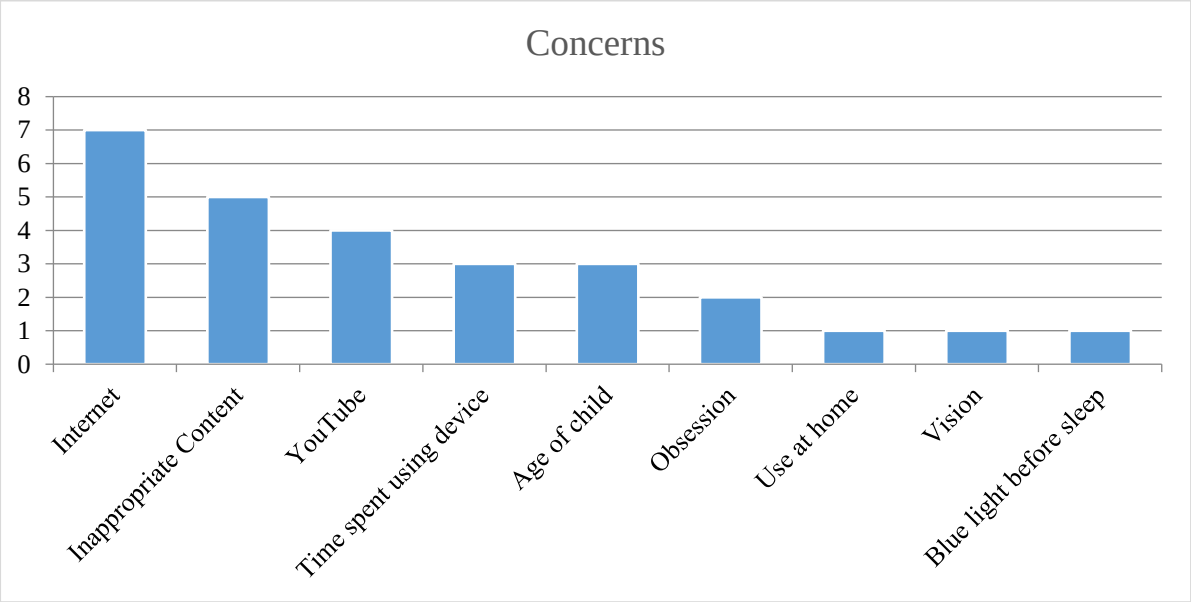
Children's attention spans were addressed further, acknowledging that supporting children's developmental delay was addressed in one way by giving children access to the technology to *"develop their concentration and things like that".* In similarity to this study, Gray *et al*., (2017) also reported positive associations to using touchscreens in enhancing children's attention spans, through speculation from practitioners that children were inclined to engage in activities for longer periods of time. These findings contest concern that touchscreen devices are hindering children's attention spans (O'Hara, 2011), considering practitioners are actively using touchscreens as a way of supporting children's concentration levels.

Within Busy Bees (CCN), approaches to supporting children's additional needs was in the form of one-to-one support with health professionals. In relation to using hand-held touchscreen devices rather than the large screens, the setting lead said, *"we use it with the children, if it's specifically for a purpose"*, such as supporting children with hearing loss. The setting lead recognised the need for 'good' games that can support children's sound discrimination needs.

7.4.4 Perceived challenges and concerns

Whilst participants across the four case sites reported positive aspects to using touchscreen technologies in their settings, there were however, reported challenges and concerns expressed.

Figure 15. Concerns expressed by participants about children's touchscreen uses



7.4.4.1 The internet

Most commonly, participants expressed concerns over children being able to access the internet. Across the four case sites, participants identified internet use was restricted as it was unpredictable what children would access whilst browsing. Where internet access was available in terms of being connected, participants reinforced the need to supervise children's touchscreen activity. One Caterpillar Corner (CM) practitioner identified she had no outright concerns regarding children's touchscreen use. She explained:

> *Whilst [children are] in the Early Years they don't really understand the concept of the internet access.*

However, the practitioner did say that children were not allowed to use the internet in the setting due to them being able to access inappropriate games. Both the setting and room lead in Caterpillar Corner (CM) explained children were not allowed to access the internet, particularly YouTube, as the content is uncertain to be age appropriate for the children. Similar concerns were also reported by parents in a recent Ofcom (2017) survey, where parents were concerned about the type of content children would access online, so much so that 23% of parents restricted their children's internet access at home. However, unlike in this study, Ofcom (2017)

reported 47% of parents believed the benefits of the internet outweighed the risks associated to it, a practice uncommon within the early years settings in this study.

Within Forrest Green (DN), the room lead identified that she monitors children's touchscreen usage because internet access is available on the device that is used. In terms of internet accessibility, the room lead said:

> *They can access the internet if they wanted it so, and some of them are very good at reading and writing so we just monitor in that way and always have someone to sit with them.*

Another practitioner reinforced that internet usage was restricted as it is *"dangerous"* for children of three and four years to access. She expressed her concerns:

> *[The tablet] is connected to the internet because we download games. Obviously if they got hold of that, they could see anything…we've put a thing on it, so they don't get pop-ups or anything like that, but yeah, I think it's dangerous*.

In relation to children accessing the internet, participants were concerned of the easiness for children to access inappropriate content, and therefore internet use was restricted across the four sites. Some participants noted inappropriate content in YouTube videos across Caterpillar Corner (CM), Busy Bees (CCN) and Little Ducklings (PS), so they adopted restrictive mediation techniques which reduced risk of harm, but subsequently reduced opportunities for extending learning (Livingstone *et al*., 2017). Particularly in Busy Bees (CCN), two practitioners spoke from experience of using YouTube with groups of children, and the issues they had encountered. Whilst recognising that content blocks were installed on all devices, the setting lead said that even with the content restrictions:

> *You can access things that aren't appropriate for three-year olds. Even if you come across a scantily clad lady singing a song that would be considered not*

inappropriate, it still wouldn't be something I would want the children watching.

The setting lead referred to children's use of YouTube, recognising that *"I'm just a little bit further away knowing that I can jump in and stop it [video] if I can".* She referred to the community and making judgements on what might be considered appropriate material for children to watch.

I never would want it [the internet] not supervised at all, because it is very easy to get something. Particularly in the community that we're in because it could be something that would be considered, I might not think it was something inappropriate, but the community might, so, and I suppose that's the same in all communities. You are responsible for other people's children and you can't decide what is ok for them to watch.

YouTube content was also referred to by a room lead within Busy Bees (CCN). As in the previous quote above, the room lead referred to the inappropriate images which appear when watching age appropriate content for three and four-year-old children. She said:

You put things on YouTube and it's appropriate for the children and then an advert will come in… right in the middle of things now… for perfume with this woman who is semi-naked, and you think 'this really isn't appropriate'… I don't understand why, if you've chosen something which is specifically for such a young age, why those adverts are on… if you go and see a film, you make sure the advert or trailers have got the same rating as a film, so what's going on with YouTube?

This frustration was not only raised by participants within Busy Bees (CCN). A room lead in Caterpillar Corner (CM) referred to an incident with her own child who had previously

accessed inappropriate content when the title of a video was targeted to children. Concerns were expressed that as anyone can upload videos onto YouTube, practitioners were unaware of what was appropriate for young children. One Little Ducklings (PS) practitioner raised attention to the inappropriate content children can access on YouTube, particularly the adverts in between and during videos. The practitioner commented how children were known to *"type in things, press adverts. All sorts of things were coming on and at times, unsuitable things".* The practitioner went on to explain that the setting had been able to restrict YouTube access for the children when using tablets, through turning off Wi-Fi if children are using tablets independently.

7.4.4.2 Other concerns

Other concerns expressed by participants included the time children spent using touchscreens, the age of the child who can use touchscreen technologies, becoming 'obsessed' with the technology, and developmental areas such as effects of the screen on children's vision.

7.4.4.2.1 Length of time spent using touchscreen devices

Participants in Caterpillar Corner (CM) and Little Ducklings (PS) raised awareness of the worry that children want to spend too much time using touchscreens, a similar concern reported by parents (Kucirkova and Littleton, 2016; Ofcom, 2017). One Caterpillar Corner (CM) practitioner identified that children wanted to spend large amounts of time using the devices, and as a result, touchscreen use was limited to a one-hour period for all children aged three and four years to access the technology. Within Little Ducklings (PS), one practitioner commented:

> *They shouldn't be mesmerised by it, I mean, they shouldn't be spending long like three-four hours on it, no. They need to have a burst, and then they need to have that enthusiasm to go back and say, 'well I wanted a go on there'; like that.*

All sites were later seen to reinforce time limit restrictions on touchscreen use, which is discussed further in the following chapter.

7.4.4.2.2 Age of access

The age of children who had access to touchscreen devices was a concern expressed in Forrest Green (DN). Participants identified children under the age of three were not allowed to use the touchscreen in the setting, however the children did access technology in the form of watching short videos on a computer. The setting lead commented how she had seen children *"as young as 12-14 months opening Mum's iPhone and putting the pin in"* and was concerned that all children might end up becoming as technologically competent as this child and using the technology at the age of one.

7.4.4.2.3 Obsession with technology

An additional concern was children becoming fixated on the technology. Within Little Ducklings (PS), the setting lead said she would become concerned if the same children continued to use the technology and chose not to access the other activities available for children, however explained that this was not the case at present. This was a similar concern by parents in O'Connor and Fotakopoulou's (2016) study that children would become obsessed with the technology.

7.4.4.2.4 Children's vision

Another area in which participants expressed concern was the effect touchscreens may have on children's vision. This was illustrated by the following comment from the setting lead at Busy Bees (CCN):

> *We have noticed… that we've had a lot of children when they've first come to us have had difficulty with peripheral vision. Erm, at first, they would find it, they would bump into things and we did wonder, and this is just us, that maybe*

it was because they were so used to looking at a screen. Even with watching a screen, you have to negotiate your place and people can walk in front of you and things, and we wondered that with the tablet, has just affected that.

The setting lead's continued observations identified:

Given the experience that they have here, and once they're allowed to have that opportunity [to use the large touchscreens], we see that [peripheral vision] improve very quickly.

The setting lead raised the point that the touchscreens that are accessible to the children in the setting are large enough to allow four children to stand in front of and use the touchscreen, indicating the size of the device available to the children. Children are then encouraged to look around over a large area to see the screen.

Within Forrest Green (DN), one practitioner during the interview referred to some information she had obtained from reading articles and through training sessions regarding the light behind the screen and the amount of time required to 'wind down' after using a screen with backlight before sleeping. In relation to children accessing the tablet in the setting, she said:

I've been on a couple of courses where they've said it takes two hours to wind down once you've been staring at something which gives off that radiation, so if we're doing it [using the tablet] before sleep time, they're [children] not going to be able to have a nap for two hours.

The practitioner then explained how her practice had changed, by turning the tablet off at 11am for a few hours, whilst children eat and sleep from 1pm. The practitioner explained this practice is repeated towards the end of the day; for the children who remain at the setting until 6pm, the tablet is not available to the children at the time, to take a screen away before the children go

to sleep in the evening. Whilst the practitioner follows this guidance, she did admit, *"I don't know if it's true".*

7.4.4.3 Reported challenges

Whilst participants reported their concerns with young children using touchscreens in each of the four case sites, participants also identified challenges when it came to using touchscreens with children.

7.4.4.3.1 Technical issues

Participants identified that technology issues were prevalent across Busy Bees (CCN) and Little Ducklings (PS). Within Busy Bees (CCN), participants spoke about their previous use of technology. They discussed how technologies were incompatible with the children, for example with calibration issues. Having previously used Interactive Whiteboards, participants noted how children were more forceful when using the stylus to touch the screen. Since updating their technology to large touchscreens, participants noted how children responded to the technology better, almost respecting the technology more when using it.

However, when discussing technology use with another practitioner, the integration of the large touchscreens was not a smooth transition for all. She explained how the screen was 'temperamental', which was synced with a laptop, which was also 'temperamental', which meant that for most of the time, the technology would not work in one of the playrooms. The practitioner continued to say that having an updated laptop decreased the amount of issues that arose, however issues were still prevalent with the screen synchronising with the laptop when children play.

The same practitioner identified that when given the chance to play independently, children would sometimes lock certain parts of the screen. Practitioners were initially unaware of what had happened, so a technician supported the practitioners in problem solving. However, the

practitioner said, *"but that doesn't seem to be the right answer to the problem all the time"*, recognising that issues are continuous.

Technical issues were also prevalent within Little Ducklings (PS). The room lead explained how on one occasion, the children had attempted to use the touchscreens to take photographs of items of interest around the school site, however the camera function on the touchscreens did not always work. The room lead reflected, *"to be honest, the camera was more successful"*. Following on from this incidence, cameras were used rather than the tablets.

7.4.4.3.2 Practitioner confidence

Another reported challenge from participants came in the form of practitioner confidence when first using the touchscreen devices. Particularly in Little Ducklings (PS), the setting lead and a practitioner reflected on initial concerns. Upon asking the setting lead how practitioners reacted to the new technology, she responded, *"with great fear at first"*. The setting lead went on to explain that particularly for the older practitioners who had been working for a long time with old technology, the practitioners had become 'deskilled'. The setting lead repeated others' fears, such as,

> *How are we going to use them? The children will know more than us.*

She explained the approach implemented to put practitioners at ease, such as ensuring they were aware of the 'basics' including turning on the tablet and logging in. The setting lead reflected that this then had an impact on how the practitioners used the tablets with the children, since the practitioners were subsequently more confident in using the technology.

This finding was unsurprising considering that other research suggests some practitioners find it challenging to adapt their usual routines to incorporate technology, particularly so if they are not technology-users themselves (Flewitt *et al*., 2014; Knowland and Formby, 2016). With the perception that children are more skilled than practitioners, researchers suggest this puts strain

on practitioners who then question their role as a practitioner, since the boundaries have changed between the adult and child in terms of knowledge and skill sets (Blackwell *et al*., 2013; Valentine and Holloway, 2001). However, practitioners within this study and in Flewitt *et al*.'s (2014) study reflected on the uptake of technology and their developing skills.

A practitioner within Little Ducklings (PS) reflected on the experience, being a concerned practitioner herself. When asked about her feelings when the touchscreen devices were first introduced, the practitioner replied:

> *At first I'm thinking (intake of breath) 'how do I do it? How do I turn it on? What do I do?*

The practitioner felt more at ease once she had learned how to turn on the tablet, and explained,

> *... but as soon as you turn the button on, it comes on the front, it's just common sense what you do.*

She then went on to comment that she is now confident with using the technology and does so at home too. Within Forrest Green (DN), the introduction of touchscreen technologies came with caution from practitioners. The setting lead reflected on practitioners' reactions:

> *A lot of the staff were like 'why do we need to introduce it, we have a computer?' But they're used a lot in schools as well and it's just moving with the times.*

The setting lead went on to say that whilst at first practitioners were unsure of its integration into daily practice, *"they now love it"* and are also using the touchscreens to support their planning through searching for activity ideas on apps and online.

7.4.5 Restrictions on children's uses of touchscreen devices

In addition to challenges and concerns regarding children's uses of touchscreen devices, participants also commented on the restrictions in place when children access the technology.

All case sites referred to time restrictions per child in using the technology as an attempt to moderate usage amongst all children, and to encourage children to play with other activities in the settings. Other restrictions included internet access and YouTube access as previously discussed in 7.4.4.1, alongside availability of the devices, supervision, the apps available to children and the age of children being able to access technology (discussed in 7.4.4.2.2).

7.4.5.1 Time allowances

Time restrictions on children's touchscreen usage were implemented within all four case sites. Within Caterpillar Corner (CM), children were reported to be allowed *"a short amount of time"* before being asked to give the tablet to another child. Participants perceived touchscreen use as a positive aspect of practice, with an emphasis on regulating children's time spent using devices. Children's tablet use is controlled because the children should not *"be on the tablet for too long, I mean, it's not good is it, they should be out and about and running"*.

This approach of encouraging children not to spend long amounts of time using touchscreen devices was also reinforced within Forrest Green (DN). The room lead explained:

> *We've tried to share it out so that each child gets about five minutes and enough time during the session, so the morning children will get a turn in the morning and the ones who are here all day will get a turn in the afternoon.*

Another practitioner suggested children were allowed up to ten minutes playing, but the children would be encouraged to share the device with other children, through being asked if they would like to allow another child a turn. Forrest Green (DN) adopted an approach where the child using the device would be encouraged to select a child to play next, to reinforce sharing and the importance of allowing others a turn using the device.

Within Busy Bees (CCN), the setting identified that time restrictions would be put in place when many children were asking for a turn to play. In this instance, a sand timer would be

utilised to explain to children that once the sand had run down, then they must allow another child to have a turn. A practitioner provided an example:

> *If there's a bit of a fight about 'my turn my turn', and if they're not sharing, we end up having to say, 'right ok, one at a time and if you can't share we will do one at a time' and say, 'you first' and we might use a sand timer so 'when the sand gets to the bottom, then it'll be your turn and then we move on'.*

The practitioner explained that this practice is the same for other activities, such as playing outside on the bikes to let all children have a turn playing. As this time restriction is not in place all the time, I asked the practitioner how she felt about time frames. The practitioner commented that there was not a timeframe adhered to, and that at the time of the interview, the practitioner had not seen a child that she felt had spent too much time using the touchscreen in any session. She identified approaches to encourage sharing, such as being aware of how long children were spending on the touchscreens and monitoring children's movements to other screens in the nursery to play on after moving on from one screen.

Time limitations within Little Ducklings (PS) were less formulated than in Caterpillar Corner (CM) and Forrest Green (DN). The setting lead commented on a way the setting sought to establish a gender balance between children's uses of the touchscreen through monitoring who is using the tablets, and through ensuring the tablets are not available to the children throughout the day. The room lead mentioned that a ten to fifteen-minute timeframe is reinforced to ensure all children gain access to the tablets, as it is recognised that there are ten touchscreen devices available to the children, but over forty children in the setting. Actual representations of children's time allocations are further explored in Chapter 8.

7.4.5.2 Accessibility of the device

Approaches to providing children access to touchscreen devices varied across the four case sites. Upon asking who controls when and for how long children can use touchscreen devices, the setting lead in Caterpillar Corner (CM) and Forrest Green (DN) identified it was their role. One practitioner in Busy Bees (CCN) identified the large touchscreens were available to the children during free-play time each day, and that touchscreen use would be controlled by the practitioners present in the room with the children. Within Little Ducklings (PS), the setting lead reflected:

> *We try and control it, but we're very busy. So sometimes it's the children, I'll be honest. And if I'm being truly honest, it should be the teachers but it's not always that way.*

Within Caterpillar Corner (CM), participants explained children could gain access to the touchscreen during a lunch hour period when younger children went to sleep. Touchscreen use was recognised as an activity on its own, where children could play and learn during quiet time. Within Forrest Green (DN), participants mentioned that touchscreens were made available during the day but not every day and would be used in accordance to the attendance of children (as discussed in 7.4.5.1). Children in Busy Bees (CCN) could use the touchscreens every day during free-play time, which was most of the daily routine. Children could access touchscreens in four different rooms where children play. Within Little Ducklings (PS), one practitioner reported touchscreen devices were used with a greater pedagogical focus accordance with planning,

> *On the timetable…they have the [touchscreens] on there so I have to go over [to the school] the day before, get the [touchscreens] and charge them up*.

Children's access and use of touchscreens were supervised by early years practitioners within Caterpillar Corner (CM) and Forrest Green (DN). The room lead in Caterpillar Corner (CM) commented that children were observed continually, so practitioners were aware of what apps children were accessing, and that they were age appropriate. Supervision was also in place to ensure the children did not access the internet whilst using the tablet.

Children's touchscreen use was also supervised in Forrest Green (DN). The setting lead explained how the tablet was relatively new, so safety tools such as a protective case and screen cover were not yet fitted to the device. Practitioners recognised how easily the touchscreen could break and were aware that the tablet was connected to the internet, so similarly like Caterpillar Corner (CM), children were supervised to ensure they were not accessing the internet, after previously raising concerns (see 7.4.4.1).

In Busy Bees (CCN) and Little Ducklings (PS), children could play independently on the touchscreen devices. In Busy Bees (CCN), the setting lead recognised the minimal supervision in place:

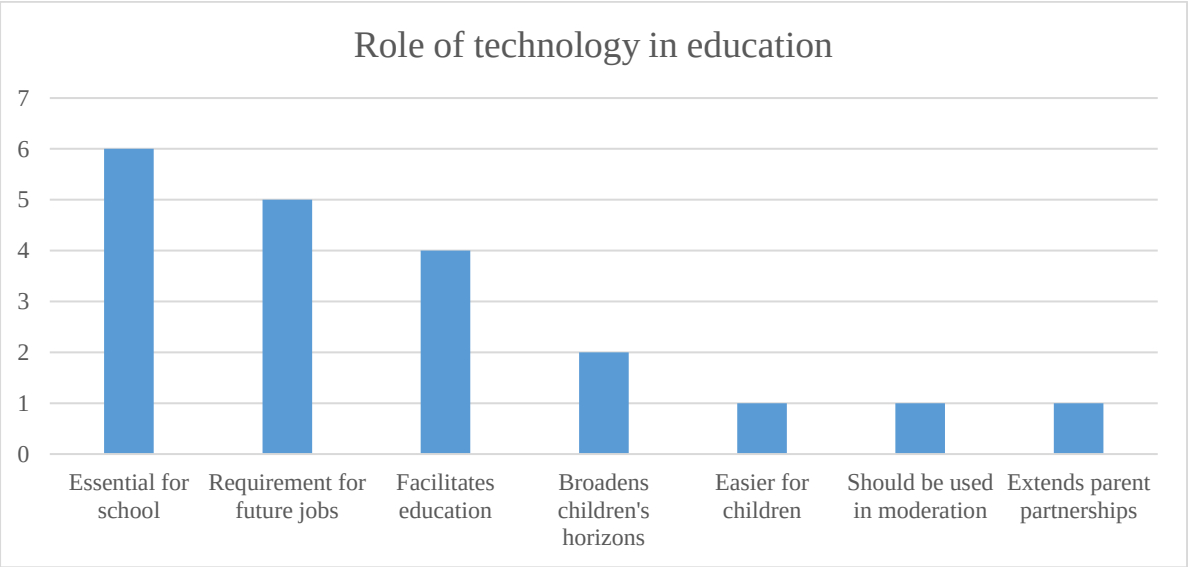
> *It isn't something we watch, it isn't a priority, you know, you can see that. It's not a priority, mainly because we've felt that it's not something that our children miss out on and there's so much that they do.*

This setting lead commented anecdotally that when on home visits to children who were due to attend the setting touchscreen use was seen frequently. The setting had decided that children should be drawn away from the touchscreens and be encouraged to use other technologies. Little Ducklings (PS) participants did not identify their supervision practices when children used touchscreens, however the setting lead did refer to supervision in regard to responding to the gender balance between boys' and girls' uses of touchscreens in the setting.

7.4.6 The role of technology in early years practice

When attempting to understand practitioners' perceptions of young children using touchscreen devices in the early years, participants were asked to reflect on the role of touchscreen technology in early childhood (figure 16).

Figure 16. Participants' responses to the role of technology in education



Some participants approached technology with caution, saying, *"I think, I'm worried"* (Little Ducklings (PS) practitioner). Another participant identified herself as 'old-fashioned' (Forrest Green (DN) room lead), as she felt children should not be using touchscreens for long periods of time. Other participants were more welcoming of technology, acknowledging the benefits of using technology in comparison to practitioners' own childhood experiences, such as writing for exams (Caterpillar Corner (CM) practitioner) and sourcing information (Little Ducklings (PS) practitioner).

Participants acknowledged freely that technology was *"a part of our children's future"* (Caterpillar Corner (CM) room lead) and *"it's a part of everybody's way of life now"* (Busy Bees (CCN) practitioner), accepting the increasing presence of technology within daily lives. It was recognised that children needed to be introduced to technologies in their early years to

prepare them for school (Caterpillar Corner (CM) practitioner), and that children should be learning technological skills. Participants explained children would need to be skilled to prepare them for working life, proposing that children's future jobs would require computer use.

It was recognised by most practitioners that touchscreen devices had a position within children's lives as they continued throughout education and into working life. As such, this vision is associated with Bronfenbrenner's chronosystems (1986), in that practitioners acknowledged that touchscreens or technologies were not temporary resources and were instead permanent fixtures within the future, yet these could change to different or newer technologies. However, whilst studies recommend early technology access to develop skills for the future (Blackwell *et al*., 2016; Finegan and Austin, 2002; Edwards *et al*., 2017; Haughland, 2000; Judge *et al*., 2004; Marsh *et al*., 2015a), Plowman and McPake (2013) suggest it is not necessary to start so early and it is in fact a myth that children need early touchscreen access, considering the technologies children will use by the time they seek employment will be considerably different to those they first used in the early years.

Participants suggested that technology could facilitate learning through providing children with a different medium to source information, to extend learning and to reinforce what children are learning through different mediums. The room lead in Forrest Green (DN) said technology had the potential to *"broaden [children's] horizons"*, and technology was a good thing for children.

One practitioner commented that the use of technology in Busy Bees (CCN) had allowed parent-partnerships to strengthen through using programmes such as 'Tapestry', a platform for online learning journeys, to share children's experiences throughout the year rather than just at the end of term. Participants reported that they could use the technology to support anxious parents on children's first days in the settings and could record videos of children playing to

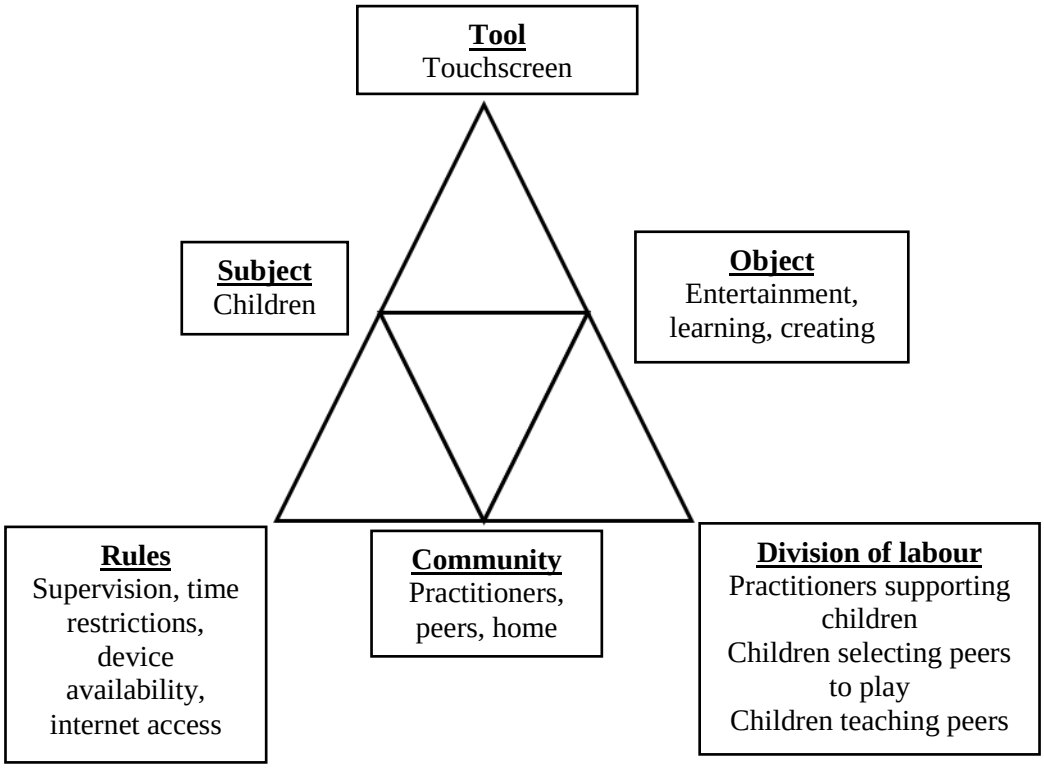
share with parents to put them at ease. Touchscreen technology was approached in a positive light, even though many practitioners accepted that technology was a *"way of life now"*.

7.5 Discussion

Upon analysing the interview data using activity theory, practitioner perceptions of the role of touchscreens influenced the nature of children's touchscreen play. As with the activity system in Chapter 6, the tool was identified as the touchscreen, since the touchscreen was a mediating artefact which children played with. Interviewing three different early years practitioners in each of the four sites enabled a greater identification of the object that children worked towards.

Practitioner emphasis on ensuring children gained some form of educational benefit from touchscreen play even though children preferred to play games, indicated the need to adhere to guidelines on children's learning within the Early Years Foundation Stage (DfE, 2017). There was a direct influence of the EYFS in determining how children interacted with the touchscreen, as identified through comments on promoting mathematical or communication and language development. As such, the central object which children worked towards as defined by practitioners was learning, through entertaining apps that the children were familiar with. Unlike in other studies which report on children's touchscreen activity, the data reflected a wide range of educational uses that children were able to use the touchscreens for.

Figure 17. Touchscreen use as reported by practitioners



Justification for using touchscreens was influenced by the belief that children need to be prepared for school, as illuminated through statements such as "*it gets them ready for school*". As such, it could be argued that an intended outcome for touchscreen play from practitioners was technological 'school-readiness'. Whilst the meaning of the term 'school-readiness' is contested within the early years, it is important to follow the language used by practitioners to accurately represent their views. Practitioners adopted this form of language to summarise their justification for using touchscreen technology through their understanding of preparing children for school. They reported how children could use this experience to develop technological skills through the promotion of equity so that all children gained access, and through the reports by some practitioners of promoting self-confidence through encouraging children to teach their peers during play. There was an assumption that children would be required to use touchscreens or technology when entering Reception, so to label this approach as technological 'school-readiness' as an outcome of touchscreen play is appropriate here,

reflecting practitioners' intentions and their understanding of supporting children's technological development ahead of school.

Children's touchscreen play was influenced by the division of labour, community and rules. The division of labour consisted of the roles both children and practitioners took, which involved supporting children through scaffolding strategies, determining the social environment and controlling if and when children taught their peers. Practitioners reinforced the potential of touchscreens to enable children to teach their peers, through using their own experiences and knowledge to extend learning by adopting the role of the more knowledgeable other (Vygotsky, 1978). Whilst this practice shows similarities to Flewitt *et al*.'s (2014) finding that children supported others during technology play, what was different with this study was that some of the practitioners intended for this to occur, rather than it being an unintended opportunity. Therefore, pedagogical approaches within this study reflected the role reversal of the adult and child in terms of knowledgeability and subsequently provided children opportunities to promote their communication and language skills.

The division of labour was further extended through reports of reinforcing the sharing element of touchscreen devices through promoting children to select a peer to have a turn. This approach has not yet been reported before and subsequently reflects how practitioners manage the 'novelty' aspect of the device for young children by giving children ownership to make their own decisions. This strategy therefore promotes positive behaviour and helps to manage the concerns raised within interviews about children becoming obsessed with technology and their ability to walk away from the device and return at a later time.

Overall, there was a clear emphasis on touchscreen activity being mediated by rules which were established by practitioners. These rules were wide ranging, from time, age of access, the internet and availability of the device. Practitioner concerns influenced the rules, most notably

in regard to the internet and the range of content that children could access. Restrictive mediation (Livingstone *et al*., 2017) techniques were implemented in all four sites through the perceived damaging nature of the internet on young children's lives.

Conversely, the fact that one practitioner identified how children were too young to understand the internet when in pre-school raised concern on how aware all practitioners were about the potential risks of the internet and the need to keep children safe. Whilst the internet was restricted in this site, it is still important that practitioners have a clear justification for restricting the internet and know how to keep children safe, rather than assuming the children do not 'understand' the internet. Children come from a wide range of backgrounds with various levels of knowledge in relation to touchscreen devices and the internet, and therefore practitioners should be aware of this and this should subsequently inform their own touchscreen practice. It was clear to see from practitioner responses that the community influenced practitioner approaches on using touchscreens, reflected through the mesosystems and wider influences from exosystems in children's lives (Bronfenbrenner, 1996).

One clear rule which influenced touchscreen play was the need to supervise children as they used touchscreen devices in two of the case sites. Touchscreen play in these sites appeared to be mediated so that practitioners were fully aware of children's actions, and this was also influenced by the need to protect the device itself from becoming damaged. This calls into question the extent to which children are trusted to use the touchscreen, with similar practice reported in Fleer's (2017) study which found practitioners took a central role in children's touchscreen play when they did not trust the children to use the devices on their own. Observations of touchscreen play further illuminate this strategy and the approaches taken by practitioners in children's touchscreen play, and this will be explored in the following chapter.

The community consisted of children, practitioners and the home environment. Practitioners reported their presence and role through interviews as discussed previously, so it was clear to see how they impacted on touchscreen activity through the protectionist stance they took in keeping children safe. Alongside practitioners, children were community members through approaches such as selecting another child to play, which has also been reported in this section. Finally, the home environment influenced children's touchscreen play through the reports from practitioners in Little Ducklings (PS) about their approaches in selecting videos to play on YouTube.

There was acknowledgement that the community or parents may not agree with what practitioners considered acceptable for young children to watch, which reveals that practitioners are constantly taking into account the views of the wider community in acceptable content for young children. The home further influenced touchscreen play through a report by one practitioner in Forest Green in asking parents what apps children played on at home, and this influenced their practice further by downloading apps which appealed to children. As such, the mesosystems within children's lives impact upon their opportunities to play with touchscreen devices (Bronfenbrenner, 1977). The beliefs prevailing in society and home experiences of touchscreen play influenced touchscreen opportunities to some degree in each of the four sites. The extent to which the community impacts on touchscreen play is further explored through observations of touchscreen use, which will allow for a comparison of data from reported practices via interviews, and actual practice via observations of touchscreen play.

There was a notable contradiction in the interview data which requires acknowledgement. Data from the settings revealed there was a divide in practitioners who found the touchscreen to be a positive contribution to children's early learning, particularly in relation to long term success through school and employment. Alternatively, there were practitioners who held reservations against the touchscreen, who were concerned about the impact of touchscreens in reducing the

time that children spent engaging in other types of play. These reports reflected how important it is to recognise that conceptions of touchscreens are socially, historically and culturally influenced, particularly in relation to how these experiences or values impact on subsequent touchscreen play.

The emphasis from practitioners that touchscreens were valuable because of the positive impact technology had in their own childhood reflected the motivation to include touchscreens within their practice, particularly when accompanied with statements emphasising the need to learn technological skills ahead of school. However, there were practitioners who were not so enthusiastic, who declared they were worried about technology and its role in the early years. This raised further questioning on how these practitioners are supported when their beliefs are different to those generally adopted by the setting in including touchscreens in their practice. Additional concern is raised when considering how these practitioners support children's touchscreen play, when the nature of play conflicts with their own beliefs.

Whilst situated within the activity system via a contradiction, the conflicting views reported by practitioners requires further acknowledgement outside of the activity theory model to recognise that, for example, there are wider systems with wider influences which impact on a child's learning experiences. Through the lens of Bronfenbrenner's (1977) ecological systems theory, I argue that practitioner opinions and values, whilst they contribute directly to play, are external influences which impact on the wider nature of children's early learning experiences.

Practitioners have their own life histories, experiences and values, and these contribute, regardless of how similar or dissimilar they are to others on children's learning. The use of touchscreens themselves is influenced by the community and practitioner ideals on children's access to these devices at a young age. As such, whilst the external influences are apparent through practitioner reports of the community contributing to touchscreen access, they are fully

embedded within practitioner approaches across the settings. These approaches are both individualised and formed within the early years practitioner community in each setting. Early years practitioners adopt practice that is developed over time, and devise strategies to support children's learning with technologies. Therefore, practitioners' own experiences with technology and their beliefs on their use with young children directly influence the pedagogical approaches adopted through the shared aspect of developing appropriate practice. This practice is developed over time as reflected within the chronosystems of Bronfenbrenner's model.

It is important to acknowledge that not all practitioners follow the same approach and therefore it must be taken into account that the way in which practitioners may implement or promote touchscreen play may differ. The interview data revealed how technology has positively impacted on some practitioners' lives, and this subsequently directed the need for touchscreen access with young children to prepare them for school. However, those practitioners who are not confident technology users may be less willing to use touchscreens because of their own beliefs regarding technology. The observation chapter which follows reveals the approaches taken by practitioners when implementing touchscreens in their practice, alongside the ways in which children used touchscreens under the direction of practitioner rules. This will assist in generating a more comprehensive understanding of how touchscreens are used, by addressing the pedagogical approaches and opportunities for play that children are provided.

7.6 Conclusion

This chapter has presented the findings from interviews with early years practitioners across four case sites in the West Midlands. The findings have been categorised according to themes that arose from the data. The interviews with practitioners highlighted the ways in which touchscreen devices were used with young children in each of the four case sites. Practitioners identified the range of positive aspects that using touchscreen technology adds to children's

early learning, such as promoting development and being an additional tool that children can utilise to assist in their learning. Children were reported to express their preferences when using touchscreens as mostly to play games, however practitioners identified ways in which children could benefit educationally from such activity.

The findings have revealed that whilst there are positive aspects to using touchscreen technology with young children, practitioners still have concerns regarding children's touchscreen access. Practitioners expressed unease at allowing children internet access, with a risk of accessing inappropriate content. There was an awareness of the risks associated with the internet and sites such as YouTube, so practitioners identified barriers in place to prevent children accessing unwanted media.

Having considered multiple perspectives from interviewing practitioners, the following chapter now directs itself to viewing first-hand the ways in which young children use touchscreen devices in each of the four sites, through analysing data from observations. The following chapter also provides an insight into children's views on using touchscreen devices in the four case sites through analysing data from focus-group interviews.

Chapter 8: Observation and focus-group interview findings

8.1 Introduction

The previous chapter discussed findings from interviews with practitioners regarding their practice of using touchscreen devices with young children across the four case sites. This chapter will now discuss the findings from observational data of young children using touchscreen technologies. The chapter also examines responses gained from four focus-group interviews conducted with young children across the sites, in order to explore their views on touchscreen play.

8.2 Research questions

Observations and focus-group interviews sought to address the following research questions:

- Which early years pedagogies do practitioners implement when supporting children's learning when using touchscreens?
- What are the perceptions and reported practices of key stakeholders (practitioners and managers) on children using touchscreen technology in the early years?
- What opportunities for social and collaborative learning do touchscreen technologies offer for children aged three to four years old in early years settings?
- How are touchscreen devices used in a range of early years settings in the West Midlands?

8.3 Analysis

On analysis, a range of themes arose from the observational data. These are separated into two broad headings: '*Diverse uses of touchscreen technology*' and '*Adult's role in children's uses*

of touchscreen technology'. Both headings are separated into themes, which are identified and discussed later.

Three themes were generated from children's conversations during focus-group interviews. These included '*Preferred use of touchscreens'*, which referred to the ways in which children used the devices such as apps or programmes; '*Preferred environment*' referred to shared access with peers and adults; and '*Children's use at home'* referred to the ways in which children reported that they had access to technology in the home environment. The results from observations of children's touchscreen uses are presented and are complemented by extracts from focus-group interviews throughout.

As with Chapters 6 and 7, data is presented in the discussion section of this chapter in accordance with the activity theory model, which was used as a central tool for analysis. Where necessary, comments are made throughout this chapter where aspects of the data are not covered by the activity theory model but could be associated with Bronfenbrenner's (1977) ecological systems model.

8.4 Results

The first theme discusses the diverse ways children use touchscreen devices. A range of data was collected to set the context of touchscreen usage. This included the range of apps available to children in each of the sites, and the length of time children were observed to use touchscreen devices for. Data was analysed using the technology-based play scale, and observational data is coded according to the play codes. Within the first theme, a sub-theme was created: '*Children's game play*', which addresses the codes which were assigned when children used the touchscreen devices. This sub-theme discusses solitary play categories, shared play and adult-led play.

8.4.1 Contextual information

8.4.1.1 Touchscreen devices available for child use

The types of touchscreen devices available for children to use varied across the four sites. Both Caterpillar Corner (CM) and Forrest Green (DN) had one touchscreen tablet device which was for children's use. In Busy Bees (CCN), there were four large touchscreens available to children, which were in the form of television touchscreens connected to a laptop. In Little Ducklings (PS), children had access to ten touchscreen tablets and two interactive whiteboards.

8.4.1.2 Apps available

Children within the four case sites had access to a range of different apps on the devices (see appendix xiii). Children in Caterpillar Corner (CM) had access to nineteen different apps. Children in Forrest Green (DN) has access to seven different apps, and in Busy Bees (CCN), children had access to eleven different apps on one programme. In Little Ducklings (PS), children had access to twenty-one apps on two different types of touchscreen device.

Table 10. App usage

	Number of apps available	**Total number of apps used in observations**	**Average number of apps used per observation**	**Most frequently used app**	**Number of times most popular app was used**
Caterpillar Corner (Child Minder)	19	54	4	'LEGO Ninjago'	8
Forrest Green (Day Nursery)	7	87	2	'Animal Matching Cards'	26
Busy Bees (Children's	11	200	2	'Matching Cards'	44

Centre Nursery)					
Little Ducklings (Pre-School)	21	87	1	Sequencing	14

Children were commonly observed in Caterpillar Corner (CM) to play on 'LEGO Ninjago' most (8 out of 54 games played). In Forrest Green (DN), the most common app was an animal matching cards game (26 out of 87 games played). Children in Busy Bees (CCN) also played on a matching cards game the most (44 out of 200 games played). In Little Ducklings (PS), children were observed to play on a sequencing game the most on an Interactive Whiteboard (14 out of 87 games played).

It was observed that children frequently changed apps whilst using the touchscreen devices. The average number of apps used per child based on the recorded observations within Caterpillar Corner (CM) was four. Children played from one to eight apps per time. Children within Forrest Green (DN) were observed to play on average two apps each time they used a touchscreen device, and they played from one to eight different apps each turn. Within Busy Bees (CCN), children played on an average of two apps during observations and were observed to use from one to nine different apps each time. Children in Little Ducklings (PS) were observed to play on average one app but were observed to play from one to eight different apps each turn.

8.4.1.3 Preferred use of touchscreens

During focus-group interviews children were encouraged to think of the ways in which they liked to use the touchscreen devices. Children expressed their preferences for different apps, some of which were common across the different settings. Apps which children enjoyed playing on included 'Peppa Pig: Paintbox', 'Frozen Free Fall', 'Minion Rush', 'Paint' and a 'Barbie' dress up game, some of those which featured on Marsh *et al*.'s (2015a) list of top ten

popular apps for young children. Children also spoke of other uses of touchscreens where a specific app was not disclosed, such as ‘lots of little games’, indicated by one child in Busy Bees (CCN) in relation to the ‘Bim Bam Boogaloo’ program. This was used on the touchscreen devices in Busy Bees (CCN) and has a range of games for children to play. Children also spoke of games such as ‘tiger’, ‘stickers’ and ‘puzzles’ across the case sites, which may have indicated the range of games children play on whilst using touchscreen devices.

From focus-group interviews, the most preferred game indicated by children was ‘Frozen Free Fall’, which three children across Forrest Green (DN) and Little Ducklings (PS) mentioned. This app was only available within these two sites. Two children mentioned they enjoyed playing on ‘Peppa Pig: Paintbox’, an app which was only available in Caterpillar Corner (CM) and Forrest Green (DN).

Children were also encouraged to think about anything which they did not like when using touchscreen devices. Only two children across the four sites commented upon negative aspects. For example, one child in Caterpillar Corner (CM) said ‘Minions’ however did not elaborate. Another child in Forrest Green (DN) mentioned his dislike of a game about monsters, but again did not elaborate. It was unclear whether the ‘monsters’ was an app or something else that he had seen that was not on the touchscreen device in the setting. The apps which children were observed to use are discussed later in the Solitary and Group Play categories, which distinguishes the different apps used and for different purposes.

8.4.1.4 Time spent using touchscreen devices

Whilst it was recorded that children played on a range of apps, the time that touchscreen devices were available for children to use differed. Across the five days of observations within each of the sites, touchscreens were available on average per day for 56.2 minutes in Caterpillar Corner (CM), 64.8 minutes (1 hour 4.8 minutes) in Forrest Green (DN), 90 minutes (1 hour 30 minutes)

in Busy Bees (CCN) and 134.6 minutes (2 hours 14.6 minutes) in Little Ducklings (PS). Within Forrest Green (DN), there were two occasions where a child used the touchscreen but withdrew consent. On both occasions, the child was the last person to use the device. Because of not recording the observation, I was unable to judge when the use of the touchscreen was suspended for the rest of the day.

Table 11. Availability of touchscreen devices each day in the four case sites

	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Total time across five days**	**Average minutes touchscreens were available daily**
Caterpillar Corner (Child Minder)	57 minutes	58 minutes	68 minutes	92 minutes	65 minutes	340 minutes	56.2 minutes
Forrest Green (Day Nursery)	61 minutes	91 minutes	73 minutes	80 minutes	19 minutes	324 minutes	64.8 minutes
Busy Bees (Children's Centre Nursery)	137 minutes	66 minutes	124 minutes	31 minutes	92 minutes	450 minutes	90 minutes
Little Ducklings (Pre-School)	189 minutes	100 minutes	129 minutes	174 minutes	81 minutes	673 minutes	134.6 minutes

Touchscreen devices were used at all times when they were available to children. There was a period within Busy Bees (CCN) and Little Ducklings (PS) where technical difficulties meant that the touchscreens were inaccessible, and this time was not recorded as time available for

children to use the devices. An overview of the length of time children were observed to use touchscreens is provided in table 12.

Time allocation approaches implemented by practitioners differed across all four sites. Practitioners supervised children's touchscreen use in Caterpillar Corner (CM) and Forrest Green (DN), which meant that practitioners were aware of the length of time children used the devices. Practitioners often exerted control over the touchscreen by taking the device from children after an undisclosed period of time, or would give children time warnings, such as *"you have five minutes left"*. In Busy Bees (CCN) and Little Ducklings (PS), children's touchscreen use was unsupervised for the periods of time that they used touchscreens during child-initiated play.

Table 12. Children's recorded times using touchscreen devices

	Shortest amount of time spent using a touchscreen	**Longest amount of time spent using a touchscreen**	**Average amount of time a child spent using a touchscreen**
Caterpillar Corner (Child Minder)	11 minutes	45 minutes	24 minutes
Forrest Green (Day Nursery)	3 minutes	26 minutes	9 minutes
Busy Bees (Children's Centre Nursery)	1 minute	49 minutes	8 minutes
Little Ducklings (Pre-School)	1 minute	51 minutes	12 minutes

The length of time that each child used the devices for therefore was unnoticed by practitioners, unless it was brought to their attention by another child. Children negotiated turn-taking by themselves, and this is discussed later in the chapter. When considering the difference between practitioner interview data which outlined general touchscreen time allocations (see Chapter 7

section 7.4.5.1) and comparing that to observational data (table 12), it showed that practitioners' ideals on time allocations were not always adhered to. This provoked questioning on how aware practitioners were on the extent of touchscreen use in their settings, and how much the children are using touchscreens in an exploratory manner with self-discovery.

Table 13. Number of observations in each site organised by gender

	Number of observations	**Observations of shared use**	**Boys**	**Girls**
Caterpillar Corner (Child Minder)	13	0	3	10
Forrest Green (Day Nursery)	35	0	13	22
Busy Bees (Children's Centre Nursery)	60	6	46	20
Little Ducklings (Pre-School)	36	9	21	26

As previously discussed, the number of observations recorded varied dependent upon the availability of the device and length of time children spent using touchscreens. In total, boys were observed across the four sites to use touchscreens 52% of the time, whereas girls used touchscreens 48% of the time, which reflected no significant difference in touchscreen use according to gender. In relation to each site, girls used touchscreen devices most across three sites apart from Busy Bees (CCN), where boys represented the majority use. These figures include observations where children returned to the touchscreen, so the numbers do not represent different children, rather an accumulation based on the observations recorded.

Shared use was observed in Busy Bees (CCN) and Little Ducklings (PS), the two sites where touchscreen use was not supervised by an adult. Shared touchscreen use was most common in

Little Ducklings (PS), and the following table shows a break-down of shared use by gender across both sites, to give an insight into who children chose to share the touchscreen devices with.

Table 14. Shared touchscreen observations by gender

	Busy Bees (Children's Centre Nursery)	**Little Ducklings (Pre-School)**
Boy-Boy	3	2
Boy-Girl	2	1
Girl-Girl	1	4
Boy-Boy-Girl	0	2

Not all instances where the touchscreens were shared were a result of children asking others to use the devices with them. At times, children walked over and played alongside their peers, which then resulted in children agreeing to play together and negotiating touchscreen space between them. Other children asked their peers to play with them or welcomed them when they approached the touchscreens, and some children sought control of the touchscreen, so they pushed their way forward to the touchscreen in an attempt to gain control. Children's shared touchscreen use is further discussed later in this chapter.

8.4.2 Children's game play

Children's touchscreen usage was analysed using a technology-based play scale (see Methodology). Nine different play codes were used when analysing children's touchscreen experiences across the four case sites. These were:

- Solitary Play (SP) – Children use touchscreen devices on their own without making contact with others;
- Aware Solitary Play (ASP) – Children play alone on touchscreens but are aware of others in their immediate environment;

- Communicative Solitary Play (CSP) – Children play alone on a touchscreen but may communicate with others;
- Supported Solitary Play (SSP) – Children play alone on a touchscreen but may be supported by others;
- Parallel Play (PP) – Children play independently using the same or individual devices within three feet of each other. They do not communicate with peers;
- Parallel Aware Play (PAP) – As with PP but children may communicate with each other;
- Group Play (GP) – Children agree to play together using technology. They may verbalise taking turns. Children play co-operatively; and
- Adult-Led Play (ALP) – Children use touchscreens as part of an activity led by practitioners. There is a distinct aim and outcome of this activity.
- Unoccupied Behaviour (UB) – Children show no interest in the touchscreen. They may gaze away from the screen or become distracted by other children/noises in the environment.

The use of codes enabled the opportunity to analyse the way in which children used touchscreen technology and organise the findings in solitary and shared groups. This was necessary to identify potential affordances of touchscreens in early years settings, and was in line with research question four, which concerned the shared element of using touchscreens with others. Table 15 shows the categorisation of play according to play codes across the four sites.

The most common category of play differed amongst the four sites. Children in Caterpillar Corner (CM) and Busy Bees (CCN) were most frequently observed to engage in Communicative Solitary Play (CSP), for 42% of the time and 34% respectively. Children in Forrest Green (DN) were observed to engage in Supported Solitary Play (SSP) the most, which

was recorded 41% of the time observed. Children were most frequently observed to engage in Adult-Led Play (ALP) in Little Ducklings (PS), which was recorded for almost half of all observations at 48%.

Table 15. Categories of play coded within the four case sites recorded by the number of times observed

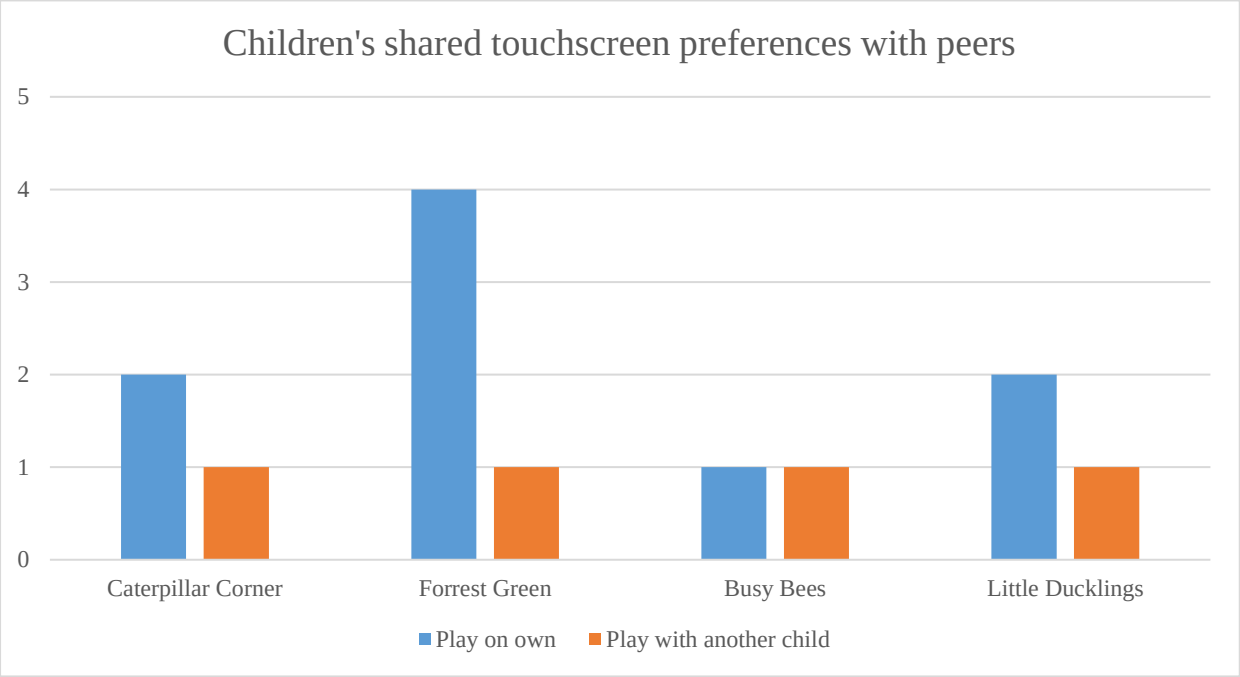
	Categories of Play								
	Solitary Play				**Shared Play**				
	Solitary Play (SP)	**Aware Solitary Play (ASP)**	**Communicative Solitary Play (CSP)**	**Supported Solitary Play (SSP)**	**Parallel Play (PP)**	**Parallel Aware Play (PAP)**	**Group Play (GP)**	**Adult-Led Play (ALP)**	**Unoccupied Behaviour (UB)**
Caterpillar Corner (CM)	3 times (12%)	4 times (17%)	10 times (42%)	6 times (25%)	0 times (0%)	0 times (0%)	0 times (0%)	0 times (0%)	1 time (4%)
Forrest Green (DN)	5 times (8%)	9 times (14%)	22 times (34%)	27 times (41%)	0 times (0%)	0 times (0%)	0 times (0%)	1 time (1.5%)	1 time (1.5%)
Busy Bees (CCN)	31 times (29%)	1 time (1%)	36 times (34%)	8 times (7%)	8 times (7%)	10 times (10%)	8 times (7%)	5 times (5%)	0 times (0%)
Little Ducklings (PS)	8 times (10%)	2 times (2%)	16 times (19%)	8 times (10%)	0 times (0%)	3 times (4%)	4 times (5%)	40 times (48%)	2 times (2%)

To provide further insight into the ways in which children used touchscreens, the following section addresses children's preferences as expressed by them during focus-group interviews within all sites.

8.4.2.1 Preferred social groups

During focus-group interviews, children were encouraged to think about their preferred ways of using the touchscreen devices in an environment with other people. When prompted to think about how they felt about using touchscreens with other children, responses across the four case sites differed. Children were most likely to enjoy using touchscreens on their own, however, this may be a representation of the ways in which children were allowed use the devices.

Figure 18. Children's shared touchscreen preferences with peers

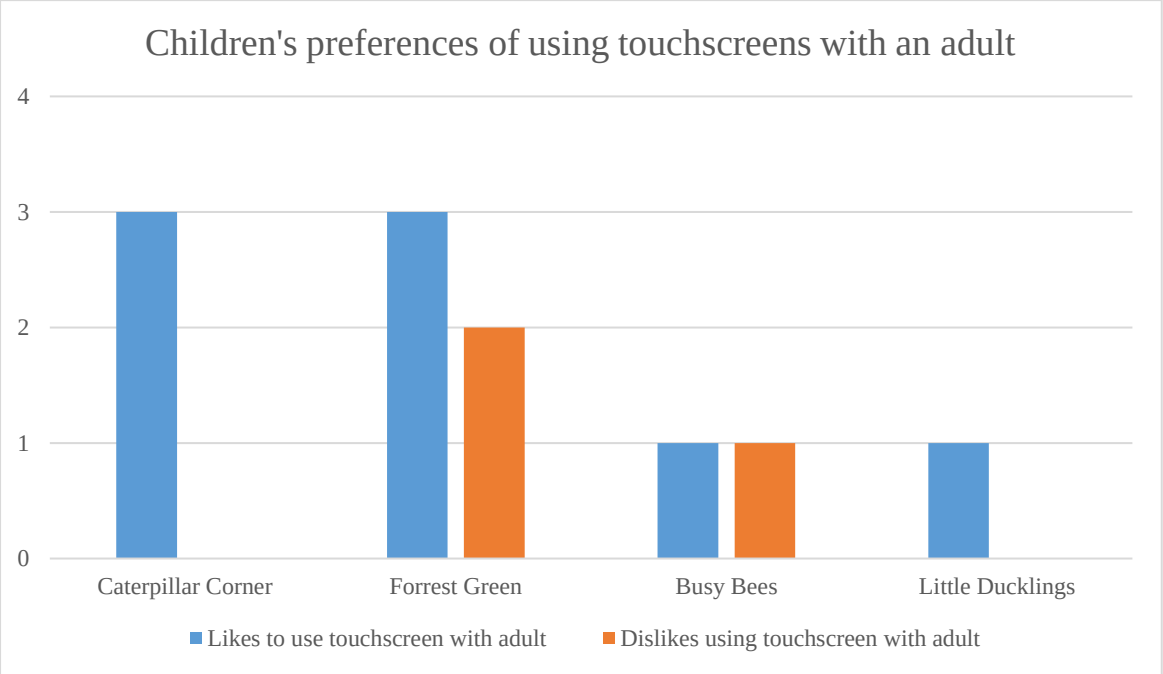


In some sites, children were encouraged to use touchscreens on their own and other children were asked by practitioners to move away. Subsequently, this prevented children in engaging in shared play, which contradicted the EYFS (DfE, 2017) in supporting children's social development. This was particularly evident within Caterpillar Corner (CM) and Forrest Green

(DN). Across the sites, there was one child in each focus-group who reported to want to share their use of touchscreens with another child. Within Little Ducklings (PS), one child said *'I like playing with Mary. She is over here… my best friend is Mary'*.

Children were also encouraged to think about whether they enjoyed using the touchscreen devices with an adult. Children's responses varied again, however it was most common that children were positive about sharing the touchscreens with adults.

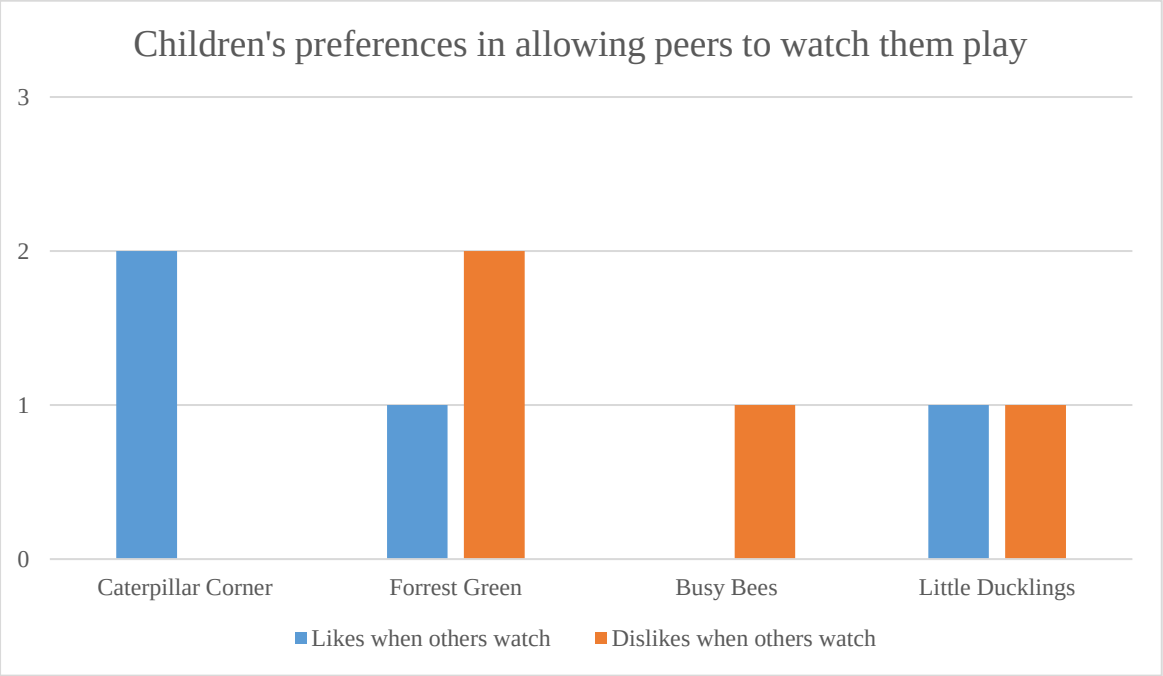
Figure 19. Children's reported preferences of using touchscreens with adults



Not all children responded, however some children directly named practitioners who they liked to use touchscreens with. One child in Busy Bees (CCN) told me *'I do. But we don't, we play with the kids'*, whilst children in the other sites did not comment further, however some shouted 'no' when the topic arose.

Finally, children were also encouraged to think about how they felt about when their peers came to watch them play. Not all children commented, however there was an equal divide of children who were welcoming and unwelcoming of the suggestion.

Figure 20. Children's expressed preferences in allowing peers to watch their touchscreen use



In Caterpillar Corner (CM), one child indicated she liked sharing with her friend who was also participating in the focus-group interview. Another child commented that she liked others watching and gave the name of a child who was in the playroom. Children in Forrest Green (DN) were less welcoming, with one child saying, *'no I don't like it'*. A third child shouted 'no', however a third child told me she did like others watching her play.

A child in Busy Bees (CCN) told me he liked playing on his own. When asked why, he said *'because I don't want anyone to see me drawing it'*, referring to the dinosaur he was creating on the screen. Again, children's preferences of allowing others to watch them play may also be a representation of general touchscreen rules across the four case sites, as some children are not allowed to watch others play.

The following sections address the play codes which were recorded when observing children use touchscreen devices. Not all codes were recorded during observations within each of the sites, therefore no data is presented for some sites in the following sections.

8.4.2.2 Solitary play

Solitary play was coded in all four sites. It was most frequently observed in Busy Bees (CCN), which accumulated 29% of all play codes recorded within that site. Within Busy Bees (CCN), children were observed to play on a range of apps, and on average played on 2.4 apps each turn. Children changed apps frequently, with seventy-four incidences of children changing apps recorded during the thirty-one occasions where SP was coded. It was most common that children played on matching pairs apps, and other apps such as 'Silly Sounds' and drawing. This was a similar observation within Forrest Green (DN); children most frequently played on a matching cards app, however in Forrest Green (DN), children played on more apps per turn (3.6 apps). In Caterpillar Corner (CM), other children were not allowed to watch a child use a touchscreen, so it was frequently observed that any child watching would be asked by a practitioner to move away to a different area and find a toy to play with. Children were observed to play on a range of apps which promoted drawing, creating characters, and racing cars.

In Little Ducklings (PS), SP was most frequently recorded when children used the IW (seven of eight occasions where SP was recorded). Children played on programmes which promoted their numeracy skills, and, like other sites, used a drawing programme which promoted creative expression and early writing through mark-making. A child was also observed to use 'YouTube' during play and demonstrated skills in minimising and maximising the size of a video using a pincer movement. The child also searched for videos using a voice command option, used the keyboard and browsed through search history. The skills demonstrated by the child in this observation was unique to this site, however it was unknown whether any other child in other sites were capable of this too.

8.4.2.3 Aware solitary play

ASP across the four sites was coded on 16 occasions. It was most frequently coded in Forrest Green (DN) (nine times) and least frequently coded in Busy Bees (CCN) (one time). During

ASP, children were observed to play alone and were aware of others around them. Children were often spoken to by their peers and by practitioners, and were observed to nod their head in response to questions, such as "do you know what you're doing?" and "what are you doing?" It was also observed the children would respond to non-verbal input from others whilst they were playing; practitioners were observed to change the difficulty level on games, and children would sometimes change it back to the level they were previously on. Children were also observed to take back the touchscreen devices when a practitioner would take it from the child, or when another child attempted to play instead.

8.4.2.4 Communicative solitary play

Whilst children were using the touchscreen devices, they sought to communicate with practitioners and their peers. This was demonstrated in a range of ways (table 16). CSP was observed across the four sites. It was most frequently observed in Busy Bees (CCN) (36 times) but was the highest percentage of codes in Caterpillar Corner (CM) (42%). Children were observed to communicate verbally in a range of ways across the four case sites. Most commonly, children were observed to talk about the app they were playing on; share their success and their progress on games; speak aloud about their game choices; and discuss turn-taking and technology ownership whilst playing.

Children also spoke about sharing touchscreen devices and were encouraged to share by practitioners and their peers. At times, children also sought to communicate with me, and this was mostly on occasions where I was the most visible adult nearby to the touchscreen area. Children sought mediation in terms of turn-taking and sought to share with me what they were doing on different apps and games. Whilst children communicated with me, the communication was not reciprocated since I considered myself a non-participant observer.

Table 16. Children's communicative interactions with practitioners and peers whilst using touchscreen devices

	Caterpillar Corner (Child Minder)	**Forrest Green (Day Nursery)**	**Busy Bees (Children's Centre Nursery)**	**Little Ducklings (Pre-School)**
Talked to a practitioner about game	✓	✓	✓	✓
Communicated with researcher about game	✓			
Talked to self about game	✓	✓	✓	✓
Talked about home use of technology	✓	✓		
Asked for help from peers/adults	✓	✓	✓	✓
Shared success with peers/adults/self	✓	✓	✓	✓
Asked for peer/adult attention	✓			✓
Talked about challenges with peers/adults	✓	✓		
Discussed the consent lanyard with adults/peers	✓	✓		
Responded to questions from adults/peers	✓	✓		
Talked about sharing to peers/adults			✓	✓

Talked about ownership of technology to peers			✓	✓
Sought mediation from adults/peers		✓	✓	✓
Discussed to self and others new games to choose	✓	✓	✓	✓
Helped peers			✓	✓
Talked about preferences within games to self/peers	✓	✓		
Told others not to watch them play	✓	✓		
Sought support with technical issues from peers/adults		✓		
Greeted others			✓	

It became apparent during observations that some children were familiar with the apps they played on. Particularly in Caterpillar Corner (CM), one child was observed to pre-empt the next scene in a game she played, which involved touching the screen to make an object appear, and touching it again to colour in the object:

> *She's sad look at the nasty witch. Oh, this one again. She's gonna do the sad face. Look at them. They rolling around…*
>
> *There's the boy's chair (whispers) there's the girl's chair. A puppy. The beard, the horsey. That's it, the donkey. Why's it not going?*
>
> *I'm not watching this again, there's a beard. I'm not watching this again now.*

The child in this observation was observed to frequently play on the same game when she used the touchscreen device. She would often speak to herself, but at times was observed to tell

others around her of what was happening and what would happen next. In this short extract, the child appeared to have lost interest, saying *"I'm not watching this again now"* as she exited the app.

Children were also observed to share their success, talking aloud about changing games, and telling others about the games they had chosen. One child was observed telling a practitioner *"I'm playing the Minions game. I pressed it. I watch it at home"*. Children also spoke of the touchscreen devices that they had at home during focus-group interviews and referred to games they played.

8.4.2.4.1 Use at home

During focus-group interviews, some children spoke to their peers about the apps they used at home and other uses of technology. Children spoke about how some of their technology devices at home were broken, and some mentioned that they were not allowed to play on them. Within Busy Bees (CCN), a child told me:

> *I play at home with my mummy's phone and my tablet and play on CBeebies and the computer.*

I asked the child whether he had his own tablet, to which he replied *'yeah!... all of those things'*. He then went on to tell me that *'my mummy's and daddy's tablet [is] broken'*, but he *'can play on mummy's laptop. It's a computer laptop… I play on 'CBeebies'*. I asked him what he did, and he said, *'you just… when I play the game to get all the fruit then you need to press the space bar'*. I asked him what the space bar did, to which he replied *'to jump the rabbits'.*

Children in Little Ducklings (PS) spoke openly about their access to technology at home. Below is an extract of a conversation in the focus-group interview.

> *C1:* Err, I play at home. I got a iPad. I need to tell my mum and play on my iPad.

C2: I need to tell my mum to play on the Hudl at home… my favourite place to play on the tablet is at home.

Interviewer: Is it? Do you play on your tablet at home?

C2: Yeah

C3: I don't have a computer or a tablet… my mum don't let me play on it.

C1: I have a computer and a tablet

C2: I play on the cushions at home

The children also recognised that even though not all of them had access touchscreen devices at home, they still could play in the setting. Even though some children could access technology at home, the children recognised barriers to access, such as parental permission and the devices being broken. Within the extract above, children also recognised that they were required to ask permission from their parents, namely their mothers to play on the touchscreens when they were at home. Children spoke openly about the type of technologies they had access to, too.

Within observations children spoke about the choices they made. A boy in Little Ducklings (PS) was observed using 'YouTube' and used the voice command option to search for 'Horrid Henry':

C6: I want to put Henry on

O2: Are you gonna put 'Horrid Henry' on?

C6: Yeah

O2: Can you put it on for me?

C6: Wait (*C6 types random letters into the search bar*)

C6: (*to researcher*) Can you put 'Horrid Henry' on for me? (*C6 types a series of random letters*)

C6: 'Horrid Henry', 'Horrid Henry' (*C6 talks into the microphone on the device having pressed the voice command icon*)

C6: Can you say, 'Horrid Henry'? (*to O2*)

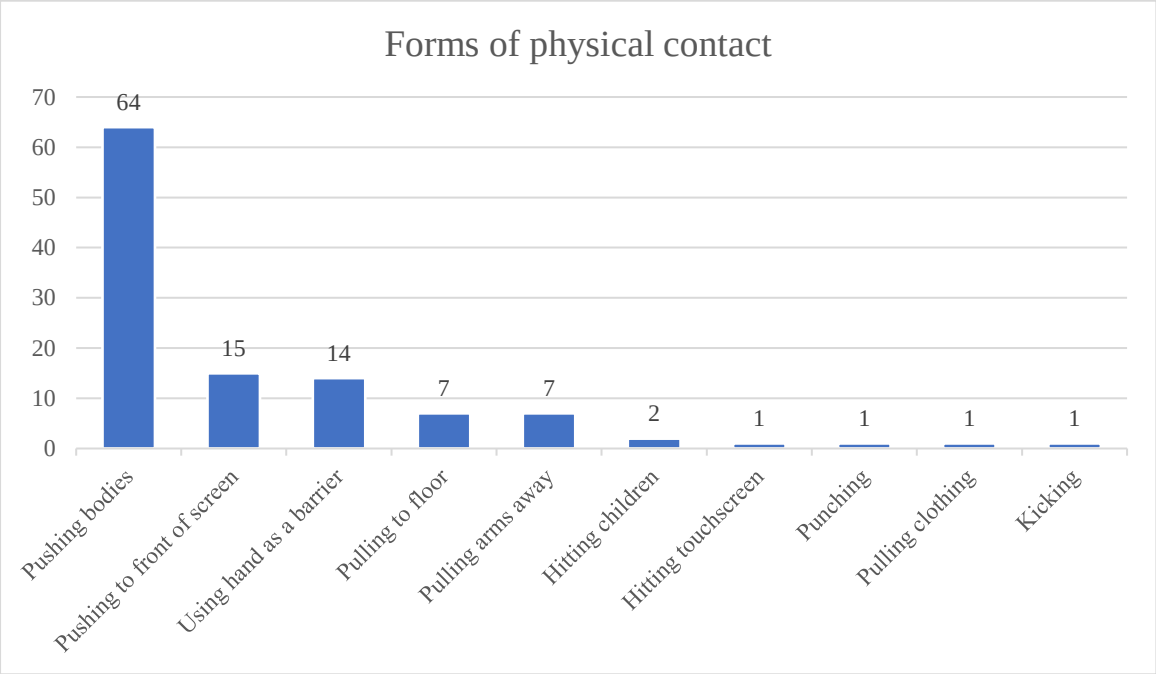
Children showed their competence in navigating on the touchscreens to find and retrieve information and media which appealed to them. Both children in this observation were aware of different functions in which to search and used these to assist in retrieving different forms of media. Children also sought support from others when they were unable to perform these actions, including myself and their peers.

8.4.2.4.2 Negative communicative interactions

Even though it was observed children engaging in many positive communicative interactions, it was also observed that some children engaged in negative communicative interactions, particularly when multiple children attempted to gain access to touchscreen devices. This was observed within Busy Bees (CCN), where children would often use physical forms of contact alongside verbal communication regarding ownership of the touchscreen devices to reinforce what they were saying. It should be noted that within Busy Bees (CCN), there were a range of children attending from diverse cultures, and English was a second language for most children. It could therefore be considered that children's use of physical contact was a way to communicate with others when language was a barrier for some children.

A total of 113 occasions were observed where children engaged in physical altercations with others within the sixty observations recorded in Busy Bees (CCN). These included pushing children's bodies from the front and back, pushing to be at the front of the touchscreen, using a hand as a barrier to the touchscreen, pulling children to the floor, pulling children's arms or hands away, hitting children, hitting the touchscreen, punching, pulling clothing and kicking. Children pushing others away was the most common form of physical altercation, which was recorded sixty-four times. To date, this has been unreported when exploring children's behaviours when using touchscreen technologies, and this research therefore enables the identification of one reality of touchscreen use and children's associated behaviours.

Figure 21. Physical altercations observed in Busy Bees (CCN)



Children also expressed their unwillingness to share the touchscreens in non-verbal means which were seen as aggressive. This was observed on an occasion where a boy (C5) did not want to allow a girl (O6) to use the touchscreen alongside him. The boy used threatening verbal and non-verbal behaviour to discourage the girl from attempting to play. A twenty-six-minute observation was recorded whereby the girl attempted to gain access to the touchscreen:

10.49am	O6 walked over and touched the screen. C5 shouted "no!" and pushed O6 away. Two children watch – O5 (a boy) and O6 (a girl). C5 turned to them, stared at the children and O5 and O6 walked backwards away from C5. C5 walked towards them with an unhappy look on his face, showing his teeth. C5 shouted "no!" and gestured to hit O6's face after she pointed to the screen.
10.50am	C5 ran back to the screen; O5 and O6 followed. C5 turned around and said to O6 "no, you're not allowed". He pointed at O6's face and shouted "no". He turned around and continued drawing.
10.53am	C5 put his arm around O5, and told O6 "no, you're not allowed to play. You have to go. You, here, you, no". The latter sentence he first addressed O5, and then O6.

10.57am	C5 walked away to look at the activities on the carpet; O5 and O6 stood together looking at the screen. C5 returned, and O5 and O6 left to play in another area of the playroom.
11.00am	C5 called to C6 who was playing on the carpet. He said, "let's play on there", and C6 joined C5 at the touchscreen area. They played on the 'Drawing' app. C6 watched and pointed as C5 touched the screen.
11.02am	O6 walked back over as she was waiting to have a turn. C5 gestured to head-butt O6, doing so a few inches from O6's head.
11.07am	C6 selected the 'Silly Sounds' app and then exited the programme. C6 opened the programme again.
11.09am	C5 shouted "get out!" to O6, who was standing nearby. He pushed her away. He walked towards O6 and stared at her, very close to her face with his head lowered, eyes looking up at O6 menacingly. C5 then left after 6 seconds of staring at her and continued playing on the touchscreen.
11.12am	O6 walked again over to the touchscreen and tapped on the home screen icon. C5 shouted at her "no, you're not playing".
11.15am	O6 walked over to the researcher and said, "I made it!" C5 and O5 walked away from the touchscreen area.

This observation demonstrated the range of approaches the boy used to maintain sole possession of the touchscreen. Non-verbal gestures were used in conjunction with verbal communication, to show the girl that she was not welcome and that she should leave the area. It was unclear why the boy used this behaviour when interacting with the girl, but the boy remained persistent, as did the girl, to maintain touchscreen possession. A greater struggle of gaining authority through possession was inherent within various observations of touchscreen use within this site and contributed to one of three main findings within the study. A further discussion on Authority struggles can be found in Chapter 9.

Children in Busy Bees (CCN) also used verbal means of communication to reinforce their role as sole user of the touchscreen device. Children mostly mediated unwanted attention through either saying or shouting 'no' at others, to signify that it was their turn playing. Some children

verbalised their possession when trying to gain touchscreen access, such as *"it's mine! It's my turn now"* and *"no! We're playing"*. Children also controlled who was allowed a turn through either speaking to their peers or to others who tried to gain access to the touchscreen as illuminated below.

> *C9*: You've had a go
>
> *O7*: I haven't
>
> *C9*: You've had two goes. Have one more go and then go and play
>
> *O7*: No, I'm going to get you and chop you like that *[gestures with hand a chopping motion]*
>
> *C9*: My dog will get your head
>
> *O7*: Well I'll chop your leg
>
> *C9*: My dog will come to your house and eat you

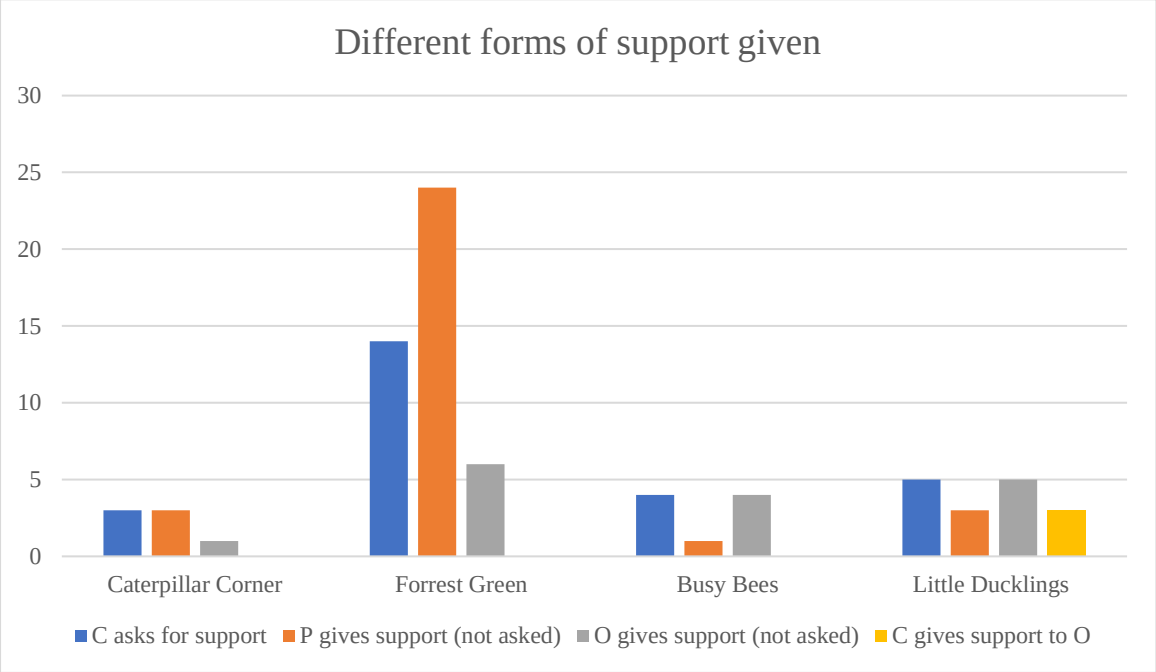
Children attempted mediation by following examples of what they had heard practitioners say when negotiating turn-taking, such as telling children "no". However, when O7 did not follow direction from C9, C9's behaviour towards O7 became less playful and turned threatening, to which O7 retorted.

For some children, sharing the touchscreens proved challenging, particularly for one child who resorted in screaming when others tried to play. Alongside screaming, children were observed to shout *"everybody get out!"*, *"no! Don't touch it!"* or shouting *"stop, stop!"* if others touched the screen. Some children became possessive over the technology if others were nearby, particularly if a child who was using the technology walked away and then returned to find others using the device. One child was observed doing this and then shouted *"Ahh!! Get off!! Ah!"* Another child (C3) was playing and an observer (O7) was trying to touch the screen. C3 shouted "no" at O7 but O7 tapped the screen. This resulted in C3 and O7 screaming, pushing each other over, rolling on the floor whilst scuffling.

8.4.2.5 Supported solitary play

Support was provided from peers and practitioners in a range of ways when children were observed engaged in SSP. The figure below shows analysis of support provided for children's use of touchscreen devices, organised into four categories. *C* refers to child, *P* refers to practitioner, and *O* refers to children who observed play.

Figure 22. Different forms of support given across the four case sites



It was observed that practitioners most commonly gave support to children without being asked. This was often the case if practitioners looked at the screen and suggested actions to perform, or if practitioners observed children accessing programmes or features on the touchscreens that they did not allow. Support from practitioners was provided in different ways across the four sites and is further discussed in 8.4.3.1.

Support from peers varied and included one child telling another to turn the touchscreen device horizontally to use an app properly or informing others how to use the touchscreen. Children were also observed to help resolve technical issues and tried multiple approaches and sought support from peers to help. A child who was watching touchscreen use was observed to

manipulate the arm of a child using the touchscreen device, to select icons to meet the goals of the game. Within Forrest Green (DN), practitioners mostly discouraged others from watching a child use a touchscreen, which may reflect the small number of instances where supported touchscreen use was observed within this site. In Little Ducklings (PS), children sought support from their peers when asking what they needed to do on different apps, and when requiring clarification, such as asking *"that one?"* whilst pointing to an object.

8.4.2.6 Parallel play

Parallel Play was only coded in Busy Bees (CCN) (eight times), where children were observed to play on a touchscreen device alongside each other. As the children used the same device, one app was open to use. Both children were observed to play independently and leant over each other to make selections of cards on a 'Matching Cards' app. Children were also observed to engage in PP when children played on sound games such as 'Silly Sounds', whereby a new sound was played each time a child touched the screen. Children were observed to tap the screen until all sounds had been played. When PP was coded, children often tapped the screen at a quick pace rather than a slower, controlled pace. It was often when different sounds were played such as on keyboard or other games which involved different sounds that children tapped the screen quickly.

8.4.2.7 Parallel aware play

Parallel Aware Play was coded in Busy Bees (CCN) and Little Ducklings (PS). It was most frequently observed in Busy Bees (CCN) (ten times). As Busy Bees (CCN) had touchscreens which were of a larger size where four children could comfortably stand in front of the screen, PAP was a commonly observed play category. Within Busy Bees (CCN), children engaged in PAP when more than one child used the same touchscreen but for their own achievements. For example, children were frequently observed to play on the same game but control their own learning, through making decisions on what game they wanted to play and through changing

features within games. On all occasions where PAP was recorded, children played with their own intentions, and there was no recognition of shared touchscreen use which formed Group Play. The coding of this type of play and the nature of interactions reflect reports from other studies which show that children often play to meet their own needs rather than considering those of others (Kumpulainen and Mutanen, 1998; Romeo *et al*., 2003). The children were aware of others around them who were also playing and were observed walking around others to touch a different part of the screen, or moving a child's hand or arm away to touch the screen.

In Little Ducklings (PS), PAP was coded on three occasions. This occurred when children played on the IW. There were two IW pens available to children on one day; the children were observed to use a drawing programme, so each child in the three observations drew with their own intentions, similar to children's play in Busy Bees (CCN). Children negotiated space in Little Ducklings (PS) to ensure they had enough room to draw. It was observed children saying things such as *"that's my. That's yours"*, *"this is my bit, that is"* and *"you go that way, I go here"*. Children made their own choices in changing the function on the programme, such as changing the drawing pen function to enable a thicker or thinner line when drawing and changing to the eraser.

8.4.2.8 Group play

Group Play was observed in Busy Bees (CCN) and Little Ducklings (PS), the two case sites where touchscreen use was not supervised. These sites also provided large touchscreens which allowed more space for children to stand in front of and use the devices. Group Play usually occurred as a result of one child informing another of what to do, and, if the action was 'correct', this proceeded with the second child stepping forward to touch the screen. GP also arose when children came and sat nearby to watch and touched the screen, to which the child using the device allowed, and the children continued playing. Children recognised GP in these

instances through saying phrases such as *"me and you play"*, and told others *"no, we're playing"* if other children approached the area.

Children spoke about shared touchscreen use frequently when they played together, and reminded each other of turn-taking:

> *C12*: My turn now!
>
> *O6 reminds C12:* We sharing
>
> *C12*: Fish!
>
> *O6*: My turn
>
> *C12*: No, you can press it now
>
> *O6*: (*O6 has a turn*) Now your turn
>
> *C12*: Where's hat?
>
> *O6*: There
>
> *C12 and O6*: Yes! (*C12 pressed the hat*)
>
> *O6*: My turn C12

The type of games that children played when they engaged in GP mostly had a theme of sequencing such as matching pairs, and other memory games which included selecting an object from a series of images. It was also observed children engaging in GP when using apps which facilitated drawing or creating, and children were observed colouring in together. Children in one observation turned using the touchscreen into a game, whereby they would colour in a picture using a scribbling method, and then say *"stop, stop"* whilst they changed colour or the type of 'brush' they were using, and then would resume colouring in. This was led by both children during the observation, so roles were shared throughout.

On one occasion in Little Ducklings (PS), a child who was using the touchscreen to watch children's videos on 'YouTube' offered to share the device and his chair to enable his peers to share the videos with him:

C6 and O4 share the chair which C6 is sitting on. C6 laughs as he slips off the chair. C6 tells O4 "I get you a chair. You can have this chair and I can have that chair. Come on". C6 pauses the video and gets another chair. Both boys sit and watch the video.

C6 asks O5 "you wanna watch this with me?" O5 nods her head. "Go on then" C6 tells her. C6 asks O5 "you wanna sit down? I watching Peppa Pig". C6 moves over to make space between the two chairs for O5 to sit down. O5 runs off.

O5 returns. C6 asks her "you wanna watch with me?" O5 nods her head. C6 tells her "come and sit down" and moves to the left and the girl sits down, sharing C6's and O4's chairs. The three children watch the video.

The observed approach to sharing was different to what was observed by other children across the four sites. Whilst C6 led the activity in the form of selecting videos, he offered to share the device. This approach was unlike many other children across all sites, who appeared to perceive the technology as in their possession and others were not allowed access.

8.4.2.9 Adult-led play

Adult-Led Play was observed in Forrest Green (DN), Busy Bees (CCN) and Little Ducklings (PS). Approaches to ALP differed: the touchscreen was used during a 'circle time' activity in Forrest Green (DN), it was supervised during free-play time in Busy Bees (CCN) and was used as a tool to assist children's learning during lessons in Little Ducklings (PS).

During ALP, practitioners used approaches such as mediating turns and they controlled the use of the touchscreen. In Forrest Green (DN), the children watched videos on 'YouTube' which had an element of learning and included a 'days of the week' video, a counting video, and a comical video singing about the bones of a skeleton. The use of videos maintained the children's attention, and many children demonstrated enthusiasm to participate in dancing and singing along. The practitioner sought to reinforce the learning element of these videos as

opposed to the entertainment, and an activity was used alongside the skeleton video whereby children could create a skeleton using foam bones.

In Busy Bees (CCN), a practitioner supervised the use of a matching pairs game and had 'locked' the screen with the intention that children would play games and complete them, rather than changing games at random points in the game. I observed practitioners reinforcing turn-taking and this usually occurred once a child had completed the game. The practitioner also offered support where needed, and ensured the children were aware of how to play. The supervision of the touchscreen limited children's time of playing to approximately five minutes each.

Table 17. Time length in minutes of adult-led uses of touchscreens in Little Ducklings (PS)

	Phonics	**Numeracy**	**Topic**
Day 1	25	16	20
Day 2	5	16	0
Day 3	25	13	18, 3, 13 (total 34)
Day 4	21	13	11
Day 5	23	0	3

Approaches in Little Ducklings (PS) were different to the other sites; children were taught numeracy and phonics sessions daily and the touchscreen was used as an aid in these sessions. Children did not directly use the touchscreen, rather it facilitated the session and the practitioner controlled its use. The length of time that the touchscreen was used for during these sessions varied.

Topic sessions were used to support children in relating on-screen objects or themes to real-life situations, so sessions included presentations and stories on the Chinese New Year, Mothering Sunday, and the roles of a firefighter, which was taught ahead of a visit to a fire station. During Phonics and Numeracy sessions, the practitioners used programmes which supported the session content, including a teddy bear number line, a drawing programme which

enabled the practitioner to write numbers, and a programme which taught children phonics. The sessions were led by and the touchscreens were used by the practitioners, but participation was encouraged from the children in assisting the practitioner to make selections on the screen. Children did not use the touchscreens during these sessions.

ALP in Little Ducklings (PS) was also coded when children used the IW. This was because the adult had organised the play, so children were not able to change games or navigate around the IW of their own accord. This was like the approach used in Busy Bees (CCN) when practitioners 'locked' the screen. When using the IW, children played on a range of programmes chosen by the practitioner, including 'Mucky Bug', a number sequencing game, a drawing tool and a picture sounds game.

8.4.2.10 Unoccupied behaviour

Unoccupied behaviour was rarely observed within the four sites. It was most common within Caterpillar Corner (CM) and usually occurred when a child was distracted by noises within the setting. Additionally, children were observed during this time to gaze away from the screen and appeared unfocussed.

8.4.3 Adult's role in children's use of touchscreen technology

Practitioners' touchscreen involvement is the second theme which arose from the data. The following section addresses the role practitioners had when young children used touchscreen devices across the four case sites. The section is divided into three parts: *'practitioners as supporters', 'practitioners as rule makers'* and '*practitioners as mediators'*.

8.4.3.1 Practitioners as supporters

As previously indicated, practitioners supported children's touchscreen activities in a range of ways across the four sites. There were common and discrepant strategies observed:

Table 18. Common and discrepant strategies practitioners implemented to support children's touchscreen use

	Common strategies	**Discrepant strategies**
Adult interaction	One-to-one activities with children (CC and LD)	Children play independently for duration of TS use (FG and BB)
Emotional support	Providing children with praise and encouragement (CC, FG, BB)	Praising children but no evidence of encouragement (LD) Encouraging independence (FG)
Offering support whilst playing	Asking children if they need help (CC, BB)	Children seek support if required (FG, LD)
	Providing in-game help such as next steps, increasing volume and explaining objects (CC, FG, BB, LD)	
	Exiting apps or games (CC, FG, LD)	Children were required to do this themselves (BB)
	Changing or choosing games/apps (FG, LD)	Children mostly change games independently and confidently (CC, BB)
	Reading instructions or telling children the aim of the game/app (CC, FG, LD)	Children were required to find out for themselves or ask someone (BB)
	Demonstrating or guiding actions (CC, FG, LD)	Children learned independently unless support was sought (BB)
Technical issues	Resolving technical issues or problem-solving (CC, BB, LD)	Children tried to resolve issues themselves (FG)

The ways in which support was provided within all four sites included offering in-game help, and this varied within sites dependent upon the support needed. Practitioners were observed to help children when they found dragging items challenging, when increasing or lowering the difficulty of games and when asking children if they knew how to play according to app expectations.

Practitioners in two of the settings engaged in one-to-one activities with the children. During these occasions practitioners were observed to talk through the aim of the games with the children, reading out words, helping to clarify objects, and ensuring the children were completing games per the rules. Practitioners implemented guided interaction (Plowman and Stephen, 2013) strategies to support children's learning through the emotional and educational support that was provided. In Caterpillar Corner (CM), one practitioner supported a child when learning first words, through recognising letters and forming words.

At times, practitioners performed actions for children on the touchscreen devices. There were occasions where children had opened apps such as 'Google Search', 'YouTube' and a clock. Children also went on to pages where they could download apps and purchase goods. Practitioners were observed to take the touchscreen device from the children and exit the apps and return to the game that the children were playing, which took away the problem-solving element this provided. Although one practitioner was observed to talk through with the child how to exit the screen, others explained that children were not allowed to use certain apps such as 'YouTube', so that children were aware of their limitations on the touchscreen device.

Other observations of the ways practitioners provided support for the children included praising and encouraging children when they were playing. Practitioners praised children for completing games, performing the correct actions, overcoming challenges and for their determination. Within Forrest Green (DN), children used apps which supported their

development of letter and number formation, and some children found challenging being able to write the numbers in the way that was expected in the game. Practitioners were observed to implement scaffolding techniques (Bruner, 1977) to guide children on how to write correctly according to the game requirements, and they praised children for their persistence in writing in this way. Practitioners observed the children in their initial attempts at writing and tailored their support dependent upon the needs of different children to help them succeed.

During observations, practitioners would often read aloud to children the game instructions, so that children were aware of how to play. Practitioners would either read from the screen or tell the children what to do. This occurred at varying stages during the observations, including when children changed apps, when practitioners gave children the devices which already had an app loaded, and when practitioners approached children who were already playing on the touchscreens. It was observed how practitioners modelled what to do, such as showing the children on the screen or making hand gestures. On occasions where children found performing actions challenging, practitioners would guide children's movements by holding their hand and together they performed the actions.

8.4.3.2 Practitioners as rule makers

The ways in which children could use touchscreens in all four sites was based upon rules that practitioners developed and implemented. Practitioners implemented rules on the length of time children could use the touchscreens for, and the ways in which the touchscreens were used. The visibility of rules was evident in observations, from practitioners verbalising rules to children, or practitioners reporting rules to me. Interviews with practitioners highlighted rules too (Chapter 7). Each site had their own approach to implementing the use of touchscreens within daily routines. Rules varied and ranged from time restrictions, availability and accessibility of the device, using the device with more than one person, and the content available to the children.

Practitioners supervised children's touchscreen usage in both Caterpillar Corner (CM) and Forrest Green (DN). Practitioners therefore monitored children's actions and the ways in which touchscreens were used. Touchscreen activity was not supervised in Busy Bees (CCN) and Little Ducklings (PS); however, practitioners were observed to approach the touchscreen area during the day and monitor its use.

Table 19. Rules enforced by practitioners when children use touchscreen technology

	Caterpillar Corner (Child Minder)	**Forrest Green (Day Nursery)**	**Busy Bees (Children's Centre Nursery)**	**Little Ducklings (Pre-School)**
Time restrictions	✓	✓	✓	
Sharing the touchscreen	✓	✓	✓	✓
Children not allowed to watch	✓	✓		
Where children should sit	✓	✓		✓
Volume control	✓			
Availability of the device	✓	✓	✓	✓
Internet access	✓	✓		✓
Number of children using device	✓	✓	✓	
Programme/apps available	✓	✓	✓	✓
Supervision	✓	✓		
Downloading content		✓		
Not touching screen when others are playing	✓	✓	✓	

Time restrictions were implemented in Caterpillar Corner (CM) and Forrest Green (DN), the two sites which supervised touchscreen activity. Practitioners were aware of the length of time that touchscreens were used, and they monitored turn-taking to ensure all children could have

a turn. In sites where touchscreen use was not supervised, children's monitoring of time was more relaxed and therefore meant children spent long periods of time using the touchscreens, and sharing the device was negotiated between peers.

Across all sites, the ways in which touchscreens were used was monitored by practitioners in relation to what content and programmes children could access. Within the three sites where children used hand-held devices, apps were downloaded by the practitioners that children could access. In Busy Bees (CCN) where large touchscreens were used which were fixed to the wall, practitioners had downloaded a programme which included multiple games for children to use. During the observation period, children in Busy Bees (CCN) were not told how to exit the programme, but it was observed a group of children exiting the programme and using 'Google', and other children frequently closed the programme and opened it again.

There were rules implemented which were focussed on protecting the touchscreen device. These included:

- The number of children allowed to observe touchscreen play;
- Where children should sit when using touchscreen devices;
- Not allowing other children to touch the screen when a child used a touchscreen device; and
- The number of children allowed to use a single touchscreen device at a time.

Practitioners appeared to monitor the rules set, to ensure the child who used the touchscreen used it safely without the risk of damaging the device. The vast number of rules implemented on touchscreen use can be associated with authority, since practitioners sought to control the touchscreen activity closely for different reasons. A greater exploration into authority can be found in Chapter 9. When compared against interview data, practitioners reported their preferences on children using touchscreens, and some commented on not allowing children to

spend long periods of time on the devices as children should be playing outside and engaging in physical activity. This chimed with reports from other studies and the general healthy and natural child movement where people viewed technologies as taking children away from other activities more suitable for them (Cordes and Miller, 2000; Howard-Jones, 2011; Plowman *et al*., 2010; The Wild Network, 2016). The implementation of these rules could be associated to practice which align with practitioner perspectives on touchscreen use.

8.4.3.3 Practitioners as mediators

Across the four case sites, practitioners were observed to take on the role of 'mediator' when young children used touchscreen technology, particularly regarding turn-taking and allowing peers to watch touchscreen use. Practitioners in all four sites had rules on turn-taking between children. It was recognised how children were not allowed to play on the touchscreen devices for extended periods of time. Children were reminded of the need to share the devices, and practitioners who monitored turn-taking often indicated to another child who was waiting to play. Different approaches to turn-taking were observed across the four sites, including giving time warnings to children, asking children to pass on the devices and allowing children *"one more turn"*. The approaches by practitioners were often successful, however some children sought to extend their time using the devices, though asking for another turn or saying 'no' and continuing playing.

Alongside turn-taking, practitioners mediated other children watching touchscreen use. It was apparent within Caterpillar Corner (CM) and Forrest Green (DN) that only one child could use the touchscreen devices, and other children should wait their turn. Practitioners often reminded children of this, and children were frequently asked to move away from the touchscreen area to allow others to play. By doing this, practitioners ensured each child had a fair turn, however it eliminated the possibility of children working and playing together on the devices. Further

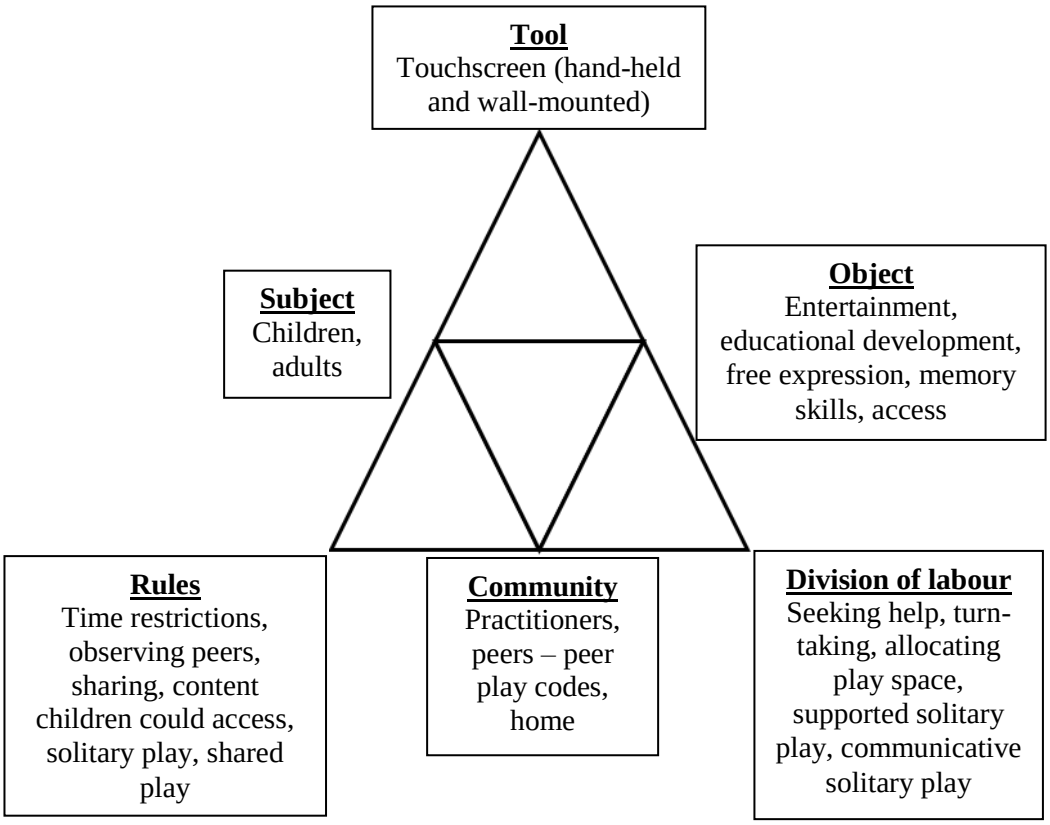
exploration into the approaches implemented by early years practitioners can be found in Chapter 9.

8.5 Discussion

Observations of touchscreen play and reports of play through focus-group interviews have been analysed separately using the activity theory model. Activity systems generated from the data can be found in figures 23 and 24. Observational data revealed the extent to which practitioner reports through interviews and survey data was reflected in practice. Consistent with the previous two data chapters, the tool was the touchscreen, both wall-mounted and hand-held touchscreen devices. Unlike in previous chapters, the subject expanded from the child, to the child and practitioner, since observations revealed a significant proportion of touchscreen play was led by practitioners through taught-lesson style activities aimed at promoting children's learning. This changed the boundaries in terms of how children's play would be determined, since practitioners often assumed the role of the touchscreen user, where children were required to observe and learn. Aside from adult-led play, child-initiated play allowed children to have measured levels of control over the devices, which were under the confines of rules or expectations established by practitioners.

The object which children and adults worked towards during touchscreen play focussed again on educational development, enhanced through entertaining apps which were downloaded by practitioners. Children were afforded opportunities for free expression through creative apps and directed their own learning through playing on a range of apps available on the devices. However, the object fluctuated dependent upon the situation and therefore included struggles for access as children entered and left the play area. Particularly in Busy Bees (CCN), the struggle for ownership replaced play as an object through the constant negotiations for access.

Figure 23. Activity system on observed touchscreen use by young children



Subsequently, children's motives were altered through the communicative interactions, both positive and negative when seeking touchscreen access. Whilst these occasions afforded children the opportunity to develop their communication and language skills through persuasive language and negotiation, in fact, a larger physical struggle monopolised play and therefore reduced play to behaviour generally considered unacceptable in the setting.

Reflecting upon these episodes, there was a greater need for adult presence to monitor turn-taking and to support children in understanding the need to share the device. As with Flewitt *et al*.'s (2014) study, there were similar reports of many children seeking access to the devices which led to unsuccessful opportunities to play. I agree with the researchers that children require support considering some children did not understand the rules of touchscreen play. When children were left to play unsupervised in this setting, the quality of play was reduced in

some cases because of these struggles, and a greater awareness by practitioners is required to enhance the potential of touchscreen play.

The rules which directed touchscreen play were extensive, and these subsequently limited children's opportunities to extend their learning further than what the apps could provide. Particularly in relation to following interests using the internet to search for information, children were limited through only being allowed access to the apps on the devices. There were eight moments in Little Ducklings (PS) where children attempted to gain access to the internet but were prevented from doing so because of lack of connectivity, yet these observations reflected that children were knowingly seeking to access the internet to search for items of interest.

Since touchscreen play was unsupervised in this setting, children did not seek the support of practitioners in following their interests and subsequently sought entertainment through different apps on the device. Therefore, there were missed opportunities for learning which went unnoticed by practitioners. This has not yet been reported before since very few studies observe actual touchscreen play but requires further recognition in order to ensure practice follows children's interests in a safe yet stimulating manner. It is clear to identify that in these moments the restrictive mediation techniques (Livingstone *et al*., 2017) reported in Chapter 7 prevented additional learning, and therefore practitioners should consider observing children's touchscreen play to determine how children interact with these devices. This subsequently could enhance children's potential learning through enabling mediation techniques (Coyne *et al*., 2017) where risks are taken into consideration but opportunities to use the internet to extend learning are provided for young children.

Another significant rule which has not yet been reported that limited children's scope for play was on the social environment, and this warrants further attention because of the missed

opportunities observed. Approaches of monitoring the social environment to protect children's touchscreen time in Caterpillar Corner (CM) and Forest Green revealed that on occasion, children sought to share their touchscreen play with their peers. Since practitioners did not acknowledge this and saw peers as an interruption, they were asked to leave the touchscreen area regardless of children's requests or non-verbal attempts to include their peers. The pedagogical approaches adopted by practitioners reflected a narrow vision for the touchscreen rather than enabling wider opportunities for enhancing play through social interaction. Children's touchscreen play was subsequently limited and promoted solitary touchscreen interactions rather than social, an approach which could put children at a disadvantage compared to their peers who use touchscreens in a shared manner.

The division of labour was multifaceted during observations, where peers were given considerable input into play. Children adopted various roles whereby they allocated space or time to access the touchscreen, which provided opportunities to exercise control and assume leadership roles. The roles that children took directed the nature of play, so the leadership roles meant that children were given a higher status than their peers whereby they could determine who played alongside them or watched, who they could ask for support and who they would accept this support from. These moments revealed a small-scale hierarchy between peers during touchscreen play, where positions were adopted to control or manage play.

Aside from the rules and division of labour, the community included practitioners, peers and the home environment. Practitioners contributed to the community through the approaches in supporting children's play and supervising access. They had a central role in monitoring the ways that children played, which included dictating how peers impacted on touchscreen activities. Peers were a part of the community through the parallel play codes which were recorded during observations, and whilst some children did not directly interact with their peers, their presence was acknowledged. Supportive solitary play reflected the impact of peers

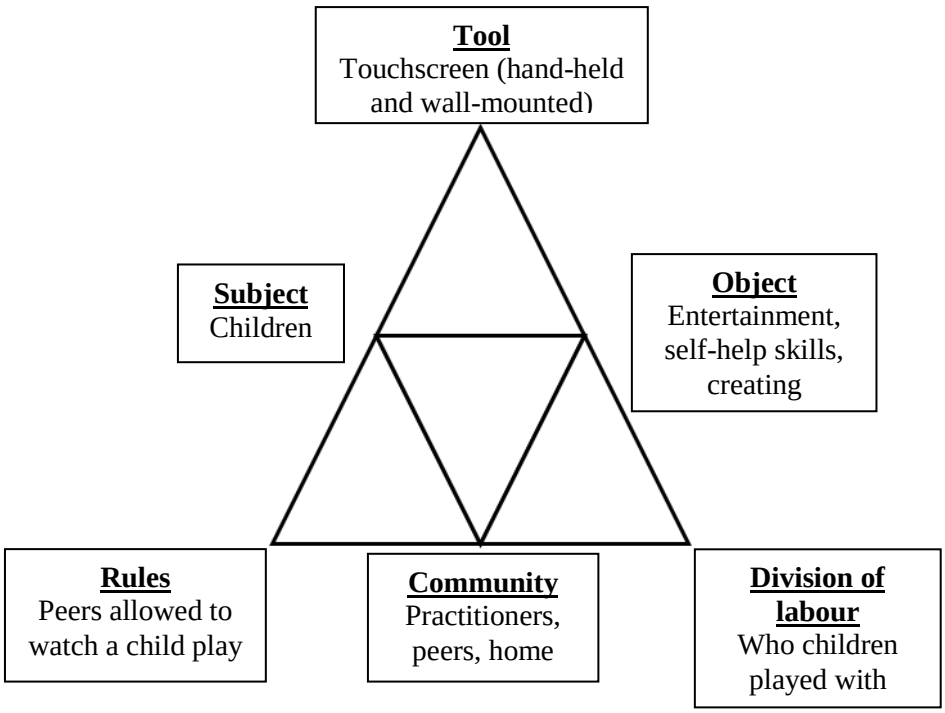
in enhancing play through the knowledge of others and their own experiences. Social learning approaches were inherent within these observations whereby knowledge was conveyed through age-appropriate strategies which sought to extend the play experience (Vygotsky, 1978).

The focus-group interviews enabled the child voice to be represented, something which was not emphasised by practitioners within interviews. Children's descriptions of play and their preferences indicated discrepancies between what practitioners reported happened, compared to what children sought to happen. In line with all previous activity systems, children's touchscreen play involved seeking entertainment and some form of educational benefit from playing on a wide range of apps. The reported uses of touchscreens by children mirrored interview findings that children mostly liked to play games, which showed that practitioners were aware to some extent of children's touchscreen preferences. However, practitioners were not aware of the social aspect of touchscreen play, represented in the activity system in figure 24 through the division of labour, rules and community.

Whilst observational data reflected that practitioners monitored the social environment, there was a strong emphasis by some children that they sought to include their peers within touchscreen play. The pedagogical approaches adopted by practitioners in supporting children's learning by enabling solitary play opportunities was at times, antithetical to what some children sought and therefore there were missed opportunities again in acknowledging the child's voice and their interests. Undeniably, some children were very averse to sharing the touchscreen as this is thoroughly represented through the interactions between children in observations. It could perhaps be inferred that practitioners adopted this monitoring role because of the associated struggles for ownership that may arise. However, these types of interactions were only observed within one site, of which children played unsupervised. The division of labour and rules were connected through the monitoring and assigning positions

within touchscreen play. This determined the extent to which peers would have an influence on the nature of play through the associated rules and assignment of roles.

Figure 24. Activity system generated from children's reported touchscreen preferences



The community consisted of practitioners, through children's requests to play with practitioners, even though observations reflected that practitioners adopted monitoring or mediating roles when children used touchscreens. Therefore, again I raise the issue that practitioners need to be more aware of children's intentions and ask questions in order to determine the ways children seek to play, as suggested within Fleer's (2017) study and her theory of a Digital Pedagogy. Only when the connections are made from practitioner and child intention can practice be well-informed to meet children's needs. In doing so, the connection between home and setting use of touchscreens can be made, as recommended by Palaiologou (2014), which is reflected within the mesosystems of Bronfenbrenner's (1977) theory in supporting child development. Children spoke openly about their home use of touchscreens, which reflected that whilst not all children gained access to this technology at home, there was

affirmation that practitioners' intention of increasing equity was occurring through these conversations with children.

8.6 Conclusion

This chapter has discussed the findings from 'a day in the life' observations of young children using touchscreen devices in each of the four case sites. The observations have provided an insight into how young children were able to use touchscreen devices across the four case sites, and has outlined the ways in which children sought support, negotiated turn-taking and shared the touchscreens with others. The data has also shown how practitioners were involved when children used touchscreens, and this has been outlined in three sub-themes. These sub-themes addressed negotiating turns, offering in-game support and establishing rules which children should abide by when they played.

The chapter has also examined the findings from four focus-group interviews with small groups of children across the four case sites. The focus-group interviews have provided the children with a means to speak their opinions of touchscreen use in each of their settings and has offered suggestions of how practitioners could develop their practice to meet the needs of the children. The children spoke of their preferences of how they used touchscreens, and children referred to the ways in which they liked to use touchscreen devices with others. By conducting focus-group interviews with children has allowed the child's voice to be represented on current touchscreen practice and has offered a medium in which to explain their actions which are referred to throughout the chapter.

The following chapter leads into a discussion on the data collected within this study. The chapter draws upon online survey findings, interviews with practitioners, observations of children's touchscreen use and focus-group interviews with young children. It also reflects on

the usefulness of activity theory and the ecological systems model as a means of analysing and interpreting the data.

Chapter 9: Discussion and conclusions

9.1 Introduction

As discussed at the beginning of this thesis and in the Literature Review, studies reflect the growing presence of touchscreen technologies in both the home and early years settings for young children (Knowland and Formby, 2016; Livingstone *et al*., 2015; Ofcom, 2017) Considering this increase in touchscreen access for young children over recent years, parents and practitioners acknowledge there is not enough information available about the touchscreen in ensuring young children are using these devices effectively (Kucirkova and Littleton, 2016; Marsh *et al*., 2015a; Palaiologou, 2016). Subsequently, calls for training or supportive resources have been made (Marsh *et al*., 2015a) to support practitioners in implementing touchscreens into practice that is of a high quality.

Whilst early years settings opt to update their technology and incorporate touchscreens into their practice, no policy is available which states any form of guidance or advice for practitioners on whether touchscreens are worthwhile or have educational benefit for young children. The EYFS (DfE, 2017) recognises that children should have access to a range of technologies whilst in their early years, however the EYFS (DfE, 2017) fails to support practitioners in the implementation of touchscreen practice. A recent report on the Early Years Foundation Stage Profile (Rawstrone, 2017) has recognised that technology requires more focus in the EYFS framework, yet this is ongoing and at the time of writing, no official changes have been made.

This study was conducted in response to a growing need to establish best practice surrounding the touchscreen, which is informed by empirical research that includes both the child's and practitioners' voice. The study's objective was to explore how touchscreens were used in play and in directed activity across the four early years settings. It was important to take a critical

stance on touchscreens in early years settings to ensure that the child's best interests were at the centre of the research. I achieved this by examining practice relation to children's learning potential when touchscreens are used in early years settings with young children.

In order to meet the study's objectives, I adopted social constructivist and social constructionist theoretical frameworks which allowed me to conceptualise knowledge emerging and being created through interactions with others in society (Berger and Luckmann, 1991). This approach focuses on interpreting the ways in which meanings are created through the actions and the comments early years practitioners and children made, and as such takes a social stance through recognising the importance of others in influencing thinking and knowledge creation (Berger and Luckmann, 1991; Burr, 1995). This perspective aligns with my own professional experience of how children learn. I sought to create an understanding of the touchscreen 'world', through focusing on the touchscreen as central to this study, acknowledging interactions surrounding the devices.

In effect, I sought to explore the 'lived experience' of touchscreen use through the perspectives of children and practitioners, attempting to understand how practitioners and children perceived the touchscreen, how it was valued, and by identifying the purpose of the touchscreen within early years settings. Exploring practice through these perspectives revealed that touchscreens were primarily used as a tool that children could use to learn a range of skills. Touchscreens also facilitated opportunities for social interaction and supportive play when practitioners sanctioned this kind of activity, and was a medium in which children could interact with apps that all practitioners perceived could extend learning and development. The touchscreen was envisioned by some practitioners as being valuable for long-term learning in regard to schooling and future jobs, whilst other practitioners considered the touchscreen to be the most appropriate technology that young children could use because of its current popularity within society.

Within the social constructionist/constructivist theoretical frameworks, analysis of the data was achieved through using different 'lenses' to view the data, so that a wider account of touchscreen practice and intention could be collected. I used activity theory (Engeström 1999c) as the central tool for analysis alongside Bronfenbrenner's (1977) ecological systems model. This enabled me to position the touchscreen at the centre of activity to determine the interactions which surrounded the devices across the four early years settings and identify the wider influences which impact upon touchscreen activity. Activity theory was useful to identify the rules which were imposed on touchscreen activity, and how significantly these impacted potential touchscreen play. Alongside activity theory, thematic analysis was employed in order to code and manage the data (Braun and Clarke, 2006). The codes that were generated were data-driven and subsequently allowed for the framing of touchscreen practice in a neutral way, rather than what analysis wholly guided by the literature would have achieved.

I created a technology-based play scale to assist in coding the data, which was adapted from Parten's (1932) categories of social play. The scale was an organising tool which managed copious amounts of observational data, and as such play was categorised into solitary and social play groups. This allowed for a deeper and more systematic understanding of touchscreen practice more widely across the four settings. Finally, analysis of the data using these methods has revealed that touchscreen practice was considerably more complex than anticipated, and using activity theory as a central analysis tool was not sufficient to represent touchscreen practice completely. Bronfenbrenner's (1977) ecological systems model was therefore utilised within this thesis to acknowledge that there are wider influences within different contexts which impact on touchscreen potential. This is reflected on and discussed later in the chapter.

9.2 Research questions

The previous three chapters attempted to answer the following research questions which arose from an extensive search of previous and current literature, from which I identified a paucity of research into children's use of touchscreen technology in formal early care and education settings.

1. Which early years pedagogies do practitioners implement when supporting children's learning when using touchscreens?
2. What are the perceptions and reported practices of key stakeholders (practitioners and managers) on children using touchscreen technology in the early years?
3. What opportunities for social and collaborative learning do touchscreen technologies offer for children aged three to four years old in early years settings?
4. How are touchscreen devices used in a range of early years settings in the West Midlands?

The data revealed that the use of touchscreens in early years settings was directed by practitioners' intention to support children's development. It was recognised by some practitioners across the sites that touchscreens were a 'way of life now' and therefore it was a natural progression to replace older technologies such as the desktop computer in favour of the touchscreen. Play opportunities were directed by practitioners, through the limited number of apps available and the restrictions enforced by practitioners on the extent to which children could explore and use the touchscreens. Within these restrictions was the element of social play, and this was controlled through practitioner ideals on how touchscreens should be used, who by, and for what purpose.

Recognising these key elements from the four data collection methods, three main themes emerged through interpretation of the data: *Play*, *Authority*, and *Pedagogy*. It became apparent

when collating the data from the different sources that there were these three recurring themes. It must be noted that within the themes there are aspects which overlap, particularly between *Play* and *Pedagogy* as it is difficult to wholly separate these as they are intertwined in early years theory (Rogers, 2011). Therefore, below I make a clear distinction between the content of the themes, but it is possible to acknowledge commonalities between them.

Within *Play*, I reflect on how touchscreen play was directed by rules and subsequently this limited children's touchscreen potential. Play consisted of children seeking entertainment through apps directed at promoting children's learning, but play was also confined through risk associations perceived in relation to the touchscreen. I argue within this section that there is a disconnect between children and practitioners in how the touchscreen is perceived, and therefore this calls for greater awareness from the practitioners on 'in the moment planning' which takes into consideration children's interests.

Authority was the second theme which arose from combining data from different methods, and this was because of the clear intentions from children and practitioners in establishing and then maintaining an element of control over the touchscreens. Practitioner rules directed children's touchscreen play, but children also sought to establish their own boundaries in relation to their peers' influence on their play. In response, this caused friction between children and therefore prompted a specific focus by practitioners on children's social behaviours in connection with the touchscreen. It was clear that for some children, sharing was challenging and subsequently children adopted various methods in which to maintain or take control of the touchscreen.

Pedagogy, the final theme, refers to the approaches taken by practitioners and children in supporting technological play. Within this theme, I reflect on pedagogical approaches in regard to their effectiveness in enhancing children's touchscreen experiences, and I argue that pedagogical approaches require adaptation to meet the nature of touchscreen play within early

years settings. I draw upon Fleer's (2017) digital pedagogy later in this chapter to argue that more recognition is needed in relation to how to support practitioners in enhancing technological play. This is particularly relevant when considering rules implemented as observed within this study which confine touchscreen potential, and limit children's opportunities to engage in shared play.

9.3 Play

Children's touchscreen play was fundamentally based upon rules set by both children and practitioners. Practitioners in all twelve interviews commented on the perceived learning aspect of touchscreens to enhance children's development, which subsequently positioned the touchscreen as a tool for children to learn from. It was common practice across the four sites that practitioners adopted a hidden pedagogy (Bernstein, 1990) whereby they downloaded apps which appeared fun and entertaining to children, yet practitioners ensured there was an element of learning within the apps. For example, creative apps which enabled free drawing and early mark-making were made entertaining or inviting by including '*Peppa Pig*' characters (a popular children's television programme). This learning intention of the touchscreen was a hidden rule to children; practitioners within all four sites commented how children preferred to play games, yet practitioners acknowledged this through downloading apps which appealed to children. This subsequently blurred the boundary between what was an educational and an entertaining use of the touchscreen.

Interviews and observations revealed that there were external influences which impacted on and directed the nature of children's touchscreen play. External influences included the EYFS (DfE, 2017), practitioners' pedagogical beliefs and external recommendations on touchscreen availability based on unrelated training sessions. Additionally, practitioners spoke of their own preferences of touchscreens and their own reasons behind incorporating them into their

practices (see Chapter 7), and this again influenced the nature of touchscreen activity. For example, one practitioner informed me that including touchscreens was a way to recognise the changing nature of technology that children interact with, and it was therefore a natural progression to include this form of technology within the setting. This reflected the influence of society and cultural activities, and how these activities shape and alter children's early play experiences. A visual representation and discussion on external influences which impact touchscreen activity can be found later in this chapter (figure 29).

Analysis of observational data through the technology-based play scale reflected a significant proportion of touchscreen activity involved solitary play. Whilst practitioners in interviews commented on the ways in which children played with touchscreens, analysis of the data using the play scale showed that touchscreen activity was significantly more complex than practitioners reported. Touchscreen play was influenced by both the restrictions and ideals from adults, but also based on children's own intentions to use the devices. It could be argued the large number of solitary play codes which were reported was a consequence of the rules on sharing which practitioners implemented (see Chapter 8, table 19). For example, practitioners in two sites limited children in playing with another child when using the touchscreen, and therefore shared play codes were uncommon in these sites.

Whilst it was apparent through observations of how practitioners limited touchscreen play through the rules implemented, children's own touchscreen experiences could also have altered the nature of their play through general touchscreen expectations established by adults around them. Searle (1995) explains "the child is brought up in a culture where he or she simply takes social reality for granted" (p. 4). Considering children were made aware of the rules regarding touchscreen play, it could be considered that children in the first two sites only sought to use touchscreens in a solitary manner because of these expectations. However, rules had a restricting nature and went against current recommendations to position the touchscreen as a

shared activity rather than solitary activity (Marsh *et al*., 2015a), and subsequently prevented children consolidating their learning by sharing their experiences with others.

When touchscreen activity was not supervised or restricted by adults in fostering a shared learning environment, there was the potential for children to play together on touchscreen devices. Children's shared touchscreen play sometimes centred on taking turns to touch the screen and make choices or to manipulate objects. Often, this was through a process of negotiation between peers on the ways in which each child would use the touchscreen, but children also sought to create a role for each other or themselves which directed the activity. The division of labour in these instances was allocated based on the negotiated ways that the children would use the touchscreens, and rules were established based on what role each child would assume during these moments. There was a collective intentionality (Searle, 1995) in the ways that children played; peers would often have different roles to fulfil yet they both worked towards the same goal when playing together. According to Kontovourki *et al*., (2017) "children negotiate complex social interactions around digital tools and texts" (p.56) in early years environments. Messer (1995) explains this form of social interaction "involves participants altering their behaviour to adapt to the activities of a partner, and in doing this a coherent sequence of activities is created" (p. 36). Both Messer (1995) and Bronfenbrenner (1977) suggest that children's interactions with each other are influenced by each child's characteristics within the environment. Wang and Ching (2003) explain how in technological play, "children constantly negotiate between their own individual and collective goals in the classroom and the affordances of the environment, as they create their own definition of computer use while simultaneously conforming to the rules set by the teacher" (p. 336). In the case of this study, there were frequent examples of one child displaying more dominant behaviour in the form of making app choices and dictating the activity, whilst the other child either took a less dominant role and followed instruction or sought to gain more control.

Children negotiated their touchscreen play based on their own and their peers' preferences within the community, and often were observed to engage in friendly and helpful interactions reflected within the Communicative Solitary Play, Supported Solitary Play and Group Play codes. Both Winegar (1989) and Valsiner (1989) argue that children's socialisation in these instances arise from "a socially negotiated and shared understanding" between each other (Brownell, 1989: 194). Children interact with each other in these situations to share an experience, which provides opportunity for learning and understanding which arises from the various roles children adopt. It is when this occurs that Brownell (1989) suggests knowledge is acquired, and this is socially constructed between peers. Corsaro and Schwarz (1991) take this further by suggesting "children enter into social systems and, by interacting and negotiating work, others establish shared understandings that become fundamental social knowledge on which they continually build" (p. 234-235). The social exchanges which children interact in, Light (1987) suggests, is where children bring their own knowledge and experiences and they create a social object whereby this information can be passed on to others.

During play, children were observed to share their own experiences with their peers whereby they helped each other. Through observing children's helping interactions, it became apparent that an affordance of using the touchscreen during free-play time enabled children to support their peers based upon their own experiences. Whilst this was not an affordance of the technology itself since these interactions could be observed in any activity, the touchscreen did not hinder opportunities for support, which reflected that the touchscreen can be used as another medium for learning within early years settings.

The way that new knowledge and experiences are shared and conveyed to other children is through culturally appropriate ways, which shapes children's constructions of knowledge and understandings of the world within society (Burr, 1995). During observations, some children were observed to support their peers based on their own experiences of using the technology.

Children would often make comments or guide a child's actions so that they correctly made choices on the screen which were influenced by previous experience. As such, there was evidence of scaffolding (Bruner, 1977) amongst children as they recognised their abilities in supporting less knowledgeable peers.

Children's experiences of playing on apps and the consequences of certain actions provided these children with banks of knowledge in which they could share with their peers to support successful play according to the app rules. It could be perceived that this example reflects common play behaviour with any toy, however I argue that whilst this is true, practitioners do not yet identify the commonality between the touchscreen and other play resources. This study has shown that practitioners have many rules regarding how touchscreens should be used as they seek to control potential play and risk of damage to the devices. However, it is now important to realise how children do not make this distinction of the touchscreen being separate, and instead this calls for a review of practice so that touchscreens can be used to a greater potential.

On the contrary, there were occasions where a shared environment was not welcomed by some children, and helping interactions were viewed upon negatively by some children who thought their peers were attempting to seek possession of the touchscreen device. These instances reflected that whilst touchscreens may provide opportunities for shared play, it was always to the child's discretion whether this occurred or not. On these occasions, children engaged in their own individual intentionality (Searle, 1995), and this caused friction between peers as they negotiated space and access to the touchscreen and sought any available means in which to do so. It was in these moments where authority-based struggles came into play, where children would attempt to assume certain roles whereby they could be in control of the touchscreen.

9.4 Authority

Authority-centred struggles amongst children often surfaced when seeking to gain access to touchscreen devices, a common finding within other studies (Flewitt *et al*., 2014; Savage, 2011). Burr (1995) suggests that a person's behaviour changes according to the situation that they are in, and children often responded to their needs or desires to access touchscreen technologies regardless of whether it was already in use or not. In turn, this provoked negative interactions amongst some peers whereby they used a range of means to seek touchscreen access.

The children were a part of a hierarchy within the early years settings in relation to access and control over the touchscreen, and their positions within that hierarchy fluctuated dependent upon their situation and the persons present within the community. Aside from the hidden pedagogy practitioners adopted by downloading apps perceived to have educational value, practitioners also adopted a visible pedagogy (Bernstein, 1990), whereby they verbally established rules on turn-taking and time limitations on touchscreen play. Yet, when practitioners were not present, this visible pedagogy blended into the background as children sought to negotiate or gain access to the technology themselves. Authority struggles most commonly occurred in Busy Bees (CCN), the site where practitioners explained the touchscreen was not a priority and was not supervised by adults. It was in this site where children frequently assumed their own self-declared positions within the social hierarchy amongst their peers, using a range of strategies to seek control and therefore dictate the touchscreen activity. Similar to Arnott's (2013) findings, children had their own social status roles and used these to negotiate touchscreen access. Saracho and Spodek (2007) explain "children co-construct their own social processes or conventions by establishing positions and status roles amongst peers" (p. 36). This was particularly prevalent in the absence of adults, as

children developed their own set of rules and adopted their own strategies to seek or maintain control over the touchscreen.

Although practitioners established a set of rules which children were to adhere to, some children across all settings were observed to bend or adapt the rules in order to meet their own aims in relation to the touchscreen activity. It was in these situations where some children adopted higher levels of authority over their peers, yet this was not always accepted, and other children sought to increase their authority too, by raising their voices or using physical contact to gain more access to the touchscreen. Children's interactions subsequently focussed on resolving their own 'social problems' amongst themselves when adults were not present (Killen, 1989). Through the constant negotiation of establishing and adhering to rules, children became social actors whereby they each had their own positions within the social environment. Rules became 'cultural resources' which were used to manage and mediate peer interactions (Cobb-Moore *et al*., 2009: 1477). Children manipulated these rules during their play to "recreate and replicate… existing dominance hierarchies", opting to "include or exclude children" (Walsh *et al*., 2010: 14). This then formed play groups or alliances amongst some children, who chose certain peers who could watch them play or join in, and they chose peers who were not 'allowed' to be near the touchscreen. It is worth noting that these observations are common processes in children's socialising, but have not before been specifically observed in relation to touchscreen use in early years settings.

Observing children's behaviour in this way identified that affordances of technology are not always positive. For some children, the technology provoked behaviour which disregarded rules established by their peers or practitioners, as they sought to gain access to, and control the touchscreen devices. I therefore argue that an affordance of the touchscreen, for some children, is to provoke strong desires to gain access to and control the devices for their own entertainment which disregards the needs of others, through adopting authoritative positions

that are not always accepted by others. It is possible that other toys in the playrooms also provoked these reactions, however, this study only focused on the touchscreen, so it is only the touchscreen that I report on and analyse.

In addition to children's authority positions, practitioners' authority in the playroom surfaced through the wide range of rules they implemented to maintain control over the touchscreen and potential touchscreen play. Since rules reflect societal and cultural values, it was unsurprising that rules varied according to each setting. McNay (1994) suggests rules or associated 'norms' within daily practice are a way to regulate behaviour. In addition, with the number of rules assigned to touchscreen activity, this meant that children were restricted in the ways in which they could interact with the devices. Killen (1989) explains:

> The nursery school environment is a diverse social structure with many established rituals and procedures that potentially bear on the type of interactions observed in such settings (p. 122).

Practitioner rules within some of the sites were a framework that children could build upon (Corsaro and Schwarz, 1991). Cultural rules assist children in making sense of their social world, and, through experimentation of implementing or abiding by and breaking the rules, children develop a sense of ownership as they begin to position themselves within the environment where rules are established. Practitioner rules gave children a sense of authority and control as they took into consideration what was expected of them, yet there was evidence that some children tailored these rules according to their own touchscreen motives. This was particularly prevalent regarding the shared aspect of touchscreen play, where children could encourage their peers to play alongside them, even when practitioners specified the touchscreen was to be used by one child only. The pedagogical strategies implemented by practitioners regarding shared play will be further explored in theme three (Pedagogy).

Authority was also exercised amongst children and practitioners, dependent upon the levels of knowledgeability they held. Berger and Luckmann (1991) assert humans perceive themselves and others to hold different levels of knowledge and expertise, and these "esoteric systems of expertise" (p. 61) are explored and taught to others. Children across the sites perceived the practitioners to hold greater levels of knowledge compared to themselves, and this was reflected in the ways they asked for help or support when encountering difficulties when playing, or when they struggled to manage the social environment independently. Adults gained a higher level of authority than children in these instances where the adult adopted the role of mediator to monitor and negotiate touchscreen play. Corsaro (2006 in Uprichard, 2009) explains how adults hold an authoritative position over children, and subsequently, children have lower levels of authority compared to adults. Yet, this study has reflected how it was not only adults who held authoritative positions within the playroom, as children adopted these roles too.

In terms of exercising control through knowledge, Burr (1995) suggests "knowledge increases a person's power" (p. 63) and therefore the hierarchical positions between child and adult can be explored in relation to touchscreen experience and knowledgeability. Children's and adults' knowledge on certain aspects of the touchscreen and their technological skills provided them with an element of authority as they chose to share their knowledge with others. Practitioners within Little Ducklings (PS) commented within interviews that some children were more knowledgeable than them in relation to technological competence. This therefore altered the learning opportunities for children, since children could take a more direct role in supporting their peers' and potentially adults' learning in the future.

Some practitioners within this study were reported to initially display reluctance in using touchscreens, and one aspect of this was because children may be more experienced than them. This destabilised the traditional views of the educator and the child from the adult's

perspective. The roles of the educator and unknowing child were reversed as it was perceived children were potentially more skilled. This concern was not unique to this study; within Flewitt *et al.*'s (2014) study there was an imbalance in skill-set and confidence when practitioners used touchscreen devices. The hierarchy of knowledge meant that children adopted higher authoritative roles than practitioners; the nature of children's play was extended in these moments whereby children could scaffold peers' learning, develop thinking and increase understanding about various aspects of children's touchscreen activities. This therefore introduces the possibility of children teaching practitioners and peers, which McLean and Edwards (2016) reported within their study, and Flewitt *et al.*, (2014) suggested was beneficial for children.

This study has therefore revealed that touchscreen technologies could potentially disrupt the normative authority relations in early years settings based upon children's experiences and skills in using this new technology. This calls into question whether new pedagogical approaches should be developed that acknowledge this potential. Keeping in line with technological activity, a new proposed pedagogical approach needs to incorporate the acknowledgement that some children are indeed more skilled than practitioners. Perhaps scaffolding itself needs to be widened to take into account the extra level of support provided within early years settings by children themselves. In this situation it could be suggested that practitioners actively recognise that they (in some cases) have the lesser knowledge compared to children, and they subsequently position more knowledgeable children as 'technological experts' in these moments. This is further explored in the following section, drawing on Fleer's (2017) 'digital pedagogy'.

9.5 Pedagogy

The pedagogical approaches employed within the settings focussed on child-centred learning, offering children opportunities to explore and play with touchscreen technologies during daily activities. A combination of adult-led and child-initiated activities reflected the different uses of touchscreens to support children's learning. One of the central agreements of integrating touchscreens into daily activities was that touchscreens supported children's learning. Practitioners reported how children could learn operational skills and learn general technological skills as a result of early experiences with touchscreens.

Whilst it could be argued that introducing touchscreens to children when aged 3-4 is an ideal time to develop operational skills (Blackwell *et al*., 2016), research suggests children do not need such early exposure to technology (Plowman and McPake, 2013). This study has presented the argument that the need to include technology in young children's lives is a social construction, through the perceived need to equip children with skills so that they are competent technology users within society. Plowman and McPake (2013) argue that the intention to enhance children's operational skills of using technology ahead of schooling years is not worthwhile, particularly because children will encounter new or different technologies at school.

However, recent research suggests it is useful to provide children with opportunities to use touchscreens before they enter school so that they are not disadvantaged amongst their peers (Marsh *et al*., 2015a). This therefore means that practitioners can be faced with a dilemma of what is most appropriate for the children they care for, based upon research recommendations and their own touchscreen values and beliefs. Practitioners within interviews reported a strong emphasis on supporting children's learning, and providing them with technological skills ahead of school. Most practitioners within this study reached the consensus that children needed this

early exposure based upon societal and cultural values and predicted technological expectation in schools.

In addition, observations illuminated the pedagogical strategies employed in using touchscreens with the children such as guided interaction (Stephen, 2010), scaffolding (Bruner, 1977), and techniques such as modelling or explaining. This reflected practitioners' knowledge and competencies in using the touchscreens, which dispelled their concerns in interviews of knowledgeability and skills. This study has shown that both adults and children had dual roles of to teach and to learn, based upon the skills and experiences each person had. What became apparent when observing some practitioners' practice, was that whilst practitioners followed established approaches which they believed supported children's learning, in some sites they dismissed the opportunity for children to engage in shared learning with their peers. Practitioners appeared to be attempting to implement practice which they implemented when using desktop computers, which is in contrast to the touchscreen device. For example, the touchscreen is a hand-held, portable device, yet the computer is fixed and generally placed in one area of a playroom.

The touchscreen provides greater opportunities for shared technological play, with studies (for example Marsh *et al*., 2015a; Prensky, 2010; Saracho and Spodek, 2008; Siraj-Blatchford, 1999; Zevenbergen, 2007) recommending the touchscreen to be positioned as a shared activity. This calls into question the extent of research that practitioners read or are exposed to as they consider integrating touchscreens within their settings. This also highlights the importance of ensuring that research is shared with practitioners so that it can subsequently inform practice, and highlights the need for policy to be created and subsequently implemented which draws upon rigorous studies focussing on children's use of touchscreens in early years settings. Whilst the data reflected the intention for single-user touchscreen activity, some of the focus-group interview and observational data reflected that children sought to engage in shared touchscreen

use with their peers and practitioners. Therefore, it could be argued that practitioners need to adopt more appropriate technological pedagogical approaches which are in line with technological activity and children's interests, because children reflect a desire to engage in shared touchscreen play.

By reflecting on the strategies adopted by practitioners in mediating touchscreen use, it appears how these are not necessarily the most suitable since there is little guidance on touchscreen activity within early years settings. As a result, practitioners establish their practices based on what they predict is most appropriate and therefore do not always utilise their knowledge of the children and subsequently select the approaches best suited to the child's needs. Some practitioners within the survey reported they restricted full access to touchscreens as they feared children may break the devices and were concerned of the subsequent cost to repair them. Others perceived the internet to be a risk for children at this age, a common finding amongst parents in Livingstone *et al*.'s (2017) study. This practice was not independent to this study; Fleer (2017) recently found that practitioners in her study did not trust children to use the touchscreens on their own, so instead practitioners opted to hold the devices and control the activity, much like the approaches found in Caterpillar Corner (CM) and Busy Bees (CCN). This form of mediation relates to approaches by parents to restrict children's access in response to concern of technological play (see Coyne *et al*., 2017; Livingstone *et al*., 2017). However, Fleer (2017) also found that once practitioners began to trust the children and recognised that the children were skilled and competent to use the technology based on prior experience, children's touchscreen play was extended based on the affordances children had identified from using the devices, such as accessing the internet to retrieve information.

In this study, rules on touchscreen activity heavily restricted children's potential affordances, particularly extended ones such as accessing the internet to further knowledge. Practitioners therefore adopted restrictive mediation techniques, in fear of risk of harm to children by

restricting internet access, which subsequently reduced learning opportunities (Livingstone *et al*., 2017). It was clear that the aim of touchscreen activity was for children to engage in playful interactions on apps which supported their learning in preparation for school in terms of technological competence. This therefore meant that children were provided opportunities to control and direct their interactions with the touchscreen, however this was always under the limitations of touchscreen access, based on practitioner ideals (Fleer, 2017).

What is important to note, was that practitioners did not communicate with the children to distinguish what children aimed to achieve whilst playing with touchscreens. Practitioners planned for activities and downloaded apps based on what they decided was good practice, but this therefore was not necessarily child-focussed. It was also only mentioned on one occasion in Forrest Green (DN) that practitioners spoke to parents about the apps that children played on whilst at home, and this led me to believe that since this was an isolated report, practitioners did not necessarily take into account children's prior learning experiences at home and tailor touchscreen play around those experiences accordingly. However, it is important to note that a connection should be made between the home and the early years setting, acknowledging that children have a wide range of experiences at home and these should be extended or build upon in the early years setting. Observing or speaking to children as they engage in touchscreen play may reveal children's home experiences, as reflected in Arnott *et al*.'s (2016) study.

There was a distinct difference between children's intentions and adults' intentions, through children's frequent attempts to access the internet and watch videos online, and I believe this restricted the potential of touchscreens when children played. However, there is an issue with this practice regarding safeguarding children and safe touchscreen uses, since practitioners were not aware of children's actions when playing on the touchscreen. This provokes greater awareness from practitioners on how they monitor children's touchscreen play and keep them safe when unsupervised. It also calls for a greater recognition that guidance on keeping children

safe online is also applicable to very young children and not limited to children of a school age, since this study alone reflects children's technology habits and their interest in watching videos and accessing online content.

In light of the disconnect between children's and adults' intentions, I cannot reach the conclusion that practitioners adopted a digital pedagogy which encompassed both the child's and adult's perspectives "as a relational whole" (Fleer, 2017: 123). This finding was also not surprising, particularly since incorporating technologies into a play-based pedagogy has been challenging for other early years practitioners (Edwards *et al*., 2017; Lindahl and Folkesson, 2012). Subsequently, the touchscreen is at risk of being used solely for operational purposes, of teaching children how to use the device rather than to gain from a wide range of affordances.

9.6 Bringing the activity together

Focusing on the touchscreen rather than the children enabled me to explore the affordances of touchscreens in supporting children's learning in early years settings. Using activity theory as a tool to analyse the data enabled me to identify the complexity of touchscreen activity, and the multiple factors which can influence the way that touchscreens are used. Analysing the data using this method acknowledged the social aspect of touchscreen activity, regardless of opinions on shared use by children and practitioners. The touchscreen was a hub of activity; the environment facilitated interaction and children were frequently observed to engage in touchscreen play together to achieve goals. Although some practitioners did not welcome shared play with a touchscreen, children were still presented with opportunities to interact with their peers directly or indirectly, and these actions taken by children reflected the ways in which some children perceived the touchscreen as both a shared and solitary-user tool.

To reach a conclusion on how children's touchscreen play is represented within the activity theory model, the stages of merging the activity systems created in Chapters 6 and 7 (figures

12 and 17) in relation to practitioner voice, and Chapter 8 (figures 23 and 24) in terms of child voice and child activity are shown in figures 25 and 26. In accordance with the third-generation activity theory model (Engeström, 1999a), the contradictions, multivoicedness and overlaps between activity systems coming together to create a third object can be identified in figure 27. Finally, the overall activity system created to represent touchscreen activity as observed and reported within this study from both children and practitioners is represented in figure 28.

Figure 25. The online survey and practitioner interview activity systems merged to identify commonalities

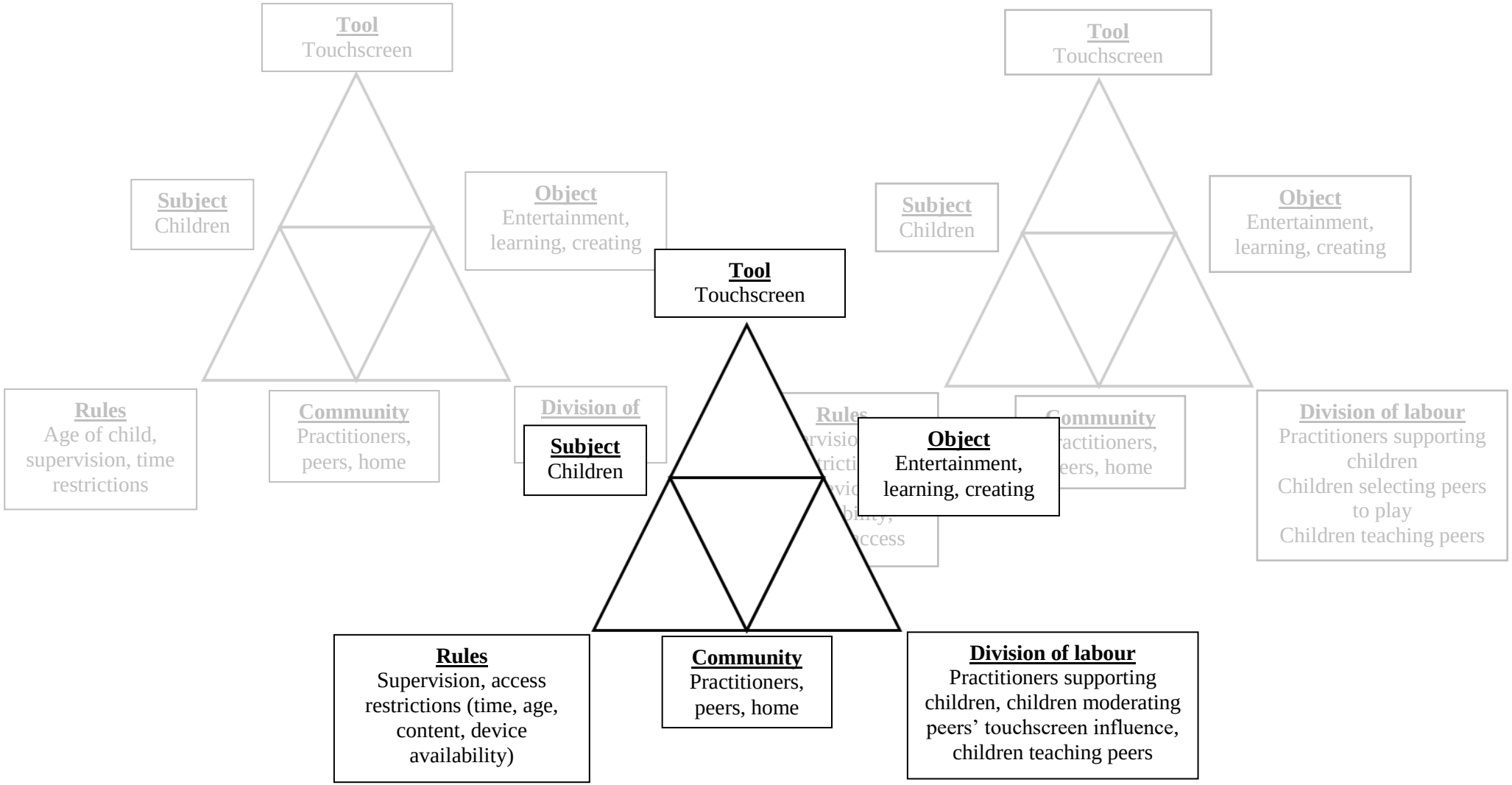
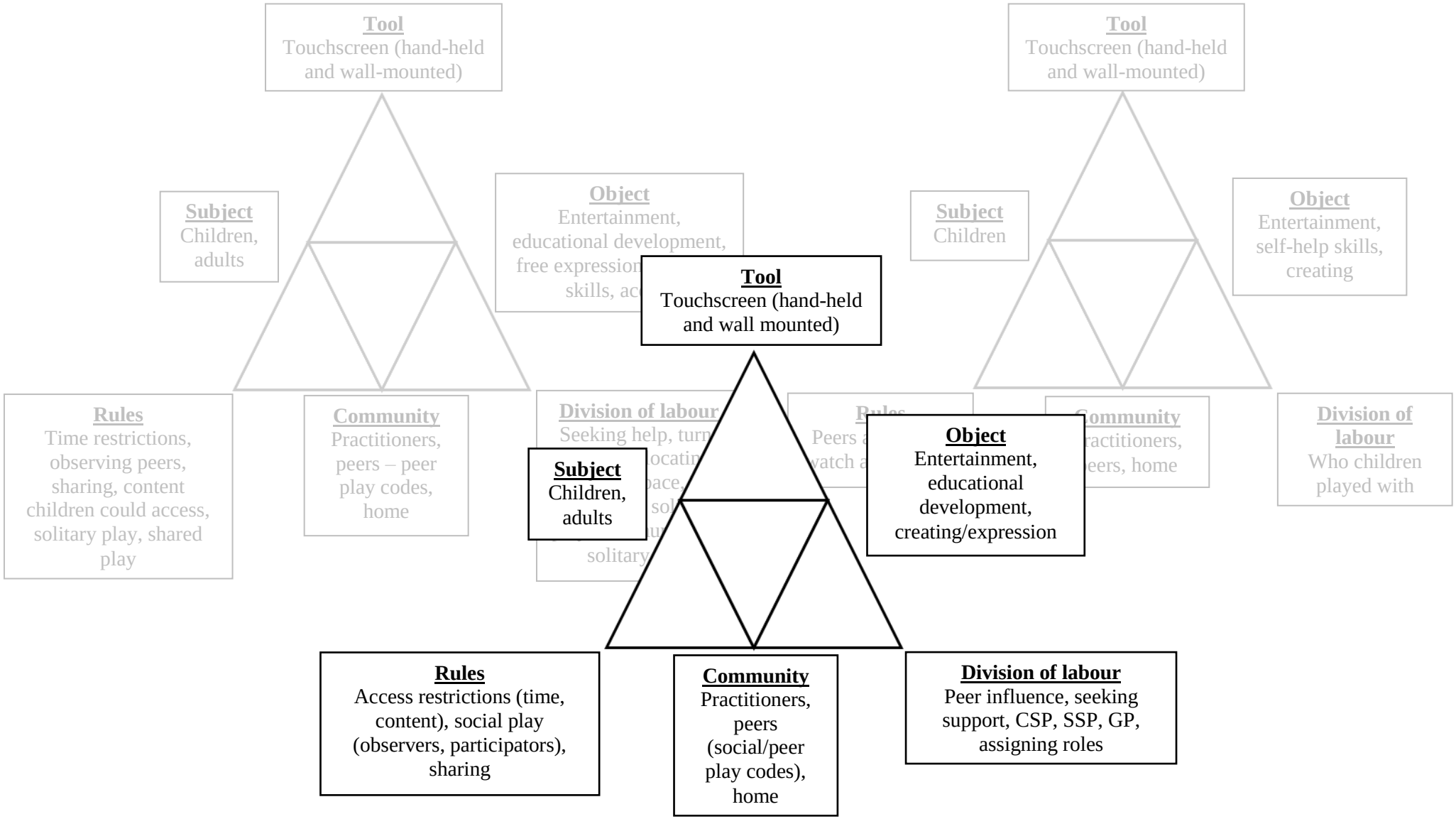


Figure 26. The observation and focus-group interview activity systems merged to identify commonalities



Figures 25 and 26 demonstrate the merging of activity systems created across the four data collection methods. Bringing together the data from the two new systems in order to identify the third outcome that Engeström reinforces within his theory, figure 27 identifies the connections and contradictions within the data. The 'lightning bolts' within the two activity systems represent the contradictions present. These include the difference in approach to touchscreen activity within the practitioner perspective and within the child's perspective. The previous data chapters have alluded to these differences, for example, the difference in opinion on touchscreens within early years settings and practitioner confidence. Observations and focus-group interviews highlighted the difference in opinion from children in relation to the shared aspect of touchscreen play, and the differences in intention which ultimately disrupted and altered the outcome of touchscreen play.

Overall, there was an inherent 'messiness' of the lived touchscreen experience which, in figure 27, reflected the difference in opinion and intention by children and practitioners. This is clearly represented through the dichotomy of play versus learning, and the contradictions represented by lightning bolts within the figure. Touchscreen play was complex, in that the nature of children's interactions with the device was guided or directed by the significant contributions of rules (both explicit and implicit) and the difference in intention by all involved in touchscreen play. As such, each time the touchscreen was used, it was used differently, influenced by children and their peers, by adult's input or their monitoring presence to ensure the activity was mediated to some extent. The pedagogical approaches implemented had an influence on the nature of play, through the perceived value of learning technological skills, and through the emphasis on solitary-based play experiences where children would benefit from this exposure to technology.

Merging these systems identified that whilst practitioners want children to gain an education through these interactive devices, and children engage in play through fun or entertaining

touchscreen activities, the intended outcome established *by practitioners* that is achieved is promoting technological 'school-readiness'. Whilst this is not the children's aim or intention, children are supported in their learning through the intentions of practitioners to enhance children's play. I can confidently reach this conclusion, reinforced through the learning through play movement currently adopted within early years settings in the UK that is guided by the EYFS (DfE, 2017), and by practitioner comments which reinforced the perceived role of technology in formal education: "*it gets them ready for school*". Therefore, this study reflects that whilst practitioners and children have different intentions (education and play), together, they meet the perceived expectation of learning through play.

In addition to technological 'school-readiness', children need other skills such as socio-emotional, cognitive, communicative and self-regulatory school readiness, yet the extent to which practitioners sought to support children in reaching these were not studied here. As such, it could be perceived that school-readiness takes on a new meaning as practitioners seek to support children in being 'ready' for school through acknowledging technology as being an additional factor which may determine whether children are prepared for school, or not.

In conclusion, whilst the three overarching themes that arose from this study reflect the disconnect between intention and practice, I reinforce the need to include the child's voice along with practitioner intention, in order for touchscreen practice to enhance children's early learning experiences. This could be achieved by employing Fleer's (2017) digital pedagogy, to ensure that practice is robust and fully informed by research and a range of perspectives.

Figure 27. Merging the two activity systems to create a third object

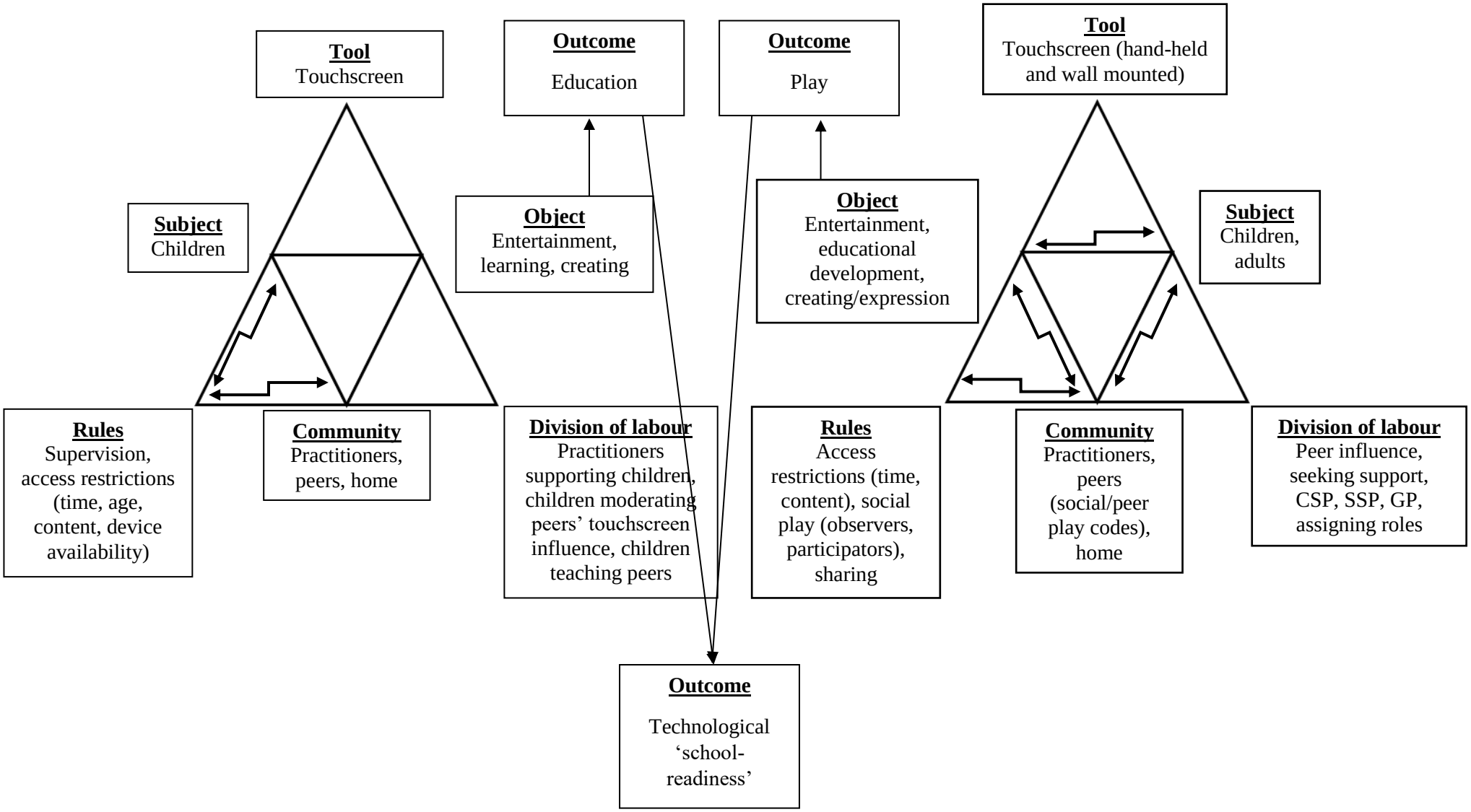
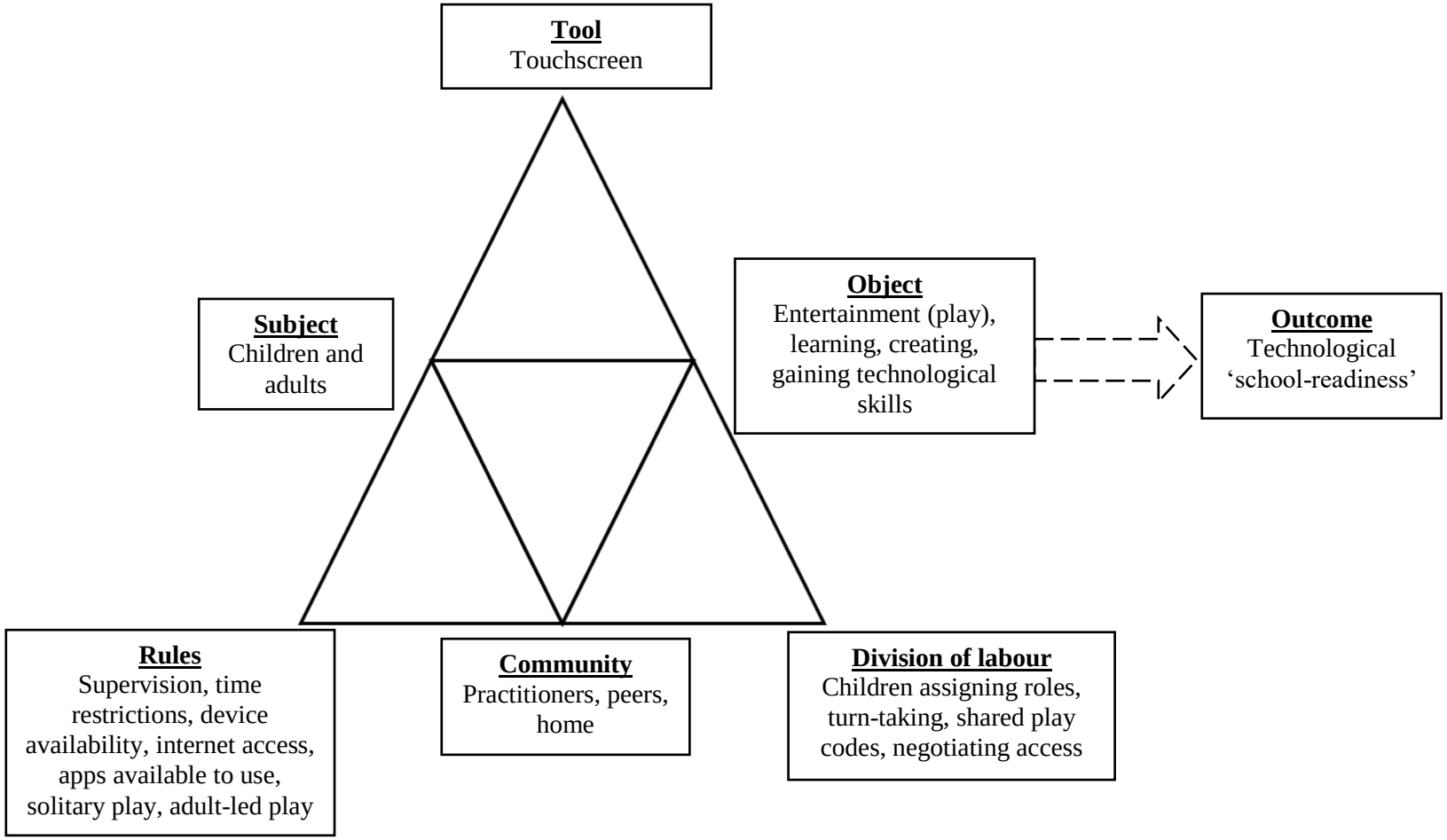


Figure 28. Activity theory in relation to touchscreen use in early years settings



9.6.1 The tool

The touchscreen was introduced within the settings as a tool to support children's learning. Limitations of the touchscreen surfaced during observations, such as the single point of contact capability, which meant that children could not play on the same device together at the same time. Children subsequently learned to overcome this limiting function and negotiated turns and allocated play space so that they could play in sequence together. Therefore, an affordance of the touchscreen is that it can provide opportunities for children to share access, however children need to first identify these limitations and respond to them in order to utilise the touchscreens to a greater potential.

9.6.2 The subject

The role of the subject within this study was assigned to both children and practitioners. Children were the primary subject since it was their use of touchscreens which was under study, but practitioners also had a central role. Interviews revealed the influence of practitioners on children's touchscreen activity, and their expectations of children's interactions with the devices influenced the ways that children played with the touchscreens. Touchscreen practice was influenced by pedagogical perspectives and personally held opinions on what practitioners considered appropriate practice for children within the age range studied. Interviewing practitioners regarding their touchscreen intentions offered the opportunity to reflect on practice, and some practitioners identified areas where they could improve or enhance their practice further, such as increasing the touchscreen's priority within the setting.

The multivoicedness of activity theory and the perceptions from both children and practitioners allowed for different viewpoints to be heard, and these meant that intentions for practice as outlined in Chapter 6 and Chapter 7 by practitioners, could be analysed against the child's intentions and actions detailed in Chapter 8. The connections between the practitioners and

child's intentions have been explored throughout the data chapters to identify where practice and intention aligns, and where it differs.

9.6.3 The object

There were many objects identified within the activity theory model which arose from interviews with practitioners, observations and focus-group interviews. As previously mentioned, practitioners intended for children to learn technological skills, and the touchscreen was used to promote school-readiness. When leading activities for children, practitioners in Little Ducklings (PS) taught lessons whereby the touchscreen was used as a tool to facilitate learning. Observations and focus-group interviews reflected that children used the touchscreens as a source of entertainment during their play times. Whilst playing under the direction of adults' intentions to promote learning, children promoted competition between peers to see who could complete a game first, and they engaged in other interactions which incorporated an element of fun.

Creativity was another object which children worked towards, and this was an unexpected finding. Whilst practitioners downloaded drawing apps to promote early mark-making skills, children interacted with apps which fostered exploration, creating or designing characters, and apps which enabled children to create shapes and manipulate their drawings on screen. These practices were in line with developmental expectations as defined within the Expressive Arts and Design section of the EYFS (DfE, 2017). The touchscreen was also used by one child to augment other activities; a child created a dinosaur on the touchscreen using a drawing app, but then decided to recreate the dinosaur in a separate area of the setting using blocks and other materials. This showed that children's imagination was extended from the two-dimensional features of the touchscreen onto the three-dimensional toys and resources that children interact with in the playrooms.

9.6.4 The rules

There were many rules enforced on touchscreen activity across all four sites (full list found in Chapter 8, table 19). However, there were other rules aside from those set by practitioners. The touchscreen itself has its own rules, such as internet connectivity, battery life, and the portability of some devices. Engeström (1999c) explains how everything that occurs during activity is mediated by an artefact. For example, children could only play with the touchscreens based upon the capabilities of the device. This therefore meant that children were bound within the rules or restrictions created by the touchscreen, and children had to adhere to them to play.

Practitioners also created a range of rules and these directed the nature of touchscreen play. Practitioners sought to maintain control over touchscreen activity therefore imposed restrictions which ensured that children could play safely (such as taking away internet connection), and within the confines of touchscreen expectations (by downloading certain 'educational' apps). In conjunction with practitioner rules, practitioners were aware of the expectations of the EYFS (DfE, 2017) in promoting children's development, and their duty to keep children safe and prevent them from harm. It is perhaps the safeguarding requirement of the EYFS which may have directed the nature of children's touchscreen activities across all four settings, based on the awareness of practitioners' duties to protect children whilst in their care.

Finally, children established their own rules on touchscreen activity based upon their opinions on touchscreen play. Children controlled the way they interacted with the touchscreen based upon their own socially constructed world which surrounds the touchscreen. Disagreements with children occurred in Busy Bees (CCN) as a result of these opinions which caused friction between children as discussed earlier in this chapter.

9.6.5 The division of labour

The way that children interacted with the touchscreen under the influence of the rules set by the touchscreens, practitioners and themselves, impacted upon the division of labour and the shared element of play. Similar to Leont'ev's (1981) object-oriented action, children interacted with each other according to peer-established rules to achieve their intended goals. This was particularly prevalent when children took turns to play on matching cards games in Little Ducklings (PS) and Busy Bees (CCN). In these moments, object-oriented action was multi-faceted; some children appeared at first to engage in turn-taking, but it became clear that they sought to gain more control over the touchscreen and have access to the device that was unrestricted by their peers. In these instances, the division of labour was complex as the children sought to negotiate access through both verbal and non-verbal contact (see Chapter 8, figure 21 for examples).

There were other observations whereby the division of labour was more successful. For example, in Busy Bees (CCN), two girls appeared to take turns by frequently recognising whose turn it was to play and by verbally reminding each other that they were sharing. In this observation alone, the children negotiated access through acknowledging who had not had a turn to play, and they continued to play together until they had finished the game.

An important aspect which arose from the division of labour was the way that children supported their peers. What was unexpected was that – considering some of the children's attitudes to sharing – some children were willing to support their peers when they encountered difficulties. In these helping moments, there was no evidence of children seeking to gain more control by offering to help. There was a strong social environment where children sought out peers who they thought could resolve issues, and children collaborated in these moments to help each other.

9.6.6 The community

The community consisted of practitioners, children and the home within this study. Practitioners were more of an indirect member of the community, in a way where they planned or strategically ensured children were working towards desired outcomes, as reflected in Plowman and Stephen's (2010) distal guided interaction. Children were more present members of the community when they used touchscreens, and they frequently approached their peers during play to provide support or to give advice on the way peers should play. Children showed their control and autonomy over the decisions they made and how they interacted with the technology and their peers; they were confident to ask for support or seek reassurance and receive positive encouragement when they achieved milestones established within apps.

The home environment was a significant aspect of the community that was referred to. For example, the acknowledgement that children gained sufficient access to technology at home meant that some early years settings in the survey opted to not include them in their settings. Children also made the connection to the home through their conversations in focus-group interviews on the ways in which they used these devices, something which requires further exploration on the practitioners' behalf to extend children's learning by building upon previous experience. Practitioners also referred to the home and expectations of parents or the community in determining the ways that children used touchscreens, particularly in relation to the internet and watching videos.

9.6.7 The outcome

As previously discussed, there was a clear outcome of touchscreen activity to promote learning and technological 'school-readiness' as children played with touchscreen devices. Therefore, children's touchscreen activities were directed by the apps downloaded which practitioners established were beneficial to children's learning. Children engaged in touchscreen activity in

what Fleer (2003) describes as an ‘artificial world’ which is distant from the real-life environment. Children played within a socially constructed early years playroom with toys and materials added to the environment which practitioners believed were beneficial for children of a young age.

9.6.8 The contradictions

Engeström’s (1987) model of activity theory acknowledges contradictions that surface because of historically accumulating tensions. Whilst this study was not longitudinal and therefore could not determine historically accumulating tensions, I was able to identify where contradictions occurred in the day-to-day practice of touchscreen activity as observed through ‘a day in the life’ observations and by speaking to early years practitioners. An initial contradiction reflected through interviews was the difference in opinion by early years practitioners on their perceptions of technology, with some declaring feeling worried or scared, and there being a general reluctance in touchscreen uptake. Conversely, other practitioners were encouraging and enthusiastic about technology, drawing upon previous experience and the positive associations of technology in enhancing their own lives. These perceptions were therefore historically and culturally embedded, which subsequently impacted upon touchscreen activity through hesitance or reluctance to engage in touchscreen play with young children. These tensions between practitioners required action to ensure that touchscreens were implemented in practice in effective ways which supported children, rather than being a barrier due to practitioner reluctance.

Practitioners identified in the survey of their approximate time length children had access to touchscreens in a day and during the week, yet when observing children, I recorded significantly different time allocations. This therefore provoked questioning on whether practitioners were aware of the length of touchscreen access children were provided within daily routines.

Another contradiction occurred in relation to rules set by practitioners and how children responded to them. As previously discussed, children were observed to alter the rules set by adults to meet their own needs. Examples of this included when a child watched videos online even though access was restricted, and when children attempted to search for characters of interest on search engines even though there was no internet connection. As a result of these interactions with the touchscreen, a safeguarding concern was raised with practitioners in settings where this occurred over the awareness that practitioners have over children's touchscreen activities, particularly when children engage in touchscreen activity that contradicts rules.

Finally, the pedagogical approaches implemented within the four case sites reflected a difference in opportunities for young children. It was clear to see the difference according to the type of setting in terms of the practice and opportunities available for children. For example, the child minder site (Caterpillar Corner) reflected practice more commonly associated with the home, as stated in the findings chapters. In comparison, the nursery on a school site (Busy Bees) reflected practice associated with Reception year at school, which was unsurprising considering the practitioners working within that site all had some form of teaching status and experience teaching in school.

There were commonalities in the nature of rules implemented, yet these differed according to each site's expectations and limitations in practice. Commonalities also were apparent in the form of touchscreen play being offered as part of the play-based approach within each setting, where children could ask for or pick up a touchscreen device on which to play. The nature of these interactions differed according to the possible levels of trust held from practitioners to children, particularly in Forrest Green (day nursery) as there was no protective equipment attached to the device. In these occasions, supervision was necessary and as such controlled the nature of children's touchscreen interactions.

Interestingly, the socio-economic status of each of the sites did not significantly contribute to the nature of practice. In contrast, there were some episodes of high quality learning in sites with low socio-economic status, whereas there was scope to extend practice in sites with medium socio-economic status. Overall, practice was implemented to the extent that it was expected based on the *type* of setting rather than the socio-economic profiling of each setting. The fact that all sites had at least one touchscreen device available to children even though the sites were in areas with low or middle SES reflected that SES did not significantly impact upon practice.

9.7 Review of research design

9.7.1 Activity theory

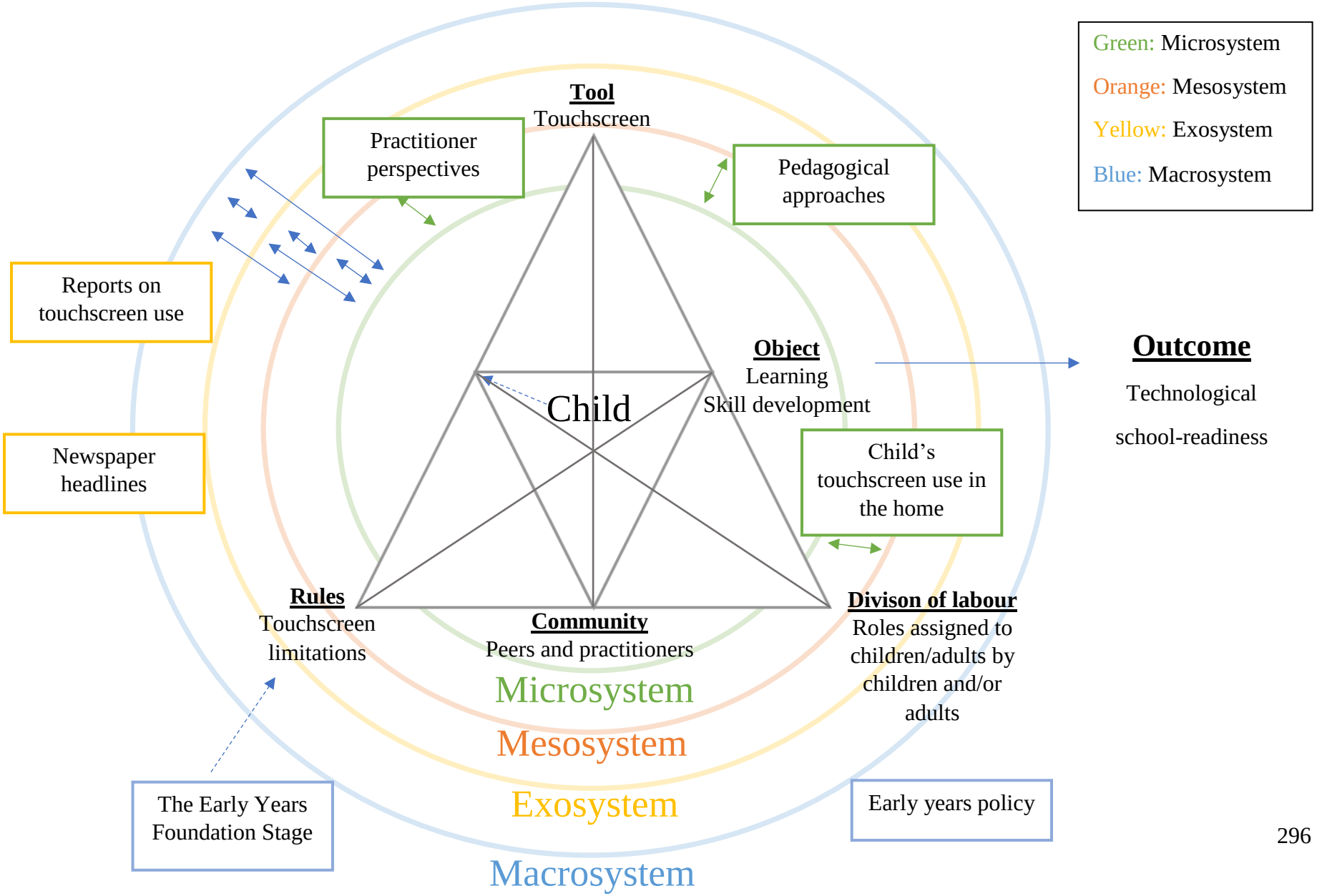
Using the activity theory model as a framework of analysis enabled the identification of the complexity of touchscreen activity within early years settings. Engeström intended for the activity theory model to identify the complexities and multi-faceted nature of activity within an educational environment (Kinsella and Fautley, 2016), and this has been achieved as demonstrated within this thesis. What became apparent was that touchscreen activity was influenced by a series of factors which inevitably impacted on the ways that touchscreens were used by young children and practitioners. The third-generation model used (Engeström, 1987) provided a means to explore touchscreen activity by taking into account the wider social environment that was important to me within this study. The first and second generations of the activity theory model have been criticised previously for their limited acknowledgement of the social environment and the way that people interact to reach goals (Kozulin, 1984). As such the third generation of this model enabled a greater exploration into these limitations by addressing them in a central way which influences activity. The third-generation model itself had both strengths and weaknesses. The model provided a means in which to explore

touchscreen activity within a social context, acknowledging where appropriate the differences in intention by children and practitioners. It also highlighted the impact of rules and how they influenced touchscreen activity.

Although in the Methodology chapter I stated I followed a multiple case study approach, the data has been reported according to the method in which it was collected. Activity systems were created based upon the data within each method, rather than according to case. This was deliberate; my intention was to accurately portray the practitioner and child voice, coupled with their intention and practice so that practice could be analysed. The data chapters have separated findings from each of the four sites, yet the activity systems created a wholesome picture of practice which could be discussed and separated where necessary.

By observing practice and engaging in discussions with practitioners and children, this model provided a framework to assign the data I had collected to certain areas in order to present touchscreen activity when the touchscreen itself was of central focus. It showed how touchscreens are used with intention across all early years settings studied, regardless of differing views on the touchscreen and its priority within the playroom. However, the limitation of the model was that it did not acknowledge the wider influences which impacted on and determined touchscreen activity. Whilst the model adapted for this study shown in figure 28 portrays a clear representation of the various aspects and how they work together to identify an outcome, it did not acknowledge from the practitioner perspective a range of influences which informed how touchscreens were used. As a result, I have adapted this model and incorporated it with Bronfenbrenner's (1977) ecological systems theory model to show the wider influences within various contexts (figure 29).

Figure 29. The external influences which impact upon touchscreen activity within early years settings



Integrating the activity theory model within the ecological systems model provided a means to accurately reflect the reality of touchscreen activity. There were various influences upon activity itself which are reflected within the triangular model, but the circular model also depicts the wider contexts and influences which directly impact on touchscreen activity in more implicit ways. It was only possible to identify these wider influences through interviews with practitioners, by listening to the way in which they spoke about touchscreen activity and by being aware of important factors which practitioners did not directly say but were acknowledged by children or reflected within practice.

Bronfenbrenner's (1977) model was appropriate in this instance because Bronfenbrenner asserts the importance of the connectedness between a range of environments within 'nested structures' which surround the child. His structures, represented by circles in his model represent in this instance that different environments have an impact on the child at the centre of the model. In the context of touchscreen activity, it is a child's activity of using a touchscreen which is directly influenced by the external influences such as policy, pedagogy, perspectives, and proximal contexts such as the home where children spend most of their early lives. The circles on this model are faded deliberately to reflect that the wider influences are present but are also hidden from the current agenda when observing touchscreen activity. These were implicit factors which were not apparent to children, and in some ways to practitioners, but were explicit when reviewing touchscreen activity as a whole to situate the activity in the context of the wider educational agenda.

Activity theory did not support the representation of these influences, rather it addressed the activity more generally and in regard to the social aspect and community. However, it was just as important to address these external influences to portray the reality of touchscreen activity and its integration into daily practice, without policy and guidance to support the integration of touchscreens.

What became apparent was that at a microsystem level, children's touchscreen uses at home contributed to the use of touchscreens within early years settings, as identified by practitioners in Chapter 7. In the Literature Review (Chapter 4), I discussed children's use of touchscreens at home as a precursor to discussing children's touchscreen use in early years settings, as a deliberate attempt to show within Bronfenbrenner's (1977) model that other immediate environments where children spend most of their time may affect the nature of play within early years settings. Practitioner perspectives and pedagogy also impacted upon touchscreen activity, since practitioner values and beliefs of touchscreen technology shaped practice in early years settings. This was based upon their constructions of learning and knowledge generation. Since early years settings support children's development through using the EYFS (DfE, 2017) framework, practitioners used touchscreens with intention according to such guidance on extending learning within a wide range of areas.

The mesosystem, a system of microsystems (Bronfenbrenner, 1994) demonstrated the linkages between different microsystems. These included the early years setting and children's home. The ways that children used touchscreens at home and the beliefs and values that practitioners had regarding touchscreen practice in the early years setting were influenced by each other.

At an exosystem level, external influences which practitioners encountered during their personal lives such as reading newspapers or reports on touchscreen technology also impacted upon the ways that touchscreens were available to children. For example, one practitioner spoke to me regarding blue light behind screens and its potential impact on children's sleeping, and this therefore influenced practice by ensuring touchscreens were not available to children an hour before sleep times.

External influences from a macrosystem level included the Early Years Foundation Stage (DfE, 2017) which practitioners frequently mentioned when discussing the intention of touchscreen

use within their settings. The macrosystem also comprised of cultural and societal values, and of which included the ideal that children should gain access to touchscreen technology at a young age. The EYFS (DfE, 2017) guided this through the understanding of children learning through play and the expectations of children's developmental levels by the time they left the early years.

Bronfenbrenner's model also includes Chronosystems. Since this was not a longitudinal study I was unable to determine the effects of touchscreen technology and how this impacted the child over time. However, technology changes over time and children may be introduced to new forms of technology as they pass through education. The influence of the change of technology, and indeed the change in early years practice which encompasses technology use as advised within early years frameworks, provokes the need for policy to be written to ensure equity of opportunity for all young children, as discussed within this study.

9.7.2 Play scale

My use of the play scale aimed to represent the different categories of play that were observed when children interacted with the touchscreens, and these categories were organised according to solitary and shared play. The scale itself was a beneficial tool in categorising play, acknowledging the large number of observations and the varied content of those observations. Whilst initially challenging to determine what constituted as certain play codes, reviewing and reflecting on the feasibility of these codes against the data collected enabled me to have clear boundaries on the types of play observed and assigning these to the different categories. Additional codes were generated where it became apparent that the content of observations did not naturally situate itself within existing codes, and these were reviewed again to test for their accurate representation of the observation. Regular consultation with my supervisory team over the creation and justification of the codes allowed an additional opportunity to strengthen the accuracy of codes, and to distinguish how they differed from other codes and scales. What

strengthened the integration of new codes was the wide range of data collected across the four sites. Triangulation occurred since all sites implemented very different practice and children directed their activity in ways that they intended. This subsequently ensured the validity of the data generated since the scale was able to contextualise these observations according to the codes without distorting the data to fit.

My intention is that this play scale may be extended or refined the more that it is used within other studies, particularly so since role-playing behaviours were not observed. When considering the varied forms of technology currently available to children such as virtual reality headsets, I believe that these technologies will foster more varied play and in turn the scale will need to be adapted to reflect that.

9.7.3 Review of the research approach

Adopting a multiple case study approach was an effective strategy for exploring in depth the various ways that four early years settings used touchscreen technologies within their practice. Focusing on each setting in turn supported the exploration of practice where I as a researcher could immerse myself into daily practice whereby my only focus was on one site at a time. Whilst this did require certain time commitments in which to collect the data and focus on each site, I believe it was effective for exploring and beginning to understand the rationale of touchscreen technologies and how they were positioned within daily and weekly routines in each site.

Rather than conducting a single case study where the four sites contributed as different elements, the multiple case study approach allowed for theoretical application through replicating the data collection methods in each site (Yin, 2009). This therefore helped to achieve robustness of the data collection tools I had designed, and supported the robustness of the new tools I had created for data analysis such as the technological play scale. Replicating

the same study in each site allowed the identification of similarities and differences in practice, something which I alluded to in the previous section of this chapter.

The case study approach has been criticised for generating 'soft data' (Denscombe, 2011) through lack of rigour commonly associated within qualitative research. However, multiple strategies were implemented in order to reduce this risk. For example, the multiple case study approach itself tested the data collection tools for rigour by implementing them in four different sites, and the technological play scale was also replicated as such. Furthermore, conducting a mixed-methods study provided an additional avenue to explore touchscreen practice which incorporated both descriptive statistics (that contextualised the study) and qualitative beliefs and meanings (which explained practice), and therefore contributed to the clear identification of the outcome and implications of the study.

9.7.4 Robustness, validity and trustworthiness

9.7.4.1 Robustness

Robustness was achieved within this study through the replication of the data collection methods across the four case sites and through a pilot study. The pilot study enabled an initial review of the data collection methods, and these were trialled on different occasions to ensure they achieved their purpose. The online survey was tested with seven early years practitioners who worked in a range of settings within the West Midlands and the responses gained from the survey were reflected on and questions were amended where necessary so that overlap of answers did not occur. Additionally, the data collection methods within the second phase were also pilot-tested for their suitability, and changes were made where necessary.

9.7.4.2 Validity

The implementation of a range of methods to collecting data across four very different early years settings has enabled me to answer the research questions. The exploratory study was not

intended to be prescriptive and address hard facts surrounding the nature of touchscreen technologies. Rather, this study intended to explore practice and therefore generalisations could not be made due to the small-scale nature of the study. However, 'fuzzy generalisations' (Bassey, 2001) were made as a result of consulting the data and identifying similarities, and this therefore helped to achieve credibility through portraying the data as believable, rather than as a generalisation of all possible touchscreen practice across the West Midlands (Glaser and Strauss, 1967).

Both interview and focus-group interview data were transcribed. Interview participants were provided a transcript of the interview to ensure their views were accurately represented, and the children were provided with opportunities to listen back to the audio recordings of focus-group interviews to ensure they had said everything they intended. The replaying of focus-group interview audio recordings was also to ensure the children could understand the nature of the role of the recorder and how their views were kept on a small device which I could then use to write up the discussion.

9.7.4.3 Trustworthiness

By using a diary to track the progress of the study and to record research activity enabled me to achieve trustworthiness. Logs were made which detailed the process of the research stages, and where the data collection methods were tested, and weaknesses were identified which required adaptation. Different chapters within this thesis have outlined the process of data collection, initially through the Methodology chapter and subsequent findings chapters which outlined the process of collecting data and the intention of the ordering of such methods (see Chapters 6, 7 and 8).

Trustworthiness was also ensured through my presence within each setting. Allowing for a familiarisation period within each site prior to data collection enabled me to situate myself

within each setting, but also to begin to communicate with children and practitioners. Over a period of 5 months from October 2015 to February 2016, 160 observations were recorded within the four sites, supplemented by four focus-group interviews and 12 practitioner interviews. The large number of observations allowed the opportunity to test and refine the play scale I developed to help categorise and analyse the data. The 160 observations were not equally divided amongst the four sites; however, the same amount of days was allocated to each site. The amount of time I spent in each site and the amount of time I recorded there was due to the daily routines enforced which incorporated touchscreen technologies. As one site only made the device available for one hour each day whereas another provided access for most of the day, it was inevitable that more data would be collected in some sites than others.

Additional examples of my attempts to gain trustworthiness was through the distribution of my research findings in a range of conferences. During these events, my research was open to questioning on my methodology and my analysis of the data. A full list of the conferences can be found in appendix xiv.

9.8 Limitations of the study

This study has highlighted the potential affordances of touchscreens in relation to children's early technology experiences in early years settings. It provides practical insight into the need for policy and guidance for touchscreen use within early years settings. Nonetheless, there are limitations of the study. The study was small scale, and with time and financial restrictions, this limited its scope. With only one researcher participating in the project, it was essential that time was managed effectively, and data collection methods were trialled rigorously to ensure the data collected was of high quality. However, whilst this did limit the nature of the research, it provided the opportunity to explore in depth touchscreen activity within four sites. This

facilitated my understanding and allowed me to reach conclusions about touchscreen activity and situate this practice within the context of various models used.

Within the initial phase of the research to recruit settings and to explore touchscreen use more generally, a 3% turnaround in survey responses led me to perceive there was little interest which was disappointing. On the contrary, when I spoke to practitioners within settings and researchers in conferences, I realised there was in fact a greater interest in this area. However, the low turnaround delayed the second phase of the study since I had only recruited three of four settings, yet I continued with data collection and involved the fourth site at a later stage. The survey was designed to not be time-consuming, and by consisting of mostly closed-style questions I thought it would be in favour of respondents by encouraging their participation.

I intended to recruit a range of settings to firstly explore touchscreen activity within each of these sites, but also to explore whether the nature of activity differed according to their site. This proved to be a true account, particularly when considering the nursery on the school site taught children through formal-style lessons on their phonics and numeracy skills, with the touchscreen used as an aid to the learning. Conversely, the child minder site had more relaxed practice than others and children frequently played on non-educational games, similar to reported touchscreen uses in the home environment (Knowland and Formby, 2016; Marsh *et al*., 2015a; O'Connor and Fotakopoulou, 2016; Ofcom, 2017).

As with the limitations of a small-scale study, and with Yin's (2003) assertion that researchers often want to explore 'everything', I was unable to study the relationship of touchscreen technologies across the home and early years environment. Children often spoke about their use of touchscreens at home (see Chapter 8), and research suggests making connections with the home and early years settings to promote effective practice (Palaiologou, 2014). However, it was not possible to explore all avenues relating to touchscreen activity, and therefore I chose

to focus my research on early years settings since this was an under-researched area, particularly for the age of children within my study's focus. This has enabled me to contribute towards this small but expanding body of research which explores touchscreen practice and practitioner perceptions of touchscreen technology when used by young children.

9.9 Implications of the study

Conducting this study has enabled identification of the affordances of touchscreen technologies when used in early years settings with children aged 3-4 years old, within the wider context of children's social and cultural worlds, and the pedagogies utilised in settings by practitioners. The three themes have discussed touchscreen affordances according to the ways they are used, and these have been highlighted through various means of collecting data.

The most apparent affordance of touchscreen use was the perceived development of technological skills which arose from the various interactions with the touchscreen itself. Whilst this study did not seek to explore specifically what skills children learned from interacting with these devices, observations showed that children sought to overcome technical issues which required logical thinking, and children needed a certain set of skills to be able to effectively use the devices to play on a series of apps. Since no two observations were the same, children had a wide range of experiences with these devices and they were required to continuously manipulate the technology according to the expectation of apps in order to play. The wide range of apps available to children, and the different expectations within these apps encouraged children to be constantly aware of the limitations and the affordances of the apps to manipulate the technology to achieve game expectations.

The touchscreen afforded opportunities for children to engage in shared play. Children often spoke about what they were doing, and they supported their peers in how to progress in games or how to overcome issues to continue playing. Their negotiations when engaging in shared

play showed their awareness of how to use the technology and how to engage in social situations, where they were required to take turns or tap simultaneously on the screen to make an object move faster or to create a drawing together. Children's negotiations of turns did at times cause hostile situations whereby threatening language was used, but under supervision of practitioners and through being supported in negotiating turns, I believe that these situations can be reduced once children are supported to learn the importance of sharing and turn-taking, with different strategies implemented to support this.

For practitioners, children's engagement with the touchscreen supported their belief that children were learning by using the devices. Downloading apps which were perceived to have educational value meant that practitioners were aware that the technology could be used as an additional medium in which children could play and learn. However, I did not observe practitioners consulting children to determine how they wanted to use the touchscreens, and as such I argue that there is a disconnect between children's and practitioners' intentions in how touchscreens were used. Once effectively incorporated into a play-based pedagogy, practitioners can extend children's learning or use the touchscreen as a follow-up activity which reinforces learning through various activities. There needs to be an informed balance of child-initiated and adult-led activities which incorporates play and learning, and children should continually be presented with opportunities to play with the touchscreen according to their needs, whether this be in a supervised way or not.

As currently there is very little guidance and no policy on integrating touchscreens into early years practice, it was understandable that practice varied significantly across the four sites I studied. There were commonalities, however, including allowing children opportunities to practise early writing skills through drawing apps, and by promoting memory through matching cards apps. Taking forward the findings from my study and the assertions from other researchers (Edwards, 2013; Parette *et al*., 2013; Tanyel and Knopf, 2011), there needs to be

an emphasis on delivering research-based training on supporting practitioners to integrate touchscreens within a play-based pedagogy. Studies are already indicating practitioners' unease in incorporating technology when it is perceived as a tool to develop operational skills rather than encourage play (Lindahl and Folkesson, 2012), and findings from my study also showed initial reluctance in using the devices with young children, particularly in relation to technological skills. As a precursor to this training, I also suggest policy-makers consider it a priority to acknowledge the current trends in early years practice. I propose developing policy guidance aimed at early years practitioners on how to use touchscreens in effective ways to enhance children's learning experience through play with touchscreen technology. This therefore may inform practice further, with the training used as a supporting means to implement such guidance.

The main findings have been identified and discussed within this chapter. By conducting this research, it has enabled me to make contributions to knowledge and these are discussed in the following section.

9.10 Contribution to knowledge

Conducting this research has been a period of knowledge generation and of understanding, but I would not have been able to produce such a study without the right materials. There are several contributions to knowledge which I would like to state.

Methodologically, there are two contributions to knowledge:

1. A technology-based play scale was created by me based upon current play scales which focus upon children's play and social interaction, in order to accurately code and analyse children's touchscreen play. This was successfully used across four different case sites who all generated different data. I therefore intend to use this scale again within future studies to additionally test for its robustness. Furthermore, the play scale

can be used or adapted for evaluative or assessment purposes too, for practitioners to monitor the range of ways children are interacting with technologies within early years settings.

2. A novel method of gaining consent and ongoing assent with very young children was devised for this study using consent lanyards showing a 'happy' and 'sad' face. These were successfully implemented when gaining initial consent from children to participate in the research, to be observed and to participate in focus-group interviews. The lanyards were also successful in giving children a voice by reducing speech and language barriers through a pictorial method of providing consent or withdrawing it. The lanyards enabled the children participating in my study to provide ongoing assent during observations and focus-group interviews, and the children used these lanyards to make informed choices, withdrawing their consent where necessary, and at times, giving back consent at later periods within observation.

In relation to the data that has been collected and the analysis that followed, another contribution to knowledge is:

3. A new model which integrates activity theory (Engeström, 1999a) and Bronfenbrenner's (1977) ecological systems theory has been generated which depicts touchscreen activity in a systematic way. This model demonstrates that there are significant external factors which influence touchscreen activity, and most of these are underlying and are not explicitly known. Reflections from practitioners and observations of practice has shown that practitioner perspectives and pedagogical approaches are culturally formulated and therefore influence the ways in which technology is used with young children. Additional influences including the Early Years Foundation Stage (DfE, 2017), early years policy and news reports contribute to the shaping of the rationale behind touchscreen integration into early years settings.

These influences, established within Bronfenbrenner's (1977) ecological systems model enabled me to show clearly how whilst touchscreen activity is at the centre of focus, there is in fact a wider agenda which impacts on touchscreen use. The use of activity theory (Engeström, 1999a) as a model has provided me with a means to reflect the ways in which touchscreens are used and this therefore enabled the identification of potential affordances. Whilst Bronfenbrenner's (1977) model reflected the external influences on a child's touchscreen activity, the activity theory model (Engeström, 1999a) portrayed the reality of touchscreen activity when situated within a social context for young children.

This new model provides early years practitioners with a tool in which to use to reflect on the nature of touchscreen play with young children. Displayed in this way, early years practitioners have the opportunity to consider the wider influences which impact upon touchscreen play, and how children are supported or impacted by these influences. For example, this model may encourage practitioners to be more aware of touchscreen use in the home or other environments where a child spends most of their early lives, since these are likely to be environments where children are exposed to this form of technology. A more simplistic version of the model has been included in appendix xv which offers scope to be adapted into a practical tool to assist practitioners in reviewing their touchscreen practice. The model may be adapted in ways similar to Edwards' (2016) web mapping, as a way for practitioners to plot influences and consider the ways in which a range of influences may contribute to a child's early touchscreen experiences.

Regarding the data that has been collected, I also can make two final contributions to knowledge:

4. Children interact with touchscreen technologies in various ways, and whilst children direct their own activity, this is mediated and controlled by both the touchscreen itself and by rules and expectations from practitioners. Children's touchscreen activity follows their interests, but this is done so always under the supervision or restrictions implemented, which subsequently limits children's potential for free expression and exploration. Within touchscreen activity, children's perceived use of the touchscreen informs the ways they interact with the devices, and since these beliefs are inherent within each child, they differ. Subsequently, touchscreen activity can become overshadowed by struggles for possession and maintaining control which impacts on the quality of touchscreen activity. Practitioners therefore need to be aware of this and make conscious effort to support children during these moments. It is in these moments where training and continued professional development is necessary to support practitioners in responding to children's behaviour.
5. I can also identify that whilst touchscreens may enable children to share and negotiate turns, they must do so within the confines of the device's limitations. In order to enable a greater potential of the touchscreens, children need to identify, respond to and seek to overcome these limitations. Children within this study have demonstrated that they are capable in doing so and show their autonomy in directing their play experience according to their interests with their peers. For example, some children acknowledged that it was not possible for more than one person to touch the screen at the same time, so they negotiated turn-taking so that children could play in pairs without technical difficulties.

9.11 Areas for future research

There are specific areas for future research that I recommend upon concluding this study:

1. Further research needs to address the connection of home touchscreen use with early years touchscreen use, so that both practitioners and parents are informed of the ways that children interact with these devices in different environments. This therefore enables more sophisticated practice to develop, as recommended by Palaiologou (2014), to take into consideration children's existing skills and extending these further.
2. I also recommend future research to be conducted to address the educational potential of touchscreen technologies in relation to various areas of learning, building upon new - albeit small-scale - studies such as Gray *et al*., (2017) on the use of mobile devices in supporting children's learning in early years settings. This may help inform practice further so that touchscreens are used with intention but still are situated within a play-based pedagogy.
3. Further research could be conducted to explore the social aspect of touchscreen technologies in more depth, building upon research by Arnott (2017; 2016b; 2013; Savage, 2011) to investigate children's touchscreen behaviours and their reactions to their peers when engaging in touchscreen play. This may enable early years practitioners and perhaps parents in addressing the social context of touchscreen play, supporting children in recognising the collaborative potential of their peers rather than children responding to their peers in unwelcomed ways, as demonstrated within my study.
4. This study found that there was often a disconnect between adults' intentions and children's intentions in touchscreen play, and practitioners subsequently positioned the touchscreen as separate with a wide number of rules to limit children's touchscreen access. In comparison, children did not make this distinct difference, and appeared to view the touchscreen as another of their toys. As a recommendation from this study, further research could be conducted to compare the differences between touchscreen

technology and other activities that are available to children, to determine the nature of children's interactions across technological and non-technological activities.

9.12 Conclusion and final remarks

This chapter has discussed and drawn conclusions from different data collection methods in a way which addresses each research question through the three main themes: *Play*, *Authority*, and *Pedagogy*. The data has been analysed and discussed according to a social constructionist and social constructivist perspective. This has been achieved through addressing the nature of activity in determining outcomes and the interactions amongst children and their peers and adults in the generation of knowledge and understanding. This has enabled me to reach conclusions regarding the affordances of touchscreen technologies, and I have discussed these within this chapter.

This study has increased knowledge and understanding regarding touchscreen practice, identifying additional areas in which further research could be conducted to address the current issues surrounding touchscreen practice in early years settings. From this research, I can reach conclusions about the nature of how touchscreens are utilised by young children, and these are:

1. Touchscreen technologies provide a means to support children's learning in a range of areas and this can be facilitated by apps which appeal to children;
2. Practitioners have varied opinions on touchscreens, but they generally believe they support children's learning and therefore children's touchscreen experiences are tailored to meet learning goals in accordance with the EYFS (DfE, 2017);
3. Generally, practitioners promote touchscreen activity through a play-based pedagogy, however their intentions of touchscreen use and their rules restrict children in fully engaging in child-initiated play since children are confined by these expectations;

4. Touchscreen technologies promote collaborative or shared learning experiences, but the devices have limitations which children need to identify and seek to overcome. Whilst touchscreens afford this shared experience, it is still to the discretion of children whether this happens or not and is dependent on how touchscreen use is managed by practitioners.

5. It is important to be sensitive to the challenges of introducing new technologies into settings for both children and practitioners. One particular challenge is the adaptation of or development of pedagogical approaches that new technologies require in order to ensure that technologies are used effectively. This does not apply solely to the touchscreen, but other technologies too. This development of practice and pedagogical approaches occurs through an on-going cycle of reflection and implementation of new strategies, as practitioners learn more and become more informed on the capabilities of new technological devices. To enhance the development of these strategies, consultation with parents and other professionals is required who understand child psychology and development.

Overall, this study has shown the potential affordances of integrating touchscreen technologies into early years settings when used with young children. However, it is worth noting that integrating technology such as this may pose many challenges, particularly so when practitioners and children may perceive the touchscreen differently as shown within this study. This research makes an important contribution to the ongoing investigation on how best to support young children's learning experiences in early years settings, in the face of frequent new technologies and changes in children's experiences with, and access to, technologies in both early years settings and at home.

Concluding the thesis and the journey which I have been on, I wish to end with a final quote.

Knowledge will bring you the opportunity to make a difference - Claire Fagin (Coleman, 2013: 3)

The PhD is an opportunity to contribute to knowledge, and with that knowledge, change can happen. This may be small-scale, it may not, but it is something. This PhD has allowed me to begin to make a difference. It is my hope that research will build upon this study to further explore practice and seek to improve touchscreen opportunities for young children.

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Appendix i – Online survey

The following survey focusses on touchscreen technology use within Early Years settings in Warwickshire. The main aim of the survey is to determine what settings within the area use touchscreen technology devices with children aged between two and four years. **By completing this survey, you agree to have the information provided to support the study in which I am conducting**. All information is confidential and will remain anonymous. Details of the study are attached in the email alongside this survey.

Thank you for taking your time to complete this survey.

Children's experiences using touchscreen technology in Early Years settings.

A survey to Early Years providers within Warwickshire.

1. Please indicate your age:

16-21 22-30 31-40 41-50 51-60 61-70 71+

2. Please indicate your gender:

Male Female

3. What type of setting do you work in? Please circle

Day Nursery

Pre-School

Maintained Nursery

Nursery Unit of Independent School

Child Minder

Other (Please State)_____

4. What is your position in the setting?

_____

5. What age children does your setting provide for?

_____

6. Do you use touchscreen devices with children in your setting?

Yes No

If you have answered yes, do not answer question 7, continue with question 8.

7. If you answer is no, please advise why?

_____
_____
_____

If your answer for question 6 was 'no', you no longer need to complete the survey, thank you for your time.

8. If your answer to question 6 was yes, what type of touchscreens do you use? Please list all devices

_____ _____

_____ _____

_____ _____

_____ _____

9. How often do the children use touchscreens?

In a day: _____ times

In a week: _____ times

Over a month: _____ times

10. How long do the children use the device for in one period? Please circle one answer

1-5 minutes 6-10 minutes 11-20 minutes 21-30 minutes

Up to an hour Over an hour Other (please specify)_____

11. Approximately, for how long do the children use touchscreen devices in one week?

Up to 15 minutes 16-30 minutes 31 minutes – 1 hour 1- ½ hours

1 ½ – 2 hours 2- 2 ½ hours 2 ½ - 3 hours More than 3 hours

12. When the children use touchscreens, are they? Please circle

Supervised Unsupervised Both

13. What do the children do with the touchscreen devices? Please tick all that apply

Play games	☐	Use colouring apps	☐
Watch educational content	☐	Learn to read	☐
Share stories	☐	Listen to music	☐
Learn the alphabet	☐	Record their own voice	☐
Learn numbers	☐	Take pictures	☐
Play in virtual worlds	☐	Make a video recording	☐
Search the internet	☐	Use Skype	☐
Watch non-educational content	☐	Download content to use	☐

Other (please state all)_____

_____

14. Do you have a policy on using technology/touchscreens/iPads? Please circle

Yes No Unsure

15. Are you willing to participate in a study looking at children's experiences using touchscreens in the Early Years? Please see the attached information sheet regarding the research.

Yes No

16. If your answer is yes, please indicate how you wish to be contacted:

Name of setting (optional) _____

Email (Please leave an email address) _____

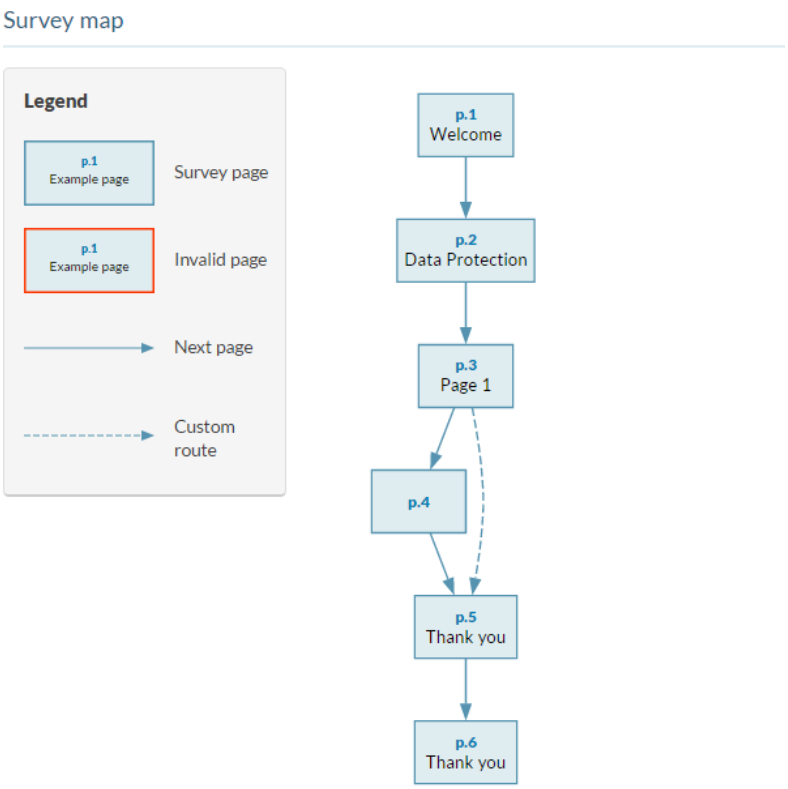
Telephone (Please leave a number) _____

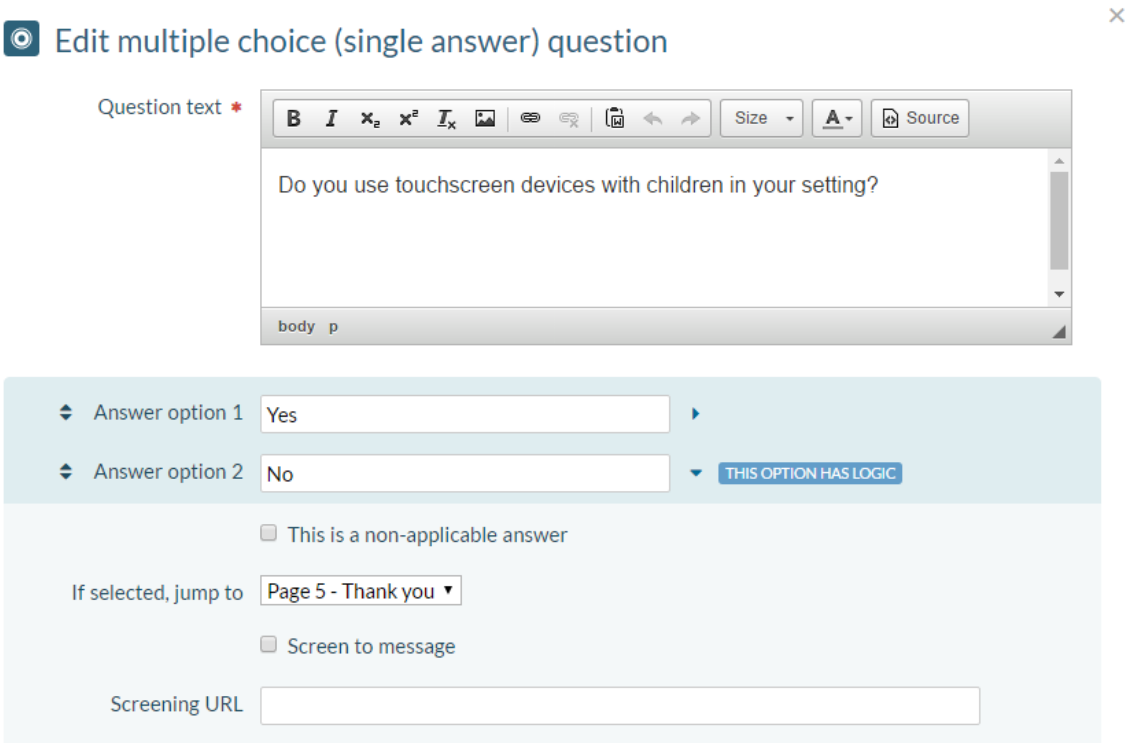
Thank you for your time and for completing this survey.

Please email your response to this survey to:

Shannon.Ludgate@mail.bcu.ac.uk

Appendix ii – Online survey amendments





Appendix iii – Interview schedule

Schedule for managers

1. What encouraged you to introduce touchscreen devices in your setting?
2. For how long have you been using touchscreen devices with young children?
3. What touchscreens are used with the children?
4. Are there any touchscreen devices that are not accessible to the children?
5. If yes, why?
6. What do you think the role of touchscreen technology is in education?
7. How have the practitioners in your setting reacted to introducing touchscreens in the setting?
8. What do you hope to gain from using touchscreen technologies with young children?
9. Do you have any concerns with very young children using touchscreen technology?
10. How do you support children's learning with touchscreens?

Schedule for practitioners

1. How do you feel about using touchscreen technology with very young children?
2. How did you react/ how did you feel when touchscreen technologies were introduced in the setting to be used with children?
3. How did the children react?
4. Have you received any support in using these devices, for example from a designated person in charge of technology use
5. Have you received any training to use these devices? Do you feel as though you are able to support the children?
6. What do you hope to gain from encouraging children to use touchscreen devices?
7. Are there any concerns that you have about children using touchscreen technology in the Early Years?
8. How are the touchscreen devices accessible to children?
9. In what ways do you use the touchscreens with the children?
10. What do you think (if anything) the children are gaining from using touchscreen devices?
11. Do you assess children's learning/development when using touchscreens? If yes, in what way?
12. Who controls when and for how long children use touchscreens for? What are the reasons behind it?
13. Do you think the children are more interested in using the touchscreens for certain roles? If yes, what are these roles? (to play games, watch videos etc.)
14. What do you think the role of technology is in education?

Appendix iv – Interview schedule amendments

Schedule for practitioners

1. How do you feel about using touchscreen technology with very young children?
2. How did you react/ how did you feel when touchscreen technologies were introduced in the setting to be used with children?
3. How did the children react?
4. Have you received any support in using these devices, for example from a designated person in charge of technology use
5. Have you received any training to use these devices? Do you feel as though you are able to support the children?
6. What do you hope to gain from encouraging children to use touchscreen devices?
7. Are there any concerns that you have about children using touchscreen technology in the Early Years?
8. How are the touchscreen devices accessible to children?
9. In what ways do you use the touchscreens with the children?
10. What do you think (if anything) the children are gaining from using touchscreen devices?
11. Do you assess children's learning/development when using touchscreens? If yes, in what way?
12. Who controls when and for how long children use touchscreens for? What are the reasons behind it?
13. How do you feel about time limits to using touchscreens? Do you have a time frame that you adhere to?
14. Do you think the children are more interested in using the touchscreens for certain roles? If yes, what are these roles? (to play games, watch videos etc.)
15. What do you think the role of technology is in education?

Appendix v – Focus-group interview schedule

1. Do you like using the tablet?
2. What do you like most? What is the best thing about using the tablet?
3. Is there anything you don't like doing? What?
4. Do you like to play on your own or with someone else?
5. Do you like playing with an adult?
6. Do you like it when people watch you play?
7. Where do you play on the tablet the most?
8. Where is your favourite place to use the tablet?
9. Do you use the tablet at home and at nursery?

Appendix vi – Focus-group interview schedule amendments

1. Tell me about when you use the tablets, is there anything that you like?
2. Is there anything that you like most?
3. How about anything that you don't like?
4. Tell me about when you play, do you play with others on the tablet?
5. Do you like it when other people watch you play?
6. How about with an adult? Do you like playing with an adult on the tablet?

Appendix vii – Observation proforma

Time	Touchscreen Used	How is it used?	By who?	Practitioner/ Child led?
9.00 – 9.30				
9.30 – 10.00				
10.00 – 10.30				
10.30 – 11.00				
11.00 – 11.30				
11.30 – 12.00				
12.00 – 12.30				
12.30 – 1.00pm				
1.00 – 1.30				
1.30 – 2.00				
2.00 – 2.30				
2.30 – 3.00				

3.00 – 3.30				
3.30 – 4.00				
4.00 – 4.30				
4.30 – 5.00				
5.00 – 5.30				
5.30 – 6.00				
6.00 - close				

Field notes:

In this section, I will write any additional comments to support the observations, such as the opportunities the children are provided when using touchscreens.

Code

Touchscreen used: Devices will be abbreviated according to the types of touchscreen devices available to the children in the setting. They will be listed below.

How is it used? Here words such as story, to play a game, learn numbers, learn alphabet, watch videos etc. will be written according to what the children are using the devices for.

By Who? This will indicate whether a child is using the device on their own, with others (and how many other children), or whether a practitioner is using it for the children.

Practitioner/Child led? This will be indicated through PL or CL to show how the device is being used with children.

Appendix viii – Revised observation proforma

Time	TS Used	How is it used?	By who?	Practitioner/ Child led?	Age of child	Previous experience?	Others present
9.00 – 9.30							
9.30 – 10.00							
10.00 – 10.30							
10.30 – 11.00							
11.00 – 11.30							

Notes.

Most common times to use TS:

TS used most commonly by:

Time	TS Used	How is it used?	By who?	Practitioner/ Child led?	Age of child	Previous experience?	Others present
12.00 – 12.30							
12.30 – 1.00pm							
1.00 – 1.30							
1.30 – 2.00							
2.00 – 2.30							

Notes.

Most common times to use TS:

TS used most commonly by:

Appendix ix – Ethical approval request

BIRMINGHAM CITY University

Faculty of Health, Education and Life Sciences

Application for Ethical Approval for RESEARCH ACTIVITY

Please read the guidance notes to assist with completion of this form.

All researchers will need to complete ALL SECTIONS.

Once the form is completed, please forward to: HELS_Ethics@bcu.ac.uk

Section 1: Project Information

A. About you and your research team:	
Name of Project Lead	Shannon Ludgate
School/Department	School of Education
Course	Researching to PhD (Education)
Level of Research: - staff research - staff research PhD/EdD - PhD/EdD - masters - postgraduate taught (Masters) - undergraduate	PhD
Name of supervisor (if applicable) **e.g. module tutor, MA supervisor, PhD/EdD supervisor (if applicable)**	Dr Jane O'Connor
School/Department	Education
Other members of the research / supervisory team /who are not based at BCU (if applicable) Name	**N/A**
Position	
Qualifications	
Telephone number	
Email address	
Name of employing organisation	
Address of employing organisation	
**Please attach a short CV for each person*	
B. About your project and research:	
Project title	Pre-school children's experiences with touchscreen technology: A study of two to four year old children in Early Years settings in Warwickshire.
Expected start date	September 2014
Expected end date	August 2017

C. If you are intending to involve children, young people, or vulnerable adults do you have an enhanced DBS certificate?					
Yes	•	No		N/A	

D. About your research field work: **Where will this research take place?**	
In the Faculty of HELS	No
In another Faculty	No
In other HEI / FEI / Schools / any other educational setting in UK setting.	Yes – 2-4 year old children in five Early Years settings in Warwickshire. 1 Day Nursery 1 Child minder setting 1 Maintained Nursery 1 Nursery Unit of Independent School 1 Pre-School
In the NHS	No
In another EU country	No
In a country outside the EU	No

In Canada or the US	No

If your research will require NHS Research Ethics Committee approval please complete section 1 **AND** the NHS REC application form found on the integrated research application system (IRAS) website. https://www.myresearchproject.org.uk/
Submit section 1 of the form together with the completed NHS REC application form to the research office.

Section 2: Ethical Dimensions of Your Project

A. Overview		
1.	Brief background to and outline of proposal including a justification for the research, why it's needed and potential benefits and beneficiaries	Considering there is limited research into children's uses of touchscreen devices such as iPads, I have chosen to research children aged between two and four years, and their experiences of using touchscreen technology when in Early Years care. The reasoning behind this is children within this age range are being exposed to more technologies, and I feel that this is an important age to focus on children's social development, and how this may be encouraged by using touchscreen devices. This research will contribute to the field of knowledge regarding touchscreens, and differs from other research projects as this age range and the types of touchscreens has not been widely researched in specific Early Years settings. The main aims of this thesis are: - To understand how using touchscreen technology in the Early Years supports learning and social development in children. - To discover practitioners' perceptions on children using touchscreens in the Early Years, and how they plan and support learning for this. - To understand key stakeholder's views on touchscreens with children, to determine their aims and reasons behind introducing these into their setting. Based on research recommendations from Palaiologou (2014) and Vittrup et al (2014), this thesis aims to understand how technology can contribute to the development of meaningful social learning contexts for very young children. The research also aims discover to what extent touchscreen technologies enhance or hinder communication when considering the social learning affordances in Early Years settings. This is an adaptation to the recommendation to discover to what extent do touchscreens enhance or hinder communication and quality of life within the family, which was explored by Vittrup et al (2014). Below is an explanation into the areas I have chosen. <u>Educational experiences</u> This will provide me with the knowledge on the value of touchscreens with children this young. It will provide an insight into the uses of touchscreens and what the benefits may be to the children. This will then indicate whether their social ability is being enhanced through the educational activity using

		touchscreens. This has a particular focus on collaboration and shared activities with both children and adults. <u>Practitioner's perceptions</u> Practitioner's perceptions is an important avenue to explore, considering they, alongside a child's parents, are gatekeepers. Formby (2014) explains how practitioners and parents alike have the potential to overrule touchscreen technology use, alongside the activity that the children engage in on the devices. Considering each practitioner will have an opinion on children using touchscreens, it is valuable to see to what extent these opinions may have an impact on children's experiences with touchscreen technology in settings. <u>Planning for and supporting learning</u> This will indicate alongside practitioners' perceptions the value they put on touchscreens as having educational potential. It is interesting to understand whether they plan for educational uses, for entertainment, a distraction or for other uses. This will also indicate the opportunities children have when using touchscreen technology to learn new things and to support their social development. And will provide a basis for comparison of use of touchscreens in different types of EY settings. <u>Key stakeholders' opinions</u> This will determine why the stakeholders introduced touchscreen technology into the Early Years settings, and what the reasoning was behind it, for example to enhance development, to provide a distraction etc. This will also determine whether their views on touchscreens limits or enhances the children's opportunities to use touchscreens. This issue of whether the stakeholders considered any risks to using touchscreens and the benefits will also be explored. The benefits of conducting this research include having an understanding of children's experiences of using touchscreen technology devices, so that I can then seek to act on that information to guide practitioners in effective ways in which touchscreens can be used with very young children.
2.	Are you applying for funding from an external body? • grant awarding body • NHS Trust • charity organisation*	No

	• faculty or university grant scheme • other	
3.	Could the research lead to the development of a new product, process or some form of intellectual property? If so, what arrangements have been set in place for this?	Possibly new guidelines/support on planning and implementing touchscreen technology in EY settings
4.	Why are you suitable to conduct this research?	I am suitable to conduct this research as I have a first class honours degree in Early Childhood Education Studies, and have Early Years Professional Status. I have a range of experience working with and planning for children within the early years, in a range of settings. In regards to the topic, I have read a range of literature concerning the research previously conducted in this field with regards to young children using technology. I have also become more knowledgeable on the theoretical framework for this thesis, and, after much thought and consideration, I feel is suitable for the research. I have experience in the Early Years, I am enthusiastic about the thesis and the topic intrigues me. I continuously search for new literature regarding aspects of the research I would like to conduct, such as young children using technology, using touchscreens and differing perspectives on very young children using touchscreen technology. I am also suitable to conduct this research as I am a PhD student, and research is the method to write my thesis. I have strong research and writing skills; I have recently completed and passed the PG Cert in Research Practice, which demonstrates my capability for research at this level.
5.	What are your research questions	The research questions generated for the purpose of this study include: 1. What opportunities for social and collaborative learning do touchscreen technologies offer for 2 – 4-year-old children in early years settings? 2. What are practitioners' perceptions on children using touchscreen technology in the Early Years? 3. How do practitioners plan for and support learning when children use touchscreens, using the Early Years Foundation Stage framework? 4. What are the key stakeholders' views on touchscreen technology use in the Early Years?
6.	Please outline the methodology and theoretical perspectives that you will be working with over the course of this research	The data will be collected through observations (see attachment 1), semi-structured interviews (see attachment 2 and 3) and an online survey (see attachment 4). The online survey which will be circulated to all EY settings in Warwickshire will be

		the first step to gathering data about touchscreen technology use. This data, both qualitative and quantitative will provide the information to generate a list of settings which use touchscreen technologies with children aged 2-4 years, and will also indicate whether the settings wish to be contacted again to be a part of the study. Once the data has been collected and analysed, a pilot study will be conducted with one setting from those who wish to be a part of the study. Two observations of children and an interview with the key stakeholder, along with one interview with a practitioner will be carried out, analysed and refined in order to conduct the main study. The settings chosen for the main study will be one of each of the five types of educational settings as identified within the online survey. The sample will be selected according to the geographical location of the researcher, within a ten mile radius. Determining factors for selection include the type of setting, as the five most popular types of setting within the radius will be used. This sampling method is similar to that of the Effective Provision of Preschool Education project (Sylva et al. 2003). It was seen to be an appropriate strategy, and offered a fair representation of settings based on specific criteria. Contact will then be made with each of the settings and a familiarisation period will follow, alongside gaining consent from the setting (see attachment 5), practitioners (see attachment 6), parents (see attachment 7) and children (See attachment 8). Consent from children will be gained throughout the data collection period, in the form of witnessed verbal consent, voice recordings of consent, and pictures if the child chooses to create these. All other forms of consent will be gained on consent forms. The data will be collected in one setting at a time, in order to remain focussed on the data gathered in each setting. One month will be allocated to collect data from each setting (including 5 days of observations and 2 days of interviews). Interviews with the key stakeholders will be conducted first to gain an insight into their aims of using touchscreens with the young children, and also the reasons behind introducing touchscreens in the settings. Observations will then be carried out, using the 'a day in the life' method to observe all children (who have consented) using touchscreens in the setting, similar to that in the Gillen et al study (2007). I will be looking to see what experiences they have and whether this supports their social development, looking at whether the children use touchscreens with another

		or on their own, supervised or unsupervised by an adult, using an interpretive framework informed by Activity Theory (Engeström, 2001). Finally, semi-structured interviews will be conducted with the practitioners in order to gain an insight into their opinions on young children using touchscreens, what they do with the children and how they plan to support their development**.** In total for each setting: 1 interview will be conducted with the key stakeholder 1 interview will be conducted with each room leader working with children aged 2-4 1 interview will be conducted with one other practitioner working with the children 5 days' worth of 'a day in the life' observations will be recorded of children using touchscreen technology. This will be recorded on a pre-planned structured observation format (see attachment?). The data collected will align within the Activity Theory theoretical framework. Observations of children using touchscreen technology in order to support their education and social development will form one activity system. A second activity system will consist of key stakeholders and practitioners' perceptions of touchscreen technology use with children aged between two and four years, with an outcome of supporting learning through planning. The outcomes from two activity systems can combine in order to create a new outcome. From the data collected, I hope that a final outcome as a result of practitioners planning and their perceptions of touchscreens, alongside children using touchscreen technology, encourages learning and develops social skills. As identified within Activity Theory, Engeström believed contradictions occur within activity systems that eventually requires activity systems to realign in order to achieve a balance. In order to do that, Engeström believed that this is where the new outcome materialises, where it is the source of development within both systems. "Contradictions are not problems; [they] are historically accumulating structural tensions within and between activity systems" (Engeström, 2001: 137). This explanation of contradictions represents itself within the activity systems for this thesis; the

		new outcome is connected by both outcomes in the systems. It is not an issue, as Engeström reinforces, however this new outcome is generated based on differing views on technology and its representation of children using touchscreens. Together these views and the development of technology over years, combine with the developments within the Early Years framework, in order to potentially create a new outcome; learning from and with touchscreens, which have the potential to enhance children's social skills. REVISION I have now decided to include the child's voice in my research, as this participation will provide substantial information in order to understand children's opinions on using touchscreen technologies in early years setting. I intend to conduct focus group interviews with a group of 2-3 children in each setting at the end of the observation period, in order to hear how the children feel about using touchscreens. The children will be carefully selected with support from the practitioners in each setting. Child consent will remain in the form of the red 'unhappy face' and green 'happy face', to show their understanding of participating in the interview. I will clearly explain the aims of the interview before starting, in order to ensure the children know what I am doing and why (Brooker, 2001. I will allow time for children to ask questions and to clarify any misunderstandings. Consent to begin the interview will be obtained verbally (recorded) and through displaying the colour face red or green. I am aware that some children may wish to not participate in the interview, therefore children will have the choice to leave the area and resume their daily activities. Parents will be informed if their child has been chosen to participate, and I will provide time to discuss with parents their child's participation in such event and to gain consent. The focus-group interviews will be recorded and will be transcribed, all names will remain anonymous. A copy of the transcription will be shown to the practitioners and will also be discussed with the children involved to ensure they are happy and to see if they have anything else they would like to contribute. Attached is an interview schedule, which has outlined the questions I intend to ask the children. May it also be noted that I am flexible to allow children to redirect the discussion, however I will

		ensure that relevant questions are discussed whilst being mindful of the children's attitudes towards participation through verbal and non-verbal consent. I will explain to all children that they are required to not comment if they do not wish, in order to ensure the children feel relaxed and comfortable in the environment. I will ensure that the area in which the interview will be conducted is comfortable, with a few toys for the children to play with and puppets, so that the children can choose to speak through them. It is important to ensure the children feel confident in my presence to discuss their experiences of using touchscreens, so it is important to ensure I spend an adequate amount of time in each setting and to allow the children to recognise me and feel comfortable with me.
7.	How are you planning to analyse your data?	After all settings have been visited and data has been collected, the data will then be transcribed, coded and analysed, identifying emerging themes as advised by McGrath and Coles (2013) and Wisker (2007). All interviews will be transcribed, and the observations will be written up on a predetermined observation record proforma. I will ensure to keep all data from settings separate so that I can determine the views from each setting, and consider how they differ/compare to that from other settings. The qualitative data will be written up separately from the quantitative, and research settings will be labelled alphabetically so that the data is clearly represented within the findings. Using the method of triangulation I will support the data collected with literature and theory in order to inform and validate the data (MacNaughton et al, 2010). I will also triangulate the data through using different methods and gaining perspectives from people from different positions within the early years.
8.	Will your research involve:	
	Withholding any aspects of routine health treatment or care	No
	Changing any aspects of routine health treatment or care	No
	Use of radiation in any form causing exposures to levels equivalent to those used in normal investigations or treatment?	No
	Collecting biological samples?	No
	Using stored biological samples?	No
	Tissue samples?	No

	Conducting a clinical trial	No
	Testing a medical device? *If the research involves testing a medical device or equipment, please attach information about this and include the manufacturer's brochures and any necessary permissions/licences with your application*	No
	Children or young people under the age of 18?	Yes – children aged 2-4 years in five Early Years settings in Warwickshire, identified through the online survey.
	Vulnerable adults (*please see definition in Guidance Notes)*	No
	Prisoners or young offenders?	No
	Settings within the Defence Forces?	No
B. PARTICIPANTS		
9.	Provide an overview of any other participants and participant groups who are likely to be involved in the study in addition to those outlined in section 8.	Practitioners in each of the five settings that work with children aged between 2 and 4 years. Key stakeholders in each of the five settings, for example Managers.
10.	How will different groups of participants be recruited?	An online survey will be emailed to each of the Key Stakeholders. Once permission is granted, I will visit the setting and speak to the practitioners. An information sheet about the research (see attachment 9) will also be attached to the email to the Key Stakeholder, so that they can also share this with the practitioners. The practitioners and key stakeholders will also have the opportunity to speak to me and ask questions to clarify any thoughts or concerns regarding the research.
11.	What is the benefit to participants of participation? Will they be paid for their time? Reimbursed their expenses?	New guidelines of how to support children's experiences using touchscreen technology will benefit the research participants, through receiving this information on how they can support children's touchscreen technology use effectively, based upon the data gathered from all five research settings. The participants will not be paid for their time, as I feel their payment will be in the form of new support and a touchscreen technology policy created within each setting that will support effective use of touchscreen technology with young children. The research will be in their place of work.
	In which parts of the research have potential research participants and/or service users been involved in the design of the research either as co-researchers, members of a project group, advisors to the project? Please indicate if they have had no involvement and briefly explain why.	I will gain feedback from the research participants of the pilot study, in order to gain their opinion on how effective the data collection methods were, in terms of how easy questions were to answer, and whether they were transparent. This information will then guide my own evaluations on the data collection methods, so that they can then be altered depending on the reliability of the results.

12.	Is there a risk that any third party might be harmed physically or psychologically by taking part in this research? *You should identify any physical, psychological or emotional risks and clearly explain what you will do to minimise these risks. If this will involve you referring participants to a particular organisation, department, service or other source of help you should provide written evidence that the organisation etc. has received information about the project and has agreed to help you in this way.*	No All information will be confidential and will remain anonymous throughout the data collection and write up period.
13.	Is there a risk of physical, psychological or emotional harm to you, or other members of the research team, as a result of undertaking this research? *You should identify any physical, psychological or emotional risks and clearly explain what you will do to minimise these risks. If this will involve you referring participants to a particular organisation, department, service or other source of help you should provide written evidence that the organisation etc. has received information about the project and has agreed to help you in this way. You may also need to consult relevant policies e.g. lone working.*	No
14.	How will you obtain informed consent? Explain clearly how you plan to obtain and record consent. In particular explain: *Who will be responsible for obtaining consent?* *How long will participants have to decide whether or not to take part?* *How will you ensure that consent is fully informed and voluntary?* *If participants cannot read or cannot read English, or have other communication needs, how will you ensure that they are fully informed about the research?* *If you cannot obtain consent in writing, how will you record it?*	In order to gain informed consent, the research participants need to be fully informed of the research intentions, the benefits to the setting and the participants, alongside their rights to withdraw at any point (BERA, 2011; Shaw, Brady and Davey, 2011; Stanley and Sieber, 1992). To inform the participants of this, information sheets aimed at each person participating will be distributed and displayed in each setting, alongside the participants having the opportunity to approach me at any time whilst in the setting, or through email to clarify any questions or concerns they have. An initial consent form will need to be signed by the key stakeholder in each setting. Once consent is gained there, the parents of all children will be given a consent form to sign on behalf of their children, and the practitioners will have a consent form to sign to participate in interviews at a later stage of data collection.

		It is important to remember that, as BERA (2011) and Hammersley and Traianou (2012) explain, parents can provide approval for their children to be researched, however cannot provide consent on behalf of their children. Parental approval should also be gained prior to gaining consent from children, as parents are their gatekeepers as the children are vulnerable research participants (BERA, 2011). If parents do not give consent for their children to participate, then their child will not be included in any observations. The children will be informed of the research intentions through speaking in small groups or on a one to one basis, explaining what I aim to do, and why I would like to observe the children. It is important to ensure that each research participant is provided sufficient age appropriate information, in order to give informed consent, understanding as far as possible why their participation is requested and what I will do with the data collected (BERA, 2011). Consent from children will be obtained in the form of verbal consent that is both witnessed by an adult and voice recorded. Harcourt and Conroy (2004) explain that consent can also be obtained through mark-making if appropriate. Examples of strategies of gaining consent with young children are attached. Continual consent will be obtained from children each time I observe them as recommended by Fraser et al (2004) and Flewitt (2005), and the children have full rights to withdraw at any period. It has been suggested that understanding consent from children can be challenging (Skanfors, 2009) and that to be vigilant is a skill required when researching children to determine whether the children are non-verbally withdrawing their consent to research. Therefore, as recommended by Skanfors (2009) I will be aware of and look out for the possible signs, such as turning away, not being visible for data to be collected, being non-responsive and not willing to answer questions. I am responsible for obtaining consent from all research participants, however I will encourage practitioners to gently remind parents to consider the possibility of their child participating in the study, and to return their forms to each setting, expressing whether they do or do not give their consent. The research participants will be given an initial period of two weeks to consider and give their consent to participate in the research. From then onwards as previously mentioned, consent will

		continually be gained from the children each time data is collected. It is important to reassure all participants and parents of child participants that they do not have to participate in the study, and that no harm will be inflicted through participating and not participating in the study. Those who have chosen not to participate will not be labelled or identified as not consenting to the project. Information sheets aimed at the parents of the children will be handed out (see appendix 10), so that the parents are aware of my intentions throughout the research, and so that they have an understanding of what I will be doing. It is important to reassure parents that the research is complying with the United Nations Convention on the Rights of the Child Article Three, whereby all actions are undertaken in the best interests of the child (UNICEF, 2012). Therefore, to reassure parents that this research can benefit children is essential. An information sheet will be displayed in each setting on the Parent's board if there is one. If not, the sheet will be displayed in an area in which the parents visit.
15.	What steps would you take if a participant who has given consent Loses capacity to consent during the research? Changes their mind?	If a participant loses capacity to consent during the research process, it will be considered with my supervisor the practicality of continuing the research with this person. By this, I mean whether to seek a gatekeeper, for example a parent who is responsible for the person for their consent, or to completely withdraw their contribution to the study. If a participant changes their mind they have the right to withdraw from the study (BERA, 2011) and all data collected in relation to their participation will be discarded. New data may then be collected to compensate for a participant's withdrawal.
16.	Please include copies of the information and consent form to be given to potential participants. *For health research projects, These should be based on the current NRES guidelines available at http://www.nres.nhs.uk/applications/guidance/consent-guidance-and-forms/?1311929_entryid62=67013*	• Information sheet to key stakeholders • Information sheet for parents • Consent forms for key stakeholders • Consent form for practitioners • Consent form for parents/carers • Consent form/activities for children
17.	How will you disseminate the results of your research? Will this research be registered on a public database?	Considering this research is a thesis, the research will be written up and is accessible to those who request to see it.

		An additional copy of my thesis will be kept available in the University library and can be seen upon request. If requested by the setting or the parents of the children, a meeting will be held in each setting explaining the results of the study and how the children and adults who participated in the study had an input which contributed to the findings. I will also write journal papers, disseminating the findings from the research, most likely in accordance to the research questions. I will also attend conferences and give talks on the findings of the thesis.
18.	How will you inform participants about the outcomes of your research?	Each setting that has participated in the study will be given a copy of their data that they can read. I will also create a short document indicating the key points from the data collected at that setting. BERA (2011) suggests it is good practice to inform each research setting of the outcomes of the research, and that copies of their data should be offered to each setting.
19.	How will you ensure anonymity in collecting data, coding, interpreting and storing it and disseminating your results?	Anonymity will be ensured when collecting data through not identifying names of research participants. Each setting will be labelled alphabetically, which will be portrayed within the research findings. The data will be kept on a password protected computer as recommended by BERA (2011), and all files on the computer will be password protected. Field notes and observation forms will be kept within a locked cabinet in the research office. Only I will have access to the files and passwords. Under the Data Protection Act 1998, data should in any form of publication, not breach each research participants' confidentiality or anonymity agreements.
20.	Please indicate any additional issues that may arise relating to diversity and equality whilst undertaking this research and how you will manage these.	When selecting the sample for data collection I will ensure to select one of each of the five different Early Years settings within a 10 mile radius of my post code. This is so that each type of setting gains equal opportunities to provide data, and will portray the range of experiences children can have. When gaining consent from the children in the setting, all children whose parents have given consent for them to participate will be asked, and data will be collected on different days of the week so that all children who attend the setting have an equal opportunity to participate in the study. This also allows for diversity as a range of people within each setting has the opportunity to participate.

21.	**Will your data collection involve asking questions about**	
22.	**Sensitive topics?**	No
23.	**Information that might require disclosure to another body?**	Possibly
24.	**Information that might be about criminal activities or behaviour?**	No
25.	*If you have answered YES to any of these questions please provide details of the actions you will take if/when such situations occur. You should include here details of how you will handle sensitive or embarrassing topics or information that may require further action e.g. child protection.*	When speaking to practitioners or children if any safeguarding issues arise these will be discussed with my supervisor and reported to the manager of the setting or other appropriate authority.
C. DATA MANAGEMENT		
26.	What different types of data will you be working work with and what issues related to data collecting handling and management will you need to address? Please consider - How data will be anonymised - How access to data will be managed and controlled - How will be stored and how long for (faculty policy is 5 years but other organisations vary)	Data will be collected in a variety of forms: Online survey; Observations; Interviews. With regards to data collecting, handling and management, I will ensure all data is anonymous and settings will be labelled alphabetically in order to ensure all data collected from different settings is separate. Access to this data is only available to me, as the computer in which the data is stored is password protected, and all files will be password protected. However, under the Data Protection Act 1998 I am aware that all participants have the right to know why their data is being kept, where it is stored, and to what use the data will be. Therefore, participants are able to request to see the data stored about them, however will not have direct access to the computer or files that are password protected. The data will be stored for 5 years as requested by the faculty.
D. RESEARCH INTEGRITY		
27.	Has any responsibility for this research been delegated to a sub-contractor?	No
28.	Will individual researchers receive any personal payments over and above their normal salaries for undertaking this research?	No
29.	Will individual researchers receive any other benefits for undertaking this research?	No
30.	Will individual researchers receive any other benefits in excess of the costs for this research?	No
31.	Does the lead researcher have any personal involvement e.g. shareholding,	No

	personal relationship with the funding organisation?	
	**If you have answered YES to any of these questions please give further details.*	
32. .	What arrangements are in place for monitoring the conduct of this research? *****_Please include details of any steering or advisory committees and any other arrangements for the internal monitoring of the project, In the case of student research, you should include arrangements for supervision._	Considering I am a PhD student, regular supervisory meetings will be arranged with my supervisor to track the progress of the data collection. It is also in these meetings that I will be able to express any concerns, for example if I feel I have insufficient time to collect data, and whether I am reaching data saturation within observations and interviews.
33.	Is there a need to inform participants' GPs or any other health professional about their participation in the study? *(Please circle as appropriate)*	No
	**If you have answered YES, please give details and attach a copy of the letter you will send to the GP/health professional.*	

CHECKLIST

Please complete this checklist to make sure that you have included all the documents required for review	
Completed application form*	Yes
Signatures of lead researcher /student and supervisor scanned as a pdf*	Yes
Research proposal*	Yes
Interview schedule	Yes
Validated questionnaire	Yes
Non-validated questionnaire	N/A
Other research tools	Yes Observation format
Written permissions for the use of copyright research tools	N/A
Letters from any persons or organisations that have agreed to provide support for participants or to help e.g. interpreters, counsellors etc.	N/A
Copies of advertisements or any other materials used to recruit participants	N/A
Letter of invitation for research participants	Yes
Participant information sheet	Yes
Participant consent form	Yes
Flow chart (for studies with multiple methods/stages)	Yes (appendix 11)
Statement about payments to participants *(if appropriate)*	N/A
Written evidence of consultation/partnership arrangements with research participants/other bodies where applicable	N/A
Letters from managers/consultants/other persons giving permission for access to patients/staff/students etc. *	No This will be gained once the first stage of the research has been conducted – an online survey to all Early Years providers within a 10 mile radius of my location. I will recruit research participants based on the responses to the survey, which aims to determine which settings use touchscreen technology with children. I need to know this information before I contact settings. I feel that this is the most professional way to recruit participants. The consent forms will be resubmitted once contact with the settings has been made and consent has been given.
Letter from statistician	N/A
Other relevant documents? *(please list and specify and continue on a separate sheet if necessary)*	

Appendix x – Information sheet – practitioners

Pre-school children's experiences with touchscreen technology: A study of two to four year old children in Early Years settings in Warwickshire.

A PhD research project undertaken at Birmingham City University

September 2014- September 2017

This leaflet contains some questions and answers that you may have about the project.

What is the research project about?

I would like to understand how using touchscreen technology in the Early Years supports learning and social development in children. I would also like to discover practitioners' perceptions on children using touchscreens in the Early Years, and how they plan and support learning for this. Finally, I would like to understand key stakeholder's views on touchscreens with children, to determine their aims and reasons behind introducing these into their setting. This research is funded by Birmingham City University.

Why is the research being done?

The existing amount of research into children using touchscreens for learning purposes is very limited within the United Kingdom. Therefore, I would like to add to that research and support the use of touchscreens with children in the Early Years.

What does the researcher want to find out?

I have four questions that I would like to know:

1. What opportunities for social and collaborative learning do touchscreen technologies offer for 2 – 4 year old children in Early Years settings?
2. What are practitioners' perceptions on children using touchscreen technology in the Early Years?
3. How do practitioners plan for and support learning when children use touchscreens, using the Early Years Foundation Stage framework?
4. What are the key stakeholders' views on touchscreen technology use in the Early Years?

Do I have to contribute in the project?

No - it is your decision whether you would like to take part or not in this project.

Will people know that I have contributed?

No – all names, including adults, children and the nursery will not be disclosed during any part of the writing up process, and in the thesis.

What will be my contribution?

You will contribute through having an interview with me, where you will have the opportunity to discuss your views on touchscreens in the Early Years, and how you aim to support children to learn through using touchscreens.

What will be the contribution from the rest of the nursery?

Two practitioners (one of these will be the Room Leader) in the nursery rooms for children aged between 2 and 4 will also take part in interviews, to explain their views on technology and how they support learning using touchscreens. I would also like to know how you and your fellow practitioners plan for using touchscreens with the children too. The children will be observed for this project, in order to see how children use touchscreens and how using touchscreens with others facilitates learning. The children observed will need to have permission to participate in the research from their parents. I aim to observe the daily interactions when using touchscreens. Therefore, I will observe a full day of touchscreens use for five days, so that I will end up with five days' worth of observations to interpret and analyse. If there is a Technology/ICT policy used at your setting, I would like to see this too.

What will happen after the data has been collected?

I will write up the interviews and the observations. The interview transcript for your interview will be shown to you, so that you can make sure that I have written up the interview accurately. If you feel that I did not do this, the recording of the interview will be listened to again and changes will be made, again, showing you the written up transcript.

How does contributing benefit the children and staff at the nursery?

The data collected will benefit the nursery through receiving guidance on effective touchscreen use, that have been created based on the data from the five Early Years settings that participated in the project. By contributing, you will also be providing me with information that will contribute towards the data for the thesis, which I can then use to support future practice in Early Years settings.

If you would like to know any further information please do not hesitate to contact me. Thank you for your time.

Appendix xi – Information sheet – parents

Pre-school children's experiences with touchscreen technology: A study of two to four year old children in Early Years settings in Warwickshire.

A PhD research project undertaken at Birmingham City University

September 2014- September 2017

This leaflet contains some questions and answers that you may have about the project.

What is the research project about?

I would like to understand how using touchscreen technology in the Early Years supports learning and social development in children. I would also like to discover practitioners' perceptions on children using touchscreens in the Early Years, and how they plan and support learning for this. Finally, I would like to understand key stakeholder's views (such as the Manager) on touchscreens with children, to determine their aims and reasons behind introducing these into their setting. This research is funded by Birmingham City University.

Why is the research being done?

The existing amount of research into children using touchscreens for learning purposes is very limited within the United Kingdom. Therefore, I would like to add to that research and support the use of touchscreens with children in the Early Years.

What does the researcher want to find out?

I have four questions that I would like to know:

1. What opportunities for social and collaborative learning do touchscreen technologies offer for 2 – 4 year old children in Early Years settings?
2. What are practitioners' perceptions on children using touchscreen technology in the Early Years?
3. How do practitioners plan for and support learning when children use touchscreens, using the Early Years Foundation Stage framework?
4. What are the key stakeholders' views on touchscreen technology use in the Early Years?

Does my child have to participate in the project?

No, it is your decision (and your child's) whether you agree for their participation in the project. Your child can choose continually (once your consent has been given) whether they would like to participate or not.

Will people know that my child has contributed?

No – all names, including adults, children and the nursery will not be disclosed during any part of the writing up process, and in the thesis.

What will happen after the data has been collected?

I will be able to look at the information provided from the observations I have taken and determine effective touchscreen technology use, and the opportunities children are given to engage in touchscreen activities within the Early Years setting they attend. I will then write up this information and provide the setting in which your child attends, some information and guidance based on the information I have collected from the five different settings I will gather data from.

If you have any further questions, please feel free to contact me at the setting, where we can discuss this project further.

Appendix xii – Consent lanyard

Appendix xiii - Overview of the four case sites

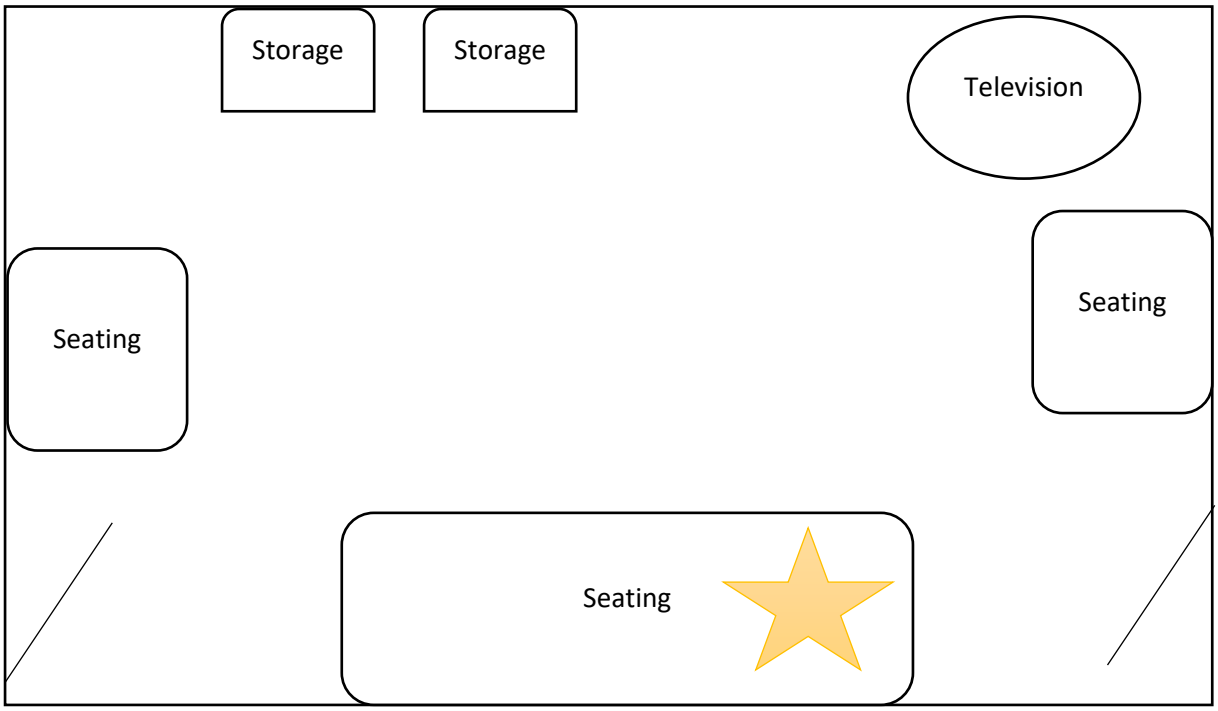
Four early years settings were identified from the online survey to progress to the second stage of the study. Contextual information about each of the four sites can be found in the table below.

Name of case site	Type of site	Ofsted rating	Age of children	Number of children on roll	Families that attend	Pedagogy implemented	Socio-economic status
Caterpillar Corner (CM)	Child minder	2	Birth to 17	12	Ethnic majority White-British	Play-based. Majority child-initiated with some adult-led input	Medium socio-economic status
Forrest Green (DN)	Day nursery	2	Four months to five years	120	Ethnic majority White-British	Play-based. Combination of child-initiated and adult-led	Medium socio-economic status
Busy Bees (CCN)	Children's centre nursery	1	Three to four years	71	Ethnic minority groups	Play-based. Forest school sessions	Low socio-economic status
Little Ducklings (PS)	Pre-school	2	Three to four years	426 (including school)	Ethnic minority groups	Play-based. Emphasis on adult-led lessons	Low socio-economic status

Case 1 – Child minder (Caterpillar Corner)

The child minder setting is situated on the outskirts of a town centre in the West Midlands. The owner's house is used as the child minder site, and employs four full-time early years practitioners, who have qualifications ranging from level 2 to an early years degree. The setting cares for up to 12 children from birth to seventeen years. Predominantly, the setting provides for children from birth to five, and cares for older children during school holidays.

There are two playrooms and a garden, which enables children to engage in a range of activities. All observations were conducted in the main play room (overview below). In the main playroom, there are sofas to sit on, a television, and numerous toys in storage boxes and shelves around the room. There is also access to a touchscreen device, where children are expected to sit on the sofa to use it. Below is a birds-eye view of the main playroom where children are observed. The star indicates where touchscreens are used.



Children have access to a Samsung Tablet, and touchscreen use is supervised by a practitioner. Practitioners are observed to assist children in turning on the device, and if necessary, reading to the children the range of apps available for children to play on. On the devices, children can

play on 19 different apps. Some of these include ‘LEGO Juniors’, ‘LEGO Racer’, ‘Barbie Make-Up’, ‘Barbie Magical Fashion, ‘1010’, ‘Temple Run’, ‘Colouring’, ‘My First Words’, ‘Painting’, ‘Drawing’, ‘LEGO My City’, ‘Sweet Baby Girl Beauty Salon’, ‘Thomas and Friends’, ‘My Boo’, and ‘CBeebies Play Time’.

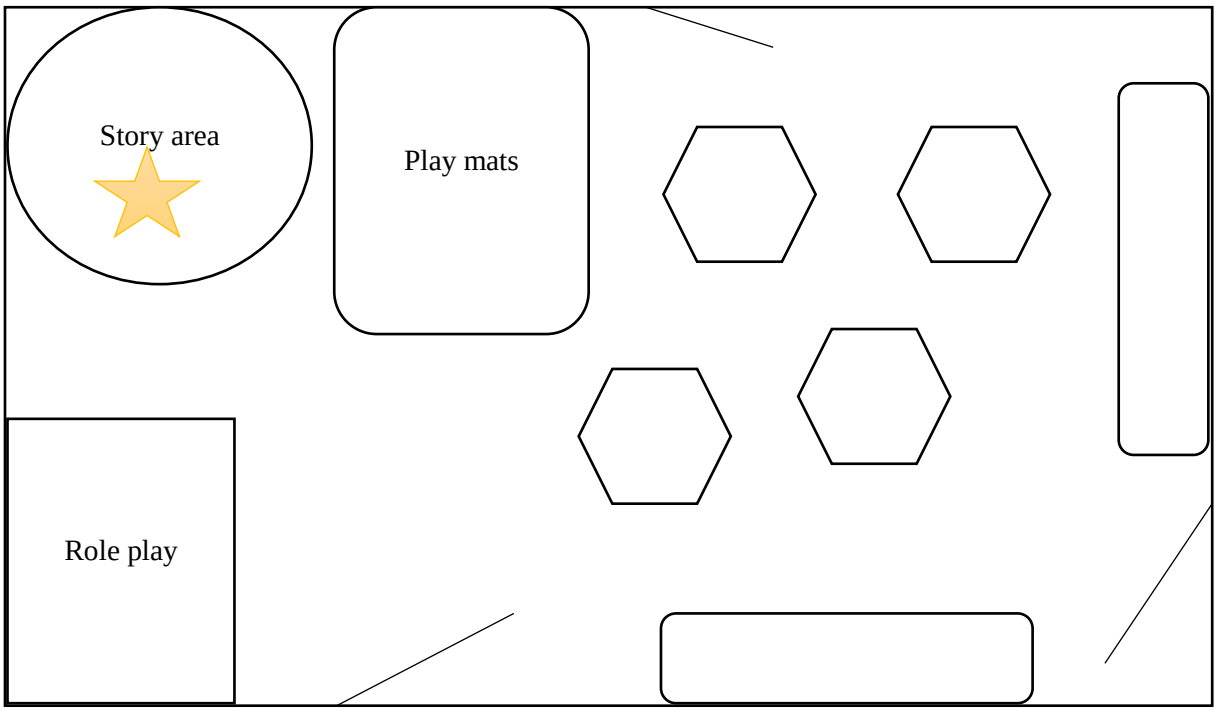
Children are allowed to play for a short amount of time during the lunch hour period when younger children are sleeping. This means that at times, children are not allowed to have the volume turned up on the device, and if they are allowed, the volume is restricted to a low level. The practitioners reinforce that children are not allowed to play on the touchscreen every day, rather it is seen as a reward if children are well-behaved. It is to the discretion of the practitioners when children should allow another child to play, and whether any children are able to gain access to the touchscreen each day.

A total of 13 observations were recorded in Caterpillar Corner (CM) of children using touchscreen devices over a period of 6 hours and 20 minutes. Two focus-group interviews were conducted with a total of five children, and three interviews were recorded with practitioners within the setting.

Case 2 – Day nursery (Forrest Green)

The day nursery setting is situated on a hospital site in the West Midlands. There are four rooms where children can play, which cares for children from 4 months to 5 years. There are 25 practitioners employed at the setting, two holding Early Years Professional Status. Qualifications range from Level 2 to Early Years degrees. The nursery is divided into four rooms – baby room, toddler room, 2-3 years room and a pre-school room. The room of focus is the pre-school room, which cares for children from 3 years until they leave for school at 4 or 5.

The children are able to play in a large room, which includes a writing table, sand pit, water tray, discovery area, a space for table-top activities such as small-world play, a role-play area, a large carpeted space where children can play with construction toys and a story corner. Children also have access to a shared private outdoor area, which is shared with children in the 2-3 years room. Below is a birds-eye view of the playroom for pre-school aged children.



Children have access to an iPad Mini, and children have to be seated in order to use the device. Most commonly, children are observed to sit in the story area, under the supervision of a practitioner. Practitioners are observed to assist children by turning on the touchscreen for the children, sometimes selecting an app for the children to play, and on other occasions, practitioners read the names of the apps which children can select from.

There were 12 apps available for the children to select from 'Minion Rush', 'Quick Math Jr', 'Kids Doodle', 'Pocket Phonics', 'Animal Counting writing game free', 'Edu Paint', 'Math 3-4', 'Maths for children age 3-5', 'YouTube', 'Memory', 'Animal zoo match free', and 'What's my pair 2'.

The children were allowed to play on the touchscreen from 9am in the morning until 11am, to allow children sufficient time away from a touchscreen device if children are sleeping after lunchtime. If children are not sleeping, then the touchscreen may be used until 11.30am, before the children are required to tidy the room ready for dinner time. In the afternoon, children were allowed to play from 1pm until 4pm, where the children tidy the room again for their evening meal. Children may be allowed to play after their evening meal. Children are allowed to play on the touchscreen daily, to the discretion of the practitioners.

A total of 36 observations were recorded in Forrest Green (DN) of children using touchscreen devices over a period of 12 hours and 32 minutes. One focus-group interview was conducted with five children, and three interviews were recorded with practitioners within the setting.

Case 3 – Children's centre nursery (Busy Bees)

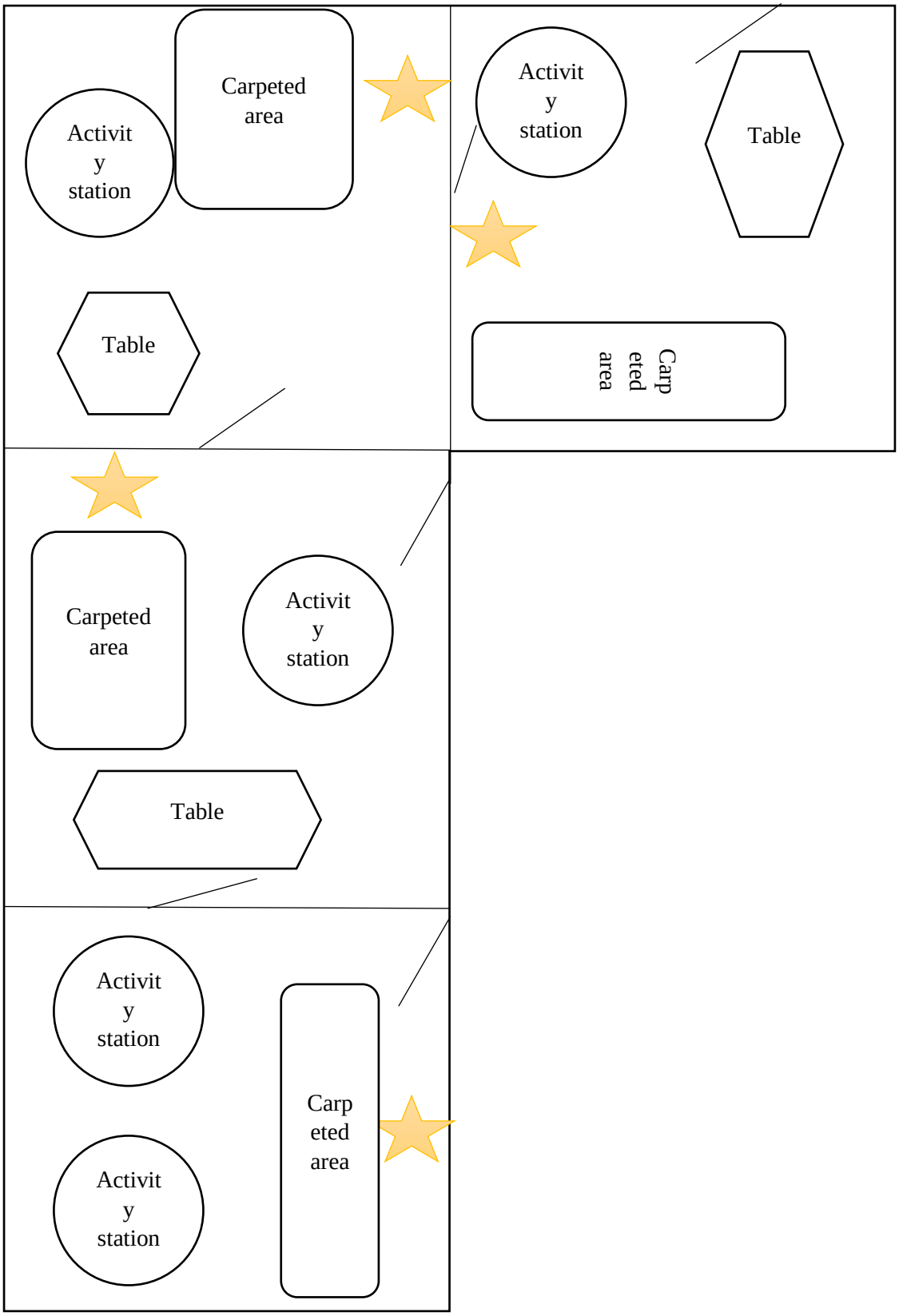
The nursery is situated inside a children's centre, in an urban area of the West Midlands. The children's centre also provides care for children aged 2-3 years, alongside providing family health services in the setting. There are 14 practitioners employed to work in the nursery, which supports children from 3-4 years, and provides care for children with additional needs who are of school age. The practitioners hold a range of qualifications, from Qualified Teacher Status and Early Years Professional Status to level 3.

The nursery is divided into four play rooms (see figure 3), where over 100 children are assigned a group. During group time, children separate into the four play rooms and engage in activities with their teacher. During free-play time, the rooms are opened to allow children free-play access across the four rooms. Within the rooms, there is a creative activity emphasis, including activities such as clay, building, creating pictures, construction and more. Children also have experiences creating with an artist, who attends the setting once a week. The children have access to a large outdoor play area, with a range of facilities to support children's physical needs. The setting is a registered Forest School, so the children are able to access the forest on a daily basis through group rotation.

There is a large touchscreen installed in each of the four playrooms, which are utilised during free-play and group activity time. Practitioners, after registration in the morning turn on their touchscreens and select a programme which the children can use. The programme has 11 games where children can extend their development in a range of areas across the EYFS (DfE, 2014). These games include 'What's under the box?', 'Matching Pairs', 'I Spy', 'Conveyor Belt', 'Silly Sounds', 'Memory game', 'Drawing', 'Sensory', 'Drums', 'Musical Notes', and 'Electric Piano'.

The children play on the touchscreens from 9am until 11.20am each morning, until the touchscreen devices are turned off by practitioners when children are required to tidy the play rooms before group time and lunch time. Practitioners turn the screens back on in the afternoon after registration, and are left on until 2.15pm when children are again required to tidy the playrooms ready for going home. Children are left unsupervised when they play, as practitioners are supporting other activities which are planned for in each of the four rooms. Not all four touchscreens are available to children at any one time. There is one touchscreen which is most commonly used, and the other touchscreens are used sporadically across the remaining three rooms.

A total of 60 observations were recorded in Busy Bees (CCN) of children using touchscreen devices over a period of 8 hours and 20 minutes. One focus-group interview was conducted with three children, and three interviews were recorded with practitioners within the setting.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Case 4 – Pre-school (Little Ducklings)

The pre-school setting is situated on a school site in the West Midlands. The pre-school is separated into seven different areas, two of these as separate rooms. The remaining areas are segregated in an open-plan space. The setting provides for children aged 3 to 4 years, before starting school on the same site. There are 6 practitioners employed to work in the pre-school with qualifications ranging from Qualified Teacher Status to Teaching Assistant.

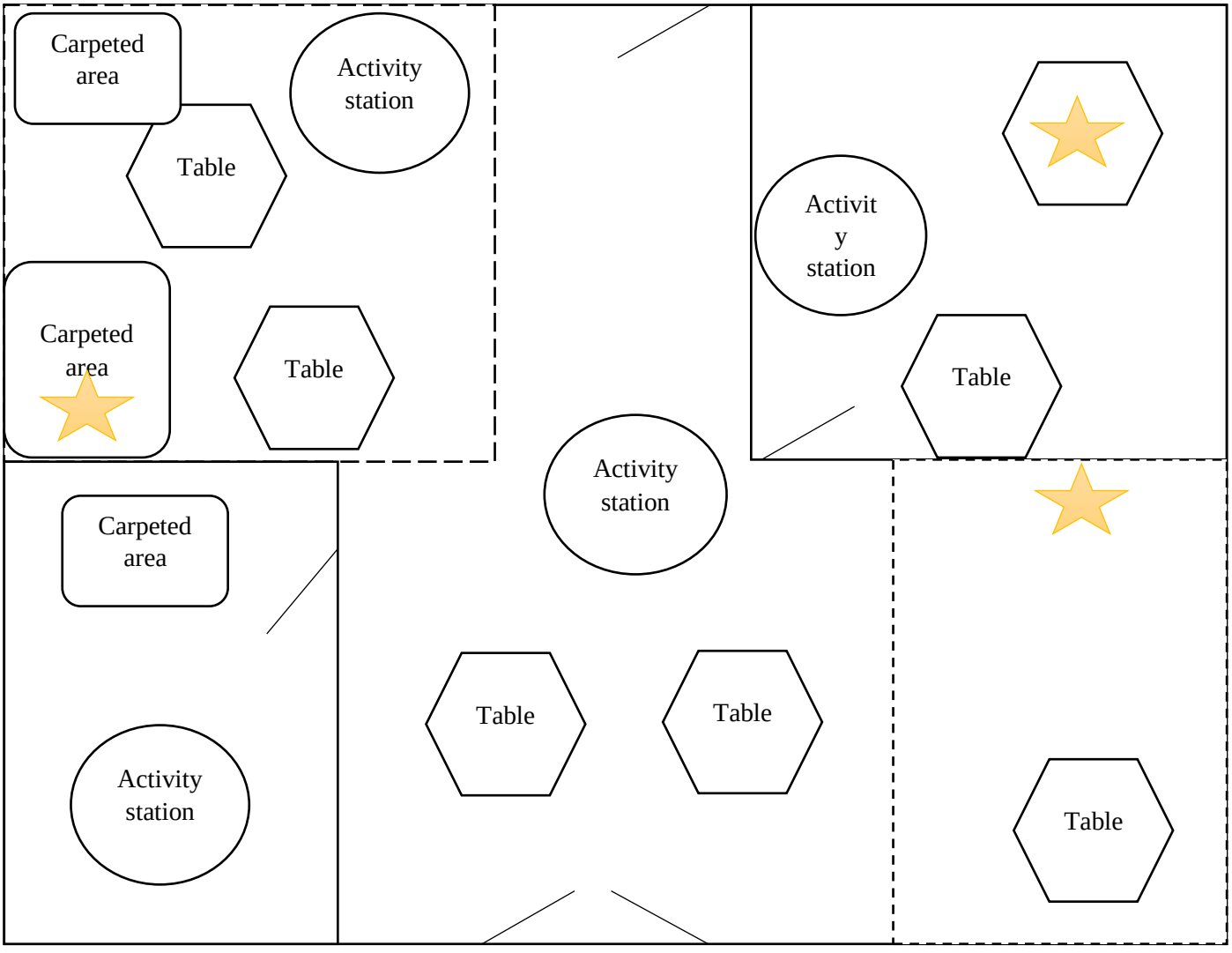
The children are able to play in all areas of the setting, including the two separate rooms during free-play time (see figure 4). Each area has a specific theme according to the EYFS (DfE, 2014). The children are separated into groups for registration and for lesson time. Lesson time groups are organised according to ability. As there are approximately 40 children in the setting, groups are small to allow for specialised support where the teacher can spend sufficient time with all children. Children are able to access a private outdoor area on the school playground during the day, and also have an organised play time for all children after eating their lunch, following the routines of the school.

Where dotted lines in figure 4 are present, represents the open access areas for children. Where firm lines are used indicates the two separate playrooms in the setting. There are two Interactive Whiteboards (IWs) used in the setting in both open access areas. In the separate room in the upper right-hand side of the diagram, children are commonly known to use Tesco Hudls. Children also gain access to Tesco Hudls in the open access areas where IWs are used. There are 9 apps installed on the Hudls, including ‘Games for Kids 3 years’, ‘Kids numbers and math’, Fisher Price Story Book 1,2,3’, ‘CBeebies Story Time’, and ‘LEGO DUPLO Train’.

Children use IWs during taught sessions; practitioners use maths or phonics related programmes. Where children are allowed to use the IWs during free-play time, children gain access to a drawing programme, and maths and literacy games. Children play on the Hudls

when they are planned for during the week. Children are able to use the IWs most days independently, and they are used daily with certain groups of children during their formal lesson times. When children play, they are generally unsupervised, particularly when using Hudls. Practitioners may supervise IW play when the children are playing to learn specific things, such as quantity and ordering numbers.

A total of 51 observations were recorded in Little Ducklings (PS) of children using touchscreen devices over a period of 11 hours and 21 minutes. Seven of these were of children using Hudls, and 44 were of children using IWs. Of the observations of children using IWs, 15 of these were practitioner-led activities, and 29 were during child-initiated play. A focus-group interview was conducted with three children, and three interviews were recorded with practitioners within the setting.



Appendix xiv – Conference presentations

I disseminated my findings in a range of Early Years conferences:

- Association for Professional Development in Early Years (TACTYC) (Ludgate, 2015);
- British Early Childhood Education Research Association (BECERA) (Ludgate, 2016; Ludgate, 2017);
- European Early Childhood Education Research Association (EECERA) (Ludgate, 2017).

I also presented my findings in two in-house University conferences where delegates came from a wide range of disciplines and therefore had limited knowledge on my research topic. These were particularly beneficial when considering the methodology I had adopted and the ways that I had approached analysis, ensuring that my data and its interpretation was understandable to a wide range of people. The conferences were:

- Centre for Study of Practice And Culture in Education (CSPACE) (Ludgate, 2015; Ludgate, 2016; Ludgate, 2017; Ludgate, 2018);
- Research Conference (RESCON) (Ludgate, 2016).

Appendix xv – Simplified model of touchscreen influences on practice