Young Children's Engagement and Interactions with Digital and Non-Digital Activities: A Case Study

by

Aderonke Ifeoma Folorunsho

Canterbury Christ Church University

Thesis submitted

for the Degree of Doctor of Philosophy

2016

ACKNOWLEDGEMENT

First, I would like to thank God Almighty for he made this possible. He deserves all the glory. I would like to express my deep gratitude to my family for all the encouragement and love they have given throughout these past three years. Thank you to my Father Mr Olayinka Folorunsho for his financial support throughout my studies. Without his support, I would not have been able to embark on this wonderful journey. I am forever grateful. I would also like to thank my mother for her loving prayers and always giving me hope and to my sister for always putting a smile on my face.

I would like to express my gratitude to my supervisors' Dr Ioanna Palaiologou and Dr Gill Hope for their support, love, critical intellectual guidance and feedback. I am grateful not only for the academic support but for the emotional support and taking care of me all these years. I could not have wished for more excellent supervisors. They have moulded me into the person that I have always wanted to be and for that I am grateful. My sincere thanks and appreciation also goes to all of the children, parents and early childhood practitioners at Canterbury Day Nursery for their involvement in this research.

Next, I would like to acknowledge my friend Nkechi Emenike who was a constant support for me when I experienced rough times in this journey. She was always there to talk to when I needed to discuss my research and gave great tips and advice. I am forever grateful. Finally, I would like to thank Elizabeth Adedeji and Divine Connect Group for their loving support and prayers.

ABSTRACT

In the last decade, research on children's interactions with digital technology in early childhood has been emerging. A growing body of research has shown that children from a very young age have access to digital technology in their homes. Researchers have turned their attention on the potential of digital technology to be integrated in a play-based pedagogy and investigate what the positive outcomes for children might be. However, limited research has explored the different ways children between the ages of three and four years engage with digital technology or compared their engagement with non-digital activities in early childhood education. Therefore, this study aims to explore how children engage and interact with digital and non-digital activities.

A mixed method approach was employed for this research study in order to explore how children engage and interact with digital and non-digital activities. The FraIM design: Framework for an Integrated Methodology supported the integration of quantitative method and qualitative method in this research study. The observation checklist was used to measure the children's levels of engagement to capture the extent to which they were engaged and the less structured observation gave an in-depth view into the different ways the children were engaged with digital and non-digital activities. 14 children between the ages of 3-4 years in an early childhood setting in England participated.

Findings revealed that digital activities such as applications on an iPad can impact on children's engagement positively. Although the quantitative data indicated that higher levels of engagement occurred with digital activities than non-digital activities, the qualitative data showed that this difference is not immense. The data also showed that the children exhibited similar playful patterns of interactions while they interacted with digital and non-digital activities. The patterns include pleasure, spontaneity, role identification, intrinsic motivation, self-regulation, self-initiated actions and preference.

TABLE OF CONTENTS

Chapter 3- Methodology

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This research thesis is reporting a case study, which explores children's engagement and interactions with digital and non-digital activities. It describes the contexts of children's play with digital and non-digital activities and combines research perspectives from the field of early childhood education and use of digital technology in the classroom. In this introductory section, I discuss my professional and theoretical interests in the chosen field of research. The aim and objectives of the study are also presented, followed by the research questions and research design and ends with an overview of the seven chapters of this research study.

1.2 RATIONALE FOR RESEARCH

During the two years I spent as a teacher of four to eight years old children in Nigeria, teaching with digital technology in the classroom was rare although digital devices like computers and projectors were available in schools. Digital technology was hardly incorporated into classroom activities but was taught as a subject which usually took place in a separate part of the school building or in a special classroom called 'the computer room'. I observed that whenever it was time for the children to go to the computer room to learn about computers which took for place for thirty minutes of their school period per week, they would be very excited about the learning opportunities they were about to embark on and they would be engaged with the activities provided by the teacher. This made me ponder whether there were similarities or differences in the ways children engaged with digital and non-digital activities. Therefore, my research interest is in early childhood education and digital technology with focus on

iPads because young children's interaction with digital technology especially between the ages of three and four is under researched. To begin with, I am interested to find that by exploring children's engagement and interactions while interacting with digital and non-digital activities, it would be discovered if digital activities will provide significant play and learning opportunities for children the same way non-digital activities do. This culminated the design and implementation of my research study and the formulations of my research questions. However, this study is conducted in England because I studied for my Masters here which gave me insight into the early childhood system enabling me to see the similarities and differences between the early childhood system in England and Nigeria. By doing this, this study can support policy making and curriculum design both in Nigeria and England.

This research study draws on literature from early childhood studies and children's interactions with digital technology. However, as it will be discussed in Chapter 2-literature review, research on young children's use of digital devices in early childhood education is still at an embryonic stage compared with other levels of education such as primary or secondary education. There is also limited research that has explored the different ways children under the age of five years engage with digital technology and that has compared their engagement and interactions between digital technology and non-digital activities. Research evidence suggests that digital technology has become a major part of the lives of children and adults in the 21st century (Aubrey and Dahl, 2008; Courville, K, 2011; Marsh et al., 2005; Marsh, 2010). In recent times, research evidence suggests that many homes are digitally fluent (Palaiologou, 2016a) and young children are exposed to digital technology both at home (Chaudron, 2015) and at school (NAEYC, 2012) but not in early childhood education. Research suggests that children are exposed to digital technology at an early age at home, of which smart phones and iPads are the prevailing devices (Gutnick et al, 2011; Rideout, 2011). There has been a

dramatic increase in tablet use (Dunn et al., 2016). In 2015, it was reported that 73% of children under the age of five had access to a tablet (ChildWise, 2015). It is clear that tablets play an important role in the lives of many children today. In education, it is seen as a 'hot trend' (Clark and Luckin, 2013) and the iPad and other tablet devices have paved the way for the potential of tablets to transform education (Arnott, Deirdre and Duncan, 2016; Kucirkova, 2014) and to create new positive learning opportunities for children (Aldhafeeri, Palaiologou and Folorunsho, 2016). It is for this reasons that this research will focus on the iPad. Moreover, current research has shed light into the playful approaches of integrating digital technology in early childhood education (Dunn et al., 2016) and new frameworks and classifications have been put forward which focuses on the changing nature of play in the digital age (Arnott, 2016; Edwards and Bird, 2015; Marsh et al., 2016 and Yelland, 2015). However, in literature there exists a debate about digital and non-digital resources in learning (Kucirkova, 2014) and concerns have been raised about how digital technology may diminish play (Marsh and Bishop, 2014). This has created the discourse on effects of digital technology on children's play and learning and if they should be used in early childhood education. The purpose of this research is to examine both sides of the debate by considering what is known about children's interactions with digital and non-digital activities and to explore how they engage with these activities. Therefore, this research is informed by the debates that surround the use of digital technology in play and learning in early childhood education (Henderson and Yeow, 2012; VanderScoter et al., 2001) and will also be focusing on the use of iPads in early childhood settings. Why the iPad will be used is explained further in Chapter 2 Section 2.2.

1.3 AIM AND OBJECTIVES OF RESEARCH

The main aim of this research is to explore how children engage and interact with digital and non-digital activities. In doing so, the objectives of this research are to:

a) look at the discourse surrounding the topic of children and digital technology;
b) compare children's engagement between digital and non-digital activities;
c) explore patterns of interactions that children exhibit while interacting with digital and non-digital activities;
d) explore the term digital play.

1.4 RESEARCH QUESTIONS

To embark on this research, it is important for me as a researcher to consider the role of the research questions and the guidance they can provide in this research process (Cohen et al., 2011). The research questions for this study focus on two important aspects which are engagement and patterns of interaction and were formulated within the professional and theoretical context discussed above. Therefore, the research questions for this study are as follows:

1) In what ways are children engaged while interacting with digital and non-digital activities?
2) Do children exhibit similar or different patterns of interactions between digital and non-digital activities?

1.5 DEFINITATIONS OF TERMS USED IN THIS THESIS

The terms engagement, interaction and play will be used throughout this thesis therefore it is pertinent to define these terms.

Engagement: In this research, engagement refers to when children are focused on activities that have taken their interests (Wlishire, 2012). They pay attention, listen,

create, problem solve, react (laugh), interact with others and explore. See sections 2.7.

Interactions: In this research, interactions refers to the patterns that occurred when children interacted with digital and non-digital activities. These patterns are the nature of the activities (child initiated, adult initiated and adult led), the period of time spent, their preferred digital and non-digital activities, the number of digital and non-digital activities they interacted within a period of time and their levels of engagement. See chapter 6.

Play: In this research, play refers to a spontaneous and active process in which thinking, feeling and doing can flourish; where cooperation and collaboration, motivation are encouraged and cognitive, physical, social and emotional development are enhanced (Fisher, 2008). See section 2.5.

1.6 RESEARCH DESIGN

The aim and objectives of this research will be achieved through a mixed methods research approach (Creswell and Clark, 2011) and this will be explored in details in the methodology chapter (Chapter 3). The convergent design is appropriate for this research because it enables me to triangulate qualitative and quantitative research methods. Quantitative method (Observation checklist) will be used to measure the children's levels of engagement to capture the extent to which they are engaged with digital and non-digital activities. Qualitative method (Less-Structured Observation) will give an in-depth view into the different ways children can be engaged with digital and non-digital activities. The design for this research study is the FraIM: Frameworks for an Integrated Methodology which was developed by David Plowright (2011). This framework supports the integration of quantitative and qualitative methods in this research to ensure the successful study of children's engagement and interaction while interacting with digital and non-digital activities.

1.7 OVERVIEW OF THESIS

This research is presented in seven chapters. This introductory section includes a review of the professional and theoretical context, aims and objectives, research questions, research design and overview of the thesis.

Chapter two is the literature review which begins with a review of literature about children's use of digital technology in the 21st century. It presents and critiques the existing literature on children's interaction with digital technology. It discusses children's play in digital and non-digital context. The chapter also discusses engagement.

Chapter three is the methodology chapter which discusses the methods employed to gather and analyse the data. The chapter starts with the introduction and an overview of the research design and research methodology. It further discusses the process of selecting the research questions. The chapter addresses in detail the research approaches and the importance of these approaches.

Chapter four and five discusses the results derived from the data. A combination of descriptive and thematic analysis will be used in order to describe the children's engagement and interaction with digital and non-digital activities, as well as understand the experiences that children engaged with through these activities.

Chapter six discusses the results obtained in order to find out the extent of achievement of the research objectives.

Finally, Chapter seven presents the conclusions, implications for research, limitations of research, recommendations for further research and closing notes.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter aims to set the theoretical background that informs this research study. As it has been stated in the introduction, the aim of this research is to explore how children engage and interact with digital and non-digital activities. This chapter is divided into three parts. The first part provides a discussion of digital technology and attempts to address the debates surrounding children's interaction with digital devices. The second part examines how digital technology has impacted play in early childhood. Finally, this chapter concludes with the discussion of engagement and establishes why it is the focus of this study.

2.2 DIGITAL TECHNOLOGY IN THIS RESEARCH

The term 'digital technology' in this research refers to internet enabled devices that operate as digital media platforms for children (Gutnick et al., (2011). These digital technologies are electronic devices, tools, and resources that generate, store and process data such as mobile technologies and desktop computers (O'Hara, 2011; Neumann and Neumann, 2014); entertainment technologies such as televisions, digital toys and games (Arnott, 2013; McPake et al., 2013) and internet enabled technologies that are platforms for digital media (Gutnick et al., 2011). However, the tablet computer is playing a more important role in the daily lives of children (Dunn et al., 2016). It has been established that children have more access to tablet computers at home (ChildWise, 2015; Dunn et al., 2016; Marsh et al., 2015) and are learning to use these tools (Brookson, Pimentel and Parslow-William (2010).

There are many companies that manufacture these tablet computers but the Apple Company which is a multinational technology company known for their hardware products like Mac laptops, iPods, iPhones and iPad tablets is one of the biggest companies in the world. Their products can be found in many homes, offices and educational institutions all over the world. Apple products can be used for entertainment, business and educational purposes. Many early childhood settings, primary and secondary schools are beginning to make use of an Apple product called the 'iPad' as an educational tool and that is why this research will be focusing on this digital device. The iPad is considered to be the pioneer of digital technology because one can easily download and purchase a variety of educational applications that support learning which makes it attractive to educators (Henderson and Yeow, 2012). It is easy to handle and use because it lacks exterior attachments which makes it easier for young children to handle.

Therefore, the term digital activities will be used to describe activities that are being done with digital technologies in the classroom or early years' settings. They include applications on the iPad (also known as apps which will be used in this research), and any other digital device that can be used to promote learning and play. The choice of digital activities for this research study was based on six categories of criteria and questions that can be used to assess and select digital activities for children by Hillman and Marshall (2010) and these can be seen in Appendix 9 Page 365. These criteria and questions can increase the quality of learning that will take place with these digital activities (ibid).

2.3 DIGITAL TECHNOLOGY IN THE 21ST CENTURY

The body of knowledge about children's access and engagement with digital technology has been growing gradually and documented in recent years in the United States

(Rideout and Saphir, 2013) United Kingdom (Livingstone et al., 2014; Ofcom, 2015; Plowman and McPake, 2013), Australia (Disney et al., 2013; Kervin, Verenikina and Rivera, 2015) Kuwait (Aldhafeeri and Palaiologou, 2016) and Europe (Palaiologou, 2016a; Palmer, 2015; Chaudron, 2015). A number of studies have revealed that a significant number of children have access to advanced digital technological devices such as iPads, mobile phones, tablets, and laptops at an early age in their homes (Marsh et al., 2005; Plowman and McPake, 2013; Teichert and Anderson, 2014) which offers them opportunities for entertainment and learning at their fingertips. This is happening because parents buy these digital technologies to provide learning and fun opportunities for their children and it has been found that children use these digital technologies as one of the tools for their play experiences (Berson and Berson, 2010). According to research conducted by Livingstone et al. (2014), children use these devices to entertain themselves with movies and television programmes. However, parents have shown concern about the negative influence these digital technologies can have on their children (Arnott, 2016; Plowman, 2014). It is understandable for parents to be concerned about the effects digital technology can have on their children because some past research has drawn attention and has shown that if children occupy themselves only with the use digital technology, it can have a negative effect on them and adults as well (Bavelier et al., 2010) and many of the digital devices manufactured are targeted at children and young people (Buckingham, 2007). Nevertheless, it cannot be denied that the world is changing due to the rise of digital technology (Palaiologou, 2016a) and it has become a part of our lives. For this reason, it can be said that "childhood has changed, in part because children (and adults) now live in a digital age" (Arnott, 2016: 331). Therefore, it is essential to discuss the debate for and against digital technologies.

2.3.1 DIGITAL TECHNOLOGY: FOR OR AGAINST?

In spite of over a decade of research about digital technology and its increased use, key stakeholders are conflicted with the inclusion of digital technology in early childhood settings (Teichert and Anderson, 2014). Popular news media and blogs have argued that children's using of iPads as the only activities that they engage will have negative cognitive and behavioural outcomes. For instance, in 2014, a Paediatric Occupational Therapist Cris Rowan wrote an article on Huffington Post (United States Edition) titled "Ten reasons why handheld devices should be banned from children under the age of twelve". She argued that young children's use of digital technology can cause sleep deprivation, delayed development and even mental illness. There is a trend in articles on the internet warning parents about the negative effects of digital technology and such blog posts can instil fear in parents and educators who are sceptical and unconvinced about the benefits of digital technology in children's lives. This has also raised more debates regarding children's use of digital technology in early childhood settings. Negative opinions about children's use of digital technology usually focuses on these three aspects: cognition and brain development, health and wellbeing, social and cultural competencies (Stephen and Plowman, 2014). Others have noted potential negative impact such as violent video games and televisions programs which have been associated with anti-social and aggressive behaviour (Anderson and Bushman, 2001; Christakis and Zimmerman, 2007). Heavy TV viewing has also been linked to decrease verbal literacy, attention problems and less time reading (Christakis, Zimmerman, DiGiuseppe and McCarty, 2004).

In 2011, The American Academy of Paediatrics (AAP) discouraged parents from allowing their children before two years of age to use iPads and tablets and limited exposure for children from ages two and upwards because of screen media. They were concerned with the negative effects screen media can have on young children if they are

exposed to it regularly. Research has shown that children are exposed to screen media from televisions to iPads to iPhones and game pads especially in their homes (Plowman and McPake, 2013). As it has been demonstrated above, it is understandable that parents should be cautioned about how long their children especially children below the age of two are exposed to digital technology but that does not mean children should be stopped from interacting with them totally (Brown, 2011). However, in a surprising turn of events, the AAP in October 2016 changed their stance on the potential harm that technology may have on developing children. In their article 'Children and Adolescents and Digital Media', it was an acknowledged fact that digital technology is an influential force in the lives of children and adolescents. Children today have been called digital natives because they were born after the widespread adoption of digital technology (Prensky, 2001). According to Prensky's work, this exposure to digital technology in the early years of children's lives is believed to give them better understanding of technology than people who were born before digital technology became predominant. However, his work received criticism because his theory is based on generalisations and assumptions (Kennedy et al. 2008). Bennet and Maton (2010) argued that simply because children are exposed to digital technology does not mean they are experts with these devices. These devices are actually created by adults who Prensky described as 'digital immigrants'. Opinions from people like Prensky and Cris Rowan brought about the AAP's stance on screen media. The AAP recommended that parents should act as mediators when their children use digital technology; for children aged two to five years old, screen time should be less than one hour while the parents monitor what the child does with the digital device and from age six, parents should establish a 'media use plan' to ensure that the digital devices does not deprive the children of play, socialising and sleep.

Basically, this information from the AAP may give parents the assurance that their children's interaction with digital technology is not detrimental to their development or health. Parents and educators can begin to look for ways to use digital technology to the advantage of the children with the helpful pointers that the AAP gave in their article. Due to the argument that children should be banned from interacting with digital technology as Cris Rowan suggested, children can interact with digital technology but in moderation as advised by the AAP. Parents and educators can have time limits on how long children watch television or use an iPad.

Not all authors agree that children should interact with digital technology. Some are of the opinion that children should not have access to it at all. Cordes and Miller (2000) are of the opinion that digital technology would be a distraction for children and they should not have access to it. In an attempt to discourage the use of digital technology, Cordes and Miller published a report in 2000 titled Fool's Gold: A Critical Look at Computers in Childhood. In the report, they argued that digital technology is intellectually, physically and socially harmful for children. Their argument emphasised the notion that digital technology is appropriate for only adults. A report was subsequently published by Clements and Samara (2003) which criticised the work of Cordes and Miller. It was titled Strip Mining for Gold: Research and Policy in Educational Technology-A response to Fool's Gold. The authors argued that no research proved their statements to be true. Although the work of Cordes and Miller is considered dated, there are current critics of digital technology that argue about the negative effects it can have children's social interactions with their parents, guardians or teachers (Kirkorian et al., 2009) on their wellbeing (Kabali et al., 2015) or can affect child centred pedagogy negatively (Morgan, 2010).

Research has shown that children make use of digital technology in their everyday lives and can have a positive impact on their learning and development (Disney et al., 2013;

Dunn et al., 2016; Haugland, 2000; Marsh et al., 2005; Marsh et al., 2016; Plowman and McPake, 2013) refuting Cordes and Miller's argument that digital technology is harmful for children. Research also indicates that by three years of age, children are familiar with the functions of digital technology and are engaged users (Livingstone et al., 2014).

Review of research into children's use of digital technology suggests that when used for entertainment and education purposes can a positive impact and this has shed a positive light on the debate. For example, three studies that were conducted by Plowman, Stevenson, McPake, Stephen and Adey (2011) challenge Cordes and Miller's statements. The studies were Already at a disadvantage? *ICT at home and children's* preparation for primary school (2003-2004), Entering e-*Society: young children's* development of e-literacy (2005-2007) and Young children learning with toys and technology at home (2008-2011). The children were three and four years old. These studies showed that in the homes, children had access to and made use of different digital technological devices. Their use of these devices did not affect them negatively. Even though they used these devices for entertainment purposes, it encouraged them to learn and also helped to establish early digital literacy. By the time they began school, most of the children were digitally literate and used this to support the progress of early print literacy. Making use of digital technology helped them with reading, problem-solving and information gathering. Digital technology had an advantage because the children were using these devices which helped in developing their cognitive skills that they would need as they grow and develop. Researchers have investigated digital technology's impact on children's cognitive development and have found that they can improve thinking and analysing skills (Klein, Nir-Gal and Darom, 2000). Other studies have found that children who used digital technology were found to show gains in

problem solving, intelligence and language skills (Clements and Samara, 2003; Vernadakis et al., 2005).

Moreover, in the nineties early researchers have argued that digital technology will be too abstract for children to understand and use independently (Goodwin, Goodwin, Nansel and Helm, 1986; Simon, 1985) and would turn them into miniature machines who will grow up without human emotions (Stout, 1983). They have also put forward that children should have access to only real learning materials of which computers is not one of them because they cannot be handled and manipulated by children (Fein et al., 1987). However, Clements, Nastasi and Swaminathan, (1993) statement challenges this notion stating that learning is not just about the physical characteristics of the materials but how they can be used in a meaningful and manipulable manner. Based on these arguments from the nineties, it can be said that digital technology has come a long way since then and that iPads and other digital devices can be physically handled and manipulated by children and can also be used as a meaningful learning material. In addition, research has shown that children do not have difficulty navigating or using an iPad instead they understand how to make use of digital technology appropriately (Plowman et al., 2011). Another concern that has been raised about children's interaction with digital technology was its likely tendency to inhibit language development in children. However, a study by Kelly and Schorger (2001) examined language use among twenty-five children in the library, art, computer and housekeeping areas of early childhood settings. They concluded that digital technology did not hinder language development, therefore computers makes available equally language-enriching environments for children. Another research conducted by Beschoner and Hutchison (2013) showed that the iPad can be used to support the teaching of literacy in the classroom thereby improving children's language development. The study made use of iPads whereby apps that encouraged listening and reading were used by the children. It

was noted that one of the benefits of using an iPad to teach literacy was that many apps connect reading, writing, listening and speaking within one context.

In spite of the backlash digital technology has received in recent years, more research is being conducted that demonstrate the positive impact digital technology can have on children. Arrowood and Overall (2004) discovered that using computers in the classroom motivated young children's writing process. Other studies also report that through the use of computers, motivation and engagement in children's learning and drawing increased compared with non-computer-related learning activities (Chung and Walsh, 2006; Couse and Chen, 2010; Schmid, Miodrag and DiFrancesco, 2008). Further research also indicated that by three years of age, children are developmentally ready to use digital technology and that they are effective and engaged users (Disney et al., 2013). Research has also shown that digital technology does not isolate children (McCarrick and Li, 2007), instead collaborative learning skills can be enhanced through well-designed digital technology (Shahrimin and Butterworth, 2002). It has been established that digital technology can bring about three kinds of interaction such as between the children and the digital device, between the children and between the children and the teacher (Higgins, Beauchamp and Miller, 2007). An example that shows this is a study by Alexandersson et al., (2000) of preschool children interacting with a computer. The results showed that children were able to relate with each other, cooperate and engage in discussions. This is similar to other studies where the children were found to be taking turns with digital technology, sharing, integrating ideas and teaching and helping each other in constructive ways (Kucirkova et al., 2014; Rojas Drummond et al., 2008; Yelland , 2015).

The current debate about children's use of digital technology outlined above demonstrates that in the 21st century and beyond, childhood will be different from ours. Digital technology is a central part of children's lives today and will continue to be

persistent in their lives (Arnott, 2013). It is therefore pertinent to say that instead of the continuous debate about children's use of digital technology, there should be more focus on how children use these digital technologies (Arnott, 2016), in what ways it engages them and the opportunities that it can bring to play and learning. In years to come, the world will become more technologically advanced and it may be important for children to be able to know how to use digital technology independently as they grow older. It is at this stage that children could be taught how to use these digital devices in ways to promote play, learning and social interaction so that they will become confident and skilled users of technology in their schooling and throughout life. Furthermore, with these arguments, it is suggested that a fairer and balanced perspective of children and digital technology is needed to understand fully its effects because the focus has been devoted to the negative effects of children's use of digital technology (Leeuw and Buijzen, 2016). This negative focus is usually on television and video games (Bushman and Huesmann, 2001). More research is needed on other digital technological devices like iPads, interactive white boards, software applications, digital cameras, desktop computers and laptops in early childhood education.

2.3.2 ACCEPTING DIG ITAL TECHNOLOGY

As discussed in the previous section, children's interaction with digital technology has been debated in recent years. The focus of this debate is mainly on the negative impact that these devices may have on young children. I agree with Arnott (2013); Bird and Edwards (2014) Price, Jewitt and Crescenzi (2015); and Palmer (2015) that more focus should be placed on how children engage with these devices and the positive impact they can have on children's interactions and engagement. Whilst the previous section focused on the debate about digital technology, this section focuses on the acceptance of digital technology and research that show the positive impact digital technology can have on children. Exposure to certain educational media has been linked to positive

impact on children's cognitive, social and sensual developments (Chen and Chang, 2006). Arrowood and Overall (2004) discovered that using computers in the classroom motivated young children's writing process. Other studies also reported that through the use of computers, motivation and engagement in children's learning increased compared with non-digital activities (Chung and Walsh, 2006; Schmid, Miodrag and DiFrancesco, 2008). Li and Atkins (2004) conducted research by asking parents of 3-5 years old children to complete a questionnaire that assessed their children's computer use at home. Each child's cognitive development was assessed and the results showed that children that had access to a computer scored high on cognitive development. The iPads Scotland Evaluation conducted by Burden et al (2012) was to identify how the use of iPads in schools impacted on teaching and learning, the results showed that the use of iPads facilitated the accomplishment of core elements that was required within the curriculum framework. The children in the research were between the ages of 8-10 years old. The iPads engaged the teachers and students equally, increased the children's motivation, promoted collaboration between the students and teachers, and facilitated the achievement and effective learning of the children. The uses of digital technology in early childhood settings have been found to improve children's engagement in drawing according to Couse and Chen (2010). In their research, Couse and Chen (2010) found that young children between the ages 3-6 were able to use a tablet for learning. The children were comfortable using the tablets for drawing after been given instruction from their teachers. As they became familiar with the tablets, they also became independent users. This is a typical scaffolding situation whereby even learning with technology requires the presence of the teacher to guide the children while learning. This challenges the argument that digital technology will isolate children and hinder them from socializing with other children. Henderson and Yeow (2012) explored the use of iPads in a few classrooms in New Zealand with students between the ages of five

to twelve. It was found that the students were very eager to use the iPads and the teachers found it very useful for teaching in their classrooms. Even studies conducted in the nineties have demonstrated that digital technology can support the development of children's cognitive abilities such as problem solving, memory, language and reasoning (Clements, 1994; Haugland, 1992; Clements, 1999). Papert (1998) argued that digital technology has an impact on children when it provides concrete experiences where children have control of their learning experience, teachers and children learn together, teachers use digital technology to teach great ideas and children collaborate with each other. In his research, he provided children with mechanical floor turtles that literarily moved around. The children experimented to find ways to draw geometric shapes, their own pictures and more complex geometric figures. Hohmann (1998) investigated the significant differences on measures of intelligence on children with a developmentally appropriate software programs. The children demonstrated cognitive development which supports Papert's argument that digital technology can provide children opportunities for active learning.

Likewise, parents have realised that the world is becoming a place where digital technology is easily accessible. More recent research by Plowman and McPake (2013) was conducted to ask parents about their children learning with iPads at very young ages. It was discovered that the parents who were interviewed expected their children to use iPads and felt it would be a disadvantage if they as adults did not develop such skills. Some of the parents believed that their children learning to use iPads at an early age would prepare them for the future. Also, many early childhood educators have recognised that digital technology can be beneficial for young children and that it is their responsibility as educators to support them in developing the digital skills that they will need as they grow up in a digital world (Association of Teachers and Lecturers, 2012).

Research studies have established the use of digital technology can make way for good learning opportunities and positive outcomes for children (McCarrick and Li, 2007). However, McManis and Gunnewig (2012) argue that for digital technology to reach its full potential, it has to have an educational component that can support children's learning and development. They add that digital technology needs to be age appropriate for children and include tools that can help teachers to successfully integrate technology in the curriculum (ibid).

2.4 DIGITAL TECHNOLOGY IN EARLY CHILDHOOD EDUCATION

Early childhood is an important period of life from birth to eight years (Copple and Bredekamp, 2009). At this stage in life, children are becoming familiar with their environment and learning about themselves. The experiences they have in the early stages of their lives can either support their development or hinder it. This is why children's use of digital technologies have caused a debate. However, the 21st century has seen changes in childhood and children's lives (Couse and Chen, 2010; Verenikina and Kervin, 2011). For some, childhood is seen to be under threat because of new technologies that continue to be developed (Moyles, 2012) and integrating digital technologies in the early childhood classrooms continues to be a challenge for early childhood practitioners (Clements and Samara, 2003) even though they recognise that digital technologies can be an advantage for children in learning (Couse and Chen, 2010). The rapid pace at which digital technology is changing aspects of our lives, education and communities should not be overlooked especially when it comes to children's play and learning. The position statement made by the National Association for the Education of Young Children (NAEYC) and Fred Rogers Centre (2012) on children's learning and digital technology offers a thoughtful perspective on appropriate implementation of digital technology in early years. The statement reads:

> *"Effective uses of technology and media are active, hand*-on, engaging and empowering, give the child control; provide adaptive scaffolds to ease the accomplishment of tasks, and are used as one of many options *to support children's learning. To align and integrate technology and* media with other core experiences and opportunities, young children need tools that help them explore, create, problem solve, consider, think, listen and view critically, make decisions, observe, document, research, investigate ideas, demonstrate learning, take turns and learn with and *from one another".*
>
> National Association for the Education of Young Children (NAEYC) and Fred Rogers Centre (2012; pp 6-7).

This statement affirms that early childhood practitioners should gain the knowledge and skills to choose and use digital technology that is developmentally appropriate for the individual interest and needs for children. Education is clearly changing with the introduction of digital technologies to support teaching and learning (Masek et al., 2012). It is important for early childhood practitioners to contemplate the role of digital technology in the early childhood curriculum (Swaminathan and Wright, 2003). In addition to this, digital technology is increasingly recognised as an important learning resource for encouraging social and linguistic development in young children (Gimbert and Cristol, 2004; Information Society for Technology in Education (ISTE, 2007). These digital devices are increasingly being used for education and introduced into many classrooms (Masek, 2012). They are seen to facilitate play and learning through interaction and fun; however, the process of producing a pedagogically valid, yet entertaining application is poorly understood (ibid).

As mentioned above, evidence suggest that there is increase in children's access and use of iPads and mobile telephones, however the actual use of these technologies in early childhood education remains infrequent (Wartella et al., 2010). Furthermore, when it is available, it is usually located in the corner of the classroom which suggests that digital activities are usually separated from non-digital activities (Arnott, 2016). This can be linked to the lack of integrating digital technology as play in early childhood settings (Edwards, 2013). Ertmer (2005) suggests that is due to early childhood practitioners' lack of pedagogical knowledge on how to use digital technology effectively within the early year's environment. Edwards and Bird (2015) also suggest that another problem is that there is little knowledge about how children learn to use digital technology through play and this lack of knowledge makes it difficult for early childhood practitioners to observe and assess the children's use of digital technology. There is a work to be done in the professional development of early year's practitioners to train and support them in effectively using digital technologies in their classroom (Zevenbergen, 2007). Unfortunately, the debate has influenced the personal beliefs of early childhood practitioners and teachers (Blackwell, Lauricella and Wartella, 2014).

The issue of early childhood practitioners limiting the uptake of digital technologies in their settings can be traced back to teachers' dispositions about technology, their skills, worries or their confidence (McManis and Gunnewig, 2012; Palaiologou, 2016b). A study conducted by Palaiologou (2016b) on teacher's dispositions towards digital technology in early childhood shows just how unconvinced some early childhood practitioners are. In this study, some of the teachers expressed concern about digital technology encouraging active or passive learning. They felt that digital technology would isolate children instead of them being active, moving around and interacting with resources, other children and adults. It was also discovered that although the teachers had fully integrated digital technology in their personal lives, they were hesitant when it

came to their classrooms. It is pertinent to say that teachers can be powerful mediators of digital technology's impact on learning (Neiderhauser and Stoddart, 2001). Nuttall et al., (2015) suggest that training early childhood practitioners on how to use digital technology within the early years' curriculum and how to develop new concepts of digital play will help them capitalise on children's use of digital technology both in their settings and at home. Early childhood practitioners do not have to be afraid of using digital technology in their settings because research is being conducted on how to do so. For example, Bird and Edwards (2014) developed a digital play framework that shows indicators for how children learn to use digital technology as cultural tools through epistemic and ludic activity. This will be explained further in Section 2.6.

The issues raised from this review of research literature establish that digital technology is here to stay and children will always interact with it either in their homes or in their schools. Therefore, it is important for parents and early childhood practitioners to critically examine the quality and content of every digital technology and software applications that are used in the homes and settings and this can be referred to as developmental appropriateness (Verenikina et al., 2003). They should understand how screens can affect children's learning and development. Also, they should always observe and determine if the any digital technology is affecting the performance and behaviour of children negatively. Finally, they should consider the cost effectiveness of spending money on digital technology and ensure that they are not extravagant and budget wisely. Hillman and Marshall (2010) suggested that because parents and early childhood practitioners are the primary gate keepers to the content that digital technology can provide for children, they should know how to evaluate any kind of digital activity because these activities should support children's social, cognitive and physical wellbeing.

With that said, it cannot be stated that purchasing iPads or any type of digital technology for a classroom will guarantee effective support for learning (Peluso, 2012) but depends on how it will be integrated into the curriculum and to what extent will teachers use it to tailor lessons to individual student needs (O'Malley et al., 2013). It may be challenging for early childhood practitioners to discover new and inventive ways of integrating digital technology in their teaching and encourage engagement in children (Couse and Chen, 2010). The NAEYC (1996) suggested using developmentally appropriate software which will engage children in learning, creative and collaborative play and problem solving. Software designers seek to develop educational content in a playful way to make it more attractive to its young audiences (ibid). Many of these digital activities usually focus on "math readiness (such as number recognition, number formation, counting, grouping), readiness skills, including reading readiness (such as letter recognition, letter formation, letter sounds, simple spelling), thinking and reasoning skills, perceptual skills, fine motor skills, skills of daily living (such a chores, hygiene), social skills, creativity and self-expression, and understanding of concepts (such as family relationships, emotion, healthy foods, safety, science concepts, music and art concepts, occupations and so on" (Lieberman, Fisk and Biely, 2009:305-306). This is why it is important to look at the developmental value of the software apps.

2.4.1 WHAT DOES THIS MEAN FOR EARLY CHILDHOOD EDUCATORS AND POLICIES IN ENGLISH CONTEXTS?

From the above discussion on children and digital technology, early childhood education in England is slowly embracing the use of iPads. This research thesis proposes that early childhood practitioners should be encouraged to enrich their lessons with digital technology which can aid in enhancing learning and also motivate the children to learn and collaborate with each other. Also, teachers in early years might

need pedagogical support to make certain that digital technology has a significant and positive impact on the children (Beastall, 2008).

According to Aubrey and Dahl (2008), the use of digital technologies in early childhood settings can contribute towards a child's learning and development, with exact reference to the Early Years Foundation Scheme (EYFS) themes and principles. They suggest that digital technology can contribute to three areas of learning which are as follows: "developing dispositions to learning that thread through personal, social and emotional development and across the EYFS in general; extending knowledge and understanding of the world in the broadest sense of communication, language and literacy, problem solving, reasoning and numeracy, creative development and recreational/playful behaviour and acquiring operational skills" (Aubrey and Dahl, 2008: 5). Given the observed trends of learning with iPads, it can be suggested that it is the content of the media that will promote effective learning in children. This point was raised by Bravelier et al., (2010) who argue that the kind of digital technological device or software being used in a learning environment should not only be fun for learning but also trigger an increase in knowledge. As (Bavelier et al., 2010; NAEYC and Fred Rogers, 2012) point out, learning with digital technology can make way for learning opportunities with an educational content. Digital technologies may not reach their full potential for supporting children's learning and development if their content is not appropriate for the right age group, easy to understand and does not have the same educational content as the foundation stage curriculum. Therefore, children television programme producers and software producers who create apps and other digital technological learning materials should work more closely with early childhood educators in developing software and television shows which can be incorporated in the foundation stage curriculum (Marsh et al., 2005).

Furthermore, supporters of the use of technology in early childhood settings agree with critics that digital technology should not be the only learning tool used in an early childhood classroom (Kosakowski, 1998; NAEYC, 1996). This is important to note because play is also an important aspect of an early childhood setting. Whilst this chapter has been focused on digital technology, it is recognised that in early childhood education in England, play underpins all aspects of a child's development. The Statutory Framework for the Early Years Foundation Stage (EYFS) recognises and supports children developing understanding of their world around them through play (Moyles, 2008). Children are active learners and not empty vessels (Piaget, 1959) who construct their own understanding of the world. The EYFS recognises this and 'acknowledges the values that support pedagogical approaches in which children are encouraged to interact both with those around them and with their environment using social and cultural tools (digital technology) to facilitate that understanding (Phethean and Clarke, 2014).

2.5 PLAY AND LEARNING IN EARLY CHILDHOOD EDUCATION

There have been many authors who have tried to define what play is and this has been problematic. Reed and Brown (2000) suggested that there is no universal definition for play and this occurs because play is something that is felt rather than done. As it has been understood in early childhood education, play is a central and important aspect of children's experiences and by which they learn and begin to familiarise themselves with their environment (Nutbrown, 2011). Play in early childhood can be said to be a spontaneous and active process in which thinking, feeling and doing can flourish; when children play they are free to be inventive and creative (Play Wales, 2014). For Vygotsky, play is a powerful way children make sense of the world (Smidt, 2011). Fisher (2008:140) also defined play as follows:

> *"Play is the natural way in which children go about the business of* learning. It enables them to integrate and consolidate a wealth of experiences that enhance their cognitive, physical, social and emotional development. It naturally encourages cooperation and collaboration, requires the use of fine and gross motor skills and demands cognitive application. It is pleasurable, but also helps children face pain and *sorrow. It is consuming and challenging and motivating".*

(Fisher, 2008; 140)

Play helps children discover their preferences and gain abilities that will develop more as they grow older. Children at an early stage in life are naturally drawn to play and this is how they explore their environment and learn. Play is recognised as an important part of their well-being and development. The right to play is written in the United Nations Convention on the Rights of the Child (1989), and play is also a fundamental commitment in Early Childhood Education. Vygotsky (1977, 1978) viewed play as an important part of child development which is the most significant activity and psychological achievement in a child's early life. Dewey (1859-1952) believed that it was important for children to be provided many different experiences to enable their learning through play "as a lifelong process in which children grow and learned along the way" Platz and Arellano, 2011:56). According to Wood (2012) children play because they are able to express themselves and engage in wide range of activities that can support problem solving, creativity, collaboration and so on. It enables learning across three domains of development which are cognitive, socio-affective and psychomotor. It also plays a role in development of learning dispositions in children such as intrinsic motivation, positive social interactions, engagement, self-esteem, and mastery of learning. As Smidt (2011) states, children need to have these experiences

and explore. They need to be in control of what they are doing so as to actually fully experience the benefits of play. Whitebread et al (2015) supports this by stating that children should be given the opportunity to pursue their interests and persist with the activities for long period of time. Children learn better by doing things for themselves rather than doing what they are being told, learn when they are interested and are actively involved (Heaslip, Hearst and Joseph, 1992).

Likewise, learning is the process in which an individual's interactions with their environment contributes to changes in how they think, feel and behave (Schaffer, 2006; Georghiades, 2004). The key ways children can learn are by playing, being engaged with activities, communicating and being with other children or adults exploring new things, scaffolding and having fun. Learning through play is an important aspect of early childhood education which has been supported by research (Lim, 2010). Brotherson (2009) states that play provides a foundation for learning and opens the door of opportunities for a child. Play also helps children develop a lasting disposition to learning by having control of their own learning which promotes desire, mastery and motivation (Erikson, 1985; Hurwitz, 2003). White (2012) argues that play is learning. She asserts that play involves exploration, testing and discovering which enables children to seek knowledge, learn cognitive skills such as problem solving, creativity, language, numeracy, socialising, negotiating, and controlling their emotions. She also states that play helps develop their fine and gross motor skills and when play is child-directed and fun, children are motivated to engage in opportunities to learn.

Research in the field of early childhood has addressed the importance of play for children's development and learning. Firstly, play provides benefit for cognitive, emotional, social, physical and moral development (Elkind, 2007; Verenikina et al., 2003). A growing body of research shows that play helps children to understand the world, solve problems and that every competency important for school success is

enhanced by play (Isenberg and Quisenberry, 2002). It also engages children's minds, emotions and bodies which they use to interact with others, experience life, manage their feelings and be confident about their abilities and themselves (2009). Play also helps children be imaginative, creative and develop social skills; it is intrinsically motivated; it is a self-initiated and spontaneous activity (Burghardt, 2011; Smith, 2010; Zigler and Bishop-Josef, 2006).

Learning through play is a way for children to develop their understanding of the world around them. Children should have access to a rich learning environment flowing with opportunities to demonstrate their understanding and learning in different contexts. The Early Years Foundation Stage (EYFS) framework stresses the importance of early years' practitioners in providing a balance between adult-led and child initiated play based activities (Moyles, 2012). The framework explains that each area of learning must be carried out in a planned and purposeful way through a combination of adult initiated, adult led and child initiated activity. This has created many interpretations of adult initiated, adult led and child initiated and play based activities.

In an early years setting, the practitioners usually define the choices, activities and resources that will be available for the children to interact, learn and explore with. However, some argue that because adults define the choices that are available, (Wood, 2013b) child initiated play is to an extent controlled by the adults although it may offer the children opportunities that may not be available in other contexts (Wood, 2014). Broadhead et al., (2011) also argued that children may see adult led play as class work and not 'real play' thereby the activity not being fun. In this case, it can be argued that the role of the practitioner is still very important in detecting the children's needs, evaluating their stage of development and intervening in play so as to provide the adequate resources that the children will need to learn (Drake, 2001). If the practitioners cannot identify the children's needs through adult initiated and adult led play based

activities, the EYFS framework may not be achieved in that early years setting. Therefore, it is important for practitioners to have adult initiated, adult led and child initiated play based activities. During adult led activities, the practitioner should act as a facilitator, stimulating, enriching and challenging the children's experiences and then allow the children to take ownership of the activity thus enabling it to become child led play because it will be easier to encourage playfulness in the activities. Nevertheless, it has been argued what the balance should be between child initiated and adult led/initiated experiences. Barber and Paul-Smith (2012) state that there is no equal balance but the balance that meets the children's needs. Therefore, "the balance should be outweighed towards the child initiated" (ibid: 35).

In this research, each of the terms will be defined based on what they mean for this study. The aim of this research is not to discuss the debate on the meaning of these concepts. It is important for this research to define the terms and how they will be applied throughout. The digital and non-digital activities the children will partake in this research will be viewed as adult initiated, adult led and child initiated.

2.5.1 ADULT INITIATED PLAY BASED ACTIVITIES These are activities whereby the practitioners provide resources with learning intention in mind and may or may not be involved in the play based activities (Moyles, 2012). The activities and resources are provided and arranged by the adults for the children to choose from. The adult is directly involved with the start of the activity and leaves the child to be in charge of that activity.

2.5.2 ADULT LED PLAY BASED ACTIVITIES These are activities that allow the practitioners to assess the children's learning in ways that may be described as playful rather than play itself (Moyles, 2012). They are learning experiences that have a specified outcome (Williams, 2010). It is assumed to be structured, resourced, planned

and managed by the practitioners in ways to promote specific outcomes (Saracho, 2012). The adult is usually in control of the activity they are providing. The Department for Children, School and Families (DCSF) (2009) describes adult led activities as those experiences that adults initiate and these activities are likely not to be seen by the children as play but however should be playful.

2.5.3 CHILD INITIATED PLAY BASED ACTIVITIES These are activities that have been genuinely chosen and completely decided upon by the children resulting in the child's intrinsic motivation to explore. It has also been described in the EYFS Practice Guidance as "when a child engages in a self-chosen pursuit" (DCSF, 2008:7). Child initiated activities arise when children choose from resources that are made available in their learning environment either indoors or outdoors and selecting their companions along the way (Featherstone and Featherstone, 2008). These are activities that the child starts doing without the help of an adult. They provide meaningful and rich context for children's learning (Bruce, 2004a). However, it has been argued that if an activity has been planned or resourced by an adult, then it is no longer child initiated. Williams (2010) argues that although the setting has been well resourced by adults, children will take the resources and use them in their own way or in way that may not be expected.

2.5.4 CHARACTERISTICS OF PLAY IN EARLY CHILDHOOD

Evidence from research on play suggests that there are different characteristics of play that children can be involved with, therefore it should be noted that whatever activities and resources that are made available, play should be a fulfilling experience for the children. Referring back to the digital activities and young children debate it can be questioned whether this could be achieved through digital and non-digital activities. In this thesis I argue that as long as children use their bodies and minds while they interact

with these activities, socialise with other children and adults, explore the unknown, share information and knowledge through their play and are enjoying the activities, the purpose of play is achieved. Also, these activities whether digital or non-digital, should allow the children to be deeply involved and focused in their play, concentrating on the activity they are interacting with. Play with digital and non-digital activities should enable children to build knowledge, skills and understanding. Furthermore, play with both digital and non-digital activities should help children express their emotions and use their imaginations. As Wood (2013:123) states, "activities should enable the children's goals to emerge through their choices and interests" (Wood, 2013:123).

Early childhood practitioners use different terms to describe play such as symbolic play, socio-dramatic play, exploratory play, constructive play, creative play, role playing and games with rules.

Table 2.1: Characteristics of Play

Types of Play	Description
Symbolic play	Play is the first medium through which children explore the use of symbolism (Whitebread, Jameson and Basilio, 2015). This type of play allows children to explore their world by using materials and objects to represent people and things (Miller et al., 2005). For example, their imaginations allow them to pretend that a wooden block is a real car and make realistic car noises while driving the wooden block on a pretend road (Macintyre, 2012).
Role Playing and Socio-Dramatic Play	These types of play have to do with children using their imaginations while playing. Role playing allows children to take on new and familiar roles (Moylett, 2010). With this type of play, children use their imaginations while interacting with objects and other children or adults. They make up stories and act these stories out with characters they choose. They act out their own perceived understanding of the role (Miller et al., 2005). They develop

	perspectives about events, people and social relationships through role playing (Wood, 2013). It also allows children to make friends and develop communication skills. Socio-dramatic play has to do with enacting real life scenarios that are based on personal experiences (Hughes, 2002). For example, going shopping, acting as a parent or child.
Constructive Play	This type of play involves building something using materials, experimenting with objects, building, learning basic knowledge about stacking and constructing. It involves "manipulation of materials to build or create something, using natural and manufactured materials such as blocks and construction kits, as well as play dough, junk and collage materials, loose parts, sand and water" (Wood, 2013:33). Constructive play has been shown to impact children's cognitive development positively (Hadeed and Sylva, 1995) and helps them practice brainstorming and making plans (Chien et al., 2010). Activities such as tower building, trains and tracks are known as constructive play. Children can develop their fine motor skills through this play by handling large and small wooden bricks, 2-dimenasional shapes, Duplo and Lego sets (Cooper, 2010).
Games with Rules	This type of play teaches children how to take turns, work in teams, develop observation and listening skills and think logically (Miller et al., 2015). These activities can be puzzles, board games, memory games and card games. In this type of play, children have to learn the rules and practice the moves if they want to become good at it (Macintyre, 2012).
Exploratory Play	This type of play involves children using their physical skills and senses to explore objects through their senses and find out what they can do with them (Hughes, 2002). Children are naturally inquisitive and have a strong exploratory drive (Bertram and Pascal, 2010). This type of play can be done outdoors for example sand play, water play and messy play. Through this type of play, children will learn about different materials such as sand, wood, metal, plastics and rubber

	through their senses and they will learn what makes these materials unique (Cooper et al., 2010).
Creative Play	This type of play allows children to be creative when they use materials to make and do things, express their feelings, thoughts and ideas (Hughes, 2002). They can be creative by painting, drawing, and arts and crafts or sculpting. Creativity and play are of great importance to children's learning and development because play encourages the use of their imagination (Bruce, 2010). They should explore and play with materials that intrigue them and then use these materials to create something.

Therefore, early years' practitioners should provide resources that will allow children the freedom to investigate, experiment and pursue personal interests (Drake, 2005). Children should be able to be involved in their play and learning through child initiated activities for whatever period of time they are comfortable with (ibid). They should be encouraged to have preferences in whatever activities they like to interact with. Each child responds differently to activities, situations and experiences because of their uniqueness. No child is alike although they may have preferences for the same activities; the way they interact with these activities can be different. Paley (1990), states that teaching would be a dull repetitive exercise without the uniqueness of each child. Children have their unique passions, desires, goals or concern that should not be interrupted or diminished. They should be allowed to choose digital and non-digital activities based on these.

Play based learning is an important aspect for pedagogy in early childhood education and digital technology is becoming an important aspect for play and learning in early childhood education (Bird and Edwards, 2014). However, how children can use digital technology through play is not fully understood (ibid). Children's play with digital technology has been linked with valued aspects of play in early childhood pedagogy

such as exploration, intrinsic motivation, social interaction and problem solving (Verenikina and Kervin, 2011). Rather than limiting play to just non-digital activities, digital activities may be seen to support different categories of play. Children at this stage of their lives are active learners who learn best by touching, hearing, tasting, smelling and moving their bodies which make them adventurous. For children play is an essential part of their existence (Sayeed and Guerin, 2000) and it can be initiated through the introduction of stimuli such as objects like toys, paper, crayons and even iPads. Therefore, the next section will discuss children's play in a digital context.

2.6 PLAY IN A DIGITAL CONTEXT

As discussed in Section 2.3, there is a debate surrounding children's use of digital technology. One of the arguments is that digital technology may bring disruption in children's play because of the extent to which they are drawn to digital technology (Brown, 2009; Frost, Wortham and Reifel, 2008). This argument has also emerged in the context of early childhood education. The focus of this section is to understand how play can occur in a digital context. Play is the basis of early childhood education (Wood, 2010) however, how children play or interact with digital technologies is not completely understood to be fully integrated into the early childhood curriculum. It has also been argued that play with digital technology is not real play (Palmer, 2016) and that digital technology may cause a decline in spontaneous forms of play (Frost, Wortham and Reifel, 2008). However, Marsh et al (2016), Bird and Edwards (2015) and Yelland (2015) with their research shows that children's play with digital technology can also be viewed as play. Children's play with digital technology has been referred to as Digital play (Bird and Edwards, 2014; Edwards and Bird, 2015; Marsh et al., 2016; Stephen and Plowman, 2014) and playful explorations (Yelland, 2015). Research associated with digital play can be significant for early childhood because they will help early childhood practitioners and parents to understand children's play with

digital technology (Edwards and Bird, 2015). The researchers who created these terms conducted research on children's play with technology which will be discussed below.

Edwards and Bird (2015) provided a digital play framework based on the sociocultural concept tool mediation and Hutt's (1966) work on epistemic and ludic activity as a basis for understanding how children learn to use digital technology. They came up with indicators from this epistemic and ludic play that can provide teachers guidance on identifying how children learn to use digital technology. Following these indicators can be a great way for early childhood practitioners to begin integrating digital technology in their settings and even modify it to suit the children's needs. They suggest that this framework will help early childhood practitioners identify how children learn to use digital technology through play. According to Hutt (1966), children play with objects in an exploratory way (epistemic play). When they have mastered what the object does, their activity moves into ludic play because they have understood how the object works and use it in innovative ways to achieve their goals. Bird and Edwards (2014) argue that children learn to use digital technology through play by moving from epistemic play which is exploring the functions of the digital device to ludic play where the children have mastered the digital technology thereby increasing their capacity to use digital technology in more symbolic ways. "They use technologies as a tool when the object of their activity is epistemic play until such time that they have mastered the functions of the technology-as-tool and shift into using the technology as a tool for realising ludic play" (ibid:1153).

In addition, Marsh et al., (2016) conducted a study to identify children's use of apps (iPad applications) and examine how the apps promoted play and creativity. They used Hughes (2002) taxonomy of play which was originally developed to identify different characteristics of play in which children were engaged. It was adapted to suit the nature of the research because it enabled detailed categories of play with digital technology to

emerge. The study showed that Hughes taxonomy of play could be applied in a digital context. On that account, what changed was not the type of play but the context of play. The findings of their study counters statements that digital play is not real play as Palmer (2016) had suggested. The characteristics of play that were adapted from Hughes (2002) were symbolic play, creative play, communication play, loco motor play, exploratory play, fantasy play, imaginative play, mastery play, object play, role play, dramatic play, deep play, socio-dramatic play, rough and tumble play, social play and recapitulative play. For example, Hughes (2002) definition of exploratory play is when children explore objects, spaces through their senses in order to gather information or explore the possibilities of those objects. Marsh et al., (2016) were able to adapt this typology of play in a digital context. They described exploratory play with digital technology as play into a digital context where children explore objects, spaces through their senses in order to gather information or explore the possibilities of the object. This shows that the type of play did not change; it was only the context in which the play was taking place that changed. Another example is fantasy play. Hughes (2002) definition of fantasy play is when children take on roles that would not normally occur in real life. Such roles could be a super hero with powers. This type of play can also be adapted in a digital context whereby the children can also take on roles on the iPad that would not occur in real life by using an avatar. With their findings, they argue against the dichotomy that is often posited between play and digital technology (Marsh, 2010).

Furthermore, Yelland (2015) also conducted research exploring playful explorations and digital technology. Children were observed using iPads for play. The findings showed that the iPad did not isolate children instead, it encouraged social engagement. They were supporting each other, helping each other navigate their way around the iPad and share their common interests. The findings also showed that the children were engaged with the iPad and enjoyed interacting with the activities on the iPad. According to

Yelland (2015), playful explorations are making available digital and non-digital activities available for children. These digital activities become part of their playful experiences. She also pointed out that playful explorations with new technologies, which may include interactions with adults including teachers, constitute "dynamic opportunities for teaching and learning in the early years" (ibid: 235). She argues for the provision of "contexts so that young children can experience different modes of representations, which, in turn, afford them the opportunity to formulate new understandings about their world" (ibid: 235). She also encouraged parents and early childhood practitioners to provide a range of learning opportunities with a variety of digital and non-digital activities however the challenge now is for parents and early childhood practitioners to be able to balance real and virtual worlds (Yelland, 2007). It is up to the parents to make sure that digital technology will not take away their children's real world experiences (Yelland, 2015).

The number of research studies discussed above show that digital technology has been found to have a positive impact in children's play in a number of ways (Bird and Edwards, 2016; Marsh et al; 2016; Yelland, 2015). Children can encounter the same cognitive functions with non-digital activities as well as digital activities (Stephen and Plowman, 2014). They can encounter literacy skills, listen to stories, match, categorise, sort and count (ibid). Other studies show that digital activities can engage children in problem solving activities, reasoning and collaborative learning (Yelland, 2005). Digital activities can also contribute to children's early knowledge of mathematics (Lieberman, Bates and So., 2009). Also well designed digital activities that are open-ended can give children the opportunity to express their artistic imaginations through drawing, music, painting, story-telling and animation thereby increasing their engagement and interests (ibid). Digital technology can be a stimulus for imaginative play whereby children can

adopt characters encountered in video games on iPads or other digital devices (Marsh et al., 2016; Marsh and Bishop, 2014).

Many of the digital activities on iPads which are targeted at children are based on television and cartoon characters that they are familiar with. In some of these digital activities, the children pretend that things are otherwise (Marsh et al., 2016), for example, Peppa Pig shopping where the children pretend to be shopping themselves. Secondly, they offer platforms for games that promote rule-bound play and free play (Plowman and Stephen, 2005). This is just like games with rules whereby children play games that have rules. Also through free play, children explore digital technology, they use their knowledge to play imaginatively, learn social skills such as turn taking, solve problems and repeat patterns that shows their interests and concerns, and lastly, they can also be used as objects in children's play, for example, using smart phones to make pretend calls (Plowman et al., 2012). In spite of this, Stephen and Plowman (2014) argue that these digital activities are marketed as educational activities disguised as entertainment. They put forward that research shows these kinds of activities may provide initial motivation and engagement for learning but only for short period of time. They state that "digital interactivity alone does not guarantee either educational or playful encounter" (ibid: 332). They go on to suggest that digital technology specifically created for children should be more open-ended and flexible so that it can easily respond to children's changing interests and relate to authentic experiences which they want to relate to play (ibid:338). Although some of the digital media available claim to have educational content to promote learning may not be expertly created, there are high quality digital media that are created by experts who understand the way children learn and develop which have clear learning goals and effective learning strategies (Lieberman, Bates and So., 2009).

In light of this, Lieberman, Fisk and Biely (2009) suggest that digital activities should incorporate a number of instructional strategies that can provide the characteristics of play. For example, they should provide clear verbal descriptions and visual presentations of content of which the child can choose a demonstration multiple times. They should provide stories that will engage the children in thinking and problem solving, have characters that the children will find interesting, activities that allow children to be creative, like planning and building projects and painting and drawing. The characters should also be able to ask the children questions to motivate them to think about the answers. The digital activities should also incorporate contests, mysteries and be motivating enough to enable children to persist till they master the activities. They should be designed to provide repetition so as to enable children persist if the game is challenging. The characters should be able to talk to the children when they make mistakes or when there are moments of inactivity to offer encouragement and persistence. More importantly, receiving virtual gifts and praises for completing a task can show children their progress and success in the digital activity. This can boost their confidence and encourage them to engage in more challenging tasks (Lieberman and Linn, 1991). The activities should also allow for social interactions to take place and they should integrate entertainment, fun, humour and fantasy to make the activities more appealing. Also, Stephen and Plowman (2014) argue that digital play should not just be about screen based digital technologies such as smart phones and iPads, there are other software and devices like the Wii and game consoles, electronic board games, learning robots and wireless hand held pen-like devices that can encourage play and learning in children. This is because for children, digital play is more than just pressing buttons and playing games, it should also be made to be mentally stimulating and encourage creativity which is closely linked or fully linked to their curriculum (Cooper et al., 2010). There are play and learning experiences that digital technology can offer.

For example, children can use digital cameras to observe and record events (Bird, 2012), use walkie-talkies that can encourage language development, musical keyboards that encourage children to make rhythm with sound and software programs and applications that encourage children to draw, paint, count and so on (Brookson, Pimentel and Parslow-Williams, 2010). Therefore, in early childhood settings, if the resources and materials provided for children, including digital activities, are designed to encourage children's preferences and interests, their desire to know, explore and play, especially digital activities based on Lieberman et al., 's (2009) suggestions, children may be able to develop and strengthen their curiosity, development and attention (Bredekamp, 1997). Digital activities should not be something that is separate or different from other classroom activities (Arnott, 2016), instead it should be integrated as part of children's play (Cooper et al., 2010).

Although different authors have put different emphasis into their descriptions of digital play, there is a general agreement that play whether digital or non-digital has an important role in a child's development. Understanding play in early childhood has been challenging (Wood, 2013) and defining play in a digital context is even more challenging. Although play has been problematic in defining, the characteristics of play are what have been identifiable. What can be identified through children's use of digital technology are the key characteristics of children's engagement with play, whether it is for learning, enjoyment or exploration. We can identify children's interactions with digital and non-digital activities, which can be considered as play. Marsh et al., (2016) research on digital play shows just how children interact with digital technology and this interaction can be regarded as play even though it is in a digital context. Their research sheds light on the issue of children interacting differently with digital and non-digital activities. There may not be a difference. Play is not changing; it is the contexts

in which that play takes that is changing. Digital technology can be just tools for play, just like constructive blocks, puzzles and so on.

This chapter commenced with the debate surrounding children's use of digital technology. What play means in early childhood and how important it is for children to experience these activities has also been explored. However, the question of whether children engage and interact with digital and non-digital activities differently lingers. This is why the purpose of this research is to explore children's engagement and interactions with digital and non-digital activities and discover if there is a difference in their interactions and engagement. Therefore, the next section will discuss engagement.

2.7 WHY FOCUS ON ENGAGEMENT IN PLAY AND LEARNING?

Engagement is regarded as an important factor in children's learning. Other factors of learning include cognitive abilities, interests, motivation, intelligence, aptitude, attitude, and environmental factors. While there have been many definitions of engagement, there is no agreement among scholars about an exact definition (Mango, 2015). However, it can be defined as "energy in action" (Appleton et al., 2006; 428) which stands for the association between a child and the activity with which they are interacting with (Ainley, 2004). It can also be defined as the degree to which children are engaged in their play and learning activities (Chen, Gonyea and Kuh, 2008). Engagement is when children focus on activities that interests them (Wilshire, 2012). When children are engaged, they have the opportunity to develop and practice new skills. Engagement has been positively linked to academic achievement (Bulgur et al., 2008).

The study of engagement is significant because of its positive academic outcomes (Appleton et al., 2006; Fredrick, Blumenfeld and Paris, 2004). It is valued because the studies which have been conducted prove that engagement is important. Through the

study of engagement, it is understood that for a child to learn, to have excellent academic outcomes, he or she must be engaged in the classroom. However, for some children, they can be easily distracted, have short attention span or not have any motivation to learn. This is why many early childhood practitioners have developed ways of engaging children in learning by introducing fun activities that can be done in the classroom. Such activities can be sand pit, drawing, arts and crafts. Through these activities, children can be engaged because it appeals to them and when they are engaged, learning takes place. To be able to help children learn, the activities have to be enjoyable, encourage the children's curiosity and effort, be fun, interactive and ensure collaboration between the children and with their teachers.

High levels of engagement are closely connected with gaining of knowledge, skills and effective learning (Furlong et al., 2003; Hargreaves, 2006), improved achievement (Barkatsas, Kasimatis and Gialamas, 2009) emotional functioning (Skinner et al., 2008) as well as effective teaching, meaningful outcome and real progress (Carpenter, 2010). Therefore, it can be concluded that engagement precedes learning. It is therefore the responsibility of early years' practitioners to ensure that the children in their settings are engaged with the activities provided either they are digital or non-digital. Frederick, Blumenfeld and Paris (2004) had identified engagement as multidimensional construct consisting of three subtypes and they are behavioural engagement, emotional engagement and cognitive engagement. They argue for the importance of thinking of engagement as a multidimensional construct that is composed of behaviour, emotion and cognition. These are discussed below:

2.7.1 BEHAVIOURAL ENGAGEMENT

This is the type of engagement whereby children are physically involved in effective learning practises and activities and includes involvement in activities related to

academic success (Fredericks, Blumenfeld and Paris, 2004). It includes behaviours such as involvement, concentration, persistence and asking questions (Finn et al., 1995). An early childhood practitioner or researcher can study behaviours such as these that children exhibit while engaged in an activity through these indicators which are the features that belong in the construct of engagement (Skinner et al., 2008). The indicators for behavioural engagement in this research are: involvement, effort, concentration and persistence (Skinner et al., 2009). By taking note of these indicators, children's behavioural engagement can be observed and measured. Children who are behaviourally engaged will typically conform to these behavioural indicators or signals (Trowler, 2010). This can enable early childhood practitioners to understand the personality, character, likes and dislikes of the children in their care. Although behavioural engagement can be observed, Linnenbrink and Pintrich (2003) argue that some children can avoid being behaviourally engaged or completing the task given by seeking for help from others. They can do this if they do not understand the activity or are not interested or motivated to learn. This type of behaviour is not a good indicator of engagement (Ryan and Pintrich, 1998). Early childhood practitioners should make sure that the children are seeking for help to understand the task so they can attempt it by themselves, scaffold them and not teach them exactly what to do.

2.7.2 EMOTIONAL ENGAGEMENT

Emotional engagement occurs when children enjoy the activity they are undertaking and have a positive attitude while they do it (Frederick, Blumenfeld and Paris, 2004). Children who are emotionally engaged experience affective reactions such as happiness, enjoyment, interest and a sense of belonging (Trowler, 2010). According to Doherty and Hughes (2009) emotions develop rapidly in childhood and form an important part of our lives. They also state that emotions are more than just physical mechanisms that show how we are feeling but more like behaviours that direct our thinking and subsequent

actions in response to events (ibid). Derryberry and Tucker, (1994) argue that children need to experience their emotions in order to attain their highest capabilities because emotions have an important implication for aspects of cognition that are relevant in educational context. Therefore, it is pertinent that early childhood practitioners ensure the children in their care have positive emotional experiences during play and learning (Linnenbrink and Pintrich, 2003). The indicators for emotional engagement in this research are; happiness, enjoyment and interest. A study demonstrating the positive impact on learning on emotional engagement was conducted by Sagayadevan and Jeyaraj (2012) to examine the relationship between lecturer-student interactions and emotional engagement. Results showed that there were higher levels of emotional engagement with the students who had good interactions with their lecturers than those had poor interactions.

2.7.3 COGNITIVE ENGAGEMENT

Cognitive engagement is the thought that takes place in the head of children when they are devoted in learning in a focused, self-regulating and calculated way (Frederick et al., 2004). Cognitively engaged children will be investing in their learning (Trowler, 2010). Newmann et al., (1992:12) defined cognitive engagement as:

> "The child's psychological investment in an effort directed toward learning, understanding or mastering the knowledge, skills, or crafts that academic work is intended to promote".

This definition is specific in stating that a child is cognitively engaged in an activity for the purpose of mastering skills or knowledge. However, it is difficult to measure children's cognition and thinking because it takes place in the mind (Linnenbrink and Pintrich, 2003). However, there are indicators that can be used to identify cognitive engagement in children (Frederick et al., 2004). In primary and secondary schools, it is

usually measured by the student's class work and homework, class attendance and when they engage in classroom discussions (Appleton et al., 2006). However, for younger children in early childhood settings, it could be observed by indicators such as: problem solving, attention, creating and constructing, going beyond requirements, relating materials to previous knowledge, memory, categorisation and integrating ideas. Children who are cognitively engaged are focused on understanding and mastery (Fredericks et al., 2014). Another way to measure cognitive engagement is to ask questions about what is being taught. This way, if the child is able to answer correctly, that means the child is cognitively engaged. Observing cognitive engagement is reasonable and this can be done by asking questions to know if they understand the activity. Also, taking notes of the children's improvement in their learning will help in observing cognitive engagement.

2.7.4 SOCIAL ENGAGEMENT

Social engagement is not part of the multidimensional construct created by Frederick, Blumenfeld and Paris (2004) however; I believe it is an important aspect of engagement for this research because of the debate about the anti-social nature of digital technology which has been discussed in the previous sections. It can be defined as the extent to which a child participates in a range of social roles, relationships and activities with others (Avison, McLeod and Pescosolido, 2007). It is also the ability of children to work within a group or with each other, enjoy each other's company and communicate. Through social engagement, children have the opportunity to interact with other children, teachers and parents in a way that enables them to learn appropriate social behaviours such as sharing, cooperating and learning to receive help from older people like teachers and parents. According to Wentzel and Asher (1995), children who participate in social interactions with their peers will develop effective communicating skills and develop cognitive, linguistic and social skills. When social engagement takes

place, children learn to collaborate with each other, interact with their peers, teachers and other adults and exchange ideas. Vygotsky believed that children's social interactions and environment is an active force needed for intellectual growth and development (Riddall-Leech, 2008). He did not believe that children operated independently, he believed that they develop intellectually through interaction with the community and learn by constructing their understanding of events in the world (Smith et al., 2011). He was convinced that children make use of the knowledge they acquire through social interactions with people to develop intelligent capabilities, to become self-sufficient, problem solvers and independent learners (Doherty and Hughes, 2009). Therefore, through social engagement children are given the opportunity to gain knowledge from other individuals.

The understandings generated from this review of literature on the domains of engagement show that it is important for behavioural, emotional, cognitive and social engagement to be present when children are actively engaged in learning activities (Fredericks et al., 2004). Therefore, it is pertinent for the digital and non-digital activities to provide opportunities for these types of engagement to occur. If children are cognitively and emotionally engaged, it is very possible that they are behaviourally engaged. However, it has been stated that children can be behaviourally engaged but not cognitively engaged (Linnenbrink and Pintrich, 2003). They will show some of the signals of behavioural engagement but learning will not be taking place. This can happen due to many reasons such as: not understanding the activity, personal issues or just lack of interest in the activity. The teacher has to be very observant and always ask questions to ensure that the children are also cognitively engaged and if they are not find out why and look for a solution. There are also situations whereby children may not be engaged in activities or exhibit any of the types of engagement and their indicators mentioned in previous sections. This can be known as disengagement (Skinner et al.,

2009a). This is an action of withdrawing from involvement in an activity. This also implies that engagement, persistence or effort to interact with an activity is absent (ibid). This could be caused by frustration, boredom, anxiety and can hinder a child's participation in play and learning activities (Skinner et al., 2008).

Table 2.2 Summary of Types of Engagement in Literature

Types of Engagement	**Indicators**
Behavioural Engagement	Involvement Concentration Persistence Intensity Focus
Emotional Engagement	Happiness Enjoyment Interest
Cognitive Engagement	Problem Solving Memory Creating and Constructing Mastery Thinking Attention
Social Engagement	Peer Engagement Cooperation Adult Interaction

The table above shows the types of engagement and their indicators that have been demonstrated in literature. These indicators will be used in identifying types of engagement that will be observed in this thesis.

2.8 ENGAGEMENT WITH DIGITAL TECHNOLOGY

With the introduction of digital technology in early childhood classrooms, early childhood practitioners have to ensure that whatever digital technology they use; iPads, iPhones, digital cameras and so on, it should engage the children and support their play and learning. Using iPads in a classroom allows the children to engage with the content,

encourages and motivates them to read and allows them to take control of their learning (Hourcade et al., 2009; Guernsey and Druin, 2009). It is understood that many early childhood practitioners are anxious about introducing digital technologies into their classrooms, however, they should understand that research has been conducted which shows that digital technology does engage children. Clark and Fallon (2013:4) have also put forward that "tablet devices have a positive impact on student's engagement with learning".

This section reviews studies about digital technology and engagement in order to highlight their positive outcomes on children's learning. A mixed methods research was conducted in the United States of America to examine the implementation of iPads in a Pre k-4th grade school (Milman et al., 2012). Findings through interviews and observations showed high levels of engagement in learning and also collaborations between students and teachers. Likewise, McKenna (2012) conducted research on how two elementary classrooms with children aged between five and six years old in the United States of America used iPads to enhance learning and achievement. Both iPads and non-iPads lessons were observed and compared. The findings showed that students were more engaged in learning with the use of iPads than when they were not in use.

In addition, Disney et al., (2013) conducted research on children's engagement while playing with iPads. The children were three to four years old and the research was conducted in child care centres in Australia. Semi-structured field observation was used to collect information about the children's engagement. They used the tool "Assessing for learning and development in the early years using observation scales: Reflect respect relate" from the Department of Education and Children Services to analyse the children's engagement levels while playing with iPads. The results showed that the children's engagement levels were medium to high while playing with iPads. Further research conducted by Kucirkova et al., (2014) also investigated the effects of a story

making app called Our Story and a selection of other apps on the learning engagement of four to five years old children. The children's engagement was analysed using Bangert-Drowns and Pyke (2001) taxonomy and the concept of exploratory talk. The findings showed that the children's engagement was high with the Our Story app in contrast to other app software. This research was done in Spain. Another study was conducted by Mango (2015) to observe iPad use and engagement in two foreign language classes in a University in The United states of America. The participants in this research were young adults. The students used the iPads for thirty to forty-five minutes for ten weeks. Questionnaires were later given to the students to explore their perception of their learning. The results showed that the students not only enjoyed using the iPads to learn but also believed that it helped them learn. Diemer et al., (2012) also found that the use of iPads in the classroom increased student's perceptions of their engagement and in turn positive effect on student activity and collaborative learning.

Furthermore, a study by Couse and Cohen (2010) explored the capability of tablets in early childhood education by investigating children's use of these tablets and how it engaged them to draw. It was found that the children were very engaged with the tablets and were at ease with the stylus for drawing. Even when issues arose from using these technologies, it was observed that the children persisted. Swan et al., (2007) investigated the impact of handheld devices on student's learning in one to one computing classes. Their results showed the students motivation and engagement was increased in comparison with students who attended regular classrooms. Haugland (1999) study found that motivation of young children increased when learning was paired with the use of computers, it can be said that engagement in the learning process was directly linked to motivation (Couse and Chen, 2010).

These research studies mentioned above studied children use of iPads and its impact on their engagement. However, few of them recorded the engagement of children's

learning without comparing it to their non-digital learning (non-digital activities). For example, research conducted by McKenna (2012) compared the levels of engagement in learning with iPads with traditional methods of teaching and learning which is similar to the methodology of this research (see chapter three). The difference with my research is that I will be making use of structured and less structured observations. Also, the others studies did not mention in what ways their participants were engaged instead they discussed engagement as a whole. For this research, behavioural, emotional, cognitive and social engagement will be explored.

2.9 SUMMARY

To summarise, this chapter acknowledged that digital technology is a social phenomenon and its dominance in homes, schools and organisations cannot be ignored. It further discussed the debate surrounding children's use of digital technology and how it impacts their play and engagement. Contrary to the issues raised by popular media, research studies have shown that the lives of children between 0-8 years are not dominated by digital technology (Stephen and Plowman, 2014). However, the issue revealed is that there is a difference in how early childhood practitioners view play with digital and non-digital activities and this brings about debates concerning what play is in a 'traditional' context and a digital context. However, how children view play is what is more important. Children have the intrinsic motivation to play and explore and they can learn through play (Singer and Singer, 2005). Therefore, if resources for play (digital and non-digital) are designed to motivate their interests, increase their desire to play and explore, they will be able to develop their love for play and learning, attention, creativity and curiosity and self-direction (Bredekamp, 1997). Also understanding how they engage with these devices and if there is a difference in their interactions with digital and non-digital activities should also be the focus of early childhood research. This chapter also highlighted different research studies that have been conducted on

digital technology and its impact on engagement. Research evidence as discussed above has shown that engagement can occur with digital devices. However, there is still relatively limited research that looks at the different ways children engage with digital devices and whether this engagement/ interactions are patterns of play. This thesis aims to examine these issues with the following research questions:

1) In what ways are children engaged while interacting with digital and non-digital activities?
2) Do children exhibit similar or different patterns of interactions between digital and non-digital activities?

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the research design process, research questions and methodology of this mixed methods study. The aim of this research is to explore children's engagement and interactions with digital and non-digital activities and their patterns of interactions with these activities. In order to address this research aim, a mixed method approach was adopted using the FraIM (Frameworks for an Integrated Methodology) (Plowright, 2011). The FraIM is a framework designed to support the integration of different elements of the research (structured observation and less structured observation) to ensure a successful study. In this chapter, details of the justification for adopting mixed methods and explanation of pragmatism that underpins this approach will be given. It continues with descriptions of the specific mixed methods designs and sampling techniques used. A description of the data collection tools follows which indicate why they were chosen and how the tools will be used to gather the data. Data analysis procedures, ethical issues including validity issues are also discussed.

3.2 JUSTIFICATION FOR MIXED METHODS METHODOLOGY

According to O'Leary (2010), a mixed method approach adopts aspects of quantitative and qualitative methods to address the shortcomings of both methods. A mixed methods approach is necessary in circumstances where neither qualitative nor quantitative methods would answer the research questions satisfactorily. As the aim of this study is to explore the different ways children are engaged with digital and non-digital activities and their patterns of interactions with these activities, quantitative method will be appropriate to measure and compare the children's level of engagement with digital and

non-digital activities and uncover patterns in the children's interactions. However, it will not provide a rich and detailed picture of the different ways children can be engaged. This is why qualitative methods will also be employed in this research. The major advantage associated with using mixed methods in this research is the corroboration of results between methods. Therefore, the quantitative and qualitative perspectives gathered in this mixed methods study are imperative in order to "obtain different but complimentary data on the same topic" (Morse, 1991:22) to answer the research questions.

3.3 RESEARCH DESIGN

Research design can be defined as "a set of advance decisions that make up the master plan specifying the methods and procedures for collecting and analysing the needed information" (Burns and Bush, 2004: 120). It focuses on research methodology, data collection methods and data analysis (Roberts-Holmes, 2011). It also provides a framework for the collection of the data. The research design for this research is the FraIM: Frameworks for an Integrated Methodology which was developed by David Plowright (2011) and it will be used in this study as it is appropriate for small scale studies like this one. Fig 3.1 below illustrates the framework for this research and the following sections explain the framework in details.

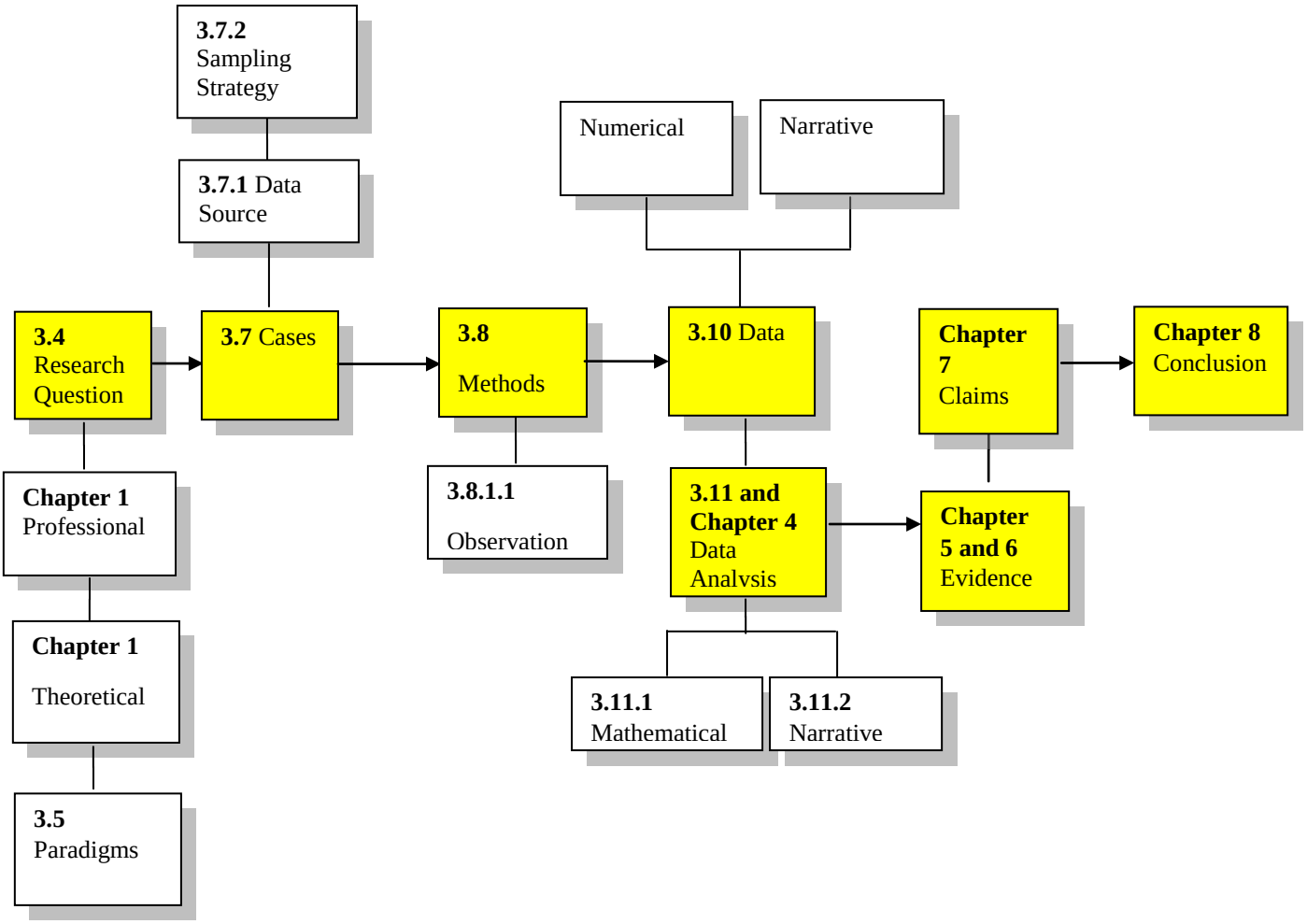


Figure 3.1 The FraIM structure for this research.

3.3.1 THE FraIM (FRAMEWORK FOR AN INTEGRATED METHODOLOGY)

The FraIM is designed to help researchers carry out small scale empirical investigations of educational and social issues (Plowright, 2011). The aim of the framework for this research study is to support the integration of different elements of the research process to ensure the successful study of children's engagement and interactions with digital and non-digital activities. Integration in this research means to combine and structure quantitative and qualitative approaches coherently. The beginning point of the FraIM design is the research questions. This is followed by the discussion on the philosophical paradigms underpinning this research. It then discusses the cases, methods and data analysis procedures. Also, the FraIM rejects traditional dichotomy between qualitative

methods and quantitative methods and does not force a particular philosophy on a researcher (Plowright, 2011). Instead it encourages an accommodating view point on answering the proposed research questions and finding a solution to an important issue (ibid).

3.4 RESEARCH QUESTIONS

The beginning point of the FraIM is the research questions (Plowright, 2011) (See Figure 3.1). To embark on this research, considering the importance of the research questions will provide guidance for the research process (Cohen et al., 2011). Bassey (1999: 67) defines research questions as “the engine which drives the train of enquiry". Robinson and Lai (2006) also define it as the anchor for planning research because it provides important clues on how to make research decisions. The questions for this research were formulated within professional and theoretical context (Plowright, 2011) (See Chapter 1: Section 1.2). As a result, the research questions for this study are as follows:

1) In what ways are children engaged while interacting with digital and non-digital activities?
2) Do children exhibit similar or different patterns of interactions between digital and non-digital activities?

3.5 PHILOSOPHICAL UNDERPINNINGS OF MIXED METHODS RESEARCH

Research differs in terms of their paradigms, epistemology, values and methods. When it comes to combining them, social researchers have argued against this citing the differences in their nature (Guba and Lincoln, 1994; Hughes, 1990; Kuhn, 1970). The problem that mixed methods researchers face is finding a rationale for combining quantitative and qualitative data in the face of seemingly incompatible paradigms that underpin them (Hall, 2013). For these reasons, possible philosophical positions that

mixed methods researchers can employ in their studies have been suggested in relevant literature. Some argue that a research study can combine a multiple paradigm stance whereby a researcher can adopt more than one paradigm such as positivism and interpretivism in their research (Teddlie and Tashakkori, 2010). However, there are also single paradigm approaches that can be adopted in a mixed method research such as pragmatism. Therefore, in the analysis of the philosophical foundations underpinning research, this section will provide a brief discussion on the positivist approach (quantitative), the interpretive/constructivist approach (qualitative) and the pragmatist approach (mixed methods). It will also provide the reasons why the pragmatic approach will be more suitable for this mixed method research.

3.5.1 THE POSITIVISM PARADIGM

Due to the significant transformation that the natural sciences (physics, chemistry and biology) were undergoing in the 18th and 19th century, French philosopher Auguste Comte, adapted the methodology of the natural sciences in social sciences and termed it positivism (Tekin and Kotaman, 2013). The positivist approach used to be the prevailing paradigm used in social sciences in the late 19th century and throughout the first half of the 20th century (ibid). It is defined as a scientific methodology that aims to reach the laws of human behaviour and social life (Kincheloe and Tobin, 2009; Onwuegbuzie, 2000). The main purpose of this paradigm is to reach objective truths and in order to reach this objective truth, the methodology used has to also be objective (Tekin and Kotaman, 2013). Therefore, the positivist approach depends on the assumption that a researcher should separate his or herself from what is being researched so as to be objective and that the objective and extrinsic truths exist can be reached through scientific inquiry or methods (ibid). The aim of these methods is to measure, quantify or find the extent of phenomenon (Mukherji and Albon, 2010). Some of these methods are questionnaires, structured observations and surveys. The

researcher identifies a set of hypothesis or research questions and uses these methods to collect numerical data. These data are then analysed to prove or disprove the researcher's hypothesis or answer the research questions (MacNaughton, 2010). In addition, the sample size in quantitative research tends to be relatively large compared to qualitative research. This is to make certain that the statistical methods used ensure that the samples can represent the population that they are drawn from. Reliability and validity are considered important in quantitative research because positivists believe that results are independent of the impacts of time and space therefore making them generalizable (Tekin and Kotaman, 2013). Hence, their means of measurement should accurately measure what was intended and the results should be replicable (Golafshani, 2003).

For this research, the positivist approach was considered because of the nature of the numerical data that will be collected. However, this approach is not very comprehensive alone for this research because it will not provide means to examine human behaviour in an in-depth manner. To understand the different ways children are engaged with digital and non-digital activities, quantitative means will not be enough. Children cannot be studied objectively and dispassionately. I have to immerse myself in the situation to get a good understanding of the context. Therefore, it is pertinent to say that this research has an interpretive approach and positivism will not be considered as the philosophical approach in this research.

3.5.2 THE INTERPRETIVE PARADIGM

The interpretive paradigm is a paradigm that "concentrates on the meaning of social interactions" (Tekin and Kotaman, 2013: 84). Interpretivists believe that reality is constructed by social actors and that their backgrounds, experiences and assumptions contribute to this reality (Wahyuni, 2012). Hence the aim of the interpretive paradigm is

to gain understanding of the meaning of social realities for those experiencing them (Noblit and Eaker, 1987). By doing so, the researcher has to be part of what is being researched; thereby making the researcher and what is being researched inseparable (Johnson and Christensen, 2014; Mack, 2010; Tekin and Kotaman, 2013). They also believe the researcher is part of what is being researched and interpretation is required to see in depth into the issue or phenomenon being researched, therefore subjectivity is required. This can be seen in the methods used in collecting data. Interpretivists research employs less structured methods of collecting data which is different from the positivist approach that makes use of quantitative methods (ibid). They prefer to work with qualitative data because it provides in-depth and rich descriptions on what is being researched (Maykut and Morehouse, 1994). Therefore, qualitative research focuses on describing experiences, exploring the nature of an issue and asking how meaning can be constructed (Coolican, 2004).

Furthermore, in contrast to positivism, interpretivism emphasises gaining deep insight into an issue as opposed to being able to make generalisations about the world (Mukherji and Albon, 2010). The generalisability of qualitative research cannot be applied to a wider population beyond the particular context from which the research was conducted because of its lack of scientific procedures for verifications (Mack, 2010). It tends to be difficult to repeat because of its occurrence in the natural setting. As a result, Wiersma (2000) stated that the traditional ideas of reliability and validity of research may present some difficulties for interpretive researchers. However, Wiersma (2000, 211) argues that "a well organised, complete persuasive presentation of procedures and results enhances external reliability". Also, Mack (2010) adds to this argument stating that interpretivists can take an objective stance when analysing collected data by bracketing their assumptions which helps them look at the data thoroughly. This informs the researcher about the issue been researched instead of his or her own

perceptions. Another threat to validity in qualitative research is researcher bias. Johnson and Christensen (2014) state that this tends to result from allowing personal views to influence data collection and interpretation. However, they suggest two strategies for overcoming researcher bias. Firstly, they state that one way to understand bias is reflexivity, which means that the researcher actively engages in critical self-reflection about his or her potential biases and predispositions. Secondly, they put forward another strategy to reduce the effect of bias called negative-case sampling. This means that the researcher attempts to carefully and purposefully search for examples that disconfirm their expectations about what they are studying. Another major difference between quantitative and qualitative research is the process of data collection and analysis. Qualitative research makes use of written data and subjective analysis while quantitative research relies on numerical data and statistical analysis (Gall, Gall and Borg, 2002). Therefore, there are certain questions that qualitative research can answer that quantitative cannot answer and vice versa.

Therefore, it is pertinent to say that although this research has an interpretive approach because the focus of this research is to observe in detail the different ways children engage with digital and non-digital activities, this research will also be making using of quantitative method thereby not making it suitable for this research. That means that a paradigm that supports the combination quantitative and qualitative methods is what is more suitable for this research.

3.5.3 PRAGMATISM

Pragmatism is a philosophical movement that began during the latter decades of the 19th Century by the American philosopher Charles Sander Peirce (1839-1914). It was later elaborated by Williams James (1842-1910), John Dewey (1859-1952), George Herbert Mead (1863-1931) and Arthur F. Bentley (1870-1957). Research for these pragmatists

began with a desire for a better world (Wolfe, 1999). Pragmatism is one of the recognised philosophical paradigms for mixed methods research because it presents a set of assumptions about the knowledge that underpins mixed methods approach (Denscombe, 2008). This paradigm is viewed as 'one best' for mixed methods because it allows a researcher to use multiple ideas that work and its flexible ways in combining different methods (Creswell and Plano-Clark, 2011). It also allows a researcher to use different methods to answer research questions instead of getting entangled in philosophical debates about what approach is better (Suter, 2005). This allows mixed methods researchers to delve further into a dataset to understand its meaning and use one method to verify findings from another (Onwuegbuzie and Leech, 2007). Its focus is not to question the ontology and epistemology as the first step of the research process; rather it focuses on answering the research questions.

However, the debate surrounding qualitative and quantitative research has had researchers taking sides instead of coming to agreement that any method or paradigm can be used in a research study. Pragmatism is not dedicated to a single philosophy therefore mixed method researchers are allowed to adopt what paradigms, methods, procedures and techniques that best meet the needs of the research purposes (Cherryholmes, 1992; Murphy, 1990). Pragmatists ascribe to the philosophy that "the research question should drive the methods used, believing that epistemological purity does not get research done" (Miles and Huberman, 1994:21). Pragmatism helps the researcher to be flexible in their methods to investigate as they attempt to address a range of research questions that arise (Onwuegbuzie and Leech, 2005). Pragmatic researchers are able to use qualitative methods to inform the quantitative portion of their research and vice versa because they have given room for flexibility in the techniques that they employ in addressing their research questions (Onwuegbuzie and Leech, 2007). Johnson and Christensen (2014) argue that although it is important not to

influence what is being researched, it is also important to understand the insiders' meanings and viewpoints.

Therefore, this research is a mixed methods study which is underpinned by the pragmatists' paradigm and is in a better position to use the quantitative portion of the research to inform the qualitative portion (Onwuegbuzie and Leech, 2007). Pragmatism corresponds to the FraIM that is; it focuses on the research questions to determine the research framework rather than question the ontology and epistemology as the first step of the research (Wahyuni, 2012). Therefore, the observation checklist was employed as the quantitative approach in which data collected will be analysed numerically. The less structured observation which is the qualitative approach was employed to complement the quantitative approach. The qualitative method is appropriate for this research because it will give insight into the under-researched of the different ways children under the age of five years engage with digital technology. However, using only a qualitative research methodology can be time consuming. To write down every day how the children are engaged with iPads would be hectic although it would yield rich information not obtainable from numerical data. Therefore, I employed the use of both quantitative and qualitative approaches to be able to observe the children's engagement with digital and non-digital activities and their patterns of interaction. This enabled me to delve deep into a dataset and to use one method to verify findings from the other method (Onwuegbuzie and Leech, 2007). Furthermore, one of the weaknesses of qualitative research is the researcher's influence and personal bias on the results (Johnson and Christensen, 2014). However, since the quantitative method can prevent researcher bias, the strength of this method in this research supported the weakness of qualitative research. The results from the quantitative research if similar to the quantitative results improved its validity and reliability. It is therefore pertinent to say

that a mixed methods approach was suitable for this research because it made use of both standardised techniques and less structured techniques.

3.5.4 AXIOLOGY

Axiology has to do with the researcher's values in the research process (Tomar, 2014). Values influence the research process and how the results will be valued. Positivist researchers are of the opinion that inquiry is free of value while interpretivists researchers are of the belief that inquiry is value bound (Lincoln and Guba, 1985). The axiological perspective underpinning a mixed method research accepts that many "goods" may emerge from the research and that "propositional knowing about the world as an end in itself is intrinsically valuable" (Guba and Lincoln, 2005:198). Values held by a researcher can have an impact on the research even though they may try not to influence the results of their research. Therefore, it is pertinent to say that my values may influence the process of this research. It could also have an effect on the outcomes.

As the purpose of this research I s to explore children's engagement and interactions with digital and non-digital activities, my value for this research translated directly to a change in the way iPads will be viewed; not as a device that is detriment to children's development, play and learning but as a device that engaged children in play and learning. Through recognising the relevant values, I averted them from being an obstacle during the research process. By identifying the relevant values, I avoided them becoming a hindrance and sustain the structure of the research design.

3.5.5 ONTOLOGY

Ontology has to do with understanding various ways of observing the world (Thomas, 2009). It is how researchers understand the nature of reality (Biddle and Schaft, 2014). The ontological position underpinning mixed methods research is that of critical realism where reality is "imperfectly and probabilistically apprehensible" (Guba and Lincoln

2005:1983). Moreover, the ontological stance of pragmatism puts forward that there are a singular and multiple realities that are open to empirical inquiry (Creswell and Plano-Clark, 2011). It also familiarises itself with solving practical problems in the real world (Feilzer, 2010) instead of revolving around assumptions about the nature of knowledge (Hall, 2013). Therefore, this research sought to find out if children interacted and engaged differently with digital activities compared to non-digital activities.

3.5.6 EPISTEMOLOGY

Epistemology concerns itself with the relationships between the knower and what is known (Biddle and Schaft, 2014). It is defined by Blaikie (2000) as the way of gaining knowledge of a social reality and whatever it is understood to be. It is portrayed as the relationship between the known world and the researcher (Palaiologou, 2013). According to Wahyuni (2012), interpretivists are of the opinion that the known and the knower are inseparable while positivists are also of the opinion that what is known and the knower are independent. The epistemological position underpinning a mixed method research is that knowledge is subjective and is generated through critical appraisal of multiple sources (Wahyuni, 2012). The epistemological position of pragmatism emphasises gathering of data that addresses the research questions (Creswell and Plano-Clark, 2011). Therefore, quantitative and qualitative methods were used in this research study to answer the research questions.

3.6 MIXED METHODS RESEARCH

As was shown in Section 3.3 Figure 3.1, next on the FraIM is the methods chosen for this research. As mentioned earlier, I made use of the mixed methods approach to explore children's interactions with digital and non-digital activities. Teddlie and Tashakkori (2010:5) have defined mixed methods as "the broad inquiry logic that guides the selection of specific methods and that is informed by conceptual positions

common to mixed methods practitioners". A broader definition was provided by Creswell and Plano Clark (2011:5) and they defined mixed methods as follows:

> *"Mixed methods research is a research design with philosophical* assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in phases of the research process. As a method, it focuses on collecting, analysing and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is the use of quantitative and qualitative approaches, in combination, provides a *better understanding of research problems than either approach alone".*

This definition suggests that qualitative and quantitative data collection and analysis is what entails a mixed methods research. Although different authors have put different emphasis into their definitions, there is a general agreement that mixed methods is about combining different methods in a research to help understand a research problem or answer a research question. In addition, it works with integrating both qualitative and quantitative methods and numeric and narrative data to meet the needs of the researcher and answer research questions suitably (Teddlie and Tashakkori, 2009). The basis of this approach is that combining quantitative and qualitative approaches can provide in-depth understanding of research questions than either approach alone (Leech and Onwuegbuzie, 2009). It rapidly becomes clear that to be able to use this design, one must understand both qualitative and quantitative methods of research (Johnson and Onwuegbuzie, 2004).

Although the term mixed methods is commonly used to describe the use of both quantitative and qualitative methods, it can also be applied to studies that involve different quantitative methods only such as surveys and questionnaires, and qualitative

methods only, such as observations and interviews (Morse, 2003). However, there has been an ardent dispute with the advocates of qualitative and quantitative research paradigms due to the fact that not all authors agree mixed methods approach is appropriate for research (Johnson and Onwuegbuzie, 2004). According to these authors (Smith, 1983; Guba, 1987; Lincoln, 1990, 1994), researchers who try to combine the two methods are likely to fail due to the inherent differences because of the paradigms that underlie them. However, the opposing view is that the differences between the two paradigms have been "overdrawn" and the schism is not as wide as has been portrayed (Tashakkori and Teddlie, 1998). It has rapidly become clear that both sides view their paradigms as the ideal for research. Quantitative (positivists) believe that research in social sciences should be objective and that educational researchers should eradicate every trace of bias and remain emotionally detached with the objects of their study (Maxwell and Delany, 2004; Popper, 1959). However, qualitative purists (interpretivism) argue that the knower and the known cannot be separated because the subjective knower is the only source of reality (Guba, 1990). Despite the debate surrounding this issue, proponents of mixed methods research call for an integration of both methods even though positivists and interpretivists are not comfortable with the idea (Feilzer, 2010). As a result of this, researchers are left to construct an alternative framework that accommodates the diverse nature of such research (Creswell and Plano Clark, 2011).

The goal of mixed methods research in this study was not to replace either qualitative or quantitative methods but to draw from their strengths in a single research framework (Johnson and Onwuegbuzie, 2004). Quantitative and qualitative research should not be viewed as approaches in opposition with each other but instead they can be complementary to each other (Aubrey et al., 2000). Gaining understanding of the strengths and weaknesses of both research methods helps the researcher to be able to

mix strategies to use (Johnson and Onwuegbuzie, 2004). This is what Johnson and Turner (2003) call the fundamental principle of mixed research. According to that principle, researchers should gather data making use of different methods and approaches in a way that the results gained will result in complementary strengths and non-overlapping weakness. Yin (2009:63) also puts forward that "mixed methods research can permit investigators to address more complicated research questions and collect richer and stronger array of evidence that can be accomplished using a single method alone".

There are seven major types of mixed method designs and they are:

1) Convergent Design
2) Embedded Design
3) Explanatory Design
4) Exploratory Design
5) Embedded Design
6) Transformative Design
7) Multiphase Design

(Creswell and Plano-Clark, 2011).

In this study I will only be making use of the convergent design which will be discussed below. The **Convergent Design** is a mixed method approach whereby a researcher triangulates research methods by directly comparing and contrasting quantitative results with qualitative findings for corroboration or validation purposes (Creswell and Plano Clark, 2011). This design works well with pragmatism according to Creswell and Plano Clark (2011) because it allows a researcher to merge two approaches in one research study. The design started with the gathering of both the quantitative data and the qualitative data. The data are then analysed separately from each other. Once this is

done, the results are merged and this merging includes comparing the results. However, to answer the second research question, 'Do children exhibit similar or different patterns of interaction with digital and non-digital activities?' **Data-transformation** which is a variant of the convergent design allowed qualitative data to be transformed to quantitative data (Creswell and Plano Clark, 2011). It was used in this research to transform the qualitative data set in this research to quantitative data set. This transformation allowed the results to be mixed during analysis so as to investigate the children's patterns of interaction from both quantitative and qualitative data.

3.6.1 VALIDITY ISSUES WITH MIXED METHODS RESEARCH

To be considered valid, research has to meet a set of conditions or criteria that determine the quality of the process of the data collection and results (Bryman, 2008). Mixed methods research has to with mixing quantitative and qualitative methods and paradigms characteristics in a research study (Johnson and Onwuegbuzie, 2004). The goal of mixed methods research in this study was to draw from the strengths of both qualitative and quantitative methods in a single research and not to replace either of these approaches (ibid). However, there are some limitations to mixing methods in a research study. Firstly, it is wondered how far mixed methods researchers analyse and interpret their research in a way that both quantitative and qualitative components are mutually illuminating (Bryman, 2007). This is why it is important for a researcher to take careful consideration of the particular assumptions and rules regarding their conduct because corruptions of those methods can occur in ways that the results obtained can become subject to question (Bazeley, 2002). It is also important for a researcher to have knowledge of quantitative and qualitative research and the paradigms that underpin them before embarking on mixed methods research so that they can avoid mistakes and issues with their results.

Secondly, the combination of quantitative and qualitative approaches raises the potential of validity issues (Creswell and Plano-Clark, 2011). Mixed methods enthusiasts have shed light on the issues of validity in mixed methods research (Onwuegbuzie and Johnson, 2006; Tashakkori and Teddlie, 2006). Validity in mixed methods research is defined as:

> *"*Employing strategies that address potential issues in data collection, data analysis and the interpretation, that might compromise the merging or connecting of quantitative and qualitative strands of the study, and conclusions drawn from the combination*"*.
>
> (Creswell and Clark, 2011:239).

"The concept of validity is used to judge whether the research accurately describes the phenomenon which it is intended to describe" (Bush, 2002:65). Researchers who intend to use mixed methods have been advised to be cautious when mixing methods because it can threaten the validity of results and claims due to the methodological assumptions that could be violated during the mixing (Morse, 2003). Validity is different in quantitative and qualitative research but in both approaches, it serves the purpose of correctness and truthfulness on the quality of data made from the results of a study (Johnson and Christensen, 2014). Validity in quantitative research means that a researcher can obtain significant conclusions from the results to a population and reliability means that the results can be consistent for a period of time (Creswell and Plano-Clark, 2011). In quantitative research, there four types of validity that are used to evaluate the inferences derived from the results of a study and they are internal, external, construct and statistical conclusion (Johnson and Christensen, 2014). However, qualitative researchers believe that the results of a qualitative research provided by the participants can be trusted and credible (Onwuegbuzie and Johnson,

2006; Lincoln and Guba, 1985). In qualitative research however, there is one validation approach that is used known as: triangulation. This is a "validation approach using multiple investigators, methods, data sources, and/or theoretical perspectives in the search for convergence of results" (Johnson and Christensen, 2014:299). There are also three types of validity that are relevant to qualitative research: descriptive, interpretive and theoretical validity (Maxwell, 1992). This is why there the issue of validity in mixed method research is still developing. There could be problems with representation, legitimisation and data integration (Onwuegbuzie and Johnson, 2006). Onwuegbuzie and Johnson (2006) suggest the term 'legitimisation' to be employed in the discourse of validity in mixed methods research. They believe in legitimisation checks occurring at every stage of mixed method research process because legitimisation is an ongoing process rather than a fixed characteristic of a particular study (Onwuegbuzie and Johnson, 2004). However, these types of validity mentioned above all draw from different paradigmatic perspectives (Plowright, 2011) and it is important for this mixed method study to consider the theoretical issues to avoid undermining the quality of the research.

A threat that can affect validity is researcher bias. This is an issue because qualitative research is less structured and more open-ended than quantitative research (Johnson and Christensen, 2014). However, in this research study, the quantitative method prevented researcher bias. The results from the quantitative research which is similar to the qualitative improved its validity and reliability. Also, as this research is a mixed methods research, making use of qualitative approach can be affected by researcher bias. An important approach used to limit researcher bias is reflexivity. This means that the researchers reflects critically on his or her bias thereby becoming more aware and monitor their biases (Johnson and Christensen, 2014). With this said, mixed method research should not be regarded as a "magical methodological solution for the

complexities of social inquiry" (Greene and Hall; 2010: 131). Instead, this research study did not take mixed methods research and pragmatism uncritically and blindly. From the above discussion, I have tried to understand what conducting a mixed method study entails.

I have considered the different criteria for assessing quality research and put forward that the warrantability is the appropriate criterion for this research. This criterion is suggested by the research design for this study (FraIM). As (Plowright, 2011:135) states, research is valid if it is a true account of the phenomenon that is being researched and reported. Therefore, warrantability of this research will be discussed in the following sections.

3.6.1.1 WARRANTABILITY WITH THE FraIM

The FraIM acknowledges that it is 'essential to design, plan and carry out research that will lead to credible and confident answers to the research questions' (Plowright, 2011:136). This study draws from the FraIM's warrantability as a criterion for assessing the quality of this research. Research is the way in which the claims made can be supported by the data (Thomson, 2015). The claims are based from the contexts on which the research is based upon and on the evidence from the data (Emenike, 2016). The evidence is used to support the claims and conclusions made by the research (Walliman, 2011). Therefore, this procedure facilitates arriving at conclusions which will address the research questions (Plowright, 2011). This ensured that appropriate decisions were made about how the contexts, research questions, data sources, methods of data collection, data analysis and backing and qualifying conditions contributed to the establishment of warrantability in this research.

3.6.1.2 CONTEXTS AND RESEARCH QUESTIONS

The research questions were formulated within two contexts. As discussed in Chapter 1 Section 1.2, my professional background as a teacher of young children was an important context for this study. Discussing the professional context upon which this research originated from suggests the potential perspective which is developed from this study. Also, it gives the reader an understanding of the encounters that led to the formalising of my inquisitiveness. Secondly, I also decided to draw on the theoretical context. The literature review chapter provided an examination of current and relevant debate surrounding children's interactions with digital and non-digital activities. The review explored research involving children's engagement and interactions with digital technology. This built a foundation for the argument that children can respond the same way to digital activities as they do non-digital activities and that play may not change only the context in which the play is experienced changes. The research questions were developed from an understanding of my professional background and the theoretical debate surrounding children's engagement and interactions with digital and non-digital activities.

3.6.1.3 DATA SOURCES

Suitable decisions were made about the data sources which added to the warrantability in this research. This research needed to explore children's engagement and interaction with digital and non-digital activities. The sampling decisions focused on convenience sampling because the participants were conveniently located in an early childhood setting where the research was carried out and the children had access to a range of non-digital activities. The digital activities were on the iPad which were provided by me.

3.6.1.4 METHODS OF DATA COLLECTION

Appropriate decisions were made about methods of data collection for this research. Detailed explanations of the rationale behind the choice of data collection methods are provided in Section 3.8.1. It was important to employ methods, with the appropriate degree of structure that would enable collection of data what was needed to examine the issues raised by the study.

3.6.1.5 DATA

Due to nature of this research, it was established that the data derived from this study would be numerical and narrative. This is because an overall assessment of contexts that will be provided by the numeric data is needed to investigate the children's levels of engagement and narrative data is needed to explore the different ways children were engaged and their patterns of interactions while they interacted with digital and non-digital activities.

3.6.1.6 DATA ANALYSIS

I gave careful consideration to the analysis of the narrative data. Thematic analysis was considered appropriate because of its thorough approach to identifying themes in a dataset that can be linked to the literature review. I felt that identifying themes would enable me explore types of engagement in my data. I also employed descriptive statistics to analyse the numeric data to ensure consistency of the analysis.

3.6.1.7 BACKING CONDITIONS

It was important to critically examine the process of this research at every stage because the decisions made about the contexts which formulated the research questions, cases, methods, data and analysis determined the trustworthiness of the claims that were made at the end of the research process. Therefore, according to Plowright (2011), my

research is able to refer to the professional and theoretical context of my research in order to backup and support my conclusions, that is, my warrant. The literature review is able to support my interpretation of the numerical and narrative data.

3.6.1.8 QUALIFYING CONDITIONS

Plowright (2011) points out that a researcher should always be open to alternative explanations and reasons for the result of the research. He argues for not immediately accepting the explanation that my research or other research has offered (ibid: 143). Gorard and Taylor (2004) suggest that inferences made should always foster scepticism, that the researcher should also be critical of the results. In this study, the results were measured against alternate or different explanations to arrive at the warrantable claims. These were the qualifying conditions that enabled the researcher to arrive at the conclusion that I did at the end of the research.

3.7 CASES

As outlined earlier, the aim of this research was to examine the children's engagement and interactions while interacting with digital and non-digital activities. To be able to investigate this, I made use of the FraIM designed by David Plowright (2011). The FraIM designed for this research (Figure 3.1) states the next stage of this research after research questions and paradigms is to look at the process of data collection. With the research questions formulated, it was apparent that this research would involve two sources of information. These sources would provide the data for this research. Cases according to Plowright (2011) capture the wide range of data sources that are used in research. The first level of cases is referred to as Data source management which decides the approaches that are going to be used for managing the sources of data (ibid).

3.7.1 <u>DATA SOURCE MANAGEMENT</u>: There are three approaches that are used for managing the sources of data and they are case study, experiments and surveys. In this research the case study approach will be used. A case study approach is the study of a single case that is associated with one or a few participants (Bryman, 2008). Creswell (2007) views it as a type of design, a methodology and a product of inquiry. It is also an in depth investigation which uses different methods to collect various kinds of information and to make observations (Hamsel et al., 1993). Also, Green et al., (2005) state that case studies are studies that can merge methods that gather and represent human phenomena with numbers such as questionnaires with methods that gather and represent human phenomena with words such as interviews and less-structured observations. A case study is suitable for going in-depth to discover detailed interactions between children and iPads operating within a narrowly defined context in a single early childhood setting (Robert-Holmes, 2011).

The decision to select a case study approach derived from the fact that this research focused on a nursery where there an in-depth data collection involved more than one source of information (open-ended observation and structured observation). This case study allowed me to observe the participants in their natural setting and explore how the children interacted and engaged with digital and non-digital activities. It was employed so as to capture the voice of the child. There are three types of case study and they are: single instrumental case study, collective or multiple case studies and the intrinsic case study (Johnson and Christensen, 2014). This study is a single instrumental case study because it focused on an issue with a bounded case to illustrate that issue. This case study refers to a single nursery in Canterbury where this research was conducted and the participants were fourteen young children between the ages of three and four years old. This is derived from the difficulties that occurred in obtaining permission from other nurseries. Due to the FraIM structure, the sampling for this research is discussed in

detail in Section 3.9.1.1. The participants were fourteen young children between the ages of three and four years old.

According to Plowright (2011), there are a number of characteristics that identify a case study in the FraIM design and they are number of cases in research, degree of control and ecological validity.

3.7.1.1 NUMBER OF CASES: It is important to take into account the number of cases in the data source when carrying out a research study. There are a number of issues that are associated with the number of cases in a research. These issues are logical and methodological. Logical issues include the geographical locations of where the data will be collected. The fewer the cases and geographical locations, the easier it is for the researcher to contact the participants. This research did not have any issues with geographical location because the cases were fourteen participants who attended the same nursery. Methodological issues are the quantity of in-depth information that can be gathered from the cases and the degree of generalisability that can be made about the inferences from the data collection (Plowright, 2011). The more cases drawn from the data of a research study, the more limited the amount of in-depth gathered from the data (ibid). Therefore, for this research, there were only a few number of cases which in turn provided large amount of in-depth detail. However, generalisability was restricted and limited.

3.7.1.2 DEGREE OF CONTROL: This has to do with the control that a researcher has over the cases that are allocated to a group in a research. Plowright (2011) argues that in a case study, the researcher may have limited or no control over case allocation to groups because a case study usually consists of a few participants. The only choice that is considered is where the research would take place and why. Therefore, for this research I was able to choose where the research would take place but I did not have

control over choosing the participants of the study during the research because I had to gain permission from the nursery management team. My participants were chosen based from the permissions I was given by the parents. This will be discussed further in Section 3.9.2.

3.7.1.3 ECOLOGICAL VALIDITY: This refers to the degree of naturalness of the research location and situation (Plowright, 2011). A case study approach to data source management uses a naturally occurring situation which is not constructed for research purposes (ibid). It is important that the research should not interfere in the natural situation occurring in the early childhood setting. Therefore, for this research, classroom activities were not disrupted because my observations focused on the children's digital and non-digital activities. This resulted in relatively high levels of ecological validity.

3.7.2 SAMPLING STRATEGY: In a research study, the sample chosen is to obtain information about the study population. It was not possible to observe every child in Canterbury or the United Kingdom in a short period, so instead I gathered data from the sub-set of the population. There are two types of sampling and they are probability and non-probability sampling (Fogelman and Comber, 2007). Probability sampling is the random selection of participants while non-probability sampling is the particular selection of a group with the knowledge that the group is not a representative of the wider population (Cohen et al., 2011).

In this research, non-probability sampling was appropriate because the choice of cases was not a random selection. It was based on the criteria that provided a sample that met the particular needs of this research study (Plowright, 2011). The cases do not represent the chosen participants outside this research. The participants were chosen for this research because they contributed directly to the research questions. Convenience sampling which is a sub-set of non-probability sampling was appropriate for this

research because the participants were conveniently located in an early childhood setting in Canterbury.

3.8 METHODS

This section focuses on the methodological tools and the data collection that were used in this research. For this study, observation checklist and less-structured observation were used. Quantitative data was collected first using the Leuven scale of engagement to measure children's level of engagement with digital and non-digital activities with observation checklist (Scotland's National Centre for Languages, 2012) and qualitative method to write down in details the ways in which the children are engaged. When the data for both methods were collected and analysed, they were compared. This helped me to explain and expand the quantitative data thereby removing bias and improving its validity. I needed the qualitative data to explain the quantitative results and add insights to them.

3.8.1 METHODOLOGICAL TOOLS

3.8.1.1 OBSERVATION

Observation can be defined as "the watching of behavioural patterns of people in certain situations to obtain information about the phenomenon of interest" (Johnson and Christensen, 2014: 236). This method has been the traditional method for researching young children (Fargas Malet et al., 2010). This tradition is emphasised by the EYFS (2012) which places observations as the starting point for learning about how children develop, play, learn and interact with others. In early childhood research, observations are used in gathering data that can be both qualitative and quantitative (Mukherji and Albon, 2011). This decision is made depending on the research question that is being investigated. Observations when used appropriately can provide information about a particular child or a group of children to be able to understand their behaviours as well

as create learning activities that will be suitable for their needs (Mukherji and Albon, 2011; Rolfe and MacNaughton, 2001). It is important to observe children because it enables early childhood practitioners to gain a greater understanding of their needs because if their needs were met effectively, their unique abilities can be recognised and help them grow into better adults (Riddall-Leech, 2008).

The voice of the child in educational research has become increasingly important. The view that children are capable of being active participants means that there has been an emergence of participatory research methods, informed by the view that research should be with or for children, rather than on children. Research conducted with the observation method can take place in a naturalistic setting such as classrooms and playgrounds (Keenan and Evans, 2009; Johnson and Christensen, 2014). As this study is a case study, it is pertinent to say that the observations took place in the natural setting of the participants which was their classroom. Observations were useful in this research because it allowed me as a researcher to observe the children in person rather than using questionnaires and surveys. I was able to watch the children in the moment, observe their behaviours with the iPad and with each other and note down the interesting things they did with the iPad.

Before going on to explore further how observation method will be used to answer the research questions, the strengths and weaknesses of observation will be discussed briefly. Observation enables the researcher to collect data in different ways depending on the goals of the study (Simpson and Tuson, 2003). It allows the recording of actual behaviour that takes place (Johnson and Christensen, 2014) that can go unnoticed if another tool was used (Cooper and Schindler, 2001). However, there are some disadvantages with the observation method. A researcher has to make decisions about what to record and if not they can miss important events that occur (Mukherji and Albon, 2010). This is because a lot can be going on during the observed period and it is

up to the researcher to know what exactly to note down. If not, it is possible to note down events that may not be useful for the research. Also, Reinharz (1997) states that the life experiences of a researcher can affect what they focus on when they are observing. It is therefore the researcher's duty to avoid personal speculations, be reflexive and to be empathetic but neutral to what is being observed (Johnson and Christensen, 2014). Mukherji and Albon (2010) suggest that using structured observations as a form of observation can overcome this disadvantage to an extent.

3.8.1.1.1 STRUCTURED OBSERVATION

The purpose of the structured observations is to give a numerical data in order to improve reliability of findings (Johnson and Christensen, 2014; Mukherji and Albon, 2011). It involves the following: who is observed, what is observed, when the observations take place, where the observations are carried out and how the observations are to be done (Johnson and Christensen, 2014). Researchers conducting structured observations use a checklist as a data collection instruments. Observation checklist is used to record the activities of a child or a group of children (Sharman at al. 2007). Structured observation can also involve observational sampling techniques, such as time sampling, event sampling and snapshot techniques (Johnson and Christensen, 2014). This study made use of time sampling which involved observing children during time intervals specified in advance, and recording what they did every minute for a short time (Sharman et al., 2007). I recorded the children's levels of engagement every two minutes. The minutes on the observation checklist in Appendix 5 Page 355 are just an example of what the researcher used when observing the participants.

In the FraIM, structured observation is also considered as high degree of structure because it makes use of a coding schedule (Plowright, 2011). Categories of behaviours that are observed are encoded and the researcher's stance cannot influence what is

recorded during the data collection (ibid). For this research, an observation checklist making use of closed coding was created using the Leuven scale of engagement (SCILT, 2012). I observed and recorded specific aspects of engagement using the pre-coded checklist. The Leuven scale which is in Appendix 4 Page 354 had a five-point scale to measure engagement from extremely low to extremely high. I observed the children based on this scale and recorded from extremely low to extremely high how engaged they were while interacting with digital and non-digital activities. It was an individual observation for each child. The checklist was supported by short written observations which allowed me to comment on any important event that occurred during the observation. The observation checklist used in this research thesis can be seen in Appendix 5 Page 355.

3.8.1.1.2 THE LEUVEN SCALE OF ACTIVE ENGAGEMENT IN LEARNING

The Leuven scale of engagement was developed by Professor Ferre Laevers and his research team. He created the five-point scale to measure active engagement from extremely low to extremely high (Kenny, 2010; Laevers, 2005). Engagement refers to being intensely motivated and engaged in learning activities and this is considered to be a necessary condition for deep level learning and development (Bertram and Pascall, 2008). I used the Leuven Scale of Engagement in Appendix 4 Page 354 to measure the children's level of engagement with digital and non-digital activities. The evidence of engagement was obtained through observing the children's behaviour and judging the level of engagement while they were engaged in an activity. Using this technique improved my skills in observing the signals of active engagement in learning. It also helped me to better understand how children learn and gain direct insight into which teaching, environment and strategies are more successful in engaging children.

3.8.1.1.3 LESS-STRUCTURED OBSERVATION

Less structured observation involves a researcher observing relevant experiences and noting what is observed as field notes (Johnson and Christensen, 2014). It is also considered as low degree of structure in the FraIM design and is a naturalistic approach to observing behaviour that occurs in the participants' natural location (Plowright, 2011). The research is usually guided by the aims and purpose of the research that they observe at that time (Mukherji and Albon, 2011). Using less structured observation gives room for less predictability in the data collected because open coding will be used giving the researcher the opportunity to choose how the data will be analysed (Plowright, 2011). Researchers record what they observe and believe is important in their field notes. The less structured observation tool was used to record the participants' engagement and interactions with digital and non-digital activities which can be seen in Appendix 6 Page 356. It is very different from the observation checklist because here I described extensively what was observed in the setting and then compared what was observed with the data from the observation. This helped me discover the different ways the children were engaged with digital and non-digital activities.

3.9 RESEARCH IMPLEMENTATION

3.9.1 SAMPLING PROCEDURES

The decisions taken in the sampling decisions are discussed in the following below.

3.9.1.1 SELECTION AND LOCATION OF THE NURSERY

The nursery where this study was conducted provided a convenience sampling located in Canterbury, England. Convenience sampling is a common sampling that involves selecting a population because of its ease of proximity or accessibility to the researcher

(Creswell, 2007). I decided to approach nurseries located within Canterbury due to the implications of travelling costs for conducting the research in several cities. One of the criticisms of convenience sampling is that the population under study may not be suitably representative and in the case of this research, valuable information may be missed from other nurseries in other locations. However, this research is a starting point for more research about children's engagement with digital technology and it is hoped that research involving nurseries in other locations is able to build on it.

At the onset of this research, the iPad was to be introduced as an intervention and two nurseries were to be observed. In the first nursery, the participants would be the Experimental Group and in the second nursery the participants would be the Control Group. To gain access to these nurseries, I emailed and visited a number of nurseries, explaining my research to the managers and requesting their permission to carry out my research. Unfortunately, I was able to gain access to just one nursery meaning I had to continue the research process with one nursery. I decided to focus on this nursery and instead have the Experimental and Control Group within this nursery. I intended to have these two groups so as to compare engagement with digital and non-digital activities between the groups. This will be explained further in the Prologue Page 94. Having being given an early positive response by the manager, I knew it was important to seek permission formally before embarking on the research. Burton et al (2009) suggested three levels of access to be negotiated before embarking on a research. The first is to gain the manager's consent to perform the research; secondly to meet the ethical requirements of the educational institution where the study is conducted and lastly to communicate the research purpose well with the potential respondents. I was able gain consent from the manager of the setting to conduct the study with the children. Also, I communicated the purpose of the research to the early childhood practitioners and key workers of the children and they were aware of how the research would be carried out.

3.9.1.2 RECRUITING PARTICIPANTS

The second level of sampling was in the recruitment of participants for this research. Questionnaires were then sent to parents of the children to investigate if the children were using digital technologies such as tablets, laptops, digital cameras and games at home and for how long they were used. This was done to enable me make choices on who participates in the research based on what digital device they were exposed to at home. Fourteen questionnaires were sent home to the parents and unfortunately, only three of the parents answered and returned the questionnaires. Consequently, a decision was made to continue the research process without the questionnaires. Due to the fact that I spent five months in the nursery before data collection began, I had the opportunity to interact with the teachers and parents. Through these conversations, I observed that some of the children had some kind of interaction with digital technology in their homes. The reason I spent five months in the nursery before data collection was for the children to familiarise themselves with me and find out the information about the children's interactions with digital technology that I could not gain through the questionnaires.

The children attending this nursery came from a wide range of socio-economic backgrounds. The setting had fifty-three children at that time and there were twenty-one teaching staff. The setting worked towards providing a single quality framework for children in its care. It offered individual learning suited to each child's needs and allowed them to make progress at their own pace, giving extra support where needed. In this study, I was a **participant observer** which meant that I spent a considerable amount of time with the children (Johnson and Christensen, 2014; Mukherji and Albon, 2011). I took a participatory role in the nursery activities that the participants were involved with thereby having an understanding of the culture of the nursery and the early childhood policies. An advantage of being a participant observer is that I was able

to have an increased insight and knowledge of the researcher situation (Plowright, 2011). I spent five months in the nursery participating in classroom activities before data collection began.

3.9.2 ETHICAL REQUIREMENTS

The main participants of this research were children between the ages of three and four. This age group was chosen because there is limited research that has explored the different ways children less than five years engage with digital technology. After gaining permission from the manager of the nursery, the next step was to meet the ethical requirements of the educational institution where this research is conducted. It was very important for me as researcher to understand ethical requirements due to the nature of this research. Children between the ages of three and four years are believed to be more vulnerable than adults to physical, emotional and psychological harm especially when they are the subject of a research (Christensen and Prout, 2002; Lewis, 2010; Taylor, 2000). Research that involves children can be viewed as constituting a risky activity (Allen, 2005). This is why research with children is being governed by codes of ethics formulated by various agencies, professional bodies, institutions and organisations, which provide the protective responsibility researchers should have towards children who are participants in their research (BERA, 2011; Bertram et al., 2016; Mukherji and Albon, 2010). These risks do not have to be physical; they can be emotional and psychological. For these reasons, this research has taken ethical considerations seriously and precautionary steps to make sure that the children who will participate in this research will not experience any harm either emotionally, physically or psychologically and will ensure that it complies with ethical codes for research with young children.

3.9.2.1 ETHICAL ISSUES

Research ethics is centrally concerned with the attitudes of the researcher towards his or her participants (Robert-Holmes, 2011). It is defined by Aubrey et al., (2000:156) as 'the moral philosophy or set of moral principles underpinning a project'. They are a set of principles developed to guide researchers in conducting their research ethically. Ethical issues can arise from the kinds of problems investigated by researchers and the methods used to obtain a valid and reliable data (Cohen et al., 2011). These problems may arise from the nature of the research, the context, the procedures to be adopted, methods of data collection and reporting the data (ibid). Consequently, there were two key issues to be addressed ethically in this research and they were i) Children's full consent ii) Children as participants in this research.

There have been arguments about children being competent to participate in research. Mukherji and Albon (2010) argue that viewing children as competent and being able to participate actively in research may have ethical implications. They argue that although it is important to get the consent from the gatekeepers (parents, teachers and management of the nursery) before the research is carried out, they argue that it is not as straightforward as it looks. They add that it is possible for a child to refuse to be observed or a parent disapproving of their child partaking in the research even after the child has been involved in the research for a period of time. Therefore, a researcher has to be prepared for such situations. There was a situation whereby a parent told me they did not want their child participating in my research. I had to honour the decision of the parent and did force them to allow their child participate in the research (Alderson, 2005).

In addition, Palaiologou (2014:690) argues that the term 'participation' in early childhood has been misunderstood and has been "deemed to be akin to a social

epidemic with the spread of the idea of children as participants and social actors having agency becoming seemingly irresistible". She puts forward that participation becomes a misconception whereby the researcher adopts a shallow interpretation of participation and the participant is seen as the dependant. Instead, she urges that the researcher should ensure the participants are actively engaged in the research and maintain dialogue with them throughout the research process and not just to be used to collect data for the research. This is important because children as participants should not be seen as objects of research just because consent is obtained from their parents and guardians. They should always be aware of what is happening at every time. The researcher should always discuss with the children and answer the children's questions honestly and correctly, if a researcher is dishonest and dubious in their activities even with an informed consent, they have failed in the moral aspect of the research.

3.9.2.2 ETHICAL CONSIDERATIONS FOR THIS RESEARCH

I knew that I had to be reflective throughout the research to ensure that the impact would not cause anxiety and stress on the children but be beneficial (Robert-Holmes, 2011). According to Robert-Holmes (2011), one of the possible ways of doing this is through the process of carrying out an impact assessment. This would help me to be critically reflective about any aspects of the research which might lead to emotionally upsetting any of the participants, especially the children. With this study, one of the steps I took was to use the reflective impact assessment (Robert-Holmes, 2011) to help critically reflect on the research questions, organise writing concerning ethical issues in this research and minimize any risks that can develop during the data collection.

The questions were:

i) What potentially sensitive issues are raised by your research questions?

ii) What are the various ways in which your research questions might be inadvertently taken the wrong way?

iii) How might your research questions cause the research respondent to worry in anyway after you have finished?

iv) Could your research questions inadvertently have a negative impact upon relationships within the early childhood institution?

v) Could your research question inadvertently have negative impact upon family relationships?

vi) In what way does your research make the institution and its members vulnerable to potential criticism?

vii) What advantages to the respondents and their early childhood institution might be there from your research?

I considered these questions stated above so as to ensure that the research questions will not make the children vulnerable in any way. From these questions, I was able to deduce that question 'i' had to be addressed. As discussed in earlier in this research, there have been arguments that suggest children should not have access to digital technology especially iPads despite the increased use of digital technology and children using iPads may be seen as a sensitive issue. That it is why it was stated in the permissions letters to the parents and guardians of the children that they would be interacting with iPads. If the parents were uncomfortable with it, they were free to disallow their children from participating in the research. For the remaining six questions, I came to the conclusion that the research questions would not make the children vulnerable in any way.

This research also followed ethical guidelines such as British Education Research Association (BERA, 2011), Canterbury Christ Church University ethics code and European Early Childhood Education Research Association EECERA (Bertram et al.,

2016) on how to conduct the research appropriately without causing any harm to the children. First of all, the most important ethical issue facing the researcher is the treatment of research participants (Johnson and Christensen, 2014). Children have the right to be protected from harm either physically or psychologically. Even though the researcher does not set out to upset people emotionally, emotional upset may occur. Therefore, I made it my responsibility to make sure that such risks are reduced. No procedure of this research harmed the children physically, emotionally and psychologically because they were in their natural environment with their teachers present and playing with the iPad. They were in their classroom sitting comfortably wherever they wanted while playing with the iPads. All I had to do was to observe the children's engagement and interactions with digital and non-digital activities. Once the child decided to stop playing with the iPad, he or she child had the right to go and play with other toys in the classroom and was no longer observed. This added to the research rather than affect it negatively.

Secondly, once consent was obtained from the parents and guardians, I informed the children of the nature and characteristics of the research to their level of understanding that may or may not affect their readiness to participate. I respected the children's freedom to choose to participate in the research or not by giving the child the opportunity to give or not give assent to participation as well as to choose to withdraw from the research at any time. Assent means that the child shows some form of agreement to participate without necessarily understanding the full significance of the research necessary to give informed consent (Johnson and Christensen, 2014).

Thirdly, this research proposal passed through the Canterbury Christ Church University ethics committee. The ethics approval can be seen in Appendix 3 Page 353. Once it was approved, I obtained informed consent from the parents and legal guardians of the children in writing by sending letters home or by speaking to them as they delivered and

collected their children at the nursery. The informed consent form can be seen in Appendix 2 Page 352. The parents were informed of all the features of the research that may affect their willingness to allow the children to participate. Fortunately, most of the parents were eager to know the outcomes of this research.

Lastly, the EECERA ethical standards state that the researcher is ethically obligated to protect the confidentiality of both the participants and the data (Johnson and Christensen, 2014). Respecting the privacy of the participants is the most important aspect of a research study (ibid). I kept all information obtained about the participants confidential and private. The participants' identities were hidden and each child was given a code name, for example, Child HB. This way the data collected will not be easily traced to the exact child. The identity of the participants was not revealed to anyone other than the researcher or the teachers and managers in the nursery. Confidentiality was maintained. If there is a possibility whereby others may gain access to such information since this is a PhD, I would have to explain the situation to the participants' gatekeepers as a part of obtaining informed consent.

3.10 DATA COLLECTION

Before data collection began, a pilot study was conducted to be able to make sure that the methodological tools would be effective. Any researcher planning to use observation to collect data about children will have to consider the following questions: what will be observed, where it will be observed and how the observations will be recorded. The pilot took place for three weeks at the nursery before the data collection began. The observation checklist and less structured observation were tested different times on five children while they were interacting with a computer available in their nursery. Following the pilot, it was apparent that corrections had to be made on both methodological tools. I discovered that that it was best to record what was observed

within twenty minutes for each child and not longer. I also discovered that the less structured observation tool needed more space for the researcher to write down what it is observed because it was noticed that some of the children partook in a number of activities within twenty minutes and there was not enough space to write down what was observed within that time. The results of the pilot study showed that the children's engagement levels were medium to high while playing with the computer.

Also, I evaluated 45 iPad apps (digital activities) using Hillman and Marshall's (2010) guidelines and criteria for choosing digital activities after I asked for suggestions from the early childhood practitioners in the setting on the type of digital activities they would like the children to interact with. The criteria table can be seen in Appendix 9 Page 365. The list of the digital activities chosen can be seen in Appendix 110 Page 366. The list of non-digital activities that the children interacted with can also be seen in Appendix 11 Page 367.

3.10.1 SCHEDULE OF DATA COLLECTION

As discussed earlier, this research made use of the mixed method approach. Less structured observation and an observation checklist were used interchangeably in this study. Below is a table that shows the schedule of how the data collection was carried out can be seen. All data were collected within a period of three months, June to August 2015. It can be observed that the data was collected in six phases and in each phase the children were observed three times. This means that each child had three observation checklist or less structured observations for each phase. The period designated for each observation was twenty minutes. However, some observations did not reach twenty minutes because of the individual preferences of the children. At the start of the observations, the aims of the research were explained to the teachers and they were assured anonymity of the children's identities. As discussed in Chapter 2 Section 2.5.1

to 2.5.3, the digital and non-digital activities that the children interacted with were viewed as adult initiated, adult led and child initiated. In this research study, the children initiated their digital activities when they approached me for the iPad or picked it up from the table. Their digital activities were adult initiated when I would approach them to play with the iPad and adult led when I guided what the child did with the digital activities.

Table 3.1: Observation Schedule

Participants	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**	**Phase 5**	**Phase 6**
14 Children	Week 1 and 2 Observation Checklist Non-Digital Activities	Week 3 and 4 Less Structured Observation Digital Activities Introduced	Week 5 and 6 Observation Checklist Digital Activities	Week 7 and 8 Less Structured Observation Non-Digital Activities	Week 9 and 10 Observation Checklist Non-Digital Activities	Week 11 and 12 Less Structured Observation Digital Activities Re-introduced

Phase 1: In this phase, the children were observed interacting with non-digital activities three times in week one and two of data collection. They were observed with the observation checklist. I was already a participant observer having spent the previous five months immersing myself in their day to day activities. Therefore, my interaction with the children was not hindered by unfamiliarity. The children had become comfortable in my presence and it was easy for me to observe them interacting with non-digital activities.

Phase 2: In this phase, the iPad was introduced for the first time in the nursery. This was the third and fourth week of the data collection and the less structured observation was used to record my data. Each child was observed three times. During this period of data collection, I observed that some of the children would initiate their digital activities, while others I had to initiate their digital activities. This was expected because they have never had an iPad in their nursery before and they needed time to get used to it. Also, while using the less structured observation tool, I realised that it was equally as important as the quantitative method because it gave me an in depth understanding of how the children interacted and engaged with the digital activities. I also observed that there were some of the digital activities that the children did not interact with and they preferred digital activities with bright colours and fun music.

Phase 3: In this phase, the children's engagement with digital activities was still observed but the observation checklist was used. This was the fifth and sixth week of data collection and each child was observed three times. The iPad had become part of the children's activities and it was observed that if a child was interacting with the iPad, some other children would surround them. More of this will be discussed in Chapters 4 and 5.

Phase 4: In this phase, the children were observed interacting with non-digital activities with the less structured observation. This was the seventh and eight week of data collection and each child was observed three times. At this stage of data collection, I realised that

using this form of methodological tool was time consuming. I had to make sure I was able to write down everything that I observed and make sure they were of importance to my research.

Phase 5: In this phase, the children's non-digital activities were also observed three times in week nine and ten with the observation checklist. My relationship with the children even without the iPad during those weeks was still going well. They would make conversations with me and ask me to join them in their non-digital activities.

Phase 6: This was the last phase of data collection in weeks eleven and twelve. The iPad was re-introduced to the children. They were observed three times with the less-structured observations.

3.11 DATA ANALYSIS

As discussed in Section 3.6, the convergent design was used for this research. This is a design that allowed the collection of quantitative and qualitative data concurrently. The quantitative and qualitative data were analysed independently using the best analytical approaches suited for the research questions.

3.11.1 QUANTITATIVE ANALYSIS AND PRESENTATION

The result of quantitative analysis is to allow the researcher visually inspect the data and conduct a descriptive analysis (the mean) and variance of responses to the items on the observation checklist to determine the trends in the data (Creswell and Plano Clark, 2011). Quantitative data is usually analysed using computer programs such as SPSS and ANOVA. However, for this research I transferred the data from the observation checklist to tables on Microsoft word. No sophisticated statistical test was required in the analysis because the number of participants were not large. Therefore, there were steps I had to take to analyse and present the data.

Step 1: The first step in analysing quantitative data was to organise the data in a way that will make it understandable. This is why the data was presented in tables. Presenting the data in tables made it easier to note the emerging patterns in the data. Therefore, the data from the observation checklist was presented in broad categories namely: name of participant, interactions (digital and non-digital activities they children interacted with), time spent and level of engagement. Tables with this information were created for Phase 1, 3 and 5.

Step 2: Colour coding was applied to differentiate child initiated, adult led and adult initiated activities on the tables. Child initiated was assigned the colour orange, adult led was assigned the colour green and adult initiated was assigned the colour blue.

Step 3: The levels of engagement had been scored previously. Scoring data means assigning a numeric value to the engagement categories on the instrument used to collect the data (Creswell, 2014). 1= Extremely Low Engagement, 2= Low Engagement, 3= Moderate Engagement, 4= High Engagement, 5= Extremely High Engagement. Due to the fact that the children's level of engagement and minutes spent are not the same because of their individual difference, to find the level of engagement for each of their observations, the mean of the first two minutes, middle two minutes and last two minutes that each child spent was calculated. Therefore, for each of their observations, the mean of their level of engagement was found and presented in the tables for Phase 1, 3 and 5. After entering the data into the tables, I made sure there were no errors in the data or any missing data. I did this by going through the observation checklist of each child and ensuring that I had calculated the correct mean and entered their correct level of engagement for each observation.

Step 4: A separate table was needed for the children's level of engagement. The levels of engagement of which the mean was previously calculated were presented in tables and

explained. There were three observations in each phase as previously explained therefore I proceeded to calculate the mean of the three observations in Phase 1, 3 and 5 was calculated. To get the mean, I summed the observed values in the table (level of engagement) and divided that sum by the number of participants (fourteen).

Mean: The mean is the sum of all the values in a data set divided by the number of values in the data set.

$$\text{“}\bar{X} = \frac{\sum X}{n}\text{”}$$

The purpose of finding of the mean is to understand the data set by getting a representative sample. Finding the mean of the data set in this research will be a fair representation because there were no outliers (very small or large values) in the data set.

3.11.2 QUALITATIVE ANALYSIS AND PRESENTATION

The purpose of qualitative analysis is to allow a researcher ‘make sense of data in terms of the participants’ definition of the situations, noting patterns, themes, categories and regularities (Cohen et al., 2011: 461). The ultimate goal for a qualitative analysis is to ‘make sense of the data (Merriam 2009:203), with the intention of answering the research question (Savin-Baden and Major, 2013). For my research, it was a process of immersing myself in the data. The data from the less-structured observation was processed through the stages of Thematic Analysis and open coding. Thematic analysis is a method for identifying, analysing and reporting patterns within a data and it describes the data in rich detail (Braun and Clarke, 2006). Open code is a label that I used to attach a piece of text to categorise that piece of text (Cohen et al., 2011). The first stage of data analysis involved typing out the written data onto Microsoft Word and then extensive reading of the observations was done. The typed data was then transferred onto NVIVO which is software for qualitative analysis so as to code the data easily. The second stage was to code

the data. Open coding was done phrase by phrase. The phrases were labelled according to the code names that were common with the data. The code names were derived from the indicators of the types of engagement that were mentioned in the Chapter 2 Section 2.7 Table 2.1. In other words, codes were assigned to texts and quotes. Examples of how texts and quotes were linked to codes:

1. Code: Persistence

Text: He is able to move the ball now but he is moving it in the wrong direction. He persists on getting the ball into the hole, his hands shaking. He keeps pressing the ball and trying to get it into the hole. He touches the ball and drags it. He releases it and it moves. "Yahahaaa" he exclaims.

2. Code: Cooperation

Quote: "It's these items you should get", says the Child P pointing at the tops of the screen. "Okay" LB replies. He swipes some more items on the list into this shopping cart. "Look you need ketchup", says the second child. "Quickly", says the Child HZ.

The third stage was to use axial coding to find connections between the codes which led to generating wider categories. For example, the first code in the example above was connected with other similar codes labelled: Behavioural Engagement. The second code was grouped with similar codes under the category labelled: Social Engagement.

Also, data transformation was employed to transform some of the qualitative data into quantitative data. What needed to be transformed was the interactions and time spent. This was done so as to find the patterns of interaction that the children exhibited with digital and non-digital activities. This transformation allowed the results to be mixed during analysis and interpreted (Creswell and Clark, 2011).

As a researcher, I was fully aware of the potential influence I could have on my data analysis due to my interests and bias so I exercised caution when carrying out the data analysis. All the data was analysed and I had a good understanding of what was relevant in answering my research questions. The method involved searching for common themes that emerged from the data. These themes were linked to the discussions in the literature review.

3.12 SUMMARY

This chapter discussed methodological issues involved in this research. It explored the methodology and methods that were employed in this research study investigating the research questions. I followed a steady process to arrive at the findings of this research. The quality of the research was considered in order to arrive at warrantable affirmation which may be useful to research as well as other researchers in the field of early childhood studies. The next two chapters aim to present the results and to explore the different ways children engage with digital and non-digital activities and their patterns of interaction.

CHAPTER 4
PROCESS OF DATA ANALYSIS

4.1: INTRODUCTION

This section discusses the process of data analysis in this research. As mentioned in Chapter 3 Section 3.9.1.1, during the data collection, the fourteen children who participated in this research were divided into two groups, the Experimental and Control Group. The purpose of these two groups was to compare between the two group's engagement with digital and non-digital activities. They were separated into two groups because the experimental group was the group were the intervention was performed and the control group was used to establish a baseline and compare the results of the intervention with the experimental group. However, during the process of data analysis, they ceased to be two groups and became just one group. This will be explained further below.

4.2: PRELIMINARY DATA ANALYSIS: The preliminary data analysis began with the quantitative data. During the analysis, the quantitative data from both groups were presented in tables in broad categories namely: name of participants in Experimental and Control Group, interactions (digital and non-digital activities the children interacted with), time spent and level of engagement. Three tables were developed with these categories because the quantitative data was collected in Phase 1, 3 and 5 as explained in Chapter 3 Section 3.10.1. Therefore, these three phases had a table that was the context for summary of the data of the experimental and control groups. With the tables, I described the results of the individual children in the experimental group and then described the results of the control group. Through this process, I began to observe a theme emerging from the quantitative data which was the patterns of interactions that the children exhibited while interacting with digital and non-digital activities. These patterns showed in the way the

children interacted with these activities, the nature of the activities (adult or child initiated), the levels of engagement they had with these activities and the amount of time they spent. Therefore, in this research the patterns of interactions that will be referred to are the patterns that the children exhibited in their preferred activities with digital and non-digital activities, the nature of the activities, the amount of time they spent with these activities and patterns in their levels of engagement.

I moved on to the qualitative analysis process which was discussed in Chapter 3 Section 3.11.2. The data derived from the experimental and control group with less-structured observation went through the process of thematic analysis and coding. The observations were typed on Micro-soft Word before being transferred into Nvivo. Through Nvivo, I was able to attach code names to texts and quotes from the data as described in Chapter 3 Section 3.10.2. Themes of engagement began to emerge from the data through this process.

At this stage of preliminary analysis, it became clear to me that two different themes were emerging from the data. They were engagement and patterns of interaction. Because of the patterns of interaction that were emerging from the quantitative data in Phase 1, 3 and 5, I decided to analyse the qualitative data in Phase 2, 4 and 6 to see if the same patterns would emerge. I did this by using the data transformation that allows qualitative data to be transformed to quantitative data (See Chapter 3 Section 3.11.2). Data-transformation is a type of convergent design that allowed me to transform a qualitative data set to quantitative data set. This allowed me to be able to place the digital and non-digital activities the children interacted with and the amount of time they spent with these activities from the less-structured observations on tables like I did with the quantitative data. I used this design because in order to find the patterns of interactions that the children exhibited with digital and non-digital activities from Phase 1 to Phase 6, the results had to be combined in order to offer a full picture of what happened with the digital and non-digital activities. This is because Phase 1, 3 and 5 are quantitative data and Phase 2, 4 and 6 are qualitative

data. Data transformation therefore allowed the results to be mixed during analysis and interpretation and facilitates interrelation (Creswell and Clark, 2011). The information needed was displayed in table form because a table helped to reveal the information from the data (Newby, 2010). This process revealed the patterns of interaction in the qualitative data.

At this stage, I had examined each child's quantitative and qualitative observations. I realised that the children were fourteen individuals with different personalities, likes, dislikes and preferences. This would not have been revealed if I had continued to examine the children as two different groups. I decided to focus on analysing each child's observations individually and just as one group rather than having the experimental and control group. This led to the decision of changing the aim of this research. I decided that instead of focusing on comparing between the experimental and control group's engagement with digital and non-digital activities, I would compare the individual children's engagement and interactions between the digital and non-digital activities. This enabled me gain more insight into the similarities and differences between the digital and non-digital activities. Given the observed themes that emerged from the data and the different route the data had taken, I decided to have two chapters for describing the data. In both chapters, the qualitative and quantitative data will be described in the phases that the data was collected. As explained in Chapter 3 Section 3.6, the convergent design which this research thesis employed allowed the results from the quantitative and qualitative data to be merged in these two chapters.

4.3 CHAPTER 5: ENGAGEMENT: The first theme that emerged from the research data which was the levels of engagement from the quantitative data and engagement and its sub-themes from qualitative data is described in Chapter 5. The minutes of engagement is also described in this chapter. This chapter is divided into three sections. The introduction is in Section 5.1, the levels of engagement (quantitative data) and the minutes of

engagement (quantitative data) will be described in the second section (Section 5.2) and the (types of engagement) qualitative data will be described in the third section (Section 5.3). In the second section, descriptive statistics was used so as describe and summarise the quantitative data (Menter et al., 2012). Therefore, a table was developed to convey each child's level of engagement in Phase 1, 3 and 5 and their minutes of engagement in Phase 1, 2, 3, 4, 5 and 6. The data for levels of engagement is presented as follows:

- Phase 1 (Non-Digital Activities/ Quantitative Analysis)
- Phase 3 (Digital Activities/ Quantitative Analysis)
- Phase 5 (Non-Digital Activities/ Quantitative Analysis)

The data for minutes of engagement is presented as follows:

- Minutes spent with non-digital activities across all phases.
- Minutes spent with digital activities across all phases.

There are categories of descriptive analysis such as central tendency, frequency of distributions and so on. They are used for the four scales of measurements which are nominal, ordinal, interval and ratio. The category that was suitable for this research is the measures of central tendency because the numerical data was derived from fourteen children. Using SPSS or any other statistical data analysis was not suitable for this research because as this was a case study and there were only fourteen children participating, any statistical analysis would not have shown the accurate picture thus numerical analysis was decided. However, the efficient means of summarising variables was used. Therefore, as explained below, the central tendency provided this research with an efficient means of summarising variables with a lot of data into a single value (Mertler, 2016:271).

Ordinal data had been considered for this data because it introduced order to the numbers of the Leuven scale of engagement. That is, numbers were used to rank the levels of engagement (1=Extremely Low, 2=Low, 3=Moderate, 4=High and 5=Extremely High).

However, it did not give indication about the magnitude of difference between the numbers on the Leuven scale of engagement. For example, the difference between 1= Extremely Low and 2= Low or 4=High and 5= Extremely High. It can be noted that 1 is before 2 and 4 is before 5 but it does not say how close 1 is to 2 or 4 is to 5. In order to manipulate the numbers on a scale, interval data was required since this kind of data has equally spaced differences. The Leuven scale of engagement does not have this, but in order to manipulate the data, the scale was treated as if it contained interval data and a mean could be calculated. The mean was a good measure in this research because the data contained values that were evenly spread with no exceptionally high or low values. To find the mean of the levels of engagement in Phase 1, 3 and 5, the sum of all the data set in the first, second and third observation was added and then divided by the number of children. The mean found was the representation of the children's level of engagement in those observations. Below is an example of how the mean for the levels of engagement was calculated:

$$\bar{X} = \frac{\sum X}{n} = \frac{\text{51 (total of level of engagement in an observation)}}{\text{14 (number of children)}} = 3.6$$

The mean that was found for each observation was then calculated to find the mean for each phase. This can be seen in Table 5.1. The mean for the levels of engagement in Phase 1, 3 and 5 were calculated like this though out. For the minutes of engagement, the mean calculated was expressed in decimal form, even though time is not expressed in decimal form. I will not be converting the minutes into seconds or hour so it is understandable to keep the mean in two decimal places. Below is an example of how the mean for the amount of time spent with digital and non-digital activities was calculated:

$$\bar{X} = \frac{\sum X}{n} = \frac{\text{206 (total minutes spent with non-digital activities in an observation)}}{\text{14 (number of children)}} = 14.7$$

In the Section 5.3 which is the qualitative section, thematic analysis was used to identify, analyse and report the themes and sub-themes of engagement that emerged from the data. The data was presented in phases:

- Phase 2 (Digital Activities/Qualitative Analysis)
- Phase 4 (Non-Digital Activities/ Qualitative Analysis)
- Phase 6 (Digital Activities/ Qualitative Analysis).

In this section, an in-depth description of the different ways the children were engaged will be explored. As discussed in Chapter 3 Section 3.10.2, code names were derived from the indicators of the types of engagement that were mentioned in Chapter 2 Section 2.7. These codes that were assigned to texts and quotes were lifted from the children's observation and placed in text boxes this chapter. The description of each observation in the text box was the written down. In each Phase, four types of engagement emerged and with each type of engagement, there were sub-themes that emerged.

4.4 CHAPTER 6: PATTERNS OF INTERACTION: The second theme that emerged from the research was the patterns of interaction. In chapter 6, the patterns of interaction the children exhibited while interacting with digital and non-digital activities will be explored in detail. This was also a combination of the quantitative and qualitative data. The six phases which will be analysed are as follows:

- Phase 1 (Non-digital Activities/ Quantitative data)
- Phase 2 (Digital Activities/Qualitative data)
- Phase 3 (Digital Activities/Quantitative data)
- Phase 4 (Non-digital Activities/Qualitative data)
- Phase 5 (Non-digital Activities/ Quantitative data)
- Phase 6 (Digital Activities/ Qualitative data)

Each child's observation was described and interpreted in each phase. This gave an understanding of how the children interacted with the digital and non-digital activities and enabled me easily identify the patterns of interaction that they exhibited and the similarities and differences with these patterns. I grouped the data into broad categories on tables from the observation checklists namely: the participants, interactions (digital and non-digital activities the children interacted with), time (Minutes spent) and level of engagement (the average of each child's level of engagement in the first, middle and last two minutes). Colour coding was then applied to indicate the activities that were child initiated, adult initiated and adult led. This same process was employed for the qualitative data by grouping categories from the less-structured observation. Presenting the data in tables was important for making sense of the data and seeing the patterns that emerge from it. The outcomes of the observation tools for each participant were collated to give the picture of the children. Therefore, at the end of each phase, forty-two observations in total were produced that means in Phase 1, 3 and 5 with non-digital activities there were 126 observations and in Phase 2, 4 and 6 with digital activities there were also 126 observations. Thus eighteen observations were produced for each child, nine when they were engaged with digital activities and nine when they were engaged with non-digital activities. A portrait was then produced for each child (See appendix 12 Page 368-384). Also, data transformation was also used to transform the number of digital and non-digital activities the children interacted with from the less structured observation into numbers so as to note the patterns in the number of activities the children interacted with in each observation.

CHAPTER 5

ENGAGEMENT WITH DIGITAL AND NON-DIGITAL ACTIVITIES

5.1 INTRODUCTION

The previous chapter discussed the methodological approach and methods that were employed in this study. The purpose of this chapter is to present the quantitative and qualitative data derived from observation checklist and less structured observations that show the children's engagement with digital and non-digital activities and the amount of time they spent with these activities. The data from the observation checklist provided the numerical data for this research while the qualitative data provided this study an in-depth written investigation into the ways the children were engaged with digital and non-digital activities.

The results are divided into two sections. Section 5.2 contains the descriptive results of the quantitative data of the levels of engagement and the amount of time spent and Section 5.3 contains the thematic analysis of the qualitative data. The convergent design which was employed in this study allowed the quantitative and qualitative data to be merged in the same chapter because they both were able to answer the first research question (See Chapter 3 Section 3.3) and give understanding as to what extent the children were engaged and the different ways children were engaged with digital and non-digital activities.

5.2 QUANTITATIVE RESULTS (OBSERVATION CHECKLIST)

This section focuses on discussing the results of the quantitative data. Section 5.2.1 discusses the results of the children's levels of engagement with digital and non-digital activities while Section 5.2.2 discusses the amount of time the children spent interacting with digital and non-digital activities.

5.2 1 LEVELS OF ENGAGMENT

As discussed in Chapter 3, the data was collected in six phases. The phases that are discussed in this section will be Phase 1, 3 and 5 because in these phases the observation checklist was used to measure the children's level of engagement therefore the data from these phases is numerical. Table 5.1 below presents the children's level of engagement with digital activities in Phase 3 and non-digital activities in Phase 1 and 5. Table 5.1 also shows the participants names (the children), the three observations in each phases, the children's levels of engagement and the calculated average for each observation and phases. The orange coloured data set is the average calculated for the children's level of engagement in each observation as a group, the green coloured data set is the average calculated for each child's individual observations and the blue coloured data set is the average calculated from each child's individual observation and their observations as a group.

Table 5.1: Summary of the Children's Levels of Engagement and Average

	Phase 1				Phase 3				Phase 5			
	Non	**Digital**	**Activities**			**Digital**	**Activities**		**Non**	**Digital**	**Activities**	
Participants	1st Observation	2nd Observation	3rd Observation	Mean For Phase 1	1st Observation	2nd Observation	3rd Observation	Mean For Phase 3	1st Observation	2nd Observation	3rd Observation	Mean For Phase 5
Child HB	4	5	3	**4**	4	5	4	**4.3**	3	4	3	**3.3**
Child JB	4	4	3	**3.6**	5	5	5	**5**	4	5	5	**4.6**
Child HG	5	4	5	**4.6**	3	5	5	**4.3**	4	5	5	**4.6**
Child R1	4	4	4	**4**	5	4	5	**4.6**	5	4	4	**4.3**
Child LB	3	4	4	**3.6**	5	5	5	**5**	3	3	4	**3.3**
Child JG	1	3	4	**2.6**	5	4	4	**4.3**	2	5	5	**4**
Child LG	3	2	3	**2.6**	4	5	5	**4.6**	3	5	4	**4**
Child IP	5	4	5	**4.6**	5	5	5	**5**	5	5	5	**5**
Child LY	3	2	5	**3.3**	3	3	3	**3**	1	4	5	**3.3**
Child R3	2	3	3	**2.6**	5	5	5	**5**	4	4	5	**4.3**
Child P	5	4	4	**4.3**	4	4	5	**4.3**	4	4	4	**4**
Child JN	4	2	4	**3.3**	5	5	3	**4.3**	3	5	4	**4**
Child R2	4	3	5	**4**	4	4	5	**4.6**	4	4	4	**4**
Child O	4	4	4	**4**	3	4	4	**3.6**	3	1	3	**2.3**
Mean for each observation	**3.6**	**3.4**	**4**	**3.7**	**4.2**	**4.5**	**4.5**	**4.4**	**3.4**	**4.1**	**4.2**	**3.9**

Level of Engagement as a Group: Orange Mean for Individual Observations: Green Mean for Individual Observation and group: Blue

In Phase 1, the children were observed interacting with non-digital activities which can be seen in Appendix 11 Page 367. By treating the Leuven Scale as if it were interval data, the data set from the first observation yielded an average of 3.6. From the second observation, the data yielded an average of 3.4 and in the third observation; an average of 4. The averages from the observations then yielded an average of 3.7 which is colour coded blue on Table 4.1 showing that the average level of engagement in Phase 1 was between moderate and high engagement. In Phase 3, the children were observed with digital activities which can be seen in Appendix 10 Page 366. The data set from the first observation yielded an average of 4.2 and in the second and third observation 4.5. The level of engagement in this phase was high. The averages from the observations then yielded an average of 4.4 showing that the average level of engagement in Phase 3 was high engagement. In Phase 5, the children were observed with non-digital activities. The data set from the first observation yielded an average of 3.4, in the second observation 4.1 and in the third observation 4.2. The averages from the observations then yielded an average of 3.9 showing that the average level of engagement in Phase 5 was in-between moderate and high engagement.

5.2.1.1 SUMMARY

The numerical data from Table 5.1 offered a general picture of the children's level of engagement with digital and non-digital activities during the research period. As it is shown, there is a difference in the children's level of engagement between digital and non-digital activities. Comparing the digital and non-digital activities, it can be concluded that:

1. With digital activities, the average level of engagement was high engagement.
2. With non-digital activities, the average level of engagement was in-between moderate and high engagement.

These results show that higher engagement occurred more with digital activities than non-digital activities. Also, by observing the individual observations of the children, it can be observed that the levels of engagement with digital activities was from moderate to extremely high and with non-digital activities from extremely low to extremely high. In Phase 1, the data from the first observation showed that the children's level of engagement with non-digital activities was in-between moderate and high engagement. In the second observation, their level of engagement was moderate and in the third observation, it was high. In Phase 3, the data from the first observation showed that the children's level of engagement with digital activities was high and in-between high and extremely high engagement in the second and third observation. In Phase 5, the data from the first observation showed that their level of engagement with non-digital activities was moderate and in the second and third observation their level of engagement was high. Although high engagement was observed with non-digital activities, it can be observed that higher engagement occurred with digital activities. However, the children were engaged with both digital and non-digital activities.

5.2.2 MINUTES OF ENGAGEMENT

This section presents the amount of time the children spent engaging and interacting with digital and non-digital activities. The stipulated time for observing the children was twenty minutes. They were observed for the duration of time they spent with an activity and the observation never went past twenty minutes. Table 5.2 below presents the amount of time the children spent with non-digital activities in Phase 1, 4 and 5 and digital activities in Phase 2, 3 and 6. This section will be comparing the amount of time spent between the digital and non-digital activities. Table 5.2 also shows the participants, the amount of time they spent and the calculated mean for each observation and phases. The orange coloured data set are the mean calculated for the amount of time spent in each observation as a

group, the green coloured data set are the mean calculated from each child's individual observation and the blue coloured data set is the mean total from each child's individual observation and their observations as a group.

Table 5.2: Minutes of Engagement with Digital and Non-Digital Activities.

	Phase 1				Phase 2				Phase 3			
	Non-Digital		Activities		Digital		Activities		Digital		Activities	
Participants	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**
Child HB	4	20	10	**11.3**	20	20	18	**19.3**	20	16	20	**18.6**
Child JB	10	20	6	**12**	20	18	20	**19.3**	16	20	20	**18.6**
Child HG	20	10	10	**13.3**	20	18	20	**19.3**	14	20	18	**17.3**
Child R1	20	20	20	**20**	20	20	18	**19.3**	20	20	20	**20**
Child LB	12	12	8	**10.6**	20	20	20	**20**	18	20	20	**19.3**
Child JG	6	6	12	**8**	14	18	8	**13.3**	20	6	12	**12.6**
Child LG	20	4	8	**10.6**	16	20	20	**18.6**	20	20	20	**20**
Child IP	18	16	14	**16**	20	18	8	**15.3**	20	14	20	**18**
Child LY	6	4	12	**7.3**	4	16	16	**12**	18	12	10	**13.3**
Child R3	20	12	16	**16**	20	20	20	**20**	20	20	14	**18**
Child P	20	20	20	**20**	20	20	18	**19.3**	16	20	18	**18**
Child JN	20	6	14	**13.3**	20	18	20	**19.3**	20	16	20	**18.6**
Child R2	20	16	20	**18.6**	16	18	20	**18**	18	14	20	**17.3**
Child O	10	8	10	**9.3**	12	20	20	**17.3**	16	18	14	**16**
Mean	**14.7**	**12.4**	**12.8**	**13.3**	**17.2**	**18.8**	**17.5**	**17.9**	**18.2**	**16.8**	**17.5**	**17.5**

	Phase 4				Phase 5				Phase 6				
	Non-Digital Activities				Non- Digital Activities				Digital Activities				
Participants	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**	**1st Observation**	**2nd Observation**	**3rd Observation**	**Mean**
Child HB	20	20	18	**19.3**	20	14	20	**18**	18	18	8	**14.6**
Child JB	10	18	6	**11.3**	20	20	20	**20**	20	20	20	**20**
Child HG	16	20	10	**15.3**	14	20	20	**18**	18	20	18	**18.6**
Child R1	20	20	16	**18.6**	20	14	20	**18**	20	20	16	**18.6**
Child LB	16	20	20	**18.6**	20	12	6	**12.6**	16	20	10	**15.3**
Child JG	6	16	6	**9.3**	12	20	20	**17.3**	20	14	18	**17.3**
Child LG	16	8	14	**12.6**	20	14	14	**16**	20	20	14	**18**
Child IP	20	20	18	**19.3**	18	18	20	**18.6**	14	20	20	**18**
Child LY	10	16	16	**14**	14	20	20	**18**	14	8	20	**14**
Child R3	16	12	20	**16**	18	6	20	**14.6**	20	20	16	**18.6**
Child P	18	20	20	**19.3**	18	20	20	**19.3**	20	8	20	**16**
Child JN	6	20	20	**15.3**	12	16	16	**14.6**	20	20	20	**20**
Child R2	20	20	8	**16**	14	20	20	**18**	20	16	20	**18.6**
Child O	20	20	8	**16**	12	20	20	**17.3**	20	8	20	**16**
Mean	**15.2**	**17.8**	**14.2**	**15.8**	**16.5**	**16.7**	**18.2**	**17.1**	**18.5**	**16.5**	**17.1**	**17.4**

Mean in each Observation: Orange Mean in Individual Observation: Green Mean total from Individual Observation: Blue

In Phase 1, by treating the minutes of engagement as if they were interval data, the data set from the first observation yielded an average of 14.7, in the second observation 12.4 and in the third observation, 12.8. The averages from the observations then yielded an average of 13.3 which is colour coded blue on Table 4.2 showing that the average minute spent with non-digital activities in Phase 1 was 13.3 minutes. This method was applied to Phase 2, 3, 4, 5 and 6 and these can be seen in Table 5.2.

5.2.2.1 COMPARISON OF MINUTES BETWEEN DIGITAL AND NON-DIGITAL ACTIVITIES

Table 5.3: Average of Minutes in Each Phase with Digital and Non-Digital Activities.

	Non Digital Activities			**Digital Activities**		
	Phase 1	**Phase 4**	**Phase 5**	**Phase 2**	**Phase 3**	**Phase 6**
Mean	13.3	15.8	17.1	17.5	17.5	17.4

Table 5.3 above shows the average minutes the children spent with digital and non-digital activities. The table is divided into non-digital and digital activities so as to note the comparisons. It can be observed that with non-digital activities, there is an increase with the average minutes with each phase and with digital activities the average minutes was in between seventeen and eighteen minutes. However, the amount of time the children spent was not controlled by me but by the children because I observed the children only when there was an interaction with an activity. The observation would stop when the children left the activity for nap time, lunch, snacks or the playground. Most times observations would continue on the playground with activities like sand play, water play, role playing, mud kitchen or chalk drawing. The same applied to digital activities. Also, with both digital and non-digital activities, some of the children spent less than ten minutes while

some spent more than ten minutes. This shows that the children are individuals who are not expected to spend the same amount of minutes with these activities. Two children can interact with Sand Play or Peppa Pig but may not spend the same amount of minutes with them.

Therefore, it can be said that the children spent more minutes with digital activities than non-digital activities. This is because in Phase 1, 4 and 5, there were 126 observations with non-digital activities, more than ten minutes were spent in 105 of these observations and less than ten minutes were spent in twenty observations. In Phase 2, 3 and 6 there are also 126 observations with digital activities and more than ten minutes were spent in 118 of these observations and less than ten minutes were spent with eight observations.

5.2.2.2 SUMMARY

The numerical data from Table 5.2 presents the amount of time the children spent with digital and non-digital activities. As it is shown and discussed, there is a difference in the amount of time the children spent between the digital and non-digital activities. Comparing between the digital and non-digital activities, it be concluded that the children spent longer periods of time with digital activities than non-digital activities.

In the following section, the qualitative results from the less-structured observation will be presented to answer the first research question and to corroborate what the quantitative data has indicated so far.

5.3 QUALITATIVE RESULTS (LESS STRUCTURED OBSERVATION)

This section discusses the different ways the children were engaged while interacting with digital and non-digital activities. The results are presented in thematic form, phase by phase (Phase 2, 4 and 6) to exemplify the different types of engagement that emerged from the children's interaction with digital and non-digital activities. Table 5.2 below shows the themes and sub-themes that emerged from the qualitative data in Phase 2, 4 and 6.

Table 5.4: Themes and Sub-Themes of Engagement

	Phase 2	**Phase 4**	**Phase 6**
Types of Engagement	**Digital Activities**	**Non-Digital Activities**	**Digital Activities**
Behavioural Engagement	Involvement Persistence Assertiveness	Involvement Persistence Assertiveness	Involvement Assertiveness
Cognitive Engagement	Problem Solving Symbolic Representation Categorizing Selective Attention Recalling	Problem Solving Creating and Constructing Selective Attention Symbolic Representation	Active Listening Working Memory Classifying
Emotional Engagement	Happiness Enjoyment	Enjoyment	Enjoyment
Social Engagement	Peer Engagement Cooperation Adult Interaction	Peer Engagement Adult Interaction Active Discovery Play	Cooperation Adult Interaction Conflict with Peers
Disengagement	Distraction Absence of Effort	Distraction Withdrawal	Absence of Effort

5.3.1 PHASE 2/ DIGITAL ACTIVITIES

In this Phase, the iPad was introduced to the children in the nursery for the first time. Therefore, the children's interaction with digital activities was observed. Below are the themes and sub-themes that emerged from the qualitative data.

5.3.1.1 BEHAVIOURAL ENGAGEMENT

The aim of this research is explore children's engagement while interacting with digital and non-digital activities. The findings showed emerging indicators of behavioural engagement in Phase 2 with digital activities. The following are the sub-themes that emerged from the qualitative data which are also coded as indicators of behavioural engagement.

5.3.1.1.1 INVOLVEMENT

Involvement was one of the indicators of behavioural engagement in this qualitative data. For a child to be involved in activity, he or she has to be intensely focused, motivated and persistent. As shown in Table 5.1, involvement occurred in Phase 2, 4 and 6 of the qualitative data. Below are the examples from Phase 2 that shows involvement. In this phase, the iPad had just been introduced in the nursery and Child HB and Child JN are an example of the children who showed how engaged they were through involvement while interacting with digital activities as they were being observed.

Child HB 2nd Observation Phase 2

He looks at the screen, looking out for the items he needs. He sees an item in his shopping cart that he doesn't need.
"I don't need that", he says.
"Then tap on the shopping cart and swipe it out", I tell him.
He taps on the shopping cart and swipes the item out.
"No Daddy Pig, don't do that", he says when the Pig puts an item not on HB's list in the shopping cart. He finds all the items he needs.
"Good job", says the voice in the game.

“We did it”, HB says with a big smile on his face.

During his second observation, Child HB was interacting with Peppa Pig Shopping. The activity began with a list of food and clothing items appearing on the screen. The task in this activity was for Child HB to get the items on the list from the shelves as quickly as possible into his shopping cart. I observed as Child HB was able to quickly identify and tap the items on the list into this shopping cart before the characters passed by them. He had the motivation to complete the task. He was also able to recognise an item that did not belong in the shopping cart. This shows how he was able to focus on the activity, showing involvement. When he could not figure out how to remove the items, I suggested what he should do. He then proceeded to remove this item by himself. I also observed that Child HB would talk to himself during this observation. He would remind himself of the items he needed so that he would not forget to put them in his shopping cart. Every time he completed the task, the main character in the activity would say ‘Good Job’. Child HB would react to this by saying ‘we did it’. His choice of the word ‘we’ is noteworthy because he was the only one interacting with this activity and there were no other children watching him. He may have been referring to me. Child HB indicated that the activity appealed to him by giving enthusiastic statements on how he felt.

5.3.1.1.2 **PERSISTENCE**

Persistence is an indicator for behavioural engagement. Child LB showed persistence while interacting with digital activities. Some children who are persistent find it hard to give up on an activity until they have accomplished their goal because of the intrinsic motivation they develop. Some children also tended to have trouble completing a task and gave up easily thereby limiting their engagement. For Child LB, he was determined to complete the activity.

Child LB 1st Observation Phase 2

He taps on a game called 'Max and Ruby'. The game starts. He chooses the activity called 'ball-o-rama'. The task is to drag a ball into a hole. Child LB seems to find it difficult moving the ball into the hole. His fingers shake as he tries to drag the ball in the direction of the hole. I use my right index finger to show him how to get the ball into the hole. He puts his finger back on the screen and learns how to move the ball. He is able to move the ball now but he is moving it in the wrong direction. He persists on getting the ball into the hole, his hands shaking. The children sitting beside us continue to discuss about birthdays. He is still very focused on the game. "Really? I think I was there" He says with his finger still on the screen not looking up from the screen, pressing the ball and trying to get it into the hole. He touches the ball and drags it. He releases it and it moves.

"Yahahaaa" he exclaims.

Child LB was interacting with Max and Ruby's Ball-o-rama while his two friends were onlookers. The task was for him to use his index finger to make the ball roll over to match the empty spot on the screen, by holding on to the ball with his finger tip on the iPad screen, then matching the correct direction and launching the ball into the empty spot by pulling back and releasing his finger from the iPad screen. Child LB had difficulty making the ball roll over to match the empty spot on the screen. He used his thumb, index and middle finger to try and roll the ball but it would not move. He had such difficulty with this activity that his fingers began to shake. Although he was having difficulty, he persisted on getting the ball into the hole. After about nine minutes he was finally able to make the ball roll. Although the ball did not enter the hole, he was still happy that he succeeded in making the ball roll.

5.3.1.1.3 ASSERTIVENESS

Assertiveness was another indicator of behavioural engagement. As behavioural engagement has to do with observable behaviour of a child during an activity which also includes their attitudes, assertiveness is included as an indicator. This has to do with the way a child speaks up for himself or herself in way that is honest and respectful. The children who were assertive were able to communicate verbally with

words or non-verbally with their behaviours and attitudes. For a child to be assertive, he or she can say how they feel, can ask for what they need or want and say no without feeling guilty.

Child HG 1st Observation Phase 2
Child C stretches his hand, swipes the screen to the next page and now taps on Peppa Pig Shopping. HG uses her hand to push the Child C's hand away from the iPad and taps on the play icon.
Child HG 2nd Observation Phase 2
11:34: Another child comes to where we are sitting and tries to touch the screen.
"NO", HG shouts.
The other child removes his hand, sits and watches HG as she plays with the iPad.

In her first observation, Child HG had just begun her turn with the iPad and was looking for what digital activity to interact with. Child C who was sitting beside her decided to choose Peppa Pig Shopping. Child C was often observed interrupting other children while they interacted with digital activities. Child HG can be seen in the extract above pushing his hand away from the iPad, thereby communicating non-verbally to the child. She was not aggressive but through that behaviour she was able to let the child know that she did not want him to touch the iPad screen. She may have also been assertive towards the child because she may have felt that her time with the iPad was being interrupted. I observed that she still continued to interact with the activity that the child chose even after pushing the child's hand away from the iPad. This shows that although she approved of the activity, she did not like the child interfering with the iPad and wanted to be the only one to touch the screen of the iPad.

In her second observation, she was assertive but this time she expressed herself verbally. From the above extract, it can be observed that another child tried to touch the screen of the iPad and Child HG verbally communicated her feelings by saying no. She was not pleased that the child tried to touch the screen while she was having her turn on the iPad. This may be because the she knew she had limited time on the iPad so she did not want anyone else to use up her time. This may also be because the iPad was special

to the child and treated it like something very precious to her disallowing anyone to touch it. The child listened to her and continued to watch Child HG interact with the digital activities without interfering throughout the observation. Being assertive during this observation showed that she may not be pushy or timid to know what she wants, which is to have her own time with the digital activities.

Child P 3rd Observation Phase 2
She taps on 'Stumpy's Alphabet Dinner'.
"You like this game?" I ask her
She nods in reply.
She looks at the screen for a few seconds.
"I want a different game" she says squeezing her face.
She exits the game and taps on Peppa's Paint Box.

Child P was searching for an activity on the iPad to interact with while I observed her. During this observation, I was interacting with her while she swiped the iPad screen from left to right. From the extract above, it can be observed that I was trying to get her view on the digital activity she had just chosen. Her reply was in non-verbal communication by nodding her head. I did not expect her to change her mind suddenly and request another game even though she was the one holding the iPad and had control over it. Her countenance changed and she looked angry. But she was assertive while doing it. She was assertive because even though she was in control of the iPad, letting me know she wanted a different activity was her way of telling me she may not want my opinion.

5.3.1.2 COGNITIVE ENGAGEMENT

Findings from this research showed the emerging indicators of cognitive engagement with digital and non-digital. The following examples below are the sub-themes that emerged from the data which are also coded as indicators of cognitive engagement.

5.3.1.2.1 PROBLEM SOLVING

Some of the children exhibited problem-solving skills with digital activities. Child HB, Child JB and Child R2's observations will be used as examples to show how they exhibited problem solving through digital activities. The first example is Child HB.

Child HB 3rd Observation Phase 2
He looks at the screen, looking out for the items he needs. He sees an item in his shopping cart that he doesn't need.
"I don't need that", he says.
He taps on the shopping cart and swipes the item out.

Child HB interacted with Peppa Pig Shopping. During this observation, he was focusing on the iPad screen, looking for the items that he needed to put in his shopping cart. It can be observed from the extract above that he was focused and had mastered the content of the activity. The problem Child HB was to solve in this activity was to find the items needed before time ran out. He knew what he supposed to do and was attentive to know when the wrong item had been put in his shopping cart. He realised that an item that did not belong in his shopping cart had been put there. Now this was a problem. If he was not able to get the items out of the cart in time, it would become full and he would not be able to get the items he needed. He was able to think and make the decision quickly what item had to be removed. He proceeded to swipe the item out of his shopping cart solving the problem he had.

Child JB 1st Observation Phase 2
A list of items appears on the screen. He focuses intensely on the items on the shelves as Peppa Pig, Daddy Pig and George pass the shelves. He concentrates on the screen to find what he needs and put them in his shopping cart. As he finds the items, he taps them into the shopping cart
No George", JB says. One of the characters George has put an item that doesn't belong in the shopping cart.
"Put in the carrot" one of the children sitting and watching tells JB.
"No it doesn't say I need carrot, my list says strawberries, rocket, apples and ketchup" JB replied.
"Bananas", says another child.
"No bananas", he replies.
One of the children tries to put a toy aeroplane in the trolley.

"No we don't need that aeroplane, we need a rocket", he tells the child.

This next extract is from Child JB's first observation where he engaged in problem solving activities. He was interacting with Peppa Pig Shopping while three other children were watching him interact with this activity. As Peppa Pig and her family moved past the shelves, he was focused intensely on the screen, watching out for the items that he needed. He had mastered the items on his list because when one of the characters put the wrong item in the shopping cart, he swiped the item out immediately. As can be seen in the extract above, Child JB knew exactly what items he needed and solved the problem of wrong items in the shopping cart. He identified the problem, brainstormed for the solution and implemented the solution. He also did not allow the other child's suggestion confuse him. He even went on to tell the child what exactly he needed, showing that he had made an effort in understanding this activity. Another instance was when Child JB stopped another child from interrupting his activity and told him he needed a rocket not an aeroplane. Both the aeroplane and rocket looked similar and a child could mistake the two if not focused but Child JB was able to tell the difference between the two because of his effort in understanding the activity. This way he may be developing skills in problem solving by matching the items at the top of the screen on his list to the items on the shelves.

Child R2 3rd Observation Phase 2
The next task is for her to stack five bricks correctly. She starts to stack them wrongly.
"Is it this one?" she asks me hoping I will tell.
"Well, try it let's see" I tell her. We both laugh.
She looks at me, stacks them right and looks at me again, smiling. I smile back.

During her observation, Child R2 was interacting with a digital activity called Alpha Tots claims to help children learn letters of the alphabet with games. In the extract above, she was learning about the letter S. The activity was to stack five coloured rings

on a cone according to their size. She began to stack the bricks at first without realising that she was to stack them from the biggest brick to the smallest brick. At a point she realised that she was making a mistake because there was no space on the cone to place the remaining bricks. That was when she asked me for my opinion. I decided not to tell her what to do but allowed her to solve this problem by herself. Encouraging children to problem solve will enable them use this skill in other areas of their lives. She looked at the screen again, removed bricks from the cone and restacked them correctly this time. As she realised that she had done this correctly she smiled at me. I had given her the opportunity to solve a problem without interfering therefore if she is faced with another similar situation, she may be able to solve the problem independently.

5.3.1.2.2 SYMBOLIC REPRESENTATION

Symbolic representation has to with an object being used to represent another object or in Child JB's observation, colour being used to represent situations or emotions. Children explore colours that they see around them. They also learn the names and differences of these colours through creative art activities. Through this, they can find out what the colours represent. Children can also represent events or situations in their paintings or drawings. Child JB was able to symbolically represent colours to situations and emotions while interacting with a digital activity.

Child JB 2nd Observation Phase 2
He taps on George. He moves his finger to the menu and taps on the red paint bucket. He uses his fingers to spread the red paint all over the screen.
"I'm making lava", he tells me.
He moves his fingers towards the menu icons and taps the blue paint bucket. He uses his fingers to spread the blue paint across the screen. He does the same with black paint.
"George is afraid of the dark", he says as he paints.

In his second observation, Child JB interacted with Peppa's Paint Box. The activity could also be known as virtual painting whereby fingers were used to paint and draw on

a virtual paper. On the right side of the iPad screen was the menu section where he could choose any colour of paint, brushes and stickers to express himself in drawings and paintings. During the observation, Child JB was using his right index finger to spread red paint on the virtual paper. As he did this, he symbolised the colour red to lava which is also red in colour. As the interaction continued, he changed to black paint and began to spread the black paint on the virtual paper. He then told me that George (who is one of the characters in the activity) was afraid of the dark. He also symbolised the colour black to fear and this may mean that he associates the colour black with fear. These signs may be patterns of cognitive engagement because he was able to represent these colours to situations. It can be observed that Child JB's imagination and mental capacity were in top gear because of the way he interacted with the activity. He identified the colours he used for painting to a stimulus that he encountered previously in his life. He may have come across this stimulus in a story book or on television shows. He was creating make believe scenarios with the character he chose to paint with. Children engage in imaginative play with toys and playing with other children but in this case, it can be observed that Child JB engaged in imaginative play in a digital context. He was also able to talk about his art thereby improving his vocabulary.

5.3.1.2.3 CATEGORIZING

Categorizing is a part of cognition and activities that encourage sorting, matching and recognition are understood to be aspects of cognitive engagement when it comes to children's play and learning. Many digital activities provide opportunities for children to use these skills and this can be seen in the example below:

Child HG 1st Observation Phase 2

Child HG is using her finger to tap the start icon on the screen. She listens to the instructions given in the game.

"Hang each shirt on the matching coloured hanger", the voice in the game says.

She listens to the instruction attentively and does exactly what she is told by using her fingers to move the shirts to their matching hangers. The next section is identifying

which shirts are dirty and those that are clean. HG is using her finger to tap on the shirts that are dirty. She is completely absorbed in the activity and does not flinch or look up as another child moves close to where we are sitting.

Child HG was interacting with a digital activity called Edu Kids Room which is an app that provides children with various activities such as colour recognition, colour sorting, number and shape recognition, memory training and counting. The activities that Child HG interacted with were matching and pattern recognition. She was able to match various coloured clothing to their specific coloured hangers. Her success on this task suggests that she had a good understanding of colours. Also, she was able to identify patterns by separating dirty clothes into the laundry basket. With the second task which was pattern recognition, she was shown shirts that were both clean and dirty. She was able to recognise the shirts that were dirty and dragged them into the laundry basket. These digital activities brought about deep concentration because she was able to focus on the activity and not get easily distracted.

Child O 3rd Observation Phase 2

He exits the game. He swipes the screen and taps on Disney Digital Books. He chooses the Frozen Matching activity. It opens with 12 cards to be matched. As he taps on each card, he quickly matches them with other cards he had previously seen. He is able to remember where he last saw a card that matched with the other. He matches everything and is very happy when he does.

Child O was interacting with Disney Digital Books which is an app that has various digital activities. The activity that Child O had chosen was the matching card game. It was based on the Disney cartoon Frozen. During this observation, he was able to utilise the ability to store, organise and retrieve information in relation to the cards as he had seen them before. The cards were laid out on the screen and he would flip one at a time, hoping for a match. If he did not get a match, he would remember where those cards are at a later time. As he was able to complete the task successfully, he progressed to a larger number of cards which he was also able to complete successfully.

5.3.1.2.4 SELECTIVE ATTENTION

The ability to be able to ignore unnecessary information and focus on the relevant information is known as selective attention. It is crucial that children are able to develop this skill as they grow older. Child P will also be used as examples to show how they were able to use their selective attention skills while interacting with the same digital activity.

Child P 1st Observation Phase 2
She taps on Edu Math 1.
"Catch all the number 7" says the voice of the game. There are number 1, 3, 5 and 7 flying around on the screen.
Child P taps on all the 7 not tapping any other number.
"Is it fun?" one of the children asks.
She nods in reply.
"Catch all the number 4" she taps on all the number 4s.
"Catch all the number 0. She moves her hand to touch the first number that flies out. She realises it is number 3 and not 0 so she does not tap it. She taps on the 0 she sees.

From the above extract, it can be observed that Child P exhibited selective attention while interacting with it. During Child P's observation, it can be observed that she was able to recognise the number she needed to catch and focus on that number meanwhile ignoring the other flying numbers that were a distraction. She even had her finger pointing at the screen, ready to catch the recognised number. As she was given the instruction to catch a number, she would select the number and focus on finding more of it and could not be distracted by the irrelevant numbers on the screen. Also the numbers to be recognised and caught were defined by features (colours) that the children could identify making visual search reaction consistent regardless of the number of distractions because the target number would regularly pop out on the screen.

5.3.1.2.5 RECALLING

Recalling has to do with children being able to remember. It could depend on their interest, relevance and attention to that activity. Below is Child JN's observation which shows recalling.

Child JN 1st Observation Phase 2
He taps on Critter Math2.
"I don't think I can play this game" he says.
"Don't worry you'll learn it" I reply.
The activity starts. There are 7 options to choose from and JN chooses 'Remember Shapes'.
There is a rectangle and circle on the screen. Both shapes are put into a bucket.
The voice in the activity asks him to tap on which bucket the rectangle was put in. Child JN focuses on the screen and taps on the bucket on the left side of the screen, revealing the rectangle. The next task is to find the triangle. There are three boxes on the screen and JN taps on the middle box revealing the triangle.

During his observation, Child JN was interacting with a digital activity called Critter Math. This digital activity was designed for pre-schoolers to help them learn basic shapes necessary for a foundation in the subject of Geometry. The idea behind this digital activity is beneficial for children because it introduces them to shapes at an early age. The basic shapes that were presented in this activity are squares, triangles, pentagons, hexagons, circles and rectangles. By interacting with this activity, I observed how Child JN was able to identify some of the shapes by their name and form. In this activity, Child JN needed to be able to recall a number of given shapes shown after they had been hidden in boxes. The number of shapes and boxes increased gradually and each time he was able to find the correct shapes. Even though he doubted himself at the beginning of the activity, he was able to recall the given shapes because he had remembered what box they had been hidden in.

5.3.1.3 EMOTIONAL ENGAGEMENT

As explained in Chapter 2 section 2.5.2, emotional engagement occurs when children have positive attitude while interacting with digital and non-digital activities. Findings from this research revealed how some of the children's behaviours responded to the digital activities they interacted with.

5.3.1.3.1 HAPPINESS

Happiness was observable in this research when some of the children showed and expressed delight in mastery of the activity they were interacting with. Their behaviours showed what they were thinking in response to the activity. Therefore, findings from this research showed the emerging indicators of emotional engagement with digital activities which are happiness and enjoyment. Two extracts from Child HB's first and second observations show him expressing happiness that determined the status of his emotional state during the observed period. He smiled and expressed his joy verbally and physically which indicated his inner state of being happy.

Child HB 1st Observation Phase 2

He looks closely at the screen with his fingers moving the pipes to their correct places. He is rewarded with three stars for getting the task right.
"YEAH", he shouts, with a smile on his face.

Child HB 2nd Observation Phase 2

The activity began with the letter R, T and A on the screen. He is supposed to move them to their correct places to form a three letter word. He begins the task by moving the letter R first because it has been highlighted on the screen. He now moves the letter t and which are not highlighted to their correct places forming the word RAT. The activity moves on to the next task. The letter A, B and T are on the screen. He uses his right index finger to move the letter B to where it has been highlighted and moves the letter A and T correctly to form the word BAT.
"Well done", says the voice in the game.
"Yaaaaaaay", HB shouts, shaking his body with joy.

In his first and second observation, it can be observed that Child HB exhibited indicators of emotional engagement while interacting with digital activities. This indicator was happiness with verbal signals which were the words he used and non-verbal signals which were his body language. In his first observation, he was interacting with Max and Ruby. The task in this activity was for him to move the pipes to their correct places so that water can flow through them and not spill. When he was able to complete the task correctly, he was rewarded three stars. He knew that the stars meant he had completed the task correctly making him react the way he did. He used the word 'yeah' to express his happiness. In his second observation, it can also be observed that he exhibited these same signals. He was interacting with the activity called Endless Wordplay which is a literacy activity. As he formed the words correctly on the screen and was told well done by the voice in the activity, Child HB reacted with happiness that he shouted 'yaay' and shook his body with excitement. He was happy that he could complete the tasks in the activity correctly. Child HB having such an experience while interacting with digital activities may encourage him to want to achieve more tasks correctly thereby driving him to unlock his full potential.

Child O 1st Observation Phase 2

He swipes the screen and taps on Endless Numbers. He taps on the first level. The activity starts with identifying the Number 1. He uses his finger to drag the number one to where it belongs and taps the eye.
"Yaaaay" says the voices in the game.
Child O giggles and jumps on his bottom.
The next level starts. He is to drag number one and two into their correct places. He is instead dragging the number 1 to where number two is supposed to be and vice versa. He tries again and gets it right.
"Hehehehehehh", he giggles when he gets it right.
The next level is to add 1 and 1. He drags the numbers into their right places.
"What is 1+1?" I ask him.
"Two" he says laughing.

From the above extract, it can be observed that Child O was happy while he was interacting with a digital activity. He was interacting with the digital activity called Endless Numbers which is a numeracy activity. The numbers have eyes and jump

around the screen. Child O used his fingers to drag the number one to where it belonged and tapped its eyes to wake it up. This feature of the game was seen to excite Child O as he giggled and wiggled his body happily. Even when he was making a mistake in the activity he was still happy and giggled when he realised his mistake and got it right. I could observe that throughout that activity, Child O had a smile on his face. It may have been that his mastery of the activity, the features in the activity could be what was making him happy.

Child LY 2nd Observation Phase 2
She taps on Tiggly Chef. The game starts. She taps on five bananas, 1 cherry, five eggs. She is using her right index finger now to tap the ingredients into the bowl.
1:02: LY laughs and looks at me. She is enjoying playing the game with the iPad. She makes the chewing sound as she taps on the food prepared. The game ends. She starts the game again excitedly.
"Strawberry", she says excitedly as she taps on two strawberries into the bowl.
10:04: She makes the munching noise as she taps on the food prepared.
"I ate it all up", she says happily.

Child LY also exhibited happiness during her observation. From the extract above, it can be observed that she was interacting with a digital activity called Tiggly Chef. This is a numeracy activity which enables children to count food ingredients of which its main goal is to enable children to learn how to count. Child LY could be observed being happy, laughing and smiling so much that while she tapped on the food ingredients on the screen, she made the munching sound. She found pleasure in the activity, pursuing her interest. It could also be observed that she enjoyed tapping the food ingredients into the bowl. Although she was not counting out loud while she did this, the voice in the activity did the counting for her. At the end of the activity, the food is prepared and Child LY reacted to this positively as she "ate it all up".

5.3.1.3.2 ENJOYMENT

Some of the children had a sense of enjoyment when they interacted with digital activities and in the instance shown below they were demonstrating their enjoyment.

Child IP 1st Observation Phase 2

IP taps on the fishing rod in boat and it moves to the fox. She uses the fishing rod to catch three fishes by tapping the fishing road into the water. The boat reaches the end of the river. IP uses her right index finger to put together the firewood and tent. She is engaged with this activity and always smiles when she passes a stage. She relaxes her back on the couch, looking comfortable with her legs are resting on the sofa as well.

During this observation, I observed that Child IP was enjoying the moment she had with the digital activity she was interacting with. From her behaviour and facial expressions, she was relaxed and did not show any sign of stress or tension. She was comfortable and relaxed in her environment. She was alone while interacting with the digital activity and this could be why she felt more relaxed because she was the only one sitting on the sofa in the nursery. Children should be able to enjoy digital activities because it drives children to be more engaged in the activities. It is important that children begin to experience this feeling from an early age as this will motivate them to continually engage in any activity they come across.

5.3.1.4 SOCIAL ENGAGEMENT

Some of the children were observed participating in social interactions with digital activities. The children were able to work together in groups, enjoy each other's company and communicate. Through social interaction, they can develop communicative and linguistic skills that will be beneficial for them as they grow older. Below are the indicators of social engagement that were observed in Phase 2.

5.3.1.4.1 PEER ENGAGEMENT

With arguments that have been made about iPads isolating children from others, data from my research showed that most of the time the children were not isolated instead it encouraged peer engagement. I observed that once a child was interacting with the iPad, a number of children would surround that child and watch the activity. Sometimes, it was the music from a digital activity that would attract other children. The children

would even take turns with the digital activities thereby enabling them to learn how to share and play together. Sometimes interesting conversations took place between the children. With regard to this, peer engagement was observed as one of the indicators of social engagement. Positive connections were shared between the children; they encouraged each other and conversed with each other. Below is an extract from Child LG's third observation and Child JN's second observation that shows this:

Child LG 3rd Observation Phase 2

She taps on 'Peppa's Paint Box'. She taps the menu of the game at the right side of the screen and taps on a red paint bucket. She uses her finger to spread the red paint all over the screen. "Yuck", says the child sitting beside LG.
LG laughs at what the child said. She taps on the bubble icon on the menu and taps the screen putting bubbles everywhere.
"Why do you put bubbles?" the child asks in funny voice.
LG laughs at this. She taps on the yellow paint bucket and spreads the yellow paint on the screen. She now taps on the mud icon and taps it all over the screen.
"Disgusting" says the other child. They both laugh.

During Child LG's observation, she was interacting with the activity called Peppa's Paint Box which is a virtual painting activity. While she was interacting with this activity, another child was watching what she was doing and would make funny comments about the activity. From the extract above it can be observed that the child would make funny comments about the colour of paint Child LG used to paint and making funny voices. Every time the child did this, I observed that Child LG would always laugh. This can be seen as peer engagement. Child LG warmly received the child's comments bringing about positive peer engagement between the two children. As children grow and develop, they become more inclined to interact with other children with their peer group and older. When interacting with other children, they learn appropriate social behaviours that help them develop lasting friendships. Most opportunities for peer engagement occur during play as it can be seen in the above

extract. Below is another example that shows interaction taking place while two children interact with a digital activity.

Child JN 2nd Observation Phase 2
He goes straight to the picnic basket and taps it. He taps on the letter D, K, Q, U as they make the munching sound.
His friend comes to where we are sitting and says "That's my letter" pointing at an alphabet. This is because his name has the alphabet in it.
JN taps on it.
"Don't eat it", the child says.
They both laugh.

Peer engagement between children can provide learning opportunities. During his observation, Child JN was interacting with a digital activity called Stumpy Alphabets and was tapping on the letters of the alphabets when Child K spotted a letter in his name and told Child JN not to eat it. They then both laughed at this. Child K had shared information to Child JN about his name and he reacted to this by tapping on the letter K. This communication is observed to be a verbal communication. It should be noted that Child K knew the letters in the name and jokingly told his friend not to eat it which makes both of them laugh. If Child JN did not know how to spell Child K's name before this observation, at that moment he would have learned that his friend's name had that letter in it.

5.3.1.4.2 COOPERATION

Children tend to have fun when they work together on an activity. It was observed that some of the children cooperated with the digital activities and they were predominantly verbal communication.

Child LB 1st Observation Phase 2
The next puzzle is a bit hard for LB because he is finding it difficult to fit it in where it belongs.
"Put that one first", his friend suggests. He nods in agreement and uses his right index finger to move the puzzle piece his friend suggested. It fits perfectly. He now moves the second piece to complete the puzzle.
"YAAAAAY", his friends shout.

He continues to fit in the puzzles. As he does this, his friends collaborate by saying "yaaay" when he is getting it right and "noooo" when he is getting the puzzles wrong. They all laugh when he misses one and are happy when he gets it right. They all enjoy the iPad and are engaged together in the activity.

Child LB was interacting with the iPad while his two friends were sitting by him watching. During this observation, he was interacting with Max and Ruby. He was supposed to drag three pipes to their correct places so that water can flow through them. I observed that he was having difficulty fitting the pipes to their correct places. His friend who was sitting beside him saw that he was having trouble with the activity and suggested what he should do. He did as the friend suggested and he got it right. As he fitted the first pipes correctly, he was able to fit in the next one. Accepting guidance from his friend helped him to achieve the task. As the digital activity progressed, their pattern of cooperation changed from words to exclamations. Whenever he was about to move the pipes in the wrong places, his friends would exclaim 'no' and 'yaay' when he was getting it right. This helped him to know if he was getting the tasks right or wrong. Below is another extract that demonstrates cooperation between Child LB and his friends.

Child LB 2nd Observation Phase 2

The game starts with Peppa, George and Daddy pig strolling by the shelves with the shopping cart. He uses his finger to swipe some strawberries and cucumber in his shopping cart. He notices some items that do not belong in the shopping cart, he tries to swipe them out but he doesn't know how.

"You have tap on the shopping cart then place your finger like this and swipe the items out", I explain to him.

Child P and Child HZ come to join us by the home corner and sit down.

"Tap on the basket", the Child P tells him.

LB taps on the shopping cart.

"Now like this", the Child P continues to explain to LB swiping her finger across the screen. LB swipes his finger across the screen, removing the item out of the basket.

"It's these items you should get", says the second child pointing at the tops of the screen.

"Okay" LB replies.

He swipes some more items on the list into this shopping cart.

"Look you need ketchup", says the second child.

"Quickly", says the Child HZ.

LB and the children laugh as he tries to quickly drag the items in the shopping cart before it passes by.

"Put the spaghetti in", says the Child P. "That doesn't belong in there", says the Child HZ. He finishes shopping for the items on the list and all the children celebrate and laugh together. "Again again", they all exclaim.

Again, during this observation Child LB and his friends cooperated. He was interacting with Peppa Pig Shopping and this is an interactive activity whereby he had to find some items as fast as possible before the characters in the activity pass the shelves. From the extract above, it can be observed that Child LB was slow in finding the items he needed. However, his friends who were watching this activity were able to find these activities and point them out to him quickly before he had passed the shelves. It can also be observed that the digital activities did not isolate Child LB from his friends. Instead of him to interact with the digital activities by himself, he cooperated with his friends and this made the activities more engaging for him. The presence of his friends Child P and Child HZ enhanced Child LB's experience with digital activities. The children supported each other by observing their actions through listening and careful watching and offering encouragement. As Child P, Child HZ and Child LB worked together with these digital activities, they had a common goal and that was to complete the tasks in the activities. They communicated their knowledge and ideas verbally at a level that they all understood.

5.3.1.4.3 <u>ADULT INTERACTION</u>

During the observations, I observed that I was able to interact with the children better due to the presence of the iPad. During the first five months of visiting the setting, I was just a visitor to the children and whenever I arrived in the mornings, I would not be noticed by the children except Child R1 whenever she was present. However, after I introduced the iPad to the children, they became more comfortable in my presence and could interact with me whenever I came into the nursery. This was because while they interacted with the digital activities, I would frequently sit beside them and interact with

them. Sometimes, when I arrived at the nursery in the mornings, some of the children would run to me and ask for the iPad. Also, through my interaction with the children, I was able to observe that some of the children needed more adult interaction when interacting with digital activities. Sometimes, the activities needed explanation for the children to understand and if there was no adult present to guide them, they would have lost interest in that activity and the purpose of that activity would be lost. Therefore, the interaction between me and children gave room for guidance and scaffolding to take place. The reason I was the only adult who had such interactions with the children was because the teachers in the nursery did not use the digital activities to interact with the children. I was the only adult who used the digital activities while the teachers focused on non-digital activities. The extract below shows examples of how I was able to interact with the children and guide them through the digital activities they were interacting with when they did not understand how to complete the tasks.

Child R1 1st Observation Phase 2

The next task is to choose the fruit that does not belong with other fruits. There are three apples and one orange. R1 looks confused as to what to do. She stares at me for a few seconds and looks back at the screen.
"You have to choose the fruit that is different from the others", I try to explain to her. She is finding it difficult to understand the concept.
"Which one is different?" I ask her.
"Orange" She replies.
"Okay tap on it", I tell her. She taps on it.
"Good job" I tell her and she smiles at me.

During her first observation, Child R1 was interacting with her second digital activity which was called Fit Brains. Fit brains is a game that is designed as a educational tool to develop critical thinking skills, increase memory for learning and strengthen early cognitive performance in children. While she was interacting with this activity, I observed that she was confused about how to complete the task. She would look at me for a few seconds and then look back at the iPad screen. At that moment, I realised that if I had not been interacting with her during this observation, she would not know how

to complete the task. Child R1 is a shy child who did not speak all the time because she was still learning how to use her words correctly so looking at me was her way of telling me she did not know what to do. So I explained how she could complete the task but she still did not understand the concept of the activity. There were three apples and an orange on the screen and she was to choose the odd fruit. I then had to ask her which of the fruits was different and she answered correctly. From this, it can be said that although she did not understand the concept of the game, she knew the difference between an apple and an orange showing that our interaction was helpful in completing the task in the activity. This could be seen in light of Vygotsky Zone of Proximal Development (Vygotsky, 1978). Our interaction could be seen as one between an experienced adult and less experienced child.

Child O 2nd Observation Phase 2

Child O exits the game and taps on Disney Digital Books. He picks Disney's Monsters. The game is to find the monster in a group of other monsters. He taps all the monsters randomly not looking for the particular monster. He exits the game. I tap on the game again.

"You can do it, just focus. Look at this monster, where is it there?" I ask him pointing at the group of monsters. Child O looks at the screen, focusing his attention in the monsters.

"There he is" Child O says.

He gets the next four monsters. He is very happy as he gets each one.

From the extract above, it can be observed that Child O was able to understand and interact with Disney Digital Books because of the adult interaction that took place. I saw that it was a moment for me to intervene rather than just sit back and watch him not fulfil the purpose that the activity was created for. By being responsive and guiding this activity, Child O may learn to take more initiative and be activity engaged and persistent in more activities as he grows older. I was able to encourage him to solve the problem for himself rather than avoiding it just because he did not understand it. This was so he could develop his own problem solving abilities. By helping understand the

activity, he was able to complete the task correctly by focusing on the screen and finding the monsters.

5.3.1.5 DISENGAGEMENT

As discussed in chapter 2, children can also be disengaged when it comes to play and learning. Results from this study show some of the children being disengaged with digital activities.

5.3.1.5.1 DISTRACTION

Distraction occurs when children's attention is easily shifted from the activity they are interacting with.

Child JG 1st Observation Phase 2
Child JG looks closely at the screen. She taps on Peppa's Paint Box. The activity starts and music begins to play. A teacher walks into the classroom and Child JG looks up at the teacher for a few seconds then looks back at the screen. She begins to use her fingers to spread blue paint across the screen. She looks up and watches the other children playing for another few seconds. She exits the activity by pressing the main iPad button and stares at the screen. She looks up from the screen and stares into space.
"Do you want to go outside and play? I ask her.
She nods in reply.

During this observation, Child JG was interacting with Peppa's Paint Box which is a digital activity. I observed that while she was interacting with this activity, she was easily distracted by other people in the nursery and sometimes she would stare into space. She would be engaged in the activity for some time but then there were moments when she would just stare into space. From the Laevers scale of involvement and engagement which was used for the quantitative data collection, these patterns Child JG exhibited are signals of extremely low engagement. When I observed that she was distracted with the digital activity, I asked her if she wanted to go outside and play and she agreed. Also, it can be said that the digital activity may not have been a distraction to non-digital activities for Child JG because from the above extract, it can be observed

that she chose to play outside over interacting with the digital activity at that moment. The reason could also be the life change that she was experiencing during that period. I was told by her teacher that her mother was due to give birth to a baby in a few days and this was making Child JG distracted and withdrawn from other children and both digital and non-digital activities in the nursery.

5.3.1.5.2 ABSENCE OF EFFORT

Some of the children in this research were observed to have shown absence of effort while they interacted with digital activities. This means that they did not show any attempt to complete the tasks in the activities despite the help that was given to them. There are reasons why this can take place such as fear, anxiety, lack of interest and lack of engagement. Below are two extracts that shows this:

Child LY 2nd Observation Phase 2

She taps on Peppa Pig Shopping. The game starts. She is given a list of items to buy. She taps on the tinned mushroom and chocolate cake. She taps on other items that are not on the list. I try to explain the game to her but she doesn't listen to me. Even the other children around her try to explain but she doesn't listen to them as well. R2 taps on the shopping cart.

"Remove those" R2 tells LY pointing at the items. But she doesn't remove them. Instead she continues to put more items in the shopping cart.

"Doh, doh, doh" she says as she taps on the items. She jumps up and down as she taps on the items. She exits the game.

Above is an extract that shows Child LY's second observation in this phase. During this observation, she was interacting with the digital activity Peppa Pig Shopping which she had interacted with in previous observations. It can be observed that she was not completing the task in the digital activity; instead she did things her own way. She tapped on every item she could tap on and most of the items she did not need. I tried to explain to her to how to get the correct items although knowing that she knew the rules but she did not listen to me. Even the children who were sitting beside us were trying to

tell her the right thing to do but she also ignored them. She did not show any effort in understanding or completing the digital activity correctly.

Child R3 1st Observation Phase 2

The shopping starts. She starts the game slowly again. She taps on the wrong items.
"Look, melons catch it quick" the other child says.
The melons are right in front of her but she doesn't tap on it, instead she taps on the banana beside it.
"You are getting everything wrong" the child says. The game finishes. She does not get any of the items in the shopping cart.

Learning from others is one of the ways children can learn how to cooperate and even collaborate with their peers and adults. However, from the extract above, it can be observed that Child R3 did not show effort in the activity and did not learn from her peers. She was interacting with the digital activity called Peppa Pig Shopping. This was not the first time I observed her interacting with this activity. However, she was not attempting the task correctly. There was another child sitting with us who knew exactly what to do and was trying to explain this to Child R3. Instead of intervening, I decided to observe how Child R3 and the child would interact during this situation. As it can be observed, Child R3 ignored the child and continued to do as she pleased even though she wasn't getting the activity right. The child eventually told her that she was getting the task wrong.

On the other hand, a different scenario was observed in section 5.2.4.2 where Child LB was observed welcoming suggestions and corrections from his friends thereby enabling cooperation. No child is the same and children may not react the same way in a particular situation. There could be many reasons why Child R3 and Child LY did not react the way Child LB reacted when the opportunity to learn from another peer was presented. I had observed that Child LB and his friend were very close and always played together, however for Child R3 and the other child; they were not close and hardly spent time together and I was able to deduce this because I had spent five months

with the children. She may have not being familiar with the child or used to having the child around her while she was interacting with an activity. This could be one of the reasons why Child R3 did not listen to other child.

4.3.2 PHASE 4/ NON DIGITAL ACTIVITIES

In this phase, the children were observed while interacting with non-digital activities. This was a change from the digital activities they were interacting with in the previous phase. These activities had been provided by the teachers in the nursery and the children were free to choose any activity they wanted. Below are the themes and sub-themes that emerged from the qualitative data.

5.3.2.1BEHAVIOURAL ENGAGEMENT

Behavioural engagement emerged with the children's interactions with non-digital activities as well as it did in Phase 2 with digital activities. The indicators which are involvement, assertiveness emerged in this phase just as it did in Phase 2.

5.3.2.2.1 INVOLVEMENT

The findings from this phase also showed some of the children involved with non-digital activities. The first example is Child HB who showed involvement while interacting with a non-digital activity.

Child HB 1st Observation Phase 4

He picks up one of the white spoons with his right hand and dips it in the small plastic glue. He brings out the spoon and spreads the glue on the paper in front of him. He moves his left hand towards the bowl of glitter dips it in the bowl and brings out a hand full of glitter. He sprinkles the glitter around the paper. HB lifts up his paper with his two hands and positions it over the glitter bowl. He shakes his paper, removing the excess glitter into the bowl and onto the table, leaving some glitter on the glued part of the paper. He places his paper back on the table.

Child HB was at the Arts and Crafts corner while I observed him. He had an A4 paper on the table in front of him with a cup of glue and bowl of glitter beside the paper. It can

be observed from the extract above that he was taking part in a creative activity. He was in the process of making something using different tools and materials in the arts and crafts corner which was designated for the children to create their art. This activity required a disposition towards being creative and having an idea of what the picture would be. Child HB was deeply absorbed and completely involved in this activity as he spread glue on his paper and sprinkled some of the glitter on the glue. He was exploring what he could do with the materials. By spreading the glitter on the glue, he knew that some of glitter would stick and that shaking the paper would remove the excess. As he did this, he was very focused in the process. It was encouraging to see how a child aged 3 was able to use his imagination and creativity to produce an art work with such involvement.

Child JB 3rd Observation Phase 4

The teacher is reading a story book to the children. JB sits and watches the teacher as she reads, smiling and she enjoys the story as well.
"Who can roar like a lion?" The teacher asks
"Rooooaaar" JB and all the other children roar excitedly.
He listens as the teacher continues to read the story book.
"Who can hiss like a snake?" She asks.
JB makes the hissing sound. The teacher is now wearing a frog puppet on her left hand.
"Who can jump like a frog?" she asks the children.
JB starts to jump excitedly.
"A frog, a frog" he says.
The teacher continues to read.
"Who can bark like a dog?" She asks
"Woof woof" JB replies.
"Good job" The teacher tells him.

The second example from **Phase 4** is from Child JB's third observation. I observed him while he was listening to a story book read by one of the teachers in the nursery. The story being read by the teacher was an interactive one because there were questions about the sounds animals make. Child JB participated in this activity and even mentioned the animals that the teacher asked about. He was excited when mentioning the animals and kept jumping. Not only was he involved during this activity, he was

also able to remember the animals that made specific noises which is good for his memory development and knowledge of animals. The activity was enjoyable for him. His mood and sitting posture during the activity showed that he was excited to be taking part in the activity. Involvement was evident in his observation because he was interested and fascinated by the activity and he was also operating at the very limits of his capabilities.

Child LY 1st Observation Phase 4

9:34: LY is at the water basin in the nursery. She is wearing a red apron. Her two hands are deep in the basin. She moves her hands to and fro in the water. She brings out a rubber duck. It is covered in foam. She squeezes the duck and it splashes water all over the floor. She dips it in the water again, lifts it out and splashes water on the floor. She laughs and screams

The third example in this phase is from Child LY's observation. She was observed interacting with Water Play in her first observation. During this observation, she and Child O were at the water basin. The water basin had water and a number of tiny toy animals in it. Water play is an activity that promotes personal, social, emotional and physical development. Children enjoy the sensory nature of water; develop fine motor skills hand/eye co-ordination and use tools, objects and water with increasing safety. During the observation, Child LY would move her hand in forward and backward motion, experiencing the sensory nature of the water, thereby developing her fine motor skills. While she did this, her eyes were focused on the movement of the toys in the water. She then picked up one of the toys which was a rubber duck and squeezed it tightly releasing water from the hole at the bottom of the duck. This showed that she knew if she squeezed the duck, water would come out of it because it had been in the water basin. Some of the water splashed on the floor and as this happened; she laughed and screamed with excitement.

5.3.2.1.2 PERSISTENCE

Child LY showed persistence while interacting with a non-digital activity.

Child LY 2nd Observation Phase 4

LY fills up the bucket one spoon full at a time. She holds the spoon with her right hand and the bucket in front of her. Slowly she fills the bucket. The bucket is now full. She carries the bucket up and turns it over. She places it on the ground and lifts the bucket to release the sand, but the sand scatters. She uses the green spoon to put more sand in the bucket. The bucket is full now. She carries the bucket and turns it upside down again. She presses the bottom of the bucket. This time she pulls up the bucket slowly. The sand is formed and standing upright. She smiles.

Child LY was in the Sand Pit filling up a bucket with sand. It can be observed from the extract above that she filled the bucket in order to build a sand castle. However, her first attempt at building the castle was not successful because it fell apart. She persisted on building the sand castle by filling the bucket again with sand and tipping it upside again. This time, she did things differently. She pressed the bottom of the bucket and pulled it slowly which enabled the sand to take the shape of the bucket thereby forming a 'castle'. This observation shows just how persistent Child LY was in making a sand castle.

5.3.2.1.3 ASSERTIVENESS

Assertiveness first emerged in Phase 2 while the children interacted with digital activities. In this phase, it can be observed that it also emerged while the children interacted with non-digital activities. Below is an example that shows this.

Child R1 1st Observation Phase 4

R1 places three trains on the tracks and attaches them together using the magnets on them. She uses her right hand to pull the trains while making the train sound.
"Choo Choo"
Child O takes some of the trains R1 is playing with.
"Nooooo that's mine" she looks upset.
O just stares at her.
"You have to learn to share O" I tell him. He places the trains back on the tracks.
They both join their trains together and pull them together.
"Choo choo" they both say.
"Let's get some more train tracks" R1 tells O.

"Okay" He replies.

From the extract above, it can be observed that Child R1 was playing with some trains and tracks in the construction corner while I observed her. It was just the two of us sitting on the carpet surrounded by toys. Child R1 was busy attaching the tracks together and pulling the trains when Child O came and picks up some of the trains she was playing with. This upset Child R1 so much that she told Child O it was hers. Although she was upset, she was able to communicate her feelings to Child O, speaking up for herself and being assertive. Otherwise, she would have allowed him to take the trains away and be upset about it which would have hurt her feelings. Instead she chose to speak up and tell Child O that those trains 'belonged' to her. Child O reacted well by returning the trains back to her. It can be observed that they ended playing together and enjoying themselves even though she could have continued to play in isolation. She exhibited the ability to problem-solve and persist during play and ended up having a wonderful play session with Child O.

5.3.2.2 COGNITIVE ENGAGEMENT

Cognitive engagement emerged in Phase 4 while the children interacted with non-digital activities. As shown in table 4.1, the sub themes that emerged were problem solving, creating and constructing and selective attention. Below are the sub themes and examples.

5.3.2.2.1 PROBLEM SOLVING

Problem solving enables children to think creatively and logically. Non- digital activities such as learning colours, counting, puzzles and shapes can help children develop creative and thinking skills that will set the basis for abstract and independent thinking when they are older. During data collection, I was able to observe two children using this skill while interacting with non-digital activities. Below are the examples.

Child LG 3rd Observation Phase 4

She has already drawn some green and pink lines on the paper. She is now using a green perforator to punch holes into her paper. The perforator leaves only a circle on the paper but it doesn't make any holes. She picks up the green coloured pencil and uses it to push out the paper from the hole the perforator made.

During her observation, Child LG was observed using a perforator to make holes in her paper. However, the perforator did not leave any holes. What she did next here was problem solving. She applied her reasoning skill to know that she would need a tool to remove the paper because the perforator had made lines where the holes should have been. She determined what the problem was and then used the tool (green pencil) to assist her. Children use these materials in different ways to explore and find solutions to problems. As Child LG demonstrated, the materials she used created an opportunity for her to problem solve. By using the pencil to remove the holes when the perforator did not work the way it should have, Child LG identified the problem, though of a solution and carried out the solution.

Child P 3rd Observation Phase 4

She continues to paint on the paper
"I'm painting a butterfly," she says looking over to her teacher who is sitting in the construction area.
"Oh wooow" the teacher replies.
She continues to tap the paint brush on the paper.
"I have a hole in my paper," she tells her teacher.
"That's because you put a lot of paint on it" the teacher replies.
"I'm going to cover it up" Child P replies confidently.
She uses the paintbrush to tap on the hole.

During this observation, Child P was painting in the nursery with two friends. From the extract above, it can be observed that she had put too much paint on a particular area of the paper that the paint made a hole in it. She told the teacher who then replied that it was because she had put too much paint on it. She considered a possible solution which was to add more paint to the paper to cover the hole. This shows that she evaluated the situation and thought about a way to fix the situation. Even though she may not have

solved the problem, she made the decision to solve the problem. This is a good skill for children to start developing at this age. At this moment, she was making a decision for herself since she did not get help from her teacher. She continued to use the paint brush to tap on the hole trying to cover it up.

5.3.2.2.2 CREATING AND CONSTRUCTING

Creative play involves children using materials to create things, share ideas and interact with their peers, teachers and adults and others. Children enjoy being creative through different activities like painting, cutting and pasting, tower building, play dough and so on. Being creative can be thinking and behaving imaginatively. A child uses his or her imagination to create an idea for a craft or painting and bringing it to existence through the use of materials provided for them. The connection between play and creativity is important for children because they are able to use their imaginations and think. In Phase 4, creating and constructing was observed during Child JG and Child R2's observations while they interacted with a non-digital activity.

Child JG 3rd Observation Phase 4

She picks up an A4 paper. She sits on the Arts and Crafts table. She places the paper on the table. She picks up a plastic spoon which is inside a transparent cup containing glue. She drags the spoon on her paper leaving some glue on it. She picks up some cut up papers with her right hand and presses them on the paper. She uses her left finger to pick up some green sparkles and sprinkles it on her paper. She uses her left hand to pick up some more cut up papers and places them on the paper. She sprinkles some more green sparkles on the paper. She picks up the spoon in the glue cup and rubs the glue on her paper.

"My picture is going to be amazing" she tells the other girls. She adds some purple feathers and some more sprinkles.

"What does this say?" she asks me showing a love shaped plastic.

"Love" I reply.

She presses the love shape on her paper.

In the nursery, the children's play was free and spontaneous which allowed them to use their imaginations regularly. During this observation, Child JG was creating a picture using a paper, some glue, feathers and green sparkles. She began the activity by

spreading glue on her paper and started to stick pieces of paper on it. She pressed the papers on the glue. She may have known that pressing the pieces of papers on the glue would make them stick permanently and not fall off. Her objective was to make her picture amazing as she told me and she believed that by adding green sparkles and purple feathers would do just that. Her creativity showed not just with the kind of materials she used and the how she used them but by her persistence in making a beautiful picture and her attitude towards herself and the process. By exploring her creativity though this activity, she has the opportunity to develop her skills in art and design.

Child R2 1st Observation Phase 4

R2 picks up a plastic butterfly and paints the black paint on it. She uses her two hands to press the part of the painted butterfly on her paper. She removes the butterfly and there is an imprint of the butterfly on the paper. She drops the butterfly on the table. She picks up the paint brush and paints her left hand. She presses her hand on the paper. She lifts up her hand and there is an imprint of her hand on the paper. She paints her hand with red paint and presses it on her paper. The imprint is a mixture of red and black

Child R2 was also observed in a creative process. She was making use of paint to create designs. The way she concentrated while she painted showed her on task behaviour. She was absorbed in her painting while she painted a plastic butterfly and pressed it on her paper to leave an imprint on it. When she sees that pressing the butterfly on the paper leaves an imprint, she goes ahead and does this with her left hand. This allowed her to express her creativity. She looked at the situation creatively and may have thought what could happen if she did the same with her hand thereby painting her hand. She was expressing herself deeply through her art. Her imagination was in full use and she was encouraged to think outside the box thereby involving exploration and creativity. When materials for creative purposes are provided, children will respond creatively. Therefore, giving them the opportunity to explore objects, mix colours, explore new

ideas and skills, and more importantly enjoy their work. This can be observed in Child R2's observation.

5.3.2.2.3 SELECTIVE ATTENTION

In **Phase 4**, Child HG's second observation will be used as an example to show how she was able to use her selective attention skills while interacting with a non-digital activity.

Child HG 2nd Observation Phase 4
She drops her card, followed by Child R3 and then Child HB. Child HG sees a slap jack card and quickly slaps it. To be able to win this game, a child has to be very attentive. Child HG is happy she has seen the card first. Child HB grumbles again. HG drops her card first again, followed by Child R3 and then Child HB. She sees the card again and swiftly slaps the card.
"Yaaaay I win again" She says.
R3 and HB look disappointed.

During Child HG's observation, she and three other children were interacting with an activity called Slapjack and this activity was adult led. The goal of this activity is for one of the children to win all the cards by being the first to slap each jack card once it is played in the centre. It can be noted from the extract above that Child HG was able to slap the jack card immediately she set her eyes on it and being able to focus her attention on just the jack card and ignore the other cards that were not needed. Because of how focused and attentive she was in this activity, she was able to identify the slap jack card quickly before the other children could.

5.3.2.2.4 SYMBOLIC REPRESENTATION

Child P's observation shows symbolic representation with a non-digital activity.

Child P 2nd Observation Phase 4
She is sitting on the ground surrounded by four bricks and another plastic transparent bowl filled with sand. She is holding the red cup with her left hand and using her right hand holding a green spoon to mix the sand.
"What are you making?" I ask.
"I'm having a picnic" she replies.
"What's that in the bowl?" I ask
"Sandwiches" she replies.
"What of that in your hand?" I ask
"Chocolate truffle and you're not invited" she replies laughing.

In her second observation, Child P was playing in the Sand Pit. As it can be observed, symbolic representation is taking place during this non-digital activity. She was using the sand to represent sandwiches and chocolate truffles. In a symbolic way, she was representing an imaginary experience through the sand, language and her actions. Pretend play can also be observed in this observation because she is pretending to be at a picnic, in which the sand pit symbolised the picnic area and the sand symbolised the sandwiches and chocolate truffles that she and her friends were going to eat.

5.3.2.3 EMOTIONAL ENGAGEMENT

Emotional engagement emerged in Phase 4 while the children interacted with non-digital activities. As shown in table 4.1, the sub themes are enjoyment.

5.3.2.3.1 ENJOYMENT

Similar to digital activities, some of the children had a real sense of enjoyment when they interacted with non-digital activities. Child O's observation below shows how he demonstrated enjoyment.

Child O 1st Observation Phase 4
O gets on his knees, holding a green and purple chalk; he draws a very long line on the ground. He draws more small lines around the long line. He enjoys being engrossed in this activity and is highly motivated. He drops the chalks and uses both hands to rub the chalk lines on the ground. Child R1 joins him. They both laugh enjoying the activity. They both lie down on the ground and draw more lines. They laugh while doing this

During this observation, Child O and Child R1 were on the playground drawing with coloured chalks on the ground. Both children were comfortable, happy and felt included while interacting with this activity. From the extract above, it can be observed that Child O and Child R1 were on the playground drawing on the floor. They did not care if they would get their clothes dirty; they enjoyed the activity they were interacting with. The indicators exhibited by Child O while he was drawing determined the state of his

emotions during that observed period which was that he was enjoying the moment. What I observed was Child O scribbling lines on the ground, but his drawing meant something to him because he was articulating his ideas through drawing.

4.3.2.4 SOCIAL ENGAGEMENT

Similar to the digital activities, some of the children were observed participating in social interactions with non-digital activities. Below are the themes that emerged in this phase.

5.3.2.4.1 PEER ENGAGEMENT

Play can encourage peer engagement between children. This was observed with digital activities. This can also be observed with non-digital activities in this Phase. The materials and activities can encourage such interactions to occur.

Child O 1st Observation Phase 4

O gets on his knees, holding a green and purple chalk; he draws a very long line on the ground. He draws more small lines around the long line. He enjoys being engrossed in this activity.
He drops the chalks and uses both hands to rub the chalk lines on the ground. Child R1 joins him. They both laugh enjoying the activity.
They both lie down on the ground and draw more lines. They laugh while doing this.
"I'm finished now" he says.
He stands up from the ground.
"Let's do it all again", says O.
"Okay let's sit nicely" replies the Child R1.
O sits down on the ground and folds the sleeves of his shirt. It is stained with green and red chalk. He and the child continue to draw more lines on the ground, laughing and looking very happy.

Child O and Child R1 were interacting with Chalk drawing. During this observation, they were drawing with coloured chalks on the playground and while they were interacting with this activity, it can be observed that they displayed a warm friendly connection. They laughed together, changed sitting and lying positions together as they drew. This was one of the few moments where I observed Child O having this kind of connection with another child. This is because most of the time he could be aggressive

toward other children, be impatient and impulsive and would have problems with sharing and being nice to other children. However, I observed a different side of Child O during this observation.

5.3.2.4.2 ADULT INTERACTION

Adult interaction was observed to be one of the emerging patterns of social engagement in this research. Below is Child R3 and Child HB's 2nd observation in Phase 4 which shows this.

Child R3 2nd Observation Phase 4
Child R3 is sitting in the backroom with five other children and a teacher. They are sitting in a circle and playing Tummy Ache.
"I don't understand the game" R3 tells the teacher.
"Well, each person gets a board and Child O will go first. Each of you will pick a card and put it in the correct places on your board, either one drink and food, one protein, one desert and one fork and food. If you get a tummy ache, everyone will shout 'tummy ache'.

During her second observation in phase 2, Child R3 was interacting with a card game called Tummy Ache with five other children which was being led by a nursery teacher. This activity encourages observational skills, discussion, personal and social skills and matching and memory skills. At the beginning of the activity, Child R3 did not understand the process so she asked her teacher to explain to her then the teacher kindly explained the steps to take while interacting with the activity. If the teacher had not taken time out to explain these steps to her, she would have been lost or confused while the activity was going on which would make her lose interest in it. This shows that the teacher engaged in one to one interaction with child R3 helping her to understand the activity expectations.

Child HB 2nd Observation Phase 4
"Let's read another book" he says.
He bends down to the floor and picks up a travel book. His teacher takes the book and places it on her laps. She opens the first page.
"Wow what is that?" He asks pointing at the page.
It's a mountain" She replies.

"Wow, that's a swimming pool?" He asks pointing at the picture of a swimming pool.
"Yes" she replies.
He turns the page of the book.
"Wow, that's amazing" he says.
"What's this? He asks pointing at the page.
"This is the desert island" the teacher replies.
"No" Child K says and turns the page.
"What's this one?" Child HB asks the teacher.
"It's a waterfall" the teacher replies.

This interaction is an adult conversing with children about a magazine they were reading. Child HB and Child K were amazed and curious about the pictures in the magazine. They began asking the teacher questions about the pictures. Asking questions are one of the ways children take an active role in their own learning. As children ask more questions, they develop critical thinking skills. Child HB and Child K were asking to satisfy their urge to know and identify. These types of questions usually have simple and factual answers which may provide the children with a context to their experience and ideas about places. Their interaction with the teacher enabled them to ask questions comfortably and thereby satisfying their curiosity.

5.3.2.4.3 <u>ACTIVE DISCOVERY PLAY</u>

This section is called active discovery play because a mixture of active and discovery play was exhibited by three children. This was a non-digital activity whereby the children were on the playground in the mud kitchen discovering their environment. Discovery play allows children to learn about their environment and how the world works. They were actively using their bodies and minds in this play. They were also interacting with the environment and with each other. Below is the extract that shows Child HB, Child JN and Child LY in the mud kitchen discovering insects that they have been taught about.

<u>Child HB 3rd Observation Phase 4</u>
His two friends are already in the mud kitchen. Three of them are looking at the bottom of a tree and screaming.

"Ahhh tiny little monster" Child HB says.
HB picks up a stick and starts to dig the sand at the bottom of the tree trunk. He kneels down on the ground searching for something. He uses the stick to hit a broken tree trunk beside the tree.
"It's a beetle" JN shrieks.
They move closer to see.
HB touches the sand slowly, trying to catch the beetle. He finally picks up the beetle with his right hand and places it on his left palm. An earthworm suddenly falls from the tree trunk to the ground.
"Ahhh the earthworm" They all scream.
HB drops the beetle back on the ground.
He observes the tree trunk for a few seconds. Three of them start to scream and run out of the mud pit still screaming. They run back into the mud pit and look at the tree trunk again. They run out screaming.

During this observation, I was observing Child HB as he engaged with two other children in the mud pit. As I observed them, I noticed that three of them were looking at the bottom of the tree and screaming. Child HB eventually picks up a beetle and all they all moved closer to observe it. Finding the beetle on the tree trunk gave the children the opportunity to discover the natural habitat for beetles. Becoming natural explorers is vital for their learning and development because as they explored the sensory variety of the outdoors, they were learning new concepts of science. For example, the living habits of insects just like the beetle they found.

5.3.2.5 <u>DISENGAGEMENT</u>

5.3.2.5.1 <u>DISTRACTION</u>

Distraction emerged as a theme in Phase 4 with non-digital activities and it is important to note that it also occurred in Phase 2 with digital activities. Below is an example that shows this.

<u>Child LB 1st Observation Phase 4</u>
He walks to the table and chair for drawing and picks up a piece of paper and a pink coloured pencil. He sits on the table where there are three other children and a teacher. He uses his right hand draw with the pink pencil some lines on the paper.
The teacher is sharpening some of the colours pencils for the children to use. She slams the sharpener on the table to remove the pencil shards. This distracts LB from his drawing. He laughs and hits the table mimicking the teacher. He looks down on the floor.

"Paper on the floor" he tells his friend sitting in front of him. He looks at what the other child is drawing and not concentrating on his drawing.
One of the children sitting beside him starts to cry. He stops drawing and looks at her, not focusing on his drawing. He looks back at the child in front of him and continues to talk, not drawing.

During this activity, Child LB was in the back room where the drawing materials were kept and decided to make a drawing. From the extract above, it can be observed that although he was engaged with the activity, he was not paying full attention to it. He was distracted by everyone and everything around him. From the teacher banging the sharpener on the table where he was drawing to the child who began to cry. He even mimicked his teacher by hitting the table. At the end of the observing, he had only drawn a few lines on his paper. The distractions interrupted his creative process during that observed period because he did not continue the activity. This shows that children may get distracted no matter the kind of activity they are interacting with. The activity itself has to be interesting and challenging enough for the children to be able to focus their attention on it.

5.3.2.5.2 WITHDRAWAL

Children withdraw from activities for different reasons. It could be that they may not be feeling well, they may be upset or sad, or may they are just hungry or tired. It is not a rare occurrence in children. It is usually accompanied by sad mood, irritability, pessimism etc. Sometimes withdrawal can interfere with a child's learning process and social life. The example below is from Child JN's first observation which shows him withdrawing from non-digital activities.

Child JN 1st Observation Phase 4
Child JN is sitting in the back room by the drawing table alone.
"Can you draw a picture for me?" I ask him.
"I don't want to draw" he replies
He leaves the back room and walks to the playground. He walks around the playground aimlessly with an absent and passive attitude.

He picks up a plastic bottle and observes it. He drops it back on the floor. He goes back into the nursery and sits down in the construction area. "What is wrong?" I asked him. "My friend hit me and didn't say sorry" he replied.

During this observation, Child JN was sad and did not want to interact with any non-digital activity. Even when I tried to initiate an activity with him he refused. I observed for a few minutes to understand why he was withdrawing himself from his friends and any non-digital activity. After a few minutes I decided to ask him what was wrong and he explained to me that his friend had hurt him and had not apologise which made him sad. This shows how negative emotions can affect a child's interest in interacting with an activity. He was making a conscious decision to withdraw from any activity. Child JN was a cheerful child and was not usually withdrawn, this was just a situation where he and a friend had a disagreement and he was not happy about it. Emotions play an important role in our behaviours and Child JN's observation shows just that. Also, he was able to identify his emotional state shows a developing understanding of his emotions. Child JN was able to verbalise his emotions but he was allowing his emotions to disallow him from interacting with an activity. This may mean that he had not yet developed the strategies he needed for emotional self-regulation.

5.3.3 PHASE 6/ DIGITAL ACTIVITIES

In this Phase, the iPad was introduced again to the children. This was the final phase of the data collection. Child O, Child HB, Child JB and CHILD P would usually ask me for the iPad more than other children. Themes and sub themes emerged from this phase and from table 4.1, it can be observed that the themes are similar to the themes in Phase 2 and Phase 4. Below are the themes and sub themes that emerged from the qualitative data.

5.3.3.1 BEHAVIOURAL ENGAGEMENT

The findings in Phase 6 showed emerging indicators of behavioural engagement with digital activities. The following are the sub-themes that emerged from the qualitative data which are also coded as indicators of behavioural engagement.

5.3.3.1.1 INVOLVEMENT

In **Phase 6**, the children were once again observed while interacting with digital activities and indicators of involvement were also observed in the phase. Below are two extracts that show this:

Child JG 1st Observation Phase 6

Salamis appear on the screen. She starts to tap on them.
"And one more and one more" she says as she taps on the salamis into the bowl.
The food is ready and bowl opens.
"Hehehehehe" she giggles. She taps on the food to eat it.
"How did that taste?" the chef asked.
"Good" she replies.
She starts the game again.
"1, 2, 3, 4" she counts as she taps on 4 jalapeno peppers.
"1, 2, 3, 4, 5" she counts 5 jelly beans. The food is ready and the bowl opens.
"Heehehe" she giggles again as she taps on it eat it.

During her first observation in Phase 6, Child JG was interacting with a digital activity called Tiggly Chef. This was a counting activity that aims to help children learn how to count from an early age. From the extract above, Child JG can be observed to be involved with this activity. She was engaged with the character in the activity, counting along with him and replying him when he asked questions. She showed persistence throughout her interaction with this activity. She directed her full attention and energy towards the activity. Children who are involved do not let go of an activity easily, they want that activity to last that is why she continued to replay the game each time it ended. The goal of this digital activity may be achieved during this interaction because she was simply matching the numbers to a given ingredient which focuses on basic number identification.

Child JN 3rd Observation Phase 6

The chef asks for 6 olives but there are 5 broccolis on the screen. He moves the broccolis to the left just like I taught him. He continues to drag food ingredients into the pot. The children laugh as they watch. Child HB, Child LY and Child A start to hug and giggle but they do not distract Child JN. He concentrates on the game. He continues to drag the ingredients on the screen. He laughs as he taps on the food to eat it.

In this observation, Child JN was also interacting with Tiggly Chef. Unlike Child JG who was alone while she interacted with this activity, he was surrounded by three children who were onlookers. These children were watching Child JN interact with the digital activity but they were also distracting. As can be observed from the extract above, Child JN was so involved in his activity that he was not distracted when the other children were hugging and giggles right beside him. It would have been normal for him to look from the iPad and see why they were laughing or tell them to stop but he did not. His focus was in trying to count food ingredients into a bowl.

5.3.3.1.2 ASSERTIVENESS

Assertiveness was another indicator of behavioural engagement in Phase 6. Child JB showed assertiveness while interacting with a digital activity.

Child JB 1st Observation Phase 6

He exits the game and taps on Stumpy Alphabet's Dinner. In this task, he is to drag the correct shapes into the monster's mouth. He starts to drag the shapes into the monster's mouth. He goes back to the picnic basket and starts to tap on letter's Z, X and W.
Child R2 tries to touch the screen.
"It's my turn not yours" he tells her.

While Child JB interacted with the digital activities, Child R2 and Child HG sat beside him and looked watched what he was doing. At the beginning of the observation, they were onlookers who were just watching Child JB but not joining in. From the extract, it can be observed that Child R2 decided to touch the screen of the iPad while Child JB was still interacting with it. At that moment, Child JB tells Child R2 that it was still his turn with the iPad and not her turn. Keeping of turns was a normal occurrence after the

iPad was introduced to the children and there were many occasions such as this when children did not want to be disturbed or interrupted while interacting with digital activities. Although the children kept turns, there were a few times when there was conflict about whose turn it was causing arguments between the children. I and the key practitioners then came up with a way to stop the arguments from happening. We used the opportunity to teach the children how to share, be patient, to learn to use their words and not be aggressive. The arguments reduced after that. The result of this is what Child JB can be observed doing. He communicated to Child R2 that he was still having his turn and she should not be touching the iPad instead of hitting her or shouting.

Child JN 3rd Observation Phase 6

I, Child JN, Child HB, Child A and Child LY are sitting in the construction area. He is playing Leo's Pad. He is holding the iPad on his laps. He and the children are discussing whose turn it is to play on the iPad after him. LY tries to touch the screen.
"No" he tells LY. He looks back on the screen and continues to play the game.

Child R2 2nd Observation Phase 6

The next task is to fly through some puffs. She is to fly through two puffs. She gets it. HB tries to touch the screen.
"Nooo" she says pushing his hand away. She gets three more numbers.

Child JN and Child R2 were also assertive like Child JB in this phase while interacting with digital activities. However, for Child JN and Child R2 they just used the word No to stop the other children from touching the iPad. It can be observed that Child R2 who touched the screen when Child JN was interacting with the iPad is the same child who did not want Child HB to touch the screen while she was interacting with it. During Child JN's observation, it can be observed that the debate about whose turn it was to interact with the iPad was ongoing. Child LY was impatient to wait for her turn thereby touching the screen which makes Child JN raise his head, look at her and tell her No with which she complies.

5.5.1.2 COGNITIVE ENGAGEMENT

Findings from this research showed the emerging indicators of cognitive engagement with digital and non-digital. The following examples below are the sub-themes that emerged from the data which are also coded as indicators of cognitive engagement.

5.3.3.2.1 ACTIVE LISTENING

A child needs good attention and listening skills to remember what has been said thereby enabling them understand and respond accordingly. In this research, it was observed that active listening was exhibited by some of the children and I will use two examples in **Phase 6** to show this. Below is an extract that shows Child HG in the Experimental Group exhibiting active listening while interacting with a digital activity:

Child HG 1st Observation Phase 6
The first task in the game is to find the pink baby dragon. HG starts to tap on all the items on the screen to find the dragon.
"Listen to what Leo says" I tell her.
Leo asks "Is she behind something shaped like a triangle?"
HG listens to this and taps on ship.
The dragon appears and hides again.
"Is she hiding behind something that's purple?"
HG taps on a purple mirror and the dragon.
The dragon hides again.
Leo asks again.
"Is she hiding beside something that's yellow?"
HG taps on the yellow pillow and the baby dragon appears.

During this observation, Child HG was interacting with a digital activity called Leo's Pad. The character in this activity talked directly to the children to create an atmosphere of engagement and interaction. The activities began with a hide and seek activity. Child HG was to look for the baby dragon hiding behind a number of items. She had to listen to Leo's clues to figure out where the baby dragon would be hiding. This activity claimed to measure shape identification and colour recognition. I observed that she was tapping on all the items on the screen without listening to Leo's instructions. As

observed from the extract, I had to tell her to listen to the instruction so she could attend to the task correctly, which she did. She listened to the instructions, focused on what she heard, translated this into meaning and then remembered where the baby dragon was. As she began to listen attentively to his instructions, she was able to find the baby dragon in all its hiding places. By doing so, she was able to successfully identify the colours and shapes by their names.

Child R2 1st Observation Phase 6

The next task is to shoot Leo into the air using a catapult. She drags three big stones into the basket but it doesn't work.

"Maybe you should take one out" Leo says.

R2 listens to this instruction and drags one stone out of the basket. Leo flies successfully. The next task is for her to be able to identify small and large numbers.

"Fly me through the five balls. Leo asks.

She drags him close to the five balls. She listens attentively as she also does 2, 3 and 1.

Child R2 was interacting with the same digital activity that Child HG interacted with. It can be observed that they both exhibited active listening while interacting with this activity because the game requires children to listen attentively to instructions given. During this observation, Child R2 was completing a different task in the activity. The task was for her to help Leo load the right number of rocks into the catapult so that it will launch him into the air and fly to his friend's house. This activity focused on numeral recognition. As she began the task, she put three big stones into the catapult which did not work. Leo then gave a suggestion on what she should do. She listened to this instruction instead of doing what she thought would have been a better solution. As she did what he suggested, Leo was able to be catapulted into the sky. As it can be observed from the extract, she continued to listen to the instructions that Leo gave to complete the activities correctly. By listening attentively to Leo's instructions, she may be developing good attention skills that she may need as she grows older.

5.3.3.2.2 WORKING MEMORY

For children, memory plays an important role in supporting their learning and development. In this research, it was observed that some of the children were able to use their working memory while interacting with some of the digital activities.

Child HG 1st Observation Phase 6
She swipes the screen and taps on Disney Book's Tinker bell. She is using her right index finger to drag the pieces of the puzzle from the left side of the screen to the middle screen. She arranges the puzzle quite quickly. She is good at it.
"Have you played this game before?" I ask.
"No" she replies. The puzzle pieces appear at the side of the screen. She begins to use her right index finger to move the puzzle pieces onto the main screen. Some of the pieces' bounce back to the side of the screen. She remembers where some of the pieces belong and drags them to where they belong.
She finishes the game.

During her observation, Child HG was interacting with a puzzle activity on Disney Digital Books. Digital puzzles are just as fun as the non-digital puzzles. They are activities that have aspects of working memory and attention skills. When a child interacts with puzzle activities, they would need to recall the colour, shape and size of the various puzzle pieces as they work through the puzzles. Child HG was able to this during her observation. When the puzzle pieces did not fit, she would set it aside and would remember the piece when it was needed. With the puzzles, her brain, eyes and hands worked together to find the pieces, therefore she was able to virtually manipulate the puzzle pieces accordingly and fit them accurately.

5.3.3.2.3 CLASSIFYING

Classifying involves grouping similar traits together. Children learn to classify by focusing on the attributes of objects or pictures and discovering what is similar or different.

Child R2 3rd Observation Phase 6
I and R2 are sitting at the construction area with another child. She is holding the iPad on her laps, while crossing her legs. She taps on Disney Digital Books. Child C is the

one choosing the game she will play.
"That one?" She asks pointing at Spot the Difference.
He agrees. The activity starts. She is to spot the differences in two pictures on the screen.
She focuses as she spots the differences in the pictures. She spots all the six differences in the pictures.
"Well done, good girl" Child C tells her.
She starts another level. She spots all the differences in this level too.
"Yaaay" she says.

As shown in the example above, the digital activity that Child R2 was interacting with was able to make her use her ability to differentiate items on the pictures on the screen. On the screen were two pictures of Snow White, the Prince, the dwarfs and forest animals. Child R2 was to spot the differences in these pictures. The first difference she was able to identify was the blue bird which appeared in the picture on the left but did not appear in the picture on the right. As she tapped on the bird, a circle appeared on the bird in the first picture and where it was supposed to be on the second picture, signifying to her that she had identified her first difference in the pictures. She was able to find five more differences as she focused on the screen. She did so well that even Child C who was sitting with us acknowledged her. It can be observed that she was able to classify the similar and different traits in the pictures, thereby enabling her to identify the missing items.

5.3.3.3 EMOTIONAL ENGAGEMENT

Findings from this research revealed how some of the children were emotionally engaged with the digital activities they were interacted with.

5.3.3.3.1 ENJOYMENT

Enjoyment while interacting with digital activities was observed to be occurring regularly. Below is Child LB's observation in **Phase 6** showing how he was enthusiastic about the digital activity he was interacting with.

Child LB 2nd Observation Phase 6

He opens Winnie the Pooh. It's a matching game. He begins to match the cards by using his left and right index fingers to tap on the cards. He smiles each time he matches a card correctly. He matches all the cards correctly.
"I did it" he laughs and holds his head with both hands.

Child LB was interacting with Disney Digital Book's Winnie the Pooh which was a matching activity. From the extract above, it can be observed that he was enjoying the activity because he had mastered the activity by matching all the cards correctly that it made him happy. His remark about this achievement shows that he enjoyed the activity. His body language also showed how enthusiastic he was that he completed the task correctly. This was an interesting experience for him. His emotional engagement in this activity can have an impact on his disposition to learning.

Child IP 3rd Observation Phase 6

She notices Daddy Pig putting an item in the shopping cart that's not on the list. She immediately taps on the shopping cart and removes it.
She finds all the items.
"I did it" She tells me smiling, lifting the iPad for me to see.
"I'm gonna play it again" she tells me.
"Good job IP" I tell her.
She starts the game again. She is given another list of items.
She starts to find the items again. One by one as she finds them she quickly taps them into the shopping cart.
"Again" she tells me. She starts the game again.

Child IP was interacting with Peppa Pig Shopping during this observation. This activity was one of the several digital activities that Child IP enjoyed. From the extract above, she can be observed enjoying the activity so much that she interacted with it three times while I observed her. This shows that as she felt satisfied and happy, her motivation increased making her to interact with the activity again and again. She used the phrase 'I did it' when she completed the tasks successfully. She showed that she was expressing delight in mastery of the activity.

5.3.3.4 SOCIAL ENGAGEMENT

Some of the children were observed participating in social interactions with digital activities in this phase.

5.3.3.4.1 COOPERATION

In **Phase 6** some of the children were observed cooperating while interacting with a digital activity.

Child JN 2nd Observation Phase 6

I can't do this one" he says.
I help with some of the pieces and he gets it right. The next task opens.
"Omigosh" he says, startled by the next puzzle.
"How will he do this Ronnie?" R2 asks me.
I explain to JN what to do and I also do some of the puzzle, leaving him to do the rest.
He starts to do it correctly.
"That one goes there" R2 and E tell him pointing at where the piece should go. JN drags the piece to the correct place.
"Yaay you did it" Child E tells him.
The next task is to make Leo fly. He is to drag some blocks into the catapult. He starts to drag the blocks on to the catapult.
"Press that" R2 tells him. He presses it but Leo doesn't fly.
"Take 1 out" R2 tells him.
"Now press the button" She tells him.
He presses the button and Leo flies.
R2 directs him as he plays the next task. Leo is to fly into a number of puffs.
"Look 4 puffs" She tells him pointing at the 4 puffs on the screen.
He drags Leo there.

In this observation, I was involved in working together with Child R2, Child E and Child JN while he was interacting with a digital activity. When the activity began, he informed us that he did not understand the activity. I decided to help him understand the rules of the activity. Child R2 and E also helped him to with the activity, telling him what to do. This situation brought about cooperation between the children. For the task to be carried out, Child R2 and Child E were telling Child JN what to do of which he followed their every instruction. This was a good experience for him because he was supported by his peers in the activity and he was also learning. At the beginning of the

activity he did not know how to play the game but by the end of the activity he had become conversant with it because he had two friends who taught him what to do.

5.3.3.4.2 ADULT INTERACTION

Below is Child R3 2nd and Child HG's 3rd observation in Phase 6 which shows adult interaction.

Child HG 3rd Observation Phase 6

She taps on Find Shapes. The task is to find the shapes in the picture. The first shape is the Hexagon. She starts to tap on all the shapes randomly until she taps on the hexagons. Next she is to find triangles. She taps on all the triangles without tapping any other shape.
The next task is to find pentagons. She starts to tap on all the wrong shapes.
"Is that a pentagon?" I ask her and she shakes her head meaning no.
"Focus and find the right shapes" I explain to her.
She focuses on the screen and taps on all the pentagon shapes correctly. She completes three more tasks correctly, finding squares, hexagons and circles.

Child HG was interacting with a digital activity called Critter Math which is an activity that helps children learn about shapes. In this particular activity, she was to find the shapes hidden in pictures and for her to do this she had to focus on the activity and also know the shape that was to be found. I observed that when she was to find the hidden triangles, she was able to find them without tapping on any other wrong shape but when she was to find hexagon and pentagons, she was tapping on all the shapes in the picture. After I told her to focus on the shapes she was supposed to find, she was able to find the pentagon, hexagon and even more shapes. If I was not there to prompt a change in the way she interacted with the activity, she may have just exited the game without gaining the full experience and learning that the activity promises. This shows that sometimes children do need adults around them, whether the activity is digital or non-digital. They need to be guided, taught so that the children do not make mistakes. The shapes were easy to find because they would blink for a few seconds, all she had to do was focus.

She was not focusing at that time and needed me to remind her that to achieve the task she needed to focus.

5.3.3.4.3 CONFLICT WITH PEERS

Conflict between children is a normal occurrence because they all have different personalities, preferences and needs. Problems often come up because children may not have the skills to resolve conflict alone. This is why adults need to help children to always listen to each other and teach them how to resolve conflicts. In this research study, I observed conflict arise between two children because of the iPad. Conflict with peers occurred in **Phase 6** of the observations. Below is the extract that shows this:

Child JN 3rd Observation Phase 6
"JN you are doing it all wrong" HB tells him angrily. "You are cheating".
"I'm not cheating, am I cheating?" He asks Child A looking angry as well.
"No" Child A replies.
Child HB and Child JN start to argue and I calm them down.
"HB, he is not cheating, he is learning how to build the telescope" I tell Child HB. They both keep quiet and look back at the iPad. Leo starts to sing in the game and all the children laugh. JN watches the game concentrating on the screen.

Child JN was interacting with a digital activity while Child HB and Child A watched him. From the extract above, it can be observed that a conflict between Child JN and Child HB occurred. Child JN was interacting with the digital activity; he was building a telescope by dragging the puzzle pieces together. He was doing this wrongly which made Child HB think that he was cheating. Child HB was visibly upset by this and confronted Child JN and Child JN defended himself. Child A who also sitting with them was quiet throughout this situation and only spoke when Child JN asked him a question. What was more astonishing about this observation was the way the conflict ended. After they began to argue, I tried to resist the urge to solve their problem because I wanted them to be able to solve it themselves. But when I realised the argument was not stopping, I had to explain the situation to Child HB and this ended the conflict between

the two. They continued with the digital activity and were even laughing together. Some conflict in childhood may help children discover respectful and positive ways to resolve conflicts just like Child JN and Child HB did.

5.3.3.5 DISENGAGEMENT

Results from this study show some of the children being disengaged with digital activities.

5.3.3.5.1 ABSENCE OF EFFORT

Below are two extracts that show Child LY, Child JN and Child LB interacting with digital activities but showing no effort in understanding them.

Child LY 1st Observation Phase 6

She taps on Peppa Pig Shopping. The game starts. She starts to tap on all the items on the shelves.
"I need orange juice" she says. She does not actually need it.
She exits the game and taps on Pixie Dust Lite. She taps stars' stickers and drags it along the screen. She exits it and taps on 'Not like the others'. She exits the game without playing it. She taps on Animal Puzzle. She drags the parrot to where it belongs. She exits the game. She keeps tapping on different icons that open the app store. She taps on Peppa Pig Shopping again.
"I'm not needing this" she tells me.
"Look you need that" I tell her pointing at the tinned strawberries. She taps on it. She taps on a bag of chips.
"You don't need that" I tell her. She ignores me.
She exits the game and opens 'Bird Collection' and exits it. She taps on Peppa Paint Box.

Child LY 3rd Observation Phase 6

She exits the game and taps on Wild Habitat. She starts to tap on all the icons on the screen. She exits the game and taps on Nursery Rhymes. The Rhyme Old MacDonald starts to play. She nods her head as the song plays. She exits the game.
She taps on Leo's Pad. It starts.
"I don't want this one" she shakes her head.
"Do you want to Critter Math?" I ask her.
She shakes her head vigorously.
I try to get her to interact with one digital activity but she doesn't listen to me.
11:06: She taps on Peppa Pig Shopping and exits it again. She taps on it again. The game starts. She starts to put different items in the shopping cart. Child EE tries to help her but she doesn't listen. She opens the shopping cart and taps all the ingredients out.
11:08: Child EE taps on a toy truck she sees. LY taps on all the items on the shelves.
"She is just pressing anything" Child EE says.
R3 laughs. LY exits the game and taps on Lumi Kids.
"No" she says as she exits the game,

11:10: She swipes on the screen form left to right then right to left, looking for what else play.

Above are two extracts from Child LY's first and third observation in **Phase 6** showing absence of effort. It can be observed that this occurred only with digital activities. In her first observation, she opened four different activities on the iPad only interacted with Peppa Pig Shopping. She would open and exit the rest of the digital activities without even getting to start any of the activities. While she interacted with Peppa Pig Shopping, she tapped on every item she could tap on even though she did not need most of them. Even when I tried to show her the right way to interact with the activity she ignored me. However, going back to her previous observations, Child LY had been interacting with this digital activity Peppa Pig since the iPad was introduced and had even watched other children interact with it so she may have understood the rules. The focus of cognitive engagement in Child LY's observation makes an important distinction between her decision to simply interact with the digital activities rather than focus her effort on understanding and mastering the activities. In her third observation as can be seen from the extract above, she could not decide what digital activity to interact with and kept opening and closing different digital activities on the iPad so that one of the children watching was also baffled. Her indecisiveness could be due to the fact she did not have interest in any of the activities that were on the iPad, the digital activities may not have been engaging enough for her, she may not have understood them or she may have had personal issues that inhibited her from focusing her attention. In other words, her observation showed that just because a child is interacting with digital activities that are meant to help them learn alphabets, counting or shapes does not mean that they are actually cognitively engaged with those activities.

Child JN 1st Observation Phase 6
He taps on Endless 123.
"Daddyyyy" he says as he taps the game. The game starts.
"What number is this?" I ask him pointing at number 1.

"1" he replies
"What number is this?" I ask him pointing at number 2.
"1" he replies again.
"What number is this?" I ask him pointing at number 3.
"1" he replies.
He is tapping on the numbers I am asking him about and the numbers are mentioned but he doesn't even hear it or say it correctly.
9:25: He continues to look intensely at the screen, dragging the numbers to their correct places.
"2+3=5" says the voice in the game showing a very big 5 on the screen.
"What number is this?" I ask pointing at number 5.
"1" he replies.
He exits the game.

The above extract shows Child JN interacting with a digital activity called Endless 123 while I observed him. During this observation, I questioned him just as I questioned Child LB in the next extract. From the extract above, it can be observed that he was interacting with the activity but he was not listening or focused. This is because in the digital activity, when a child touches the number, a voice from the iPad identifies the number and says it continuously until the child touches another number. As I asked him about the numbers, he would tap on them. Although he was able to identify number one, he identified the rest of the numbers I pointed as number one. This was happening while the voice in the activity was identifying the numbers. He would hear number two and still say one. He eventually exited the activity and moved on to another one.

Child LB 1st Observation Phase 6
He taps on Alpha Tots. The game starts.
"What letter is this?" I ask him about the letter A.
"I don't know" he replies.
I ask him about letter B, C, D, and E.
"I don't know" he replies.
"Okay this is letter A, B, C, D, and E. I try to teach him.
He shows no interest in learning. He keeps looking around the classroom.
"Can I play another game?" he asks me.
"Don't you want to learn about the letters?"
"No, my mummy hasn't taught me yet" he replies.

I was observing Child LB while he interacted with a digital activity and as usual, his friends who always watched what he was doing on the iPad surrounded him. During this

observation, I decided to ask him questions about the letters since the activity was to help children learn about the letters with creative and interactive activities. Although the voice in the activity mentioned the letters, I wanted to make sure that Child LB was listening to them and be able to identify some of them. As I began to point to some letters and asked him to identify them, he said that he did not know. I began to tell him the letters I had just pointed to but he showed no interest in learning them instead, he removed his focus from the iPad and began to look around the classroom. He then asked me if he could play another game. When I asked him if he did not want to learn the letters, he replied that his mother had not taught him yet. He would rather at that moment interact with another activity than me use Alpha Tots to teach him about the alphabet. His statement about his mother not teaching him yet is also interesting because his teachers at the nursery taught the children about the letters regularly. On that account, it could be said that Child LB was not cognitively engaged with this digital activity. He could not identify the letters of the alphabet at that moment and did not want help to learn them. It could also be that he did not know the alphabet or was not familiar with the digital activity and decided not to engage himself cognitively.

5.4 SUMMARY

This chapter discussed in great detail how the digital and non-digital activities engaged the children in different ways. The qualitative results revealed more than just engagement; they revealed the different ways that children can be engaged which were also discussed in the literature review. From Table 4.1, it can be observed that five major themes and twenty-three sub themes emerged from the data. The themes were Behavioural, Emotional, Cognitive, Social Engagement and Disengagement. These types of engagement were just umbrella terms for the many sub-themes that emerged from the data. This shows the less structured observation that was used in this research yielded detailed descriptions of the children and the activities that were observed.

Also, it was observed that there were similarities in the way the children were engaged between the digital and non-digital activities. Firstly, it is noted that with both digital and non-digital activities, behavioural, cognitive, emotional, social engagement and disengagement occurred in Phase 2, 4 and 6. Secondly, sub-themes that emerged with digital activities also emerged with non-digital activities. Sub-themes such as involvement, assertiveness, problem solving, selective attention, enjoyment, peer engagement, cooperation, adult interaction and distraction. This shows that the way the children can be engaged with non-digital activities is the same as the way they can be engaged with digital activities. However, there were some sub-themes that emerged with only digital activities and they were persistence, symbolic representation, categorizing, recalling, classifying, working memory, active listening, creating and constructing, happiness, conflict with peers, no cognitive engagement and absence of effort. Also, there were sub-themes that emerged with only non-digital activities and they are: active discovery play and withdrawal. It can be concluded that the digital and non-digital activities presented engaging opportunities for children. The data also showed that some of the children were disengaged with both digital and non-digital activities.

The results from the quantitative and qualitative data show that the children were engaged with digital and non-digital activities. The quantitative results showed to what extent they were engaged and the qualitative results show the different ways in which the children were engaged.

CHAPTER 6

PATTERNS OF INTERACTION WITH DIGITAL AND NON-DIGITAL ACTIVITIES

6.1 INTRODUCTION

The purpose of this chapter is to present the results of the quantitative data derived from the observation checklist and qualitative data derived from the less structured observation. The data will be presented in phases (see Chapter 4). In this chapter, the data from the observation checklist provided the numerical data for this research and will be worth mentioning because they present the indicative results on the patterns of interaction the children exhibited while they engaged with digital and non-digital activities. The data from the less structured observation also provided in-depth details on the children's patterns of interactions. Both the numerical and written data contained valuable information about the children's patterns of interaction over the period of the research. Table 6.1 below shows the patterns of interactions that emerged from the quantitative and qualitative data from Phase 1 to 6.

Table 6.1: Patterns of Interactions

Patterns of Interactions	Nature of Digital and Non-Digital Activities: Child Initiated, Adult Initiated and Adult Led
	The period of time spent with digital and non-digital activities
	Preferences with digital and non-digital activities
	Number of Digital and Non-digital activities
	Levels of Engagement

6.2 PHASE 1: NON-DIGITAL ACTIVITIES/ QUANTITATIVE RESULTS

This section presents the data from Phase 1 of this research. In this phase, the children were observed three times for two weeks while they interacted with non-digital activities. They were free to move from the nursery to playground between 10am to 12pm and 1pm to 3pm every day. There were various activities and play materials such as arts and crafts, construction play, sand play and water play already prepared and displayed by the teachers. These play materials are very important for cognitive, social, physical, emotional and language development. The results were categorised into Table 6.2 so as to note the patterns of interaction the children exhibited while interacting with non-digital activities. This observation took place at the beginning of the data collection process on the 1st of June 2015.

Table 6.2: Context for Summary of Quantitative Results in Phase 1

Participant	Phase 1	Observation 1		Observation 2			Observation 3		
	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement
Child HB	Painting	4	4	Sand Play	20	5	Construction Play (Sand and Blocks)	10	3
Child JB	Story Time	10	4	Water Play	20	4	Arts and Crafts	6	3
Child HG	Looking for Ladybirds(Exploring)	20	5	Role Playing (Making Mud pies)	10	4	Drawing Arts and Crafts	10 14	5
Child R1	Tower Building Role playing (with food)	12 8	4	Tower Building Trains &Tracks	8 12	4	Tower Building Puzzles	10 10	4
Child LB	Playing with Cars Drawing	2 10	3	Sand play	12	4	Sand Play Role Playing(a baby)	4 4	4
Child JG	Counting	6	1	Arts and Crafts	6	3	Sand Play Water Play	10 2	4
Child LG	Role playing (with toys Drawing	10 10	3	Reading	4	2	Tower Building	8	3
Child IP	Drawing Tower Building	9 9	5	Tower Building Reading	8 8	4	Drawing	14	5
Child LY	Constructive Play (Sand and Blocks)	6	3	Construction Play (Blocks and Cement)	4	2	Arts and Crafts	12	5

Child R3	Role Playing(with toys)	20	2	Tower Building (Blocks) Reading Poems	6 6	3	Arts and Crafts	16	3
Child P	Sand Play	20	5	Sand Play	20	4	Sand play	20	4
Child JN	Water Play	20	4	Reading	6	2	Role Playing with tools	14	4
Child R2	Drawing	20	4	Reading	16	3	Arts and Crafts Tower Building (Blocks)	10 10	5
Child O	Tower Building	10	4	Tower Building	8	4	Puzzles	10	4

Child Initiated Activities: Orange Adult Initiated Activities: Blue Adult Led Activities: Green

6.2.1. NON-DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 1

The children chose the activities with the support of their teachers present in the nursery during the observed period. As discussed in Chapter 2, section 2.4, it is important for practitioners to have adult initiated, adult led and child initiated play based activities in their nurseries so that children can have a well-rounded experience in play and learning. In this research, I was able to observe the children initiating their activities and participating in adult initiated and led activities. The children had access to a wide array of activities displayed by their teachers and the learning environment was designed to make resources easily accessible to all the children. The resources were organised in different areas of the nursery so the children could have access to a wide range of interesting open-ended resources to explore and investigate imaginatively. Table 6.2 shows the nature of the activities the children interacted with.

Table 6.3: Nature of Non-Digital Activities in Phase 1

Nature of Digital Activity	Number of Children in 1st Observation	Number of Children in 2nd Observation	Number of Children in 3rd Observation	Total Number
Child Initiated	12	13	12	37
Adult Initiated		1	1	2
Adult Led	2	1	1	4

Fourteen children were observed interacting with non-digital activities in this Phase and Table 6.3 above shows the nature of the activities the children partook in. There are 42 observations in this phase and it can be observed from the table above that in this phase 37 child initiated non-digital activities, 2 adult initiated non-digital activities and 4 adult led non-digital activities were observed. This shows that in Phase 1, more child initiated activities were observed than adult led and adult initiated activities. It should be noted that in Child IP's 2nd observation as shown in Table 6.2; she moved from a child initiated activity to an adult led activity.

6.2.2 NUMBER OF NON-DIGITAL ACTIVITIES IN PHASE 1

Table 6.2 also showed the number of non-digital activities the children interacted with in each observation in Phase 1. Table 6.4 below shows how many children interacted with one or more activities.

Table 6.4: Number of Non-Digital Activities in Phase 1

Number of Non-Digital Activity	Number of Children in 1st Observation	Number of Children in 2nd Observation	Number of Children in 3rd Observation
One Activity	10	11	9
Two Activities	4	3	5

In the first observation, 10 children interacted with 1 non-digital activity while 4 children interacted with 2 non-digital activities. In the second observation, the table shows that 11 children interacted with 1 activity while 3 children interacted with 2 non-digital activities. Finally, in the third observation, 9 children interacted with one non-digital activity while 5 children interacted with 2 non-digital activities. This shows that in Phase 1, most of the children interacted with one non-digital activity during the observed period.

Therefore, the following examples below will highlight how the children interacted with non-digital activities and the patterns they exhibited.

6.2.3 INTERACTIONS WITH NON-DIGITAL ACTIVITIES IN PHASE 1

As explained in Chapter 3, the aim of this research is to explore children's engagement and interactions with digital and non-digital activities. The time stipulated for each observation was twenty minutes and Table 6.2 shows that some of the children interacted with activities for less than the 20 minutes that was stipulated for each observation. The time the children spent on each activity varies. The amount of minutes the children spent interacting with a non-digital activity is not crucial for this research. What is important is how they engaged with the non-digital activities during those interactions. Therefore, the following examples will highlight how the children

interacted with non-digital activities, the amount of time spent on these activities individually and their level of engagement.

Child HB

Child HB interacted with one non-digital activity each in his three observations in Phase 1. These activities were child initiated. In his first observation, he spent four minutes painting. Although he spent four minutes, he was observed to be focused and involved in the non-digital activity making him highly engaged. In his second observation, he spent twenty minutes in the sand pit. It can be observed that he spent longer time in the sand pit than he did painting. During this observation, he pretended that the sand was snowballs. This can be said to be symbolic play because he imagined sand to represent snow. This allowed him to challenge his understanding of his environment because he may have understood that the texture of snow and sand was similar because you could roll both of them. He was extremely engaged during this observation because he not only was he involved and persistent in the activity, he was able to use his understanding of his environment while playing. In his third observation, he spent ten minutes with sand and blocks on the playground. This activity was fantasy play because he took the role as Bob the Builder and informed me that he was building a shed. He was moderately engaged during this observation. He was distracted by the other children on the playground. He was busy with the activity but at a fairly routine level.

Child JB

Child JB also interacted with one non-digital activity like Child HB in his three observations. In his first observation, he interacted in an adult led activity which lasted for ten minutes. During this observation, one of the early childhood practitioners was reading to a group of children of which Child JB was one of them. She was reading a book about animals and as she read she showed them pictures. I observed him to be focused and attentive to the story. He had a smile on his face most of the time and

would move his body towards his teacher to look at the animals properly. In his second observation, he spent twenty minutes at the water basin. He spent the entire twenty minutes playing with the animals in the water. He made splash sounds and pretended that the animals were swimming. After a few minutes, he put some of the animals in a bowl and pretended that they were in a boat. In his third observation, he was at the arts and crafts corner creating a picture for six minutes. During this observation, his engagement was moderate because he kept staring into space and would blank out for a few minutes before continuing the activity.

Child HG

Child HG interacted with one non-digital activity in her first observation and second observation two non-digital activities in her third observation. These non-digital activities were child initiated. In her first observation she spent twenty minutes exploring the nursery playground, looking for ladybirds. She had a piece of paper and a pencil to write down how many lady birds she found. One of the adults in the nursery joined her ten minutes into the activity and assisted her in looking for ladybirds. She led the teacher to where they could find ladybirds. She was motivated to find these ladybirds and as she found one after the other and noted them on her paper showing persistence throughout the whole observed period. In her second observation, she took up the role of a cook in the mud kitchen for ten minutes. She pretended to make mud pies with cooking utensils that had been provided. Her demeanour during this activity showed that she had observed an adult cooking before because of the way she used these utensils. In her third observation, she interacted with two non-digital activities. The first activity was drawing for ten minutes and arts and crafts for four minutes. During both activities, she was absorbed in the creative process and was not distracted by the other children playing close to where she was sitting. She was focused and

attentive to her activity. When she finished her drawing, she moved to the arts and crafts table where she spent four minutes creating a picture with pieces of paper and glue.

Child R1

Child R1 interacted with two non-digital activities in three of her observations. These activities were child initiated. In her first observation, she interacted with tower building for twelve minutes and eight minutes' role playing with plastic food. She pretended they were real food and eating them. She sat in the construction area using wooden blocks to build a tower while I observed her. When she finished building the tower, she would knock it down with her hands and laugh and start again. In her second observation, she spent eight minutes' tower building and twelve minutes playing with train and tracks which was also twenty minutes. She built towers and knocked them down just like in her first observation. She then moved to the trains and tracks and made a rail line and played with the trains. In her third observation, she spent an equal ten minutes on tower building and puzzles making this twenty minutes. During the tower building activity, she built the tower but this time she asked me to knock the tower down and laughed while I did this. After the tower building activity, she interacted with the puzzles (which were placed in the construction area by a teacher) by arranging the puzzle pieces correctly. The patterns that Table 6.2 showed are the non-digital activities, minutes spent and her level of engagement. Firstly, I observed that she interacted with tower building in three of her observations. She was always at the construction area every time she visited the nursery. Secondly, within twenty minutes of each observation, she interacted with two non-digital activities. And within those twenty minutes, she spent either eight, ten or twelve minutes. Finally, her level of engagement was consistently high in three of her observations.

Child LB

Child LB interacted with two non-digital activities in his first and third observation and one non-digital activity in his second observation. These activities were child initiated. In his first observation, I began observing him while he was playing with toy cars before he went into the drawing room. In his second observation, he was playing at the sand pit with two of his friends. They were building sand castles by using the bowls and cups in the sand pit to form these castles. They were all involved in the activity and were enjoying playing together. In his third observation, I began the observation while he was at the sand pit with his friends just like in the first observation. However, during this observation he spent less time in the sand pit. He and his friends began role playing as a family and he was the baby. He made baby sounds and kept asking for food like a baby would. A pattern could be noted in Child LB's observations in Table 6.2. It could be noted that he interacted with Sand Play in his second and third observation and this could likely show his preference. It could also be noted that with this activity he had high level of engagement in both observations.

Child JG

Child JG interacted with one adult led non-digital activity in her first observation, one adult initiated non-digital activity in her second observation and two child initiated non-digital activities in her third observation. In her first observation, her behaviour was melancholic because when her teachers tried to get her to do an activity she refused. I was told by her teacher that her mother was due to give birth to a baby in a few days and this was making Child JG withdraw from non-digital activities in the nursery. I noticed that she would stand and watch other children interacting with each other without joining in or even interacting with an activity. When one of the teachers finally got her to do a counting activity which was observed by me, her level of engagement was extremely low. She showed no motivation to learn and stared into space throughout the

activity and it lasted for six minutes. In her second observation, she participated in arts and crafts for six minutes however she was moderately engaged because she showed little interest in the activity and did not use her capabilities to full extent. In her third observation, she interacted with two activities; sand play for ten minutes and water play for two minutes and these activities was child initiated. Her behaviour during this observation was different from the first two. She was more engaged with the activities. In the sand pit, I asked her what she was making and she replied that she was making a wedding cake. She sang as she pretended to make the wedding cake. I was later told by her teacher that her mother had given birth to a baby.

Child LG

Child LG interacted with two child initiated non-digital activities in her first observation and one child initiated non-digital activity in her second and third observation. In her first observation, she interacted with role playing for ten minutes and drawing for another ten minutes making that twenty minutes. She was busy with these activities but there were few signs of involvement making her moderately engaged. Her attention was not directed towards the activities at particular moments because she would stare at what other children were doing. In her second observation, I observed her reading a story book called 'Jungle Book'. I observed as she flipped the pages and stared at the pictures. She would also watch what other children were doing at the same time. In her third observation, she spent eight minutes playing with tower blocks. Similar to her first and second observation, she did not show much interest in the activity.

Child IP

Child IP interacted with two non-digital activities in her first observation, two non-digital activities in her second observation and one non-digital activity in her third. A pattern can be observed in the activities she interacted with. In her first observation, she interacted with drawing and tower building for nine minutes each. During both

activities, she was focused and involved. In her second observation, I began observing her while she was playing with the tower blocks again. She had finished with the blocks when I offered to read a story book to her to which she agreed. This is why she was recorded as child initiated and adult led activity in her second observation. In her third observation, she interacted spent fourteen minutes drawing. The patterns that Table 6.2 showed are the non-digital activities. She interacted with both drawing and tower building twice.

Child LY

Child LY interacted with one non-digital activity in three of her observations and these activities were child initiated. In her first observation, she spent six minutes interacting with constructive play. This interaction took place on the playground where a section had been provided with sand and bricks. There was a large blue bowl with wet sand and bricks. I observed Child LY being unfocused with the activity. Although she began by using a hand trowel to place some sand on the bricks, she would stop and watch what other children were doing on the playground. In her second observation, she also spent four minutes with sand and bricks like her first observation. She was also not concentrating on the activity and was distracted by the other children on the playground. In her third observation, she spent twelve minutes creating a picture in the arts and crafts corner. She used a pair of scissors to cut papers into small pieces and uses glue to attach them to an A4 paper. As she did this, she concentrated, showed her creative energy and was completely absorbed. She understood the use of scissors and maintained grip effectively while cutting the papers into pieces.

Child R3

Child R3 interacted with one non-digital activity in her first and third observation and two non-digital activities in her second observation. These activities were child initiated. In her first observation, she spent twenty minutes role playing with her friends.

They took on domestic roles and pretended that the toys were real household items. However, her friends were more engaged in the activity than she was. She would show some degree of involvement but there were moments of non-activity where she would stare into space. In her second observation, she spent six minutes playing with tower blocks with her friends. They were collaborating during this activity by putting the wooden blocks together to make a big tower. Six minutes into the activity she moved from the construction area to the reading corner and looked at a book of poems. I observed as she tried to pronounce the words she saw on the pages. In her third observation, she spent sixteen minutes in the arts and crafts corner. She was by herself this time. It should be noted that her level of engagement in this phase did not go beyond moderate.

Child P

Child P interacted with one non-digital activity in three of her observations and these activities were child initiated. In her first observation, she spent twenty minutes in the sand pit. She pretended to make chocolate cake by mixing sand in a bowl. In her second observation, she also spent twenty minutes in the sand put. This time she and her friends were pretending to make ice cream. When they finished, they offered other children on the playground and the children accepted the ice cream. In her third observation, she spent yet another twenty minutes in the sand pit with the same friend pretending to make a cake. During this observation, she and her friend were making two cakes, she was making one while her friend was making the other. They were using the spoons to scoop some sand into a bowl and mixed the sand like batter. They then poured the sand into another bowl and pretended the cake was ready. It can be noted that there is a pattern in Child P's interactions. Firstly, she was observed in the sand pit in three of her observations. This shows that the sand pit could be one of her preferred activities in the nursery. This also shows that she saw the sand pit as an opportunity to explore and

experiment with cooking thereby developing fine motor skills through manipulating tools stirring, digging and moulding. Secondly, she spent twenty minutes in each observation and finally her levels of engagement in her observations were high to extremely high.

Child JN

Child JN interacted with one non-digital activity in three of his observations. In his first observation, he spent twenty minutes at the water basin. This activity was child initiated. He used a small cup to fill a bowl and emptied it repeatedly. He also played with the toy animals that were in the bowl. During this observation, I observed how consistent he was in the activity and how he was able to concentrate on pouring the water in and out of the bowl. In his second observation, he spent six minutes reading a book. This activity was also child initiated. Sometimes during the observation, he would stare into space. In his third observation, he was given toy construction tools (screw driver and power drill) to play by his key practitioner. His teacher sat beside him and observed how he interacted with the toys.

Child R2

Child R2 interacted with one non-digital activity in her first observation and second observation and two non-digital activities in her third observation. These activities were child initiated. In her first observation, she spent twenty minutes drawing. During this observation, she was sitting with two other children in the drawing corner and drew lines on her paper with coloured pencils. She and the children were focused on their drawings. In her second observation, she spent sixteen minutes reading story books. I observed her as she flipped through the pages of these books. However, she did not show any real interest in them because she kept looking around the classroom. If she was not watching other children she would flip the pages without focusing on them for more than a second. In her third observation, she spent twenty minutes interacting with

two non-digital activities. She spent ten minutes on arts and crafts and another ten minutes on tower building. She was persistent throughout the observation and was very engrossed with her arts and crafts as she used a pair of scissors to cut magazines into tiny pieces and paste them on an A4 paper with glue. When she finished with this activity, she moved on to tower building in which she built a high tower with wooden blocks. When she built the tower, she placed little toy people on the edges of the tower.

Child O

Child O interacted with one non-digital activity in his three observations. In his first observation, he spent ten minutes building towers with Child R1 in the construction area. This activity was child initiated. They were working together to build a house for their toys. When they finished building the tower, he and Child R1 began to place the toys carefully so as not to shake it and cause the tower to fall apart. In his second activity, he spent eight minutes interacting with tower building again; just like in his first observation but this time he interacted with this activity alone. This activity was also child initiated. In his third observation, he spent ten minutes with puzzles which was an adult led activity. This was an activity that I and Child O did together. The activity was memory puzzles that had pictures of animals of which he had to identify which of the animals appeared twice. He was able to identify all the animals that appeared twice and was very happy when he got them right. It can be observed that there is a pattern in his observations. Firstly, he interacted with tower building in his first and second observation and his level of engagement was consistent throughout the observations. Also the time he spent with these non-digital activities are in close range with each other.

6.2.4 SUMMARY

In Phase 1, a number of points were noted. Firstly, Table 6.2 showed that 37 child initiated, 4 adult led and 2 adult initiated non-digital activities occurred. This shows that

more of the activities were child initiated. Secondly, Table 6.2 showed the children's patterns of interaction in the non-digital activities they interacted with. 8 out of 14 of the children were observed to have interacted with a non-digital activity in more than one observation in Phase 1. Child LB interacted with sand play activity in his second observation and third observation. Child R1 interacted with tower building in three of her observations. Child IP interacted with tower building in her first and second observation and drawing in her first and third observation. Child LY interacted with constructive play in her first and second observation, Child P interacted with sand play in three of her observations and Child O interacted with tower building in his first and second observation. This pattern shows that the children were allowed to explore and experiment with resources that have been provided thereby enabling them to discover their preferences.

Thirdly, it can be noted that in this phase all the non-digital activities that occurred were 54 in total. The recurrent activities were sand play, tower building, drawing and arts and crafts and reading and role playing. These non-digital activities totalled 39. Therefore, out of the 54 non-digital activities that occurred, 39 were the recurring non-digital activities. It should be noted that only three of these activities were adult initiated. This shows that the children interacted with these non-digital activities based on their preferences.

Furthermore, the stipulated time for each observation to take place was twenty minutes. However, some of these observations occurred for less than twenty minutes and this depended on the children's choices. It can be observed from Table 6.2 that the lowest minutes spent were four minutes and the highest minutes spent were twenty minutes. This is based on the children's individual differences which played a significant role in the time they spent with these non-digital activities. Therefore, it should be mentioned

that only 10 out of 14 children had spent twenty minutes with an activity in one or three of their observations.

Finally, with the level of engagement, Table 6.2 shows that the children exhibited different levels of engagement with non-digital activities from extremely low to extremely high. Child R1 was the only child to have consistent high level of engagement in this phase. Some of the children like Child IP, Child P and Child O had high to extremely high level of engagement. Some of the children like Child LG and Child R3 had low to moderate level of engagement. Also, it should be noted that Child HB in his first observation spent four minutes painting while Child LG also spent 4 minutes reading a storybook in her second observation. However, their level of engagement was different. As table 6.2 shows, Child LG's level of engagement was low because during this activity although engaged, there were moments of inactivity where she stared into space, was easily distracted and had limited concentration. The activity may not have been engaging enough for her. This cannot be said for Child HB because he was focused and involved in the activity. During those 4 minutes, he smiled as he painted, happy with what his finished art looked like. It can be said that although both children spent 4 minutes on different activities, they both had different outcomes. Child LG was distracted thereby reducing her concentration while Child HB was able to express himself in his drawing. It can be stated that it really does not matter how much time a child spent in an activity as long as the activity is engaging enough, this is more important.

6.3 PHASE 2: DIGITAL ACTIVITIES/ QUALITATIVE RESULTS

This section presents the data from Phase 2 of this research. In this Phase, the iPad was introduced for the first time to the children. These observations took place in the third and fourth week of data collection. They were observed interacting with digital activities three times for two weeks. Less structured observation was used in this phase

to observe the children but the qualitative results were categorised in a table so as to note the patterns of behaviour that the children exhibited while they interacted with digital activities. Thus Table 6.5 shows the qualitative results from this phase. Table 6.5 consists of the nature of activities and the length of time the children spent with these activities. Table 6.5 is a summary of the children's interactions with digital activities that I will be discussing in the following section below. The children were free to choose from any of the forty-one digital activities that were on the iPad.

Table 6.5: Context for Summary for Qualitative Results in Phase 2.

Participants	Observation 1		Observation 2		Observation 3	
Experimental Group	**Interactions**	**Minutes**	**Interactions**	**Minutes**	**Interactions**	**Minutes**
Child HB	Peppa's Paint Box Max and Ruby Hooked Phonics Edu Kids Room	2 6 6 6	Endless Word Play Endless 123 Peppa Pig Shopping	6 4 10	Peppa Pig Shopping	18
Child JB	Peppa Pig Shopping Wild Habitat	10 10	Peppa's Paint Box	18	Peppa Pig Shopping Wild Habitat Peppa's Paint Box Animal Puzzle Elmo 123 Mini School House Hunt	2 2 2 2 2 4 6
Child HG	Edu Kids Room Peppa's Paint Box Wild Habitat Peppa Pig Shopping Addition	6 4 4 2 4	Edu Kids Room Funbrain Jr. Elmo 123 Peppa's Paint Box	4 2 4 8	EduMath 1 Peppa's Paint Box Colour Book	4 10 6
Child R1	Endless Word Play Fit Brains	8 14	Endless Word Play	20	Literacy Puzzle 123	18
Child LB	Puzzles 123 Max and Ruby	10 10	Max and Ruby Peppa Pig Shopping	6 14	Max and Ruby Peppa's Paint Box	4 16
Child JG	Peppa's Paint Box	14	Max and Ruby	18	Max and Ruby Reading Rainbow Farm 123	2 2 4
Child LG	Endless Numbers Endless Reader	6 10	Peppa Pig Shopping Animal Puzzle Max and Ruby	6 8 6	Peppa's Paint Box Endless Reader Peppa's Pig Shopping	8 6 6
Child IP	Lego Game	10	Peppa's Paint Box	9	Peppa's Paint Box	8

	Peppa' Paint Box	10	Lego Game	9		
Child LY	Peppa's Paint Box Elmo 123	2 2	Peppa's Paint Box Tiggly Chef Disney Junior Peppa Pig Shopping Nursery Rhymes	2 6 2 4 2	Disney Digital Books Peppa Pig Shopping Tiggly Chef Endless Reader Max and Ruby Peppa's Paint Box	2 2 2 2 2 6
Child R3	Stumpy Peppa Pig Shopping	4 16	Stumpy Peppa Pig Shopping Disney Junior	6 6 8	Stumpy Peppa Pig Shopping Disney Junior Max and Ruby Tiggly Chef Stumpy Max and Ruby Peppa's Paint Box Leo's Pad Disney Junior	2 2 2 2 2 2 2 2 2 2
Child P	Elmo 123 Edu Math 1 Disney Junior Mr Potato Head	6 6 4 4	Stumpy Puzzle 123 Peppa's Paint Box Leo's Pad	2 12 4 2	Stumpy Turtle Math Peppa's Paint Box Disney Digital Books Edu Kids Room Puzzle 123	4 4 2 2 2 4
Child JN	Critter Math Road Trip Disney Junior Stumpy	2 6 4 8	Monsters Peppa Pig Shopping Nursery Rhymes Puzzle 123 Stumpy	2 4 2 6 4	Nursery Rhymes Stumpy Disney Digital Books Mini School Tiggly Chef	2 8 4 4 2
Child R2	Monki Birthday Party Nursery Rhymes Bird Collection Puzzle	2 4 2 6 2	Lego Game Disney Junior Alphabet Tots Tiggly Chef Max and Ruby	2 6 4 2 4	Lego Game Alphabet Tots Disney Junior	2 12 6

	Animal Habitat Disney Junior					
Child O	Disney Junior Peppa Pig Shopping Monster Endless 123 Edu Kids Room	2 2 2 2 4	Stumpy Disney Junior Peppa's Paint Box Tiggly Chef	8 8 2 2	Peppa's Paint Box Endless Reader Edu Math 1 Disney Books Peppa's Paint Box Monsters Max and Ruby Peppa Pig Shopping	6 2 2 2 2 2 2 2

Child Initiated: Orange Adult Initiated: Blue Adult Led: Green

6.3.1 DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 2

The children had access to a range of digital activities on the iPad which were specifically designed for young children. I ensured that these digital activities fitted the curriculum of the nursery before I began data collection. I first of all asked the teachers what areas of learning they would like the digital activities to focus on. Based on their feedback, I made use of Hillman and Marshall (2010) guidelines and major criteria for choosing digital activities for children. Some of the digital activities were numeracy and literacy based activities. Others were shapes and puzzle activities. At this phase, I was already a participant observer in the nursery and had interacted with the children before data collection began. Below is Table 6.5 that shows the nature of their digital activities.

Table 6.6: Nature of Digital Activities in Phase 2

Nature of Digital Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation	Total Number
Child Initiated	5	4	6	15
Adult Initiated	8	11	7	26
Adult Led			1	1

14 children were observed interacting with digital activities in this phase and Table 6.6 above presents the nature the activities they partook in. There were 42 observations in this phase and it can be observed from the table above that in this phase 15 child initiated activities, 26 adult initiated activities and 1 adult led activity were observed. This shows that more adult initiated activities were observed compared to non-digital activities in Phase 1. This could be due to the fact that the iPad had just being introduced to the children and they were just beginning to familiarise themselves with it.

6.3.2 NUMBER OF DIGITAL ACTIVITIES IN PHASE 2

Table 6.7 below shows how many children interacted with one or more activities in Phase 2. As it can be observed in Table 6.4, the children interacted with not more than two non-digital activities in Phase 1. However, by observing Table 6.7 it shows that some of the children interacted with more than three digital activities when compared to the non-digital activities in Phase 1.

Table 6.7: Number of Digital Activities in Phase 2

Number of Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation
One Activity	1	3	2
Two Activities	7	2	2
Three Activities		3	4
Four Activities	3	3	
Five Activities	3	3	1
Six Activities			2
Seven Activities			1
Eight Activities			1
Nine Activities			1

6.3.3 INTERACTIONS WITH DIGITAL ACTIVITIES IN PHASE 2

The following examples highlight how the children interacted with digital activities and the amount of time they spent with these activities individually.

CHILD HB

Child HB interacted with four digital activities in his first observation, three digital activities in his second observation and one digital activity in his third observation. This is in contrast to his observations in Phase 1 where he interacted with only one non-digital activity in each observation. In his first and second observation, his activities were adult initiated while his third observation was child initiated. In his first observation, he spent twenty minutes focused on the digital activities and did not allow the children beside him to distract him. Whenever he got a reward, he would shout 'YEAH'. In his second

observation, he spent another twenty minutes with three digital activities. This observation took place on the playground. He was focused on the activities and attentive to instructions. In his third observation, he spent eighteen minutes with one digital activity. He was surrounded by children again. Their interruptions distracted him from completing the task correctly. He decided to start the game again and completed the task correctly. This shows that he was persistent and determined with this activity. Also, it can be observed that the number of digital activities he interacted with reduced with each observation. Finally, it should be noted that he interacted with Peppa Pig in three of his observations.

Child JB

Child JB interacted with two digital activities in his first observation, one digital activity in his second observation and seven digital activities in his third observation. These activities were adult initiated. Firstly, it can be noted that he spent twenty minutes in his first and third observation and eighteen minutes in his second observation. During his third observation, he had flitted through six digital activities in fourteen minutes but when he got to the last digital activity which was called house hunt, he relaxed his back on the couch and focused on the activity for six minutes. Secondly, he also interacted with Peppa Pig in three of his observations and wild habitat in his first and third observation. This pattern is similar to Child HB's observations. It can also be noted that the number of digital activities increased in the third observation.

Child HG

Child HG interacted with two child initiated activities and one adult initiated activities in this phase. It can be observed that the number of digital activities increased with each observation. During her first observation, Child HG interacted with five digital activities. I observed her as she paid attention to the instructions being given on the activities. In her

second observation, she interacted with four digital activities and in her third observation three digital activities. The number of digital activities reduced with each observation. Also, she spent twenty minutes in her first and third observation and eighteen minutes in her second observation. From looking at the activities that she interacted with in her three observations, a pattern can be observed. This pattern is the numeracy aspects that these digital activities have. Addition, Elmo 123, fun brain Jr and edu math 1 are all numeracy digital activities.

Child R1

Child R1 interacted with two digital activities in her first and third observation and one digital activity in her second observation. In her first observation, she spent twenty minutes interacting with two digital activities. This observation was adult initiated. During this observation, she would always look at me to get my approval before beginning an activity. Whenever she completed a task correctly, she would wiggle her body and clap her hands in excitement. In her second observation, she spent twenty minutes with one digital activity which was child initiated. Before she began the activity, she just stared at the iPad. I asked her if she knew what to do and she said yes but she still kept looking at the screen not doing anything. I then asked her what activity she wanted and she pointed at Endless Wordplay. Although she approached me to interact with the iPad, she could not bring herself to choose the activity she wanted. Perhaps she was waiting for my approval like she did in her first observation. During the activity, she continued to wait for my approval to interact with the activity even though she had control over the activity and was not being led by me. In her third observation, she spent eighteen minutes interacting with two digital activities. This observation was adult led. During this observation, she also exhibited the same behaviour by waiting for my approval before interacting with an activity like she did

in her first and second observation. The only difference was that I was in control of the activities she interacted with and guided her at every step.

Child LB

In his three observations in this phase, Child LB exhibited similar patterns in the nature of activities, the number of activities and the amount of time he spent with these activities. It can be observed that he interacted with two adult initiated activities in three of the observations and he also spent twenty minutes in each of the observations. In his first observation, he interacted with two digital activities for ten minutes. During this observation, I observed that Child LB showed the trait of sharing with the iPad. When he was interacting with the iPad, he passed it on to his friend who was sitting beside him. Also, during the puzzle activity, he told me he did not understand it but I convinced him to continue and that he could do it. After a few seconds he was able to arrange the puzzle pieces together. His reaction was positive. He smiled so hard that his face turned red. Even his friends who were sitting beside him celebrated with him.

Child JG

Three of her observations were adult initiated just like Child JB, Child LG and Child IP. In her first observation she interacted with one digital activity of which she spent fourteen minutes. After fourteen minutes, she told me that she was done interacting with the activity. I told her she could still use the iPad if she wanted. She then glanced at the screen searching for another digital activity. She tapped on Peppa's Paint Box again and stared at the screen for a few seconds. I asked her if she wanted to go outside and play and she said yes. I observed that although she accepted to interact with the iPad, she would be engaged for a while then there were moments of non-activity. It could be that she preferred to go outside and play rather than interact with the iPad. In her second observation, she also interacted with one digital activity. During this observation, she was also not completely

engaged in the activity. She was distracted by other children in the nursery and would stare at them for long periods of time. She would look back at the iPad screen and continue to interact with the activity. In her third observation, she interacted with three digital activities. During the first two activities, she would tap on the icons on the screen randomly and not actually begin the tasks. But when she tapped on Farm 123 she was able to interact. She even responded to the voice and the instructions given. When she was done she told me she did not want to play anymore and gave me back the iPad.

Child LG

In her first observation, she interacted with two digital activities which were adult initiated. During the second activity, I noticed that she was engaged but it did not last long. She began to look around the nursery and when she looked back at the iPad her interaction began to look like a routine. I then asked her if she was bored and she replied yes. She gave me back the iPad and walked to the playground. In her second observation, she interacted with three digital activities and these activities were child initiated. During the observation, I observed that she was more comfortable than the first observation. In her third observation, she also interacted with three digital activities like her second observation and this observation was adult initiated. During this observation, she was more comfortable with the digital activities when compared to the first observation. She was smiling, interacting with other children and more importantly she was engaged with the digital activities.

Child IP

Child IP interacted with two digital activities in her first and second observation and one digital activity in her third observation. In her first observation, she interacted with two activities for twenty minutes. During this observation, she sat comfortably and kept smiling while she interacted with the activities. In her second observation, she interacted with the

same digital activities as the first observation but she spent nine minutes with each activity. She was also engaged during this observation and gave me back the iPad when she was done. In her third observation, she interacted with Peppa's Paint Box again for eight minutes but it should be noted that the eight minutes is similar to other amount of minutes she spent with the same activity in the other two observations. Also, it can be observed that there was a pattern in the activities she interacted with in this Phase which is that she interacted with Lego game twice and Peppa's paint box three times in this phase.

Child LY

Child LY interacted with two digital activities in her first observation, five digital activities in her second observation and six digital activities in her third observation. It can be observed that the number of activities increased with each observation. In her first observation, the activities were adult initiated and she spent two minutes each with these activities. During the observation, I observed how she would swipe the screen with excitement. With the two activities she ended up choosing, she did not spend a long time with them. During her second activity, she asked me how she could turn off the activity. When I asked her why, she replied that she did not want to play anymore. In her second observation which was also adult initiated, she was not engaged with the activities. During this observation, the other children observed that Child LY was not interacting with the activities and tried to correct her but she did not listen to them. She was in her own world, laughing and exiting the activities when she was bored with them. In her third observation, she did not give time to understand the activities. She may have wanted to experiment with as many activities as she could or was not satisfied with any digital activity.

Child R3

Child R3 interacted with two digital activities in her first observation, three digital activities in her second observation and nine digital activities in her third observation. In

her first observation, she spent twenty minutes with the digital activities. During the second activity, she was supposed to put the items on the list at the top of the screen into the shopping cart. She was picking the right items but she did not know how to remove the unnecessary items that the characters in the activity had put in the shopping cart. One of the children sitting beside her tried to explain to her but she did not do what the child suggested. Instead she just smiled and continued with the activity. In her second observation, she also spent twenty minutes. During the first activity, she was quite slow in dragging the letters into the monster's mouth, but as time went on, she got faster and more confident with that activity. Also, while she interacted with Peppa Pig Shopping, I noticed a difference from the first observation. During the first observation, she was a bit reserved and confused with the activity, but during this observation, she was more confident and knew exactly what to do without anyone's help and was highly engaged. She focused her attention on the activities and was able to complete all the tasks correctly. I also observed that she was beginning to be more comfortable around me ever since I introduced the iPad to the nursery. In her third observation, she interacted with nine digital activities and spent two minutes with each one. This is similar to Child LY's first observation.

Child P

Child P interacted with four digital activities in her first and second observation and activities in her third observation. In her first and second observation, she was surrounded by her friends during this observation who were onlookers. They watched as she interacted with the digital activities. She would tell them what she was doing before she did it. Sometimes they would ask a question about the activity and she would reply. They were communicating and she was not isolated with the iPad. In her third observation, I initiated her activities. During this observation, she was alone this time because I had approached

her and she was not with her friends. But with the first and second observation, she initiated her activities and was with her friends when the observations occurred.

Child JN

Child JN interacted with four digital activities which were child initiated in his first observation and five digital activities in his second and third observation which were adult initiated. In his first observation, he began with Critter Math for two minutes. When he began the activity, he told me that he did not understand the activity and I encouraged him to try. The voice on the app began to give instructions on what Child JN was supposed to do and he listened. He was able to complete the tasks correctly and was able to do a number of tasks even though it was only for two minutes. I observed that a child can achieve a lot with two or more minutes as long as the activity is engaging. He spent twenty minutes during the whole observation. During his second observation, there were two children who watched what he was doing on the iPad and he even answered some of the questions that they asked about the activity. They were attracted by the music from the first activity that Child JN interacted with. The children laughed when he did funny things with the characters in the activity. Also, some of the activities occurred more than once revealing his preferences. These activities were Stumpy and Nursery Rhymes. In his third observation, he spent twenty minutes with the digital activities. It can be observed that he interacted with Stumpy in three of his observations.

Child R2

Child R2 interacted with five digital activities in her first and second observation which were child initiated. She also interacted with three digital activities in her third observation which were adult initiated. In her first observation, she was with two of her friends who were watching what she was doing. While she was interacting with Nursery Rhymes, she and her friends sang along to the songs. She spent sixteen minutes interacting with these

activities. During her second observation, she spent eighteen minutes interacting with five digital activities and I was able to observe cooperation between her and her friends. In her third observation, she interacted with three digital activities for twenty minutes. It could also be observed that two digital activities occurred twice during her observations which were Disney Junior and Lego Game.

Child O

Child O interacted with five digital activities in his first observation, four in his second observation and eight in his third observation. During his first observation, Child O was excited to be interacting with the digital activities. He would giggle and wiggle his body whenever he completed a task correctly and the voices in the activity celebrated with him. He was always laughing and smiling showing that he was enjoying the digital activities. He spent twelve minutes during this observation. In his second observation, it can be observed that he spent twenty minutes during this observation. Just like his first observation, he was happy and excited while interacting with the digital activities. At a point during the observation, he laid down on his belly with the iPad on ground facing him. It seemed that he wanted to be more comfortable while interacting with the iPad. In his third observation, he interacted with eight digital activities. During this observation, he cuddled the iPad like a baby doll. He was his usual cheerful self during this observation. He was engaged with the activities. Also, I noted that even though he spent two minutes in most of the activities, he was able to actually complete the tasks. For example, the task in Edu Math 1, he was to catch all the flying number 1. This activity enabled Child O to sustain his attention on the specific number. He was able to catch the numbers. He may have interacted with the activity for a short time, but he was cognitively engaged.

6.3.4 SUMMARY

In Phase 2, a number of points were noted. Firstly, Table 6.5 showed that with each child's observations, 15 child initiated, 16 adult initiated and 1 adult led digital activities occurred in this phase. This is because the iPad was introduced at this phase and the children were just becoming familiar with it so most of the activities had to be initiated by me. Secondly, Table 6.5 showed the children's patterns of interaction in the non-digital activities they interacted with. All the children interacted with a digital activity in more than one observation. This showed that the children were beginning to choose their preferred digital activities.

Thirdly, it can be noted that in this phase the activities that occurred totalled 144. This is a large difference compared to the non-digital activities in Phase 1. The recurrent activities were Peppa's Paint Box, Peppa Pig Shopping, Max and Ruby, Disney Junior, Stumpy, Disney Digital Books and Edu Kids Room and Endless 123 and Tiggly Chef. These digital activities totalled eighty-six. Therefore, out of the 104 digital activities that occurred, 86 were the recurring digital activities.

Furthermore, the stipulated time for the observations to take place was twenty minutes. Some of these observations occurred for less than twenty minutes. The amount of time the children interacted with these activities does not matter as long as they were interacting with an activity. This data is based on the children's individual preferences which played a significant role with the time they spent with digital activities. Therefore, it should be mentioned that two of the children were observed for the complete twenty minutes in three observations and they are Child LB and Child R3. I also observed a pattern with the amount of time some of the children spent with the digital activities. It can be observed from Table 6.4 that Child HB, Child JB, Child HG, Child R1, Child P and Child JN spent twenty minutes in two observations and eighteen minutes in one observation. This is a

pattern because I observed the children from the time they started these activities to the exact minute the completed the activities. Also, the lowest minutes spent were four minutes and this is similar to Phase 1 where some of the children also spent four minutes.

Finally, it was observed that whenever a child was interacting with the iPad, a number of children would sit around the child and watch the digital activity he or she was interacting with. For example, during Child HB's second observation, he was surrounded by six children. The children would also keep turns for the iPad and argue about whose turn it was.

6.4 PHASE 3: DIGITAL ACTIVITIES/ QUANTITATIVE RESULTS

This section presents the data from the Phase 3 of this research. In this phase, the children were observed interacting with digital activities three times for two weeks. These observations took place in the fifth and sixth week of the data collection. Observation checklist was used in this phase to observe the children and the results were categorized in Table 6.8 below so as to note the patterns of interaction that the children exhibited while interacting with digital activities. The children had already been observed interacting with digital activities in Phase 2 with less structured observation, therefore in this phase, they have become familiar with the digital activities.

Table 6.8: Context for Summary of Quantitative Results in Phase 3.

Participants	Observation 1			Observation 2			Observation 3		
	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement
Child HB	Max and Ruby Tonia Colour book Road Trip Addition Funbrain Jr	4 2 6 4 4	4	Peppa Pig Shopping Peppa's Paint Box Elmo 123 House Hunt	2 2 2 10	5	Road Trip Peppa Pig Shopping Max and Ruby	8 2 10	4
Child JB	Peppa Pig Shopping Wild Habitat	8 8	5	Lego Forest		5	Lego Forest		5
Child HG	Elmo 123 Endless Reader PeppaPig Shopping Endless Wordplay	2 2 2 8	3	Endless Wordplay Pixie Dust Lite Literacy Peppa Pig Shopping Road Trip	4 4 4 2 6	5	Tiggly Chef Disney Junior Art Studio Endless 123 Road Trip The Garden Monsters Animal Puzzle	2 4 2 2 2 2 2 2	5
Child R1	Endless Reader Edu Kids Room	12 8	5	Farm 123 Road Trip	8 12		Stumpy Tiggly Chef		
Child LB	Peppa Pig Shopping Peppa's Paint Box Max and Ruby	8 2 8	5	Peppa Pig Shopping Road Trip	10 10	5	Road Trip Disney Junior Edu Math 1	8 8 4	5
Child JG	Max and Ruby Edu Kids Room Peppa Pig Shopping Peppa's Paint Box	2 6 8 4		Max and Ruby Edu Kids Room	4 2		Disney Junior Art Studio Disney Puzzle Packs	6 2 4	
Child LG	Road Trip Max and Ruby	16 4	4	Road Trip Stumpy	8 12	5	Tiggly Chef Stumpy Peppa Pig Shopping	6 4 4	5

							Not like the Others Play Kids	4 2	
Child IP	Disney Digital Books	20	5	Disney Digital Books	14	5	Peppa Pig Shopping Peppa's Paint Box Disney Digital Books Mini School	8 2 4 6	5
Child LY	Peppa Pig Shopping Pixie Dust Lite Animal Puzzle Peppa Pig Shopping Bird Collection Peppa's Paint Box Tiggly Chef Endless Reader Leo's Pad	2 2 2 2 2 2 2 2 2	3	Peppa Pig Shopping Wild Habitat Leo's Pad Peppa Pig Shopping Lumi Kids Disney Digital Books	2 2 2 2 2 2	3	Disney Digital Books Peppa Pig Shopping Tiggly Chef Endless Reader Peppa's Paint Box	2 2 2 2 2	3
Child R3	Peppa Pig Shopping Farm 123 Disney Junior Max and Ruby	6 2 6 6	5	Tiggly Chef Disney Junior Peppa Pig Shopping	6 6 8	5	Alphabet Tots Max and Ruby's Water Blast	10 4	5
Child P	Stumpy Animal Puzzle Alphabet Tots	6 6 4	4	Peppa's Paint Box Stumpy Max and Ruby/ Water Blast	8 8 4	4	Disney Junior Animal Puzzle Peppa Pig Shopping Peppa's Paint Box Tiggly Chef	4 4 4 2 4	5
Child JN	Nursery Rhymes Peppa Pig Shopping Cardtoons Math Literacy Stumpy	2 4 4 4 2 4	5	Leo's Pad Disney Digital Books	10 6	5	Max and Ruby's Water Blast Stumpy Disney Digital Books Alphabet Tots	2 4 2 12	3

Child R2	Doddle Critter Math Addition Tiggly Chef Nursery Rhymes	8 4 2 4	4	Mini School Critter Math Addition Edu Kids Room	6 2 2 4	4	Endless Word Play Addition Fun brain Junior	8 4 8	5
Child O	Disney Junior Play Stumpy Disney Junior Play Disney Digital Play Book	6 2 2 6	3	Disney Junior Peppa's Paint Box Max and Ruby's Ballorama Disney Digital Books Peppa's Paint Box Stumpy	2 2 2 2 6 4	4	Endless Reader Peppa's Paint Box Endless Wordplay Disney Junior's Princess Sophia Peppa Pig Shopping	2 2 2 2 6	4

Child Initiated Activities: Orange Adult Initiated Activities: Blue Adult Led Activities: Green

6.4.1 DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 3

Table 6.9 presents the nature of the digital activities the children interacted with in this phase.

Table 6.9: Digital Activities Initiated and Led in Phase 3

Nature of Digital Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation	Total Number
Child Initiated	6	9	8	23
Adult Initiated	7	5	6	18
Adult Led	1			1

There are 42 observations in this phase and it can be observed from the table above that in this phase there were 23 child initiated, 18 adult initiated digital activities and 1 adult led digital activity. This shows that in this phase, more child initiated digital activities were observed compared to Phase 2 when the digital activities were first introduced.

6.4.2 NUMBER OF DIGITAL ACTIVITIES IN PHASE 3

Below is Table 6.10 that shows the number of children in each observation who interacted with more than one activity in Phase 3.

Table 6.10: Number of Digital Activities in Phase 3.

Number of Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation
One Activity	1	3	1
Two Activity	3	4	2
Three Activities	3	2	4
Four Activities	2	2	2
Five Activities	3	3	4
Six Activities	1		
Eight Activities	1		1

It can be observed from Table 6.10 that more digital activities in an observation occurred just like in Phase 2. For example, in the first observation, one of the children interacted

with seven digital activities, another one interacted with six digital activities and three interacted with five digital activities.

6.4.3 INTERACTIONS WITH DIGITAL ACTIVITIES

The following examples highlight how the children interacted with digital activities, the amount of time they spent with these activities individually and their level of engagement in each observation.

Child HB

Child HB interacted with five digital activities in his first observation, four activities in his second observation and three digital activities in his third observation. In his first observation, he spent twenty minutes interacting with digital activities while six children were watching what he was doing. They were adult initiated. He was not distracted by the children instead he was focused on the iPad. Throughout the observation, he did not look up from the iPad, instead he was attentive. In one of the digital activities, he was involved in mastery play where he had to build bridges for animals to pass through. In his second observation, he spent sixteen minutes with the digital activities and they were child initiated. He kept smiling throughout the observation showing that he was in a pleasant emotional state. In his third observation, he spent twenty minutes interacting with three digital activities and were adult initiated. There was a pattern in the activities he interacted with. He interacted with Peppa Pig shopping, Max and Ruby and road trip in two of his observations. This can also be observed in his observations in Phase 2. Also in this phase, it can also be noted that with each observation, the number of digital activities he interacted with decreased. In his first observation, he interacted with five digital activities and then in the second observation it was four digital activities and then in the third observation it was three digital activities. He also showed this pattern in Phase 2 where the number of digital activities reduced with each observation.

Child JB

Child JB with two digital activities in his first observation and one digital activity in his second and third observation. In his first observation, he interacted with two digital activities and he spent eight minutes with each activity of which these activities were adult initiated. This observation took place on the playground because he wanted to interact with the iPad there. The noise of the other children playing did not distract him from the activities as he focused intensely putting food items in shopping carts in Peppa Pig Shopping and identified animals and what habitat they belonged to in the second digital activity. In his second observation, he interacted with one child initiated digital activity for twenty minutes called Lego Game. During this observation, I observed that when he finished the task, he would start it all over again. Child HG was also with him during this observation and they collaborated. In this third observation, he interacted with the same digital activity he interacted with in his second observation and also for twenty minutes. This activity was adult initiated. He laughed and smiled as he interacted with the activity showing that he was emotionally engaged. Child JB's observations in Phase 2 and 3 also show his preferences in the activities. He interacted with Peppa Pig Shopping, Peppa's Paint Box and Lego Game more than once. His level of engagement in his three observations was extremely high. This shows that in each observation, he was focused and attentive on the digital activities.

Child HG

Child HG's digital activities were child initiated in three of her observations. In her first observation, she interacted with first three digital activities with two minutes each. However, after the observation began she did not seem interested in the activities. But when she opened the fourth activity which was Endless Wordplay she spent eight minutes. While interacting with this particular digital activity, she moved away from the other

children who were onlookers but they followed. The children may have been a distraction because she was not absorbed in the activity. She had limited motivation to interact with the activity. In her second observation, she interacted with five digital activities for twenty minutes. She was surrounded by children again but this time she allowed them to watch her interaction with these activities. In her third observation, she interacted with eight digital activities. It can be observed that she spent two minutes with seven of the activities because she was fast in completing the tasks. She was focused and attentive throughout the observation. It can also be noted that the number of digital activities she interacted with increased in each observation unlike Child HB whose digital activities decreased with each observation.

Child R1

Child R1 interacted with two digital activities in three of her observations. These observations are quite similar to her observations in Phase 2 where she also interacted with two digital activities in her first and third observation. In her first observation, she spent twelve minutes interacting with endless reader and eight minutes interacting with Edu Kids' room. This observation was adult led because I had to help her understand the activities she interacted with. During this observation, she was always happy when she concluded a task. When the voices from the digital activities celebrated with her, it helped her know that she had successfully finished the task. The more I explained to her, the more she understood and was able to attempt them by herself. In her second observation, she spent eight minutes interacting with Farm 123 and twelve minutes interacting with Road Trip. These activities were child initiated. She was able to navigate the iPad without my help in this observation. In her third observation, she was able to interact with these activities without my help and was always happy when she finished the tasks. A pattern can be noted in the amount of time she spent with these activities. She spent either eight or

twelve minutes with these digital activities. Also her level of engagement was consistently high and extremely high throughout her observations.

Child LB

Child LB's digital activities were child initiated in three of his observations. This is a contrast to his observations in Phase 2 because the iPad was just introduced in that phase. In his first observation, he interacted with three digital activities. He was surrounded by five children during this observation but instead of their presence being a distraction to him, he and the children were collaborating. He was interacting with Peppa Pig Shopping and the task was to get the items on a list into the shopping cart as quickly as possible. He and the children worked together to get all the items he needed into the shopping cart before the time ran out. Each time he finished the task, he and the children would celebrate together. With the Max and Ruby activity, whenever he made a mistake with placing the pipes correctly, the children would correct him. In his second observation, he was very excited to interact with the digital activities. He repeated the activities constantly until the twenty minutes was up. In his third observation, he interacted with three digital activities. His levels of engagement in his three observations were extremely high like Child JB. He and his friends were engaged with the digital activities together. He displayed motivation in completing the tasks which often showed on his face. He was not easily distracted but did not also give up on the activities when he faced difficulties.

Child JG

Child JG's digital activities were adult initiated just like in Phase 2. In her first observation, she interacted with four digital activities. As the stipulated time for interacting with the digital activities was twenty minutes, Child JG refused to return the iPad to me or give another child waiting for his turn after twenty minutes even though the activity was adult initiated. Her level of engagement during this observation was extremely high and

this shows in her refusal to give the iPad back. However, in her second observation, I noticed that her interaction with the digital activities was different from the first observation. When she was interacting with the Max and Ruby for four minutes, she would tap the different buttons on the screen, curious about what would they reveal. Within the six minutes she spent in this observation, she paid full attention to the activities, responded to the voices in the activities and completed the tasks. This time she returned the iPad to me. In her third observation, she interacted with three digital activities for twelve minutes. Her preferred activity was Max and Ruby as she interacted with it Phase 2 and 3.

Child LG

Child LG interacted with two activities in her first and second observation and five activities in her third observation. In her first observation, she interacted with road trip for sixteen minutes and Max and Ruby for four minutes of which the activities were adult initiated. In her second observation, she interacted with road trip again this time for eight minutes and Stumpy for twelve minutes. Her level of engagement was extremely high. During this observation, she looked happy interacting with the digital activities as she concluded the tasks successfully. In her third observation, she spent twenty minutes interacting with five digital activities. A pattern can be observed in her observations. Firstly, she interacted with Stumpy and Road Trip in two of her observations. Also, she spent twenty minutes in three of her observations. There is a difference in her level of engagement with digital and non-digital activities. In Phase 1, it was recorded that her level of engagement was from low to moderate with non-digital activities but in Phase 3 her level of engagement was high to extremely high with digital activities.

Child IP

Child IP interacted with one digital activity in her first and second observation and four activities in her third observation. The activities were adult initiated. In her first

observation, she spent twenty minutes interacting with Disney Digital Books. The activities were puzzle games and spot the differences. During these activities, Child IP showed intense motivation to complete the puzzle tasks correctly and the speed at which she completed it. In the spot the difference activity, she also showed the same intense motivation to spot the differences in the pictures on the iPad screen. Spotting these differences showed that she was very attentive during this activity. In her second observation, she spent fourteen minutes interacting with Disney Digital Book again on the playground. In her third observation, she interacted with four digital activities. This is quite a shift from her previous observations where she interacted with one or two activities. A pattern can be noted in her observations. She interacted with Disney Digital Books in three of her observations. Also, her level of engagement was extremely high in her three observations.

Child LY

Child LY interacted with eight digital activities in her first observation, five digital activities in her second and third observation. In her first observation, she interacted with these activities for two minutes each. It can also be observed in the table that she interacted with Peppa Pig Shopping twice. These activities were child initiated. I observed that she was trying to interact with as many activities as possible within the observed period. As she tapped on these activities, she did not show any sign of motivation or real involvement. In her second and third observation, she also interacted with these activities for two minutes each. It can also be observed that she interacted with Peppa Pig Shopping twice just like her first observation. These activities were adult initiated. It can also be observed that the amount of time she spent with the digital activities reduced with each observation. Her level of engagement in each observation was moderate because she was busy with the digital activities but at a fairly routine level.

Child R3

Child R3 interacted with five digital activities in her first observation, three digital activities in her second observation and two digital activities in her third observation. In her first observation, her activities were child initiated and she spent twenty minutes. In her second observation, she spent another twenty minutes with three digital activities. During her second observation, I noticed that she would wait for my approval before beginning the activity or pressing play. This was similar to Child R1 in Phase 2. She would look at me, waiting for me to nod my head before she started the activity. In her third observation, she spent fourteen minutes with two digital activities. A pattern can be observed in her observations. It can be observed that the number of digital activities reduced with each observation. Also, she showed extremely high engagement in three of her observations. This is quite different from her observations in Phase 1 with non-digital activities where her engagement levels were from low to moderate. This shows that she was more engaged with digital activities than non-digital activities.

Child P

Child P interacted with three digital activities in her first and second observation and five digital activities in her third observation. In her first observation, she spent sixteen minutes interacting with three digital activities. During her interaction with stumpy, I noticed that she would put the wrong letters in the monster's mouth and laugh. I realised that she knew when the wrong letter was put in the monster's mouth; it spits it out and makes the 'urgh' sound. Every time she did this and the monster reacted that way, she would laugh loudly. During her second observation, I noticed again how she interacted with stumpy like her first observation. She knew how to drag the correct letters into the monster's mouth but she would also drag the wrong letters and laugh at the monster's reaction showing that she was engaged. It can be observed that this digital activity was her preferred activity because she

also interacted with it in Phase 2. In her third observation, she spent eighteen minutes with five digital activities. Her level of engagement with non-digital activities in Phase 1 is similar to Phase 3 because she shows high to extremely high engagement in both phases. This showed that her level of engagement is consistent with both digital and non-digital activities.

Child JN

Child JN interacted with six digital activities in his first observation, two digital activities in his second observation and four digital activities in his third observation. In his first observation, he spent twenty minutes. During his first observation, he would listen to the instructions that the voices in the digital activities gave before interacting with these activities. This showed that he was attentive and focused. In his second observation, he spent sixteen minutes with two digital activities. In his third observation, he interacted with four digital activities and he spent twenty minutes. This is similar to his observations in Phase 2 where he also spent twenty minutes in two observations.

Child R2

Child R2 interacted with two four digital activities in her first and second observation and three digital activities in her third observation. In her first observation, she interacted with four digital activities and spent eighteen minutes with these activities. During this observation, I observed that she enjoyed critter math because she kept interacting with each level she came across. She always smiled at me when she completed a task correctly. In her second observation, she interacted with another four digital activities for fourteen minutes. During this observation she was collaborating with another child to complete the tasks in the activities. They would both choose an activity together and complete the tasks together. In her third observation, she interacted with three digital activities for twenty minutes. During this observation, I observed Child R2 did not understand one of the tasks

in funbrain junior which was to identify the alphabet. So I sang the alphabet song to her and asked her if she knew it. She knew the alphabet song and used it to identify the letters.

Child O

Child O interacted with four digital activities in his first observation, six digital activities in his second observation and five digital activities in his third observation. His digital activities in these three observations are child initiated. In his first observation, he interacted with four digital activities and spent sixteen minutes. During the first digital activity, I noticed that Child O kept tapping the screen randomly and excitedly so much that I had tell him to calm down. He was not concentrating on the activities, making him moderately engaged. He did not show any motivation to complete the tasks correctly. In his second observation, he interacted with five digital activities for eighteen minutes and interacted with Peppa's Paint Box twice. He was calmer during this observation making him to be able to focus on the digital activities. In his third observation, he interacted with five digital activities for fourteen minutes. He was also calm during this observation. It can be observed that his preferred activity was Disney Junior and Peppa's Paint Box because these activities occurred more than once in Phase 2 and Phase 3.

6.4.4 SUMMARY

In Phase 3, a number of points were noted with the fourteen children who were observed interacting with digital activities. Firstly, Table 6.8 showed 23 child initiated, 19 adult initiated and 1 adult led digital activities occurred. This shows that majority of the digital activities the children interacted with were child initiated. This is in contrast to Phase 2 where majority of the digital activities were adult initiated. This is because in Phase 3 the children had become used to the iPad. It should also be noted that so far Child LB and Child HG are the only children who initiated their all non-digital activities in their three observations in the Phase 1 and all their digital activities in Phase 3. Secondly, Table 6.8

also showed the children's patterns of interaction in the digital activities they interacted with. Some of the children were observed to have interacted with particular digital activities in more than one observation.

Thirdly, it can be noted that in this phase all the activities that the children interacted with were one-hundred and fifty in total. The recurring activities were Peppa Pig Shopping, Max and Ruby and Peppa's Paint Box, Disney Digital Books and Disney Junior, Road Trip and Stumpy, Tiggly Chef, Edu Kids' room, Endless Wordplay, Animal Puzzle and Addition. These digital activities are 96 in total. Therefore, out of the 150 digital activities that occurred, 96 ninety-six were the recurring digital activities.

Furthermore, the stipulated time for each observation to take place was twenty minutes. However, some of these observations occurred for less than twenty minutes and this depended on the children's choices. It can be observed from Table 6.8 that the lowest minutes spent was six minutes and the highest minutes spent were twenty minutes. This is based on the children's individual differences which played a significant role in the time they spent with these digital activities. Therefore, it should be mentioned that eleven out of the fourteen children had spent twenty minutes in one or more of their observations. Also, Child R1 and Child LG spent twenty minutes in three of their observations.

Finally, with the level of engagement, Table 6.8 shows that the children exhibited different levels of engagement with non-digital activities from moderate to extremely high. Four out of the fourteen children had extremely high engagement in three of their observations. They are Child JB, Child LB, Child R1 and Child R3. None of the children exhibited low engagement with digital activities.

6.5 PHASE 4: NON-DIGITAL ACTIVITIES/ QUALITATIVE DATA

This section presents the data from the Phase 4 of this research. In this phase, the children were observed three times for two weeks while they interacted with non-digital activities. Less structured observation was used in this phase to observe the children but the qualitative results were categorised in a table so as to note the patterns of interaction that the children exhibited while they interacted with non-digital activities. Table 6.11 shows the results from this phase which contains the non-digital activities the children interacted with and minutes they spent with these activities.

Table 6.11: Context for Summary of Qualitative Results in Phase 4.

Phase 4	**Observation 1**		**Observation 2**		**Observation 3**	
Participants	**Interactions**	**Minutes**	**Interactions**	**Minutes**	**Interactions**	**Minutes**
Child HB	Arts and Crafts	20	Reading	20	Sand Pit	18
Child JB	Tower Building	10	Drawing	18	Reading	6
Child HG	Drawing	16	Slap Jack	20	Drawing	10
Child R1	Trains and Tracks Reading	16 4	Reading	20	Tower Building	16
Child LB	Drawing	16	Drawing	20	Drawing Role Playing	4 16
Child JG	Reading	6	Drawing	16	Arts and Crafts	6
Child LG	Drawing	16	Drawing	8	Drawing	14
Child IP	Drawing Sand Play	14 6	Drawing Role Playing	14 6	Sand Play	18
Child LY	Water Play Reading	6 4	Sand Play	16	Pasta Play	16
Child R3	Role Playing	16	Card Game/ Tummy Ache	12	Drawing	20
Child P	Drawing	18	Sand Pit Water Play Painting	8 6 8	Painting	20
Child JN	Walking around	6	Water Play	20	Pasta Play	20
Child R2	Drawing Painting	2 18	Drawing	20	Drawing	8
Child O	Sand Play Chalk Drawing	10 10	Trains and Tracks	20	Playing with toys	8

Child Initiated Activities: Orange Adult Initiated Activities: Blue Adult Led Activities: Green

6.5.1 NON-DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 4

It should be noted that the non-digital activities that occurred were child initiated, adult initiated and adult led activities. Table 6.12 below demonstrates the total number of the child and adult initiated and adult led non-digital activities that the children interacted with in each observation in Phase 4.

Table 6.12: Non-Digital Activities Initiated and Led in Phase 4

Nature of Digital Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation	Total Number
Child Initiated	12	10	10	32
Adult Initiated	1	3	3	7
Adult Led	1	2	1	4

Fourteen children were observed interacting with non-digital activities in this Phase and Table 6.12 above shows the nature of the activities the children partook in. There are 42 observations in this phase and it can be observed from the table above that in this phase 32 two child initiated, seven adult initiated and four adult led activities were observed. This shows that in Phase 4, more child initiated activities occurred than adult led and adult initiated activities. It should be noted that Child IP and Child P moved from adult initiated to child initiated activities in their second observation.

6.5.2 NUMBER OF NON-DIGITAL ACTIVITIES IN PHASE 4

Below is Table 6.13 that shows the number of children in each observation who interacted with more than one activity in Phase 4.

Table 6.13: Number of Non-Digital Activities in Phase 4

Number of Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation
One Activity	10	12	13

Two Activities	4	1	1
Three Activities		1	

It can be observed from 6.13 that the children continued with their pattern of number of activities in this phase like they did in Phase 1. The table shows that most of the children interacted with just one activity in this phase.

6.5.3 INTERACTIONS WITH NON-DIGITAL ACTIVITIES IN PHASE 4

The following examples highlight how the children interacted with non-digital activities and minutes spent on these activities individually.

Child HB

Child HB interacted with one non-digital activity in his three observations. It can be observed from Table 6.11 that his first observation was child initiated, his second observation is adult led and his third observation is adult initiated. In his first observation, he spent twenty minutes at the arts and crafts corner of the nursery making a picture. He was deeply absorbed and completely involved in this activity. In his second observation, a teacher was reading story books to him and this lasted for twenty minutes. He would ask questions about the characters and pictures in the book. In his third observation, he spent eighteen minutes in the sand pit. During this observation, he and his friends were building sand castles in the sand pit. It can be observed that in Phase 1, Child HB spent four minutes interacting with a non-digital activity in Phase 1. This is a contrast to his forthcoming observations. The pattern of eighteen and twenty minutes with non-digital and digital activities began in his second observation in Phase 1. From observing all the tables, it can be observed that he spent at twenty minutes in one or two observations in each phase. Also, his observations were child initiated in his first observation, adult led in his second observation and adult initiated in third observation.

Child JB

Child JB interacted with one non-digital activity in three of his observations. In his first observation, he interacted with tower building for ten minutes. This activity was child initiated. During this observation, he and Child HB were playing with blocks and dinosaurs. They were building a tower for the dinosaurs. Child JB loved dinosaurs and enjoyed playing with them because he used to tell me about them all the time. In his second observation, he spent eighteen minutes drawing. As he drew, he was telling the other children who were sitting around the table that he was drawing a picture for his mother and father. He then mentioned that the colour he was using to draw which was blue is his favourite colour. This showed that he not only was he able to concentrate on the picture he was making, he was able to relate and communicate with other children. He was able to describe what he was doing and why he was doing it. In his third observation, he was read a story by a teacher. This activity took place in six minutes. The activity was enjoyable for him and he was engaged throughout.

Child HG

Child HG interacted with one non-digital activity in her three observations. In her first observation, she spent sixteen minutes drawing. During this activity, I observed as she drew features of a person. I watched as she drew intensely and attentively on her paper. When I asked her who she was drawing she replied that she was drawing a portrait of me. In her second observation, she spent twenty minutes playing a game called slapjack with Child R3 and Child HG. This activity was competitive between the children because Child HG was winning and the other children were sad that they were not winning. In her third observation, she spent ten minutes drawing again. A pattern can be noted in her observations. It can be observed that she interacted with drawing in her third observation in

Phase 1 and first and third observation in this phase. This showed that she enjoys this activity.

Child R1

Child R1 interacted with one non-digital activity in three of her observations. In Phase 1, she showed a pattern in the non-digital activities she interacted with and the amount of time she spent with them. She interacted with two non-digital activities in each observation and spent eight, ten and twelve minutes with each activity. In this Phase, this pattern did not occur. However, she interacted with two of the activities from Phase 1 which were trains and tracks and tower building in this phase. This shows that she enjoys these activities and they are her preferred activities in the nursery. In her first observation, she interacted with trains and tracks for sixteen minutes. During this observation, she and Child O arranged train tracks on the flour, dragged the toy trains on the tracks and made "Choochoo" sounds. When she was done with that activity, she walked to the book shelf and picked up a story book for me to read to her which I did. During her second observation, we spent time reading again. She also initiated this activity and this activity took place for four minutes. Her third observation was initiated by me. We both sat in the construction area in the nursery while she played with tower building blocks. A teacher came towards her with a camera to take her picture; Child R1 looked up at the camera and smiled. She then looked back at the wooden blocks and continued to build her tower.

Child LB

Child LB interacted with one non-digital activity in his first and second observation and two non-digital activities in his third observation. All the activities were child initiated and this is similar to his observations in Phase 1. Also it can be observed that he interacted with drawing in three of his observations. In his first observation, he spent sixteen minutes drawing. During this observation, I observed that he was not completely engaged with the

activity. He was distracted by his teacher and other children with him in the drawing room. He watched a child cry for a few minutes and got up from his chair to pick up some paper and pencil from the floor. But with all these distractions that occurred he was still able to draw some lines on his paper. In his second observation, he also interacted with drawing but this time for twenty minutes. He was more engaged during this interaction than in his first observation. During his third observation, he asked me to draw a picture for his mother but I told him that she would appreciate it more if he drew it. So he proceeded to draw a picture for his mother. When he finished the drawing, he folded it and gave it to his teacher. He then proceeded to his next activity during the observed period which was role playing. He and his friends were role playing as a family and he was the baby. A pattern can be noted in his activities. For the two times I have observed him role playing with his friends, he had been the baby. Also, he interacted with drawing in Phase 1 and Phase 4.

Child JG

Child JG interacted with an adult led activity in her first observation, a child initiated activity in her second observation and an adult initiated activity in her third observation. The nature of the activity in her observations is similar to Child HB and Child HG. It can also be observed that this pattern of the nature of activities also occurred in Phase 1. In her first observation, she and two other children were sitting on the couch in the reading corner while a teacher read a story book to them. This took place for six minutes. Child JG was smiling and enjoying this activity. When the teacher finished the story book, the other children got up to play while Child JG sat and watched the children in the nursery. In her second observation, she spent sixteen minutes drawing. In her third observation, she spent six minutes creating a picture. Her teacher had announced who would like to do some arts and crafts. I saw Child JG run excitedly to the arts and crafts area and pick up an A4 paper. On the table, the teacher had provided glue, some green sparkling glitters and coloured

feathers. She used all the resources that had been provided to make a picture on which she spent six minutes. When she finished, she placed the picture in her drawer.

Child LG

Child LG initiated her activities in her three observations. It can also be observed that she interacted with just one activity in all three observations which was drawing. It can be said that the three observations are similar but the only difference is the amount of time she spent the activity. In her first observation, she spent sixteen minutes, in the second observation eight minutes and in the third observation fourteen minutes. All the observations took place in the drawing room and she was always with her friends. They enjoyed drawing together and laughed at each other's drawing. Also, it can be observed from Table 6.2 that she also interacted with drawing in Phase 1.

Child IP

Child IP's observations show similar patterns between Phase 1 and Phase 4. The first similarity is that she interacted with two non-digital activities in her first and second observation and one non-digital activity in her third observation. The second similarity is that she switched the nature of activities in her second observation in Phase 1 and Phase 4. The third similarity is that she had preferred non-digital activities in this phase just like she did in Phase 1. She even repeated one of the non-digital activities from Phase 1 in this phase which is drawing. In her first observation, she spent fourteen minutes drawing and six minutes in the sand pit. In her second observation, she also spent fourteen minutes drawing. It can be observed that she switched from an adult initiated activity to a child initiated activity within the twenty-minute observation. In her third observation, she interacted with sand play for eighteen minutes.

Child LY

Child LY initiated all her activities in three of her observations. This is similar to her observations in Phase 1 where she also initiated all her activities. In her first observation, she spent six minutes at the water basin and four minutes reading. During the first activity, she was with Child O. They were both using their hands to splash water in the basin. Some of the water spilled out which made the teacher complain. This made Child LY run away from the basin. She went back but only for a few minutes before moving to the book corner. In her second observation, she spent sixteen minutes at the sand pit. During this observation, she made use of the bucket and spoons in the sand pit to scoop some sand to make a sand castle. She showed a certain degree of motivation when her sand castle collapsed and persisted by continuing until the sand castle stood upright. In her third observation, she spent another sixteen minutes playing with uncooked pasta. This was the longest I had observed Child LY with a non-digital activity.

Child R3

Child R3 initiated her activities in her first and third observation and partook in an adult led activity in her second observation. In her first observation, she role played with her friends and the entire observed period during that activity was sixteen minutes. During this observation, she was role playing as Princess Anna from the Disney cartoon called Frozen while her friends also role played as other characters. This activity took place on the playground and the monkey bar was their castle. In her second observation, she took part in an adult led activity. This activity was a card game called tummy ache. When she was asked to take part in the activity, her teacher explained the rules of the game to her. She and other children sat in a circle with the cards in their middle and she was fully involved with this activity. In her third observation, she interacted with drawing for twenty minutes.

Child P

Child P's second observation is similar to Child IP's second observation. Both of them switched from adult initiated activities to child initiated activities during the observed period. In her first observation, Child P interacted with drawing for eighteen minutes and she initiated this activity. During this observation, she drew a picture for her father. As she was drawing, she was telling me things about her father. While she was drawing, she looked down on the ground and saw some sharpened pencil pieces on the floor. She then bent down to pick them up but I told her not to worry about it so she could continue her drawing. But she insisted on clearing the mess herself and picked up a dustpan and brush from the cupboard in the nursery and swept the pencil pieces into the dustpan. In her second observation, she started the observed period with a child initiated activity in the Sand pit. While she was interacting with her friends in the sand pit, her teacher announced for the children to move to the water basin which was filled with toys. She spent six minutes at the water basin before moving into the nursery to paint for another eight minutes. In her third observation, she interacted with painting for twenty minutes. Unlike her observation in Phase 1 where she interacted with sand play in her three observations, in this phase she interacted with a variety of non-digital activities. The amount of minutes has however been consistent as she spent twenty minutes in her second and third observation and like she did in three of her observations in Phase 1.

Child JN

During Child JN's first observation, he withdrew from the different activities that were initiated by me and the teachers in the nursery. It was quite difficult to observe Child JN interacting with a non-digital activity during this observed period because he was upset with his friend. However, I realised that observing him in this situation was as important as observing interacting with a non-digital activity because it is normal for children to be

upset with their friends thereby making them withdraw. His second and third observations were different. He was more involved and interacted with his friends during these activities. In his second observation, he interacted with water play for twenty minutes. This time, he was with his friends showing that they had settled their differences from the previous observation. In his third observation, he interacted with pasta play for twenty minutes. During this observation, he joined other children at a table in the nursery which had a bowl filled with coloured pasta and some plastic plates. He began to interact with the children and have conversations with them. It can also be observed that he initiated the activities in his second and third observation. It should also be noted that he spent twenty minutes with water play in his first observation Phase 1 and second observation in Phase 4.

Child R2

Child R2 initiated all her activities in her three observations. From observing table 6.10, it can be observed that she interacted with drawing in the three observations. She also interacted with drawing in her first observation in Phase 1. In her first observation, she interacted with drawing for two minutes and painting for eighteen minutes. During the first activity, I observed her as she was drawing some lines on an A4 paper but the drawing room was so noisy. She was distracted by this noise which led her to leave the drawing room and move to the main nursery where she interacted with her second activity. It was less noisy in the main nursery so she was able to concentrate on her activity. In her second observation, she interacted with drawing for twenty minutes. She was lying on her belly on the floor in the nursery with two other children. She had some pencils on the ground beside her which she used to draw a picture. In her third observation, she interacted with drawing for eight minutes. During this observation, she was sitting in the backroom and there were three other children who were role playing there as well. Child R2 wanted to join them because she asked if she could be one of the characters. She ended up not joining them and

walked around the nursery before returning back to her drawing. She was still able to finish her drawing.

Child O

Child O initiated his activities in three of his observations. In his first observation, he interacted with sand play for ten minutes and chalk drawing for another ten minutes. Even though this was Child O's observation, he and Child R1 interacted with both activities together. They were both engaged with the activities and enjoyed each other's company. In his second observation, I was sitting in the construction area with Child R1 when Child O passed by. He stood and watched Child R1 as she played with the trains for a few seconds before sitting down and joining us. He helped himself to some of the trains and tracks and began to arrange the pieces on by one. After a few minutes, he got up and walked away from us then walked back and continued to play with the trains. The children interacted with this activity separately. In his third observation, I observed him playing with toys. Throughout the observed period this was the only activity he interacted with, most of time he was running around in the nursery.

6.5.4 SUMMARY

In Phase 4, a number of points were noted with the fourteen children who were observed interacting with digital activities. Firstly, Table 6.11 showed that 32 child initiated, 7 adult initiated and 4 adult led non-digital activities occurred. This shows that majority of the non-digital activities were child initiated. Secondly, Table 6.11 showed the children's pattern of interaction in the non-digital activities they interacted with. 5 out of 14 children were observed to have interacted with a non-digital activity in more than one observation.

Thirdly, it can be noted that all the activities that occurred were fifty-one in total. The recurrent non-digital activities were drawing, reading, sand play, water play, painting and

role playing. These non-digital activities totalled 38. Therefore, out of the 51 non-digital activities that occurred, 38 were the recurring non-digital activities. It can be observed that drawing and sand play was also a high number of non-digital activities in Phase 1 as well.

Furthermore, the stipulated time for each observation to take place was twenty minutes. However, some of these observations occurred for less than twenty minutes and this depended on the children's choices. It can be observed from Table 6.11 that the lowest minutes spent were six minutes and the highest minutes spent were twenty minutes. This is based on the children's individual differences which played a significant role in the time they spent with these non-digital activities. Therefore, it should be mentioned that ten out of the fourteen children spent twenty minutes interacting one or more of the non-digital activities in this phase.

6.6 PHASE 5: NON-DIGITAL ACTIVITIES/ QUANTITATIVE RESULTS

This section presents the data from the Phase 5 of this research. In this phase, the children were observed three times for two weeks while they interacted with non-digital activities. These observations took place in the ninth and tenth week of the data collections. Observation checklist was used in this phase to observe the children. Table 6.14 below shows the results from this phase in which the data is categorized into the interactions, the amount of time the children spent with these activities and their level of engagement.

Table 6.14: Context for Summary of Quantitative Results in Phase 5.

Participants	Observation 1			Observation 2			Observation 3		
Control Group	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement	Interactions	Minutes	Level of Engagement
Child HB	Trains and Tower Building	20	3	Flour/Messy Play	14	4	Drawing	20	3
Child JB	Reading (Book on Wildlife)	20	4	Messy/Flour Play	20	5	Drawing	20	5
Child HG	Frozen Themed Puzzle	14	4	Drawing	20	5	Drawing	20	5
Child R1	Sculpting	20	5	Drawing	14	4	Sand Play	20	4
Child LB	Drawing	20	3	Drawing	12	3	Drawing	6	4
Child JG	Messy/Flour Play	12	2	Sculpting	20	5	Drawing	20	5
Child LG	Sculpting	20	3	Drawing	14	5	Drawing	14	4
Child IP	Water Play Sand Play	8 10	5	Sand Play Water Play Sand Play	8 6 6	5	Sand Play	20	5
Child LY	Drawing	14	1	Mud Pie Kitchen (Looking for bugs)	20	4	Sand Play	20	5
Child R3	Memory Game/Peppa Pig Tumble and Spin	18	4	Memory Game/Things that go together	6	4	Role Playing (Travel Agent)	20	5

Child P	Arts and Crafts	18	4	Sand Play	20	4	Interactive Flash Cards (Opposite sides)	20	4
Child JN	Memory Game/Peppa Pig Tumble and Spin	12	3	Arts and Crafts	16	5	Tower Building (Blocks)	16	4
Child R2	Drawing Memory Game/Peppa Pig Tumble and Spin	4 10	4	Arts and Crafts Drawing	6 14	4	Drawing	20	4
Child O	Memory Game/Peppa Pig Tumble and Spin	12	3	Role Playing (Home Corner) Puzzles	8 12	1	Drawing	20	3

Child Initiated Activities: Orange Adult Initiated Activities: Blue Adult Led Activities: Green

6.6.1 NON-DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 5

Table 6.15 presents the nature of the non-digital activities the children interacted with in this phase.

Table 6.15: Non-Digital Activities Initiated and Led in Phase 5

Nature of Digital Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation	Total Number
Child Initiated	9	12	11	32
Adult Initiated			1	1
Adult Led	6	2	2	10

There are forty-two observations in this phase and it can be observed from Table 6.15 that in this phase thirty-two child initiated activities, one adult initiated activity and ten adult led activities were observed. This shows that in Phase 5, more child initiated activities were observed than adult led and adult initiated activities. However, it should be noted that the number of adult led activities increased in this phase compared to the previous phases where one or two usually took place. Also, Child R2 moved from a child initiated activity to an adult led activity in her first observation. This is similar to Child IP's second observation in Phase 1 where she moved from a child initiated activity to an adult led activity.

6.6.2 NUMBER OF NON-DIGITAL ACTIVITIES IN PHASE 5

Table 6.16 shows how many children interacted with one or more non-digital activities.

Table 6.16: Number of Non-Digital Activities in Phase 5.

Number of Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation
One Activity	12	13	14
Two Activities	2		
Three Activities		1	

It can be observed from Table 6.14 that the children continued with their pattern of number of activities in this phase like they did in Phase 1 and 4. The table shows that most of the children interacted with just one activity in this phase.

6.6.3 INTERACTIONS WITH NON-DIGITAL ACTIVITIES

The following examples will highlight how the children interacted with non-digital activities, minutes spent on these activities individually and their level of engagement.

Child HB

Child HB initiated three of his observations in this Phase. This is similar to his observation in Phase 1. In his first observation, he spent twenty minutes interacting with trains and tower Building. In his second observation, he interacted with Messy Play for fourteen minutes. He would use his hands to feel the texture of the flour in the large bowl and fill up small containers with the flour. He would also hide toy animals in the flour and pretend they were missing then find them again. In his third observation, he interacted with Drawing for twenty minutes. I observed him interacting with this activity in the back room. He was sitting with two other children who were also drawing. He would be busy with the activity but then get easily distracted by other children and had limited motivation to draw anything. Therefore, his level of engagement was moderate.

Child JB

Child JB interacted with one activity in three of his observations and they were child initiated. In his first observation, he was reading a book about wildlife. I observed him as he looked at the pictures of the animals and was able to identify most of them and the ones he could not identify he would ask me. In his second observation, he interacted with messy play for twenty minutes. He and his friend were using their hands to feel the flour in the large bowl and find toy animals that were in the flour. In his third observation, he interacted with drawing for twenty minutes. The amount of minutes Child JB had spent

with non-digital activities varies. The lowest amount of minutes he spent with a non-digital activity was six minutes and this was in Phase 1 and Phase 4. The highest was twenty minutes which can be seen to be four out of nine non-digital observations in Phase 1, 4 and 5. In this phase however, he spent twenty minutes in each observation. In this phase, he had high to extremely high engagement.

Child HG

Child HG interacted with one activity in her three observations and they were all child initiated. In the first observation, she spent fourteen minutes interacting with a frozen themed puzzle. During this observation, she had the puzzle pieces lying on the floor and one by one she put the pieces together correctly. She showed intense motivation to complete the puzzle and her engagement was high. In her second and third observation she interacted with Drawing for twenty minutes and her level of engagement was extremely high. This is one of her preferred activities because she had also interacted with drawing in her third observation in Phase 1 and her first and third observation in Phase 4. Her level of engagement in this phase was high to extremely high.

Child R1

Child R1 interacted with one non-digital activity in three of her observations. In her first observation, she sculpted for twenty minutes. This was an adult led non-digital activity. During this activity, the teacher guided her on what to do with the clay that she had been given. With the teacher's instructions, she used both her hands to make a sculpture of a ladybird. She was extremely engaged and highly motivated by the activity. She was not easily distracted by the other children in the nursery and she enjoyed being engrossed in the activity. In her second observation, she interacted with drawing for fourteen minutes. This was a child initiated activity and she was highly engaged. She used coloured pencils to draw a picture for her mother and father. In her third observation, she interacted with

sand play for twenty minutes and this activity was adult initiated. She was making a birthday cake by using the cooking utensils that had been provided by the teachers. She smiled as she used her spoons to scoop sand into her bowl and mix it like cake batter. She was highly engaged with this activity. Also, Child R1 had consistent high and extremely high engagement throughout her observations in Phase 1, 4 and 5.

Child LB

Child LB interacted with three non-digital activities in three of his observations and they were child initiated. The activities in this phase showed his pattern of preferences in activities. It can be observed that he interacted with drawing in three of his observations. For him to interact with only this activity during the observed period shows that it was the only activity he was interested in at that time. It is also important to note that in his third observation, although he spent six minutes with the activity, he was highly engaged unlike his first two observations where he was moderately engaged.

Child JG

Child JG interacted with one non-digital activity in her three observations. In her first observation, she interacted with messy play for twelve minutes. This activity was child initiated. During this observation, I observed that she would leave the area where the activity was taking place and walk around the nursery, watching what other children were doing. She would then walk back to the messy play area and continue to interact with the activity. She did this three times in twelve minutes showing that her engagement was low. In her second observation, she spent twenty minutes sculpting and it was an adult led activity. This observation is different from the first observation because she was extremely engaged with this activity. She looked very comfortable interacting with the activity. It could be that she was able to focus for twenty minutes because the non-digital activity was being led by her teacher who sat in front of her. In her third observation, she spent twenty

minutes drawing. She drew an airport and two people in front of it. When I asked her who they were she replied her father and grandfather. She smiled and concentrated on the drawing because she intended to give it to her father later that day.

Child LG

Child LG interacted with one non-digital activity in three of her observations. In her first observation, she spent twenty minutes sculpting. The activity was led by one of the teachers however she was moderately engaged. She was not completely absorbed in the activity and could not concentrate. In her second and third observation, she spent fourteen minutes drawing in both observations and her level of engagement was extremely high in the second and high in the third observation. A pattern in the activities she interacted with can be observed. In Phase 1, 4 and 5, it can be observed that she interacted with drawing and all the drawing activities were child initiated.

Child IP

Child IP's observation in Phase 5 is quite similar to her observations in the Phase 1 and 4. She interacted with two non-digital activities in her first and second observation and one non-digital activity in her third observation in the three phases. In her first observation, she interacted with water play for eight minutes and sand play for ten minutes. In her second observation, she spent eight minutes interacting with sand play, then water play for six minutes and then went back to sand play for another six minutes. In her third observation, she interacted with sand play for twenty minutes. She was extremely engaged in three of her observations just like her observations in Phase 3 with digital activities. She can be observed to have had high to extremely high engagement with both digital and non-digital activities. Also, she exhibited a pattern with the non-digital activities she interacted. She would interact with one or two activities more than once in an observation. In Phase 1, it was tower building and drawing. In Phase 4, it was drawing and sand play. In Phase 5 it

was water play and sand play. It can be observed that these activities are her preferred activities in the nursery.

Child LY

Child LY interacted with one non-digital activity in three of her observations which were all child initiated. In her first observation, she spent fourteen minutes drawing a picture. However, her level of engagement was extremely low because she did not concentrate or show any motivation throughout the observation. She would stop drawing and stare at the other children playing in the nursery thereby not allowing her to concentrate on the activity she was interacting with. In her second observation, she spent twenty minutes in the mud kitchen looking for bugs with Child HB. At the beginning of the observation, she was gathering sand to bake when she saw a bug. This caused her to look for more bugs. She then called Child HB who was also playing in the mud kitchen to assist her in looking for more bugs. Her engagement was high. In her third observation, she spent twenty minutes in the sand pit. She was making a cake using the cooking utensils that have been provided by the teachers in the nursery and she was extremely engaged.

Child R3

Child R3 interacted with one activity in her three observations. The three activities were all adult led and she is the only child to have adult led activities consistently in her three observations in Phase 5. In her first observation, she spent twelve minutes interacting with a non-digital memory activity called Peppa Pig tumble and spin and her level of engagement during this activity was high. In her second observation, she spent six minutes interacting with another non-digital memory activity called things that go together and her level of engagement was also high. In her third observation, she spent twenty minutes' role playing with other children. The teacher initiated and led this activity by asking the

children to act as travel agents and speak to customers about their travel destinations. The teacher guided the children on what to do and say and she was extremely engaged.

Child P

Child P interacted with one non-digital activity in three of her observations in this phase. In her first observation, she spent eighteen minutes interacting with arts and crafts. She and two other children were interacting with this activity together. As they did this, they talked about their families while they created art by cutting papers and magazines and using glue to attach them to an A4 paper. In her second observation, she spent twenty minutes making a birthday cake in the sand pit. It can be observed from the table 6.9 that this non-digital activity is Child's P preferred activity. She spent twenty minutes in this activity in the three of her observations in Phase 1 and now in Phase 5. In her third observation, she spent twenty minutes with a non-digital interactive flash cards activity called opposites sides. She was able to identify the opposites of the objects shown to her on the cards. Her level of engagement was high in three of her observations. This can also be said of her observations in Phase 1 and Phase 3. This showed that she had high levels of engagement with both digital and non-digital activities. It can also be observed that the lowest amount of minutes she spent with these non-digital activities was eighteen minutes and the highest was twenty minutes. This shows that she may be able to focus her attention on activity for a long period of time whether the activity is child initiated or adult led.

Child JN

Child JN interacted with one non-digital activity in three of his observations just like his observations in the Phase 1 and 4. In his first observation, he spent twelve minutes with a non-digital memory activity called Peppa Pig Tumble and Spin. This was an adult led activity. In his second observation, he spent sixteen minutes interacting with arts and crafts activity. This was a child initiated activity. He was cutting up papers with a scissors and

attaching them on an A4 with glue. He did this with care and concentration. In his third observation, he spent sixteen minutes with tower building. This activity was also a child initiated activity.

Child R2

Child R2 interacted with two non-digital activities in her first and second observation and one in her third observation. In her first observation, she initiated the first activity which was drawing for four minutes. She was sitting with five other children on the table and chair in the nursery and they were all drawing. As she was drawing a teacher starts an adult led activity and asked if the children would like to play and she and the children agreed. She left her drawing on the table and sat on the floor with the other children in front of the teacher and proceeded to interact with the game. She spent ten minutes with this activity and her level of engagement was high throughout the observation. In her second observation, she spent six minutes with arts and crafts then she spent fourteen minutes drawing. In her third observation, she interacted with drawing for twenty minutes. Her level of engagement was consistently high throughout the observations in this phase and in Phase 3 with digital activities. She also had high and extreme engagement in Phase 1 but also had moderate engagement in Phase 1 as well. Also, it can be observed that drawing is her preferred activity because she interacted with it in Phase 1 in her first observation, her three observations in Phase 4 and Phase 5.

Child O

Child O interacted with one non-digital activity in the first and third observations and two non-digital activities in his second observation. In his first observation, he spent twelve minutes with a non-digital memory activity which was adult led. He was not paying full attention to the instructions the teacher gave and did not focus on what the other children were doing as well. So when one of the children asked the teacher if he could leave the

activity and she said yes, Child O got up as well and left the activity. In his second observation, he was role playing in the home corner in which he spent eight minutes. He would stare into space for a few minutes or lie down on the carpet and watch other children. He then proceeded to interact with puzzles in which he spent twelve minutes with this activity. However, he showed no motivation to put the puzzles together correctly and kept looking around the nursery to watch the other children. This showed that he had low engagement. In his third observation, he spent twenty minutes drawing.

6.6.4 SUMMARY

In Phase 5, a number of points were noted. Firstly, Table 6.14 showed that 32 child initiated, 1 adult initiated and 10 adult led activities occurred. From the data it can be said that the majority of the activities were child initiated. Secondly, Table 6.14 showed the children's patterns of interaction in the non-digital activities they interacted with. Five out of fourteen children were observed to have interacted with a non-digital activity in more than one observation in this phase. This pattern shows that the children were allowed to explore and experiment with resources that have been provided thereby enabling them to discover their preferences.

Thirdly, it can be noted that in this phase all the activities that occurred were 47 in total. The recurring non-digital activities were drawing, sand play, memory games, arts and crafts and messy play. These totalled 35. Therefore, out of the forty-seven non-digital activities that occurred, 35 were the recurring non-digital activities. It can be observed that drawing and sand play are continued preferred activities for the children throughout the non-digital observations in Phase 1, Phase 4 and now Phase 5.

Furthermore, the stipulated time for each observation to take place was twenty minutes. However, some of these observations occurred for less than twenty minutes and this depended on the children's choices. It can be observed from Table 6.14 that the lowest

minutes spent was six minutes and the highest minutes spent were twenty minutes. This is based on the children's individual differences which played a significant role in the time they spent with these non-digital activities. Therefore, it should be mentioned that only thirteen out of fourteen children had spent twenty minutes in an activity in one or more of their observations.

Finally, with the level of engagement, Table 6.14 shows that the children exhibited different levels of engagement with non-digital activities from extremely low to extremely high. Child IP was the only child to have consistent extremely high engagement in this phase.

6.7 PHASE 6: DIGITAL ACTIVITIES/ QUALITATIVE RESULTS

This section presents the data from Phase 6 which is the final phases of this research. In this Phase, the children were observed interacting with digital activities three times a week for two weeks. These observations took place in the 11^{th} and 12^{th} week of the data collection. Less structured observation was used in this phase to observe the children and the qualitative results were categorized in a table so as to note the patterns of interaction that the children exhibited while they interacted with digital activities. Thus table 6.17 shows the results from this phase. The table consists of the nature of the activities and the length of time the children spent with these activities.

Table 6.17: Context for Summary of Qualitative Results in Phase 6.

Participants	**Observation 1**		**Observation 2**		**Observation 3**	
Experimental Group	**Interactions**	**Minutes**	**Interactions**	**Minutes**	**Interactions**	**Minutes**
Child HB	Stumpy Disney Digital Books Monsters Lego Game	2 6 4 6	Disney Digital Books Disney Junior Bugs and Numbers	8 2 8	Disney Junior Stumpy Tiggly Chef	2 4 2
Child JB	Critter Math Stumpy	10 10	Critter Math	20	Endless 123 Endless Reader Stumpy Tiggly Chef	6 4 2 8
Child HG	Leo's Pad Disney Digital Books Farm 123 Fun Brain Jr Art Studio	6 2 2 4 4	Edu Math 1 Puzzle 123 Disney Digital Books Fun Brain Jr	2 6 6 6	Critter Math Cardtoons Lego Game	6 4 8
Child R1	Endless Reader' Puzzle 123 Addition	14 2 4	Edu Kids Room Endless 123 Critter Math	8 6 6	Alpha Tots Endless Reader	4 12
Child LB	Alpha Tots Peppa Pig Shopping Animal Puzzle Disney Junior	4 6 2 4	Disney Digital Books Peppa's Paint Box Disney Digital Books	4 14 2	Stumpy Turtle Math Elmo 123	2 6 2
Child JG	Tiggly Chef	6	Tiggly Chef	2	Tiggly Chef	2

	Peppa's Paint Box Disney Digital Books Disney Junior Peppa Pig Shopping	4 6 2 2	Peppa's Paint Box Disney Junior Peppa Pig Shopping Mmax and Ruby Edu Kids Room Tiggly Chef	2 2 2 2 2 2	Disney Junior Peppa's Paint Box Stumpy Disney Digital Books Tiggly Chef Edu Math 1 Disney Junior	2 2 2 2 2 2 6
Child LG	Endless Wordplay Lego Game Disney Junior Leo's Pad	2 6 4 8	Peppa Pig Shopping Endless Wordplay Leo's Pad Disney Junior Disney Digital Books	2 4 10 2 2	Peppa Pig Shopping Animal Puzzle Max and Ruby	4 8 2
Child IP	Disney Junior Art Studio	10 4	Lego Game Peppa Pig Shopping	10 10	Peppa Pig Shopping Critter Math	10 10
Child LY	Peppa Pig Shopping Pixie Dust Lite Animal Puzzle Peppa Pig Shopping Bird Collection Peppa's Paint Box Tiggly Chef	2 2 2 2 2 2 2	Tiggly Chef Peppa Pig Shopping Endless Reader	2 2 4	Peppa Pig Shopping Nursery Rhymes Peppa Pig Shopping Peppa's Paint Box	4 2 4 4
Child R3	Disney Digital Books Stumpy Peppa Pig Shopping	10 4 6	Tiggly Chef Disney Digital Books Fun Brain Jr Pixie Dust Lite Fun Brain Jr Disney Junior Play	2 4 4 4 2 4	Peppa Pig Shopping Pixie Dust Lite Stumpy Disney Digital Books Elmo 123 Tiggly Chef Fun Brain Jr Peppa Pig Shopping	2 2 2 2 2 2 2 2
Child P	Tiggly Chef Disney Digital Books Turtle Math	4 12 2 2	Tiggly Chef Max and Ruby	4 4	Tiggly Chef Stumpy Peppa's Paint Box Edu Math 1	2 6 4 2

	Stumpy				Elmo 123 Disney Junior Play	4 6
Child JN	Nursery Rhymes Peppa Pig Shopping Stumpy Disney Digital Books Endless 123 Endless Reader	2 6 2 4 4 2	Leo's Pad	20	Leo's Pad Disney Digital Books Tiggly Chef Stumpy	4 4 10 2
Child R2	Leo's Pad Critter Math Bird Collection Monsters	14 2 2 2	Leo's Pad	16	Disney Digital Books Puzzle 123 Endless Wordplay	6 4 10
Child O	Disney Junior Peppa Pig Shopping Disney Junior	4 12 4	EduMath 1 Peppa Pig Shopping Disney Junior Peppa's Paint Box	2 2 2 2	Disney Junior Books Tiggly Chef Peppa's Paint Box Animal Puzzle Stumpy Endless 123	2 4 2 2 4 6

Child Initiated Activities: Orange Adult Led Activities: Green Adult Initiated: Blue

6.7.1 DIGITAL ACTIVITIES INITIATED AND LED IN PHASE 6

Table 6.18 below presents the nature of the digital activities the children interacted with in Phase 6.

Table 6.18: Digital Activities Initiated and Led in Phase 6

Nature of Digital Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation	Total Number
Child Initiated	11	9	8	28
Adult Initiated	2	3	5	10
Adult Led	1	2	1	4

There are 42 observations in this phase and it can be observed from Table 6.18 that in this phase there were 28 child initiated, 10 adult initiated and 4 adult led digital activities. This shows that in this phase, more child initiated activities were observed. Compared to when the iPad was first introduced in Phase 2, the number of child initiated activities increased from Phase 3. This shows that the children had become familiar with the iPad and began to initiate their activities with it just like they did with the non-digital activities in the nursery. The digital activities had become a part of their classroom activities.

6.7.2 NUMBER OF DIGITAL ACTIVITIES IN PHASE 6

Table 6.19 Number of Digital Activities in Phase 6

Number of Activity	Number of Children from 1st Observation	Number of Children from 2nd Observation	Number of Children from 3rd Observation
One Activity		3	
Two Activity	2	2	2
Three Activities	3	4	6
Four Activities	5	2	2
Five Activities	2	2	
Six Activities	2	1	2
Seven Activities			1
Eight Activities			1

It can be observed from table 6.19 that more digital activities in an observation occurred again in Phase 6. For example, in the first observation, two of the children interacted with six digital activities and in the third observation, one of the children interacted with eight digital activities.

6.7.3 INTERACTIONS WITH DIGITAL ACTIVITIES IN PHASE 6

So far the data has revealed some of the patterns of interaction that the children exhibited while they interacted with digital and non-digital activities. In this section, the following examples will highlight how the children interacted with digital activities and the patterns of interaction each child exhibited with digital and non-digital activities throughout the phases will be highlighted.

Child HB

Child HB interacted with four digital activities in his first observation, three digital activities in his second and third observations. In his first observation, he was highly engaged in the digital activities. Even when he came across an activity that was quite difficult for him to understand, he refused to give up. In his second observation, he and two children collaborated. Whenever he did not understand what to do, they would work together. In his third observation, he also interacted with three digital activities. While he was playing with the iPad, a child came into the nursery from the playground with a ladybird and he wanted to carry the ladybird. Another child told him that if he carried it he would not play with the iPad anymore. Child HB decided to continue playing with the iPad. Child HB's observations show some differences in the patterns he exhibited with digital and non-digital activities. Firstly, it can be observed that he interacted with just one non-digital activity in the stipulated time in each observation in Phase 1, Phase 4 and Phase 5. However, he interacted with more than one digital activity with the highest number being five digital activities in Phase 3. Secondly, he enjoyed non-digital activities that he

could do with his hands and were messy in nature. In Phase 1 he interacted with sand play, sand and blocks and painting. In Phase 4 he played in the sand pit and in Phase 5 he interacted with messy play. All these activities required him to use his hands thereby developing and improving his fine-motor skills, use his senses and being creative. Thirdly, he showed interest in some digital activities because he interacted with them more than once. These digital activities were Peppa Pig Shopping, Max and Ruby and Disney Games. Furthermore, in the amount of time he spent with non-digital activities, the lowest was four minutes and the highest was twenty minutes. With digital activities, the lowest was eight minutes and the highest was twenty minutes. Finally, with digital activities, he showed high to extremely high engagement and with non-digital activities he showed moderate to extremely high engagement. This shows that during the observed period he had high levels of engagement with digital activities.

Child JB

Child JB spent twenty minutes in his first observation interacting with two digital activities. During the first activity, he was so persistent that he finished all ten levels in the game. In his second observation, he spent twenty minutes with the same digital activity. This showed that he enjoyed the digital activity the first time and wanted to interact with it again. This was adult led because I used the opportunity to assess his understanding of shapes. As he tapped on the shapes on the screen, I would ask him for the name of the shape of which he would answer correctly. In his third observation, he interacted with four digital activities for twenty minutes. During this observation, some of the children in the nursery began to play musical instruments beside him which distracted him from the digital activities. Child JB was upset about and voiced his concern to the children. However, he did not lose focus. He continued with the digital activities. Child JB's observations show some similarities and differences in the patterns he exhibited with

digital and non-digital activities. Firstly, it can be observed that he interacted with one non-digital activity in Phase 1, 4 and 5. However, he interacted with more than one digital activity with seven being the highest. Secondly, he spent twenty minutes in each observation in Phase 5 with non-digital activities and Phase 6 with digital activities. Also, a pattern that can be observed with the digital activities is that some of them are numeracy based, for example, Elmo 123, Critter Math, Endless 123, and Mini School. It can be observed that he enjoyed reading of story books either by him or by a teacher because it occurred in Phase 1, 3 and 5. Finally, he had moderate to extreme engagement with non-digital activities and extreme engagement with his digital activities.

Child HG

Child HG interacted with five digital activities in her first observation, four digital activities in her second observation and three digital activities in her third observation. This pattern can also be observed in her observation in Phase 2 where she interacted with the exact number of activities in each observation. It can be observed that the number of digital activities decreased with each observation. However, in Phase 3 the number of digital activities increased with each observation. During her second observation, she was surrounded by three children who were having discussions based on the digital activities she interacted with. She however did not join in the discussion and focused on the activities. Child HG's observations show some differences in the patterns she exhibited with digital and non-digital activities. This pattern was that she interacted with more digital activities than non-digital activities. With non-digital activities, the most she would interact with within the stipulated time was two which occurred in Phase 1. However, with digital activities, the most she interacted with was eight and the lowest was three. Also, it can be observed that she interacted with drawing in five observations out of nine observations that were non-digital. Furthermore, the least minutes she spent with non-digital activities were

ten minutes and the highest was twenty minutes. With digital activities the lowest minutes was fourteen and the highest was twenty minutes.

Child R1

Child R1 interacted with three digital activities in her first and second observation and two digital activities in her third observation. These activities were all adult initiated. During the second observation, she was learning to count. I would point at the numbers and she would tell me what they were. The same was done with Critter Math where I asked her to identify the different shapes on the screen, which she was able to. Child R1's observations show some similarities and differences in the patterns she exhibited with digital and non-digital activities. Firstly, she interacted with tower building in four of her non-digital observations. Also, the digital activities were numeracy and literacy in nature. There was a similarity in the amount of time she spent with digital and non-digital activities. In an observation, she would spend twelve and eight minutes each with two digital or non-digital activities. This can be seen in Phase 1 and 3. Her level of engagement was high to extremely high in eighteen of her observations. It should also be noted that when the iPad was first introduced in Phase 2, she was shy and would only interact with the digital activities with my approval. In Phase 3, she became more confident with the iPad and by Phase 6, she did not need my help to navigate the iPad or wait for my approval.

Child LB

Child LB interacted with four digital activities in his first observation and two digital activities in his second and three digital activities in his third observation. During his second observation, while he was interacting with Disney Digital Books, every time he matched the cards correctly he would grab his head, smile really hard and say 'I did it'. In his third observation, his friends were sitting beside him again. While he was interacting with Stumpy, he would deliberately drag the wrong letter into the monster's mouth because

every time he did this, his friends would laugh. This was a routine action and he was actually focused on getting the right letters. Child LB's observations showed some patterns he exhibited with digital and non-digital activities. Firstly, he interacted with drawing in Phase 1, 4 and 5 with Phase 5 where it was the only non-digital activity in the three observations. Also, it can be observed that all his non-digital activities are child initiated. With digital activities, Max and Ruby, Peppa Pig Shopping and Disney occurred more than twice. His level of engagement with non-digital activities was moderate to high and with digital activities was extremely high in all three observations.

Child JG

Child JG interacted with five digital activities in her first observation, seven digital activities in her second observation and eight digital activities in her third observation. She interacted with more digital activities in this phase than in Phase 2 and 3. During her first observation, she was attentive to the digital activities she was interacting with. She would wait for the instructions to be given before attempting a task. In her second observation, while she was interacting with Tiggly Chef, she would count along with the chef on the screen. One of the patterns that stood out in Child JG's observations was that she interacted with child initiated, adult initiated and adult led non-digital activities in Phase 1 and 4. Also, in Phase 2 when the iPad was first introduced all her observations were adult initiated and this went on into Phase 3. But by Phase 6, she initiated her second and third observation. With the digital activities, it can be observed that she interacted with Max and Ruby twice in Phase 2 and twice in Phase 3. The highest number of non-digital activities that she interacted with was two. With digital activities, the highest was eight. The lowest amount of minutes she spent with digital and non-digital activities is six minutes and the highest is twenty minutes.

Child LG

Child LG interacted with four digital activities in her first observation, five digital activities in her second observation and three digital activities in her third observation. In her second observation, while she was interacting with Leo's Pad, she was able to listen to the instructions and follow them appropriately. However, during the activity she was supposed to make Leo fly by using a large catapult. He was giving the instructions of what she should do. She was doing exactly what he said but it was not working so she gave up on the game and moved on to another digital activity. In this phase all her activities were child initiated and this is similar to her observations in Phase 1 and 4. A pattern that stood out in Child LG's observations was that she interacted with Peppa Pig Shopping in five out of nine of her digital observations. Also, the lowest minutes she spent with a non-digital activity was four and the highest was twenty. With digital activities, the lowest minute was twelve. There is quite a difference in the lowest minutes between digital and non-digital activities.

Child IP

Child IP interacted with two digital activities in each observation in this phase. During her second observation, whenever she completed a task, she would tell me 'I've done it' with smile on her face. Even with the children surrounding her, she did not allow them distract her. She was focused and attentive to the digital activities. Child IP's observations showed some similarities and differences in the patterns she exhibited with digital and non-digital activities. Firstly, there was a pattern in the digital and non-digital activities she interacted with. With non-digital activities, it can be observed that she interacted with tower building, drawing, sand play and water play more than once. Also the pattern showed how this changed from each non-digital activity in each observation. With digital activities, she interacted with Peppa's Paint Box, Disney Digital Games and Lego Game more than once.

Secondly, she had high and extremely high engagement with both digital and non-digital activities. Finally, a pattern in the amount of time she spent with these activities can be observed. In Phase 1, she spent nine minutes with each activity in her first observation and eight minutes each in her second observation. In Phase 2, she spent ten minutes with each digital activity in her first observation and nine minutes each in her second observation. In Phase 4, she spent fourteen minutes and six minutes with each non-digital activity in her first and second observation and in Phase 6 ten minutes with each activity in her second and third observation.

Child LY

Child LY interacted with six digital activities in her first observation and three digital activities in her second and third observation. In her first observation, I observed that she would follow the instructions given in the activities. She would open these digital activities, tap all over the screen, and drag the icons and characters without actually attempting any tasks. Her second observation was similar to her first observation with the first two digital activities, but when she began the third digital activity, she was able to focus for a little while and complete the task before returning the iPad. During her third observation, she was surrounded by other children who noticed how she interacted with the digital activity. Child LY's observations showed some patterns she exhibited with digital and non-digital activities. Firstly, the highest number of non-digital activities she interacted with was two. With digital activities, the highest was eight. Secondly, it can be observed that with the digital activities, there is a pattern in the amount of time she spent. She either spent two, four or six minutes with each activity. Thirdly, she had moderate engagement in three of her digital observations in Phase 3. It can also be observed that five out of nine non-digital activities were outdoor play. Finally, she interacted with Peppa Pig Shopping

twice in her first and second observation in Phase 3 and first and third observation in Phase 6.

Child R3

Child R3 initiated her digital activities in Phase 6. She interacted with three digital activities in her first observation, five digital activities in her second observation and seven digital activities in her third observation. During her second observation, she was virtually painting with the colour purple and blue with the Pixie Dust Lite when a child asked her what she was painting. She told the child she was painting a swimming pool to which the child told her that a swimming pool is just blue. On hearing this, Child R3 wiped the paint of the screen with her fingers and exited the activity. This showed that she allowed the opinion of that child to affect her interaction with the activity. Child R3's observations showed some similarities and differences in the patterns she exhibited with digital and non-digital activities. Firstly, she interacted with more digital activities than non-digital activities. The highest number of digital activity was nine and highest number of non-digital activities was two. Also, with her level of engagement with non-digital activities it can be observed that she had low to moderate engagement in Phase 1 and high to extremely high engagement in Phase 4. It should be noted that the non-digital activities in Phase 4 were all adult led and this may be the reason why she had high engagement when compared to her child initiated activities in Phase 1. With digital activities, she had extremely high engagement in three observations in Phase 3.

Child P

Child P interacted with four digital activities in her first observation, two digital activities in her second observation and six digital activities in her third observation. During her second observation, there were three children sitting beside and watching while she interacted with the digital activities. Every time she dragged food ingredients into a bowl

or dragged pipes to their correct places, she and the children would laugh. She and the other children were enjoying her time with the iPad. Also, Child P's observations show some similarities and differences in the patterns she exhibited with digital and non-digital activities. Firstly, it can be observed that she interacted with sand play in five out of nine of her non-digital observation. In Phase 1, she interacted with sand play in her three observations and spent twenty minutes. Secondly, she had high to extremely high engagement with digital and non-digital activities. Finally, it can be observed that she spent more minutes with non-digital activities. The lowest number of minutes she spent with digital activities was eight and the lowest with non-digital was eighteen minutes. The highest number of minutes she spent with digital and non-digital activities was twenty minutes.

Child JN

Child JN interacted with six digital activities in his first observation, one digital activity in his second observation and four digital activities in his third observation. He spent twenty minutes in all three observations. During his first observation, while he was interacting with Peppa Pig shopping, one of the children sitting beside him kept telling him what to do even though it was the wrong thing. Child JN was focused on the activity and did not allow the child to distract him. In his second observation, he showed persistence. He was to build a telescope in Leo's Pad but he had difficulty doing it. Child R2 tried to show him what to do but he still was not getting it so he exited the activity. He then tapped on the activity and completed the telescope without any help. He was happy when he did this. Child JN's observations showed some patterns he exhibited with digital and non-digital activities. Firstly, it can be observed that he interacted with Stumpy in seven out of nine non-digital activities and Disney Digital Books in five of the digital observations. Also, the lowest minutes he spent with non-digital activities was six minutes but with digital activities the

lowest minute was sixteen minutes. The highest minutes he spent with digital and non-digital activities were twenty minutes.

Child R2

Child R2 interacted with four digital activities in her first observation, one digital activity in her second observation and three digital activities in her third observation. During her three observations, I observed as she was able to listen attentively to the instructions given in the digital activities. She was focused and persistent on completing the tasks. Child R2's observations showed some similarities and differences in the patterns she exhibited with digital and non-digital activities. It can be observed from the non-digital activities that she interacted with, they can be categorised as creative play. In Phase 1, she interacted with drawing and arts and crafts. In phase 4, she interacted with drawing in three of her observations and painting in her first observation. In Phase 5, she interacted with drawing in three of her observations like in Phase 4 and arts and crafts in her second observation. The lowest minutes she spent with non-digital activities was eight and the lowest minutes with digital activities was fourteen. The highest minutes she spent with digital and non-digital activities were twenty minutes. With non-digital activities her level of engagement was moderate to extremely high and with digital activities it was high to extremely high. Also, the lowest number of non-digital activities she interacted with was one and the highest two but with digital activities the lowest was three and the highest was five.

Child O

Child O interacted with three digital activities in his first observation, four digital activities in his second observation and six digital activities in his third observation. During his first observation, he and the children sitting with him were playing with the iPad together. They would laugh whenever he did something funny on the iPad. I also observed that every time he opened Disney Junior on the iPad, he would giggle. Child O's observations show some

differences in the patterns he exhibited with digital and non-digital activities. Firstly, the lowest number of non-digital activities he interacted with was one and the highest two. The lowest number of digital activities he interacted with was three and the highest eight. Therefore, he interacted with more digital activities than non-digital activities. Secondly, a pattern can be observed in the digital activities he interacted with. Peppa Pig shopping and Peppa's paint box occurred five out of nine of his observations. Disney junior occurred in eight out of nine of his observations. Similar patterns occurred with non-digital activities. He interacted with puzzles and tower building in two observations each. Also, his level of engagement with non-digital activities was low to high and with digital activities moderate to high.

6.7.4 SUMMARY

In Phase 6, a number of points were noted. Firstly, Table 6.17 shows that 28 child initiated, 10 adult initiated and 4 adult led digital activities occurred. This showed that majority of the digital activities were child initiated. Compared to Phase 2 and 3, this is the highest number of child initiated activities with digital activities. This showed that by Phase 6, the iPad had become a normal resource in the nursery just like the other non-digital activities. The children had become more confident and comfortable in approaching me to interact with the digital activities. Secondly, Table 6.17 also showed the patterns of interaction in the digital activities the interacted with. Some of the children were observed to have interacted with a particular digital activity in more than one observation.

Thirdly, in this phase it can be noted that all the digital activities the children interacted with were 157 in total. The recurring digital activities were Peppa Pig Shopping, Disney Junior, Disney Digital Books, Tiggly Chef, Stumpy, Peppa's Paint Box, Leo's Pad, Critter Math, Funbrain Jr, Endless Reader and Lego Game. These digital activities were 107 in

total. Therefore, 107 out of 157 digital activities occurred more than four times in this phase.

Furthermore, the stipulated time for each observation to take place was twenty minutes. However, some of these observations occurred for less than twenty minutes and this depended on the children's choices. It can be observed from Table 6.17 that the lowest minute spent was eight minutes and the highest minutes were twenty minutes. This is based on the children's individual differences which played a significant role in the time they spent with these digital activities. Therefore, it should be mentioned that twelve out of fourteen children had spent twenty minutes in one or more of their observations and Child JB and Child JN spent twenty minutes in three of their observations.

Finally, exploring the children's individual observations with digital and non-digital activities revealed how unique and different each child is when it came to their interactions with digital and non-digital activities. This showed that children had interests in digital or non-digital activities that was significant to them at a particular time and therefore could repeat that activity many times as long as it interested them. This also showed that the children were able to play confidently in their nursery. They had support from their teachers to help them learn and experience new things. There was consistency with the materials available in the nursery which made it easy for them to access. The iPad blended in effectively with the non-digital activities and had become one of the many resources that the children had access to. Also, the results showed that children responded differently to situations. For example, some of the children enjoyed having other children around the iPad while they interacted with digital activities, others did not; some of the children could spend longer periods of time with digital activities than non-digital activities; their levels of engagement were different which depended on their individual interests, behaviours or emotional state at that moment in time; the amount of time they spent varied. This supports

the point that children are individuals, with individual preferences, likes and dislikes. Teachers, educators and app developers should focus on that aspect when developing and preparing digital and non-digital activities for children.

6.8 COMPARISON OF DIGITAL AND NON-DIGITAL ACTIVITIES

The results from the observations over the period of the study have been presented in the above sections. These showed that during Phase 1, Phase 2, Phase 3, Phase 4, Phase 5 and Phase 6, the children exhibited patterns of interaction while interacting with digital and non-digital activities. In Phase 1, 4 and 5, the children were observed interacting with non-digital activities while in Phase 2, 3 and 6, they were observed interacting with digital activities. The purpose of this section is to present the comparisons between the children's interactions with digital and non-digital activities.

6.8.1 DIGITAL AND NON-DIGITAL ACTIVITIES: The total number of non-digital activities that occurred in Phase 1, 4 and 5 were 152 non-digital activities. The total number of digital activities that occurred in Phase 2, 3 and 6 were 451 digital activities. This is because the children interacted with more digital activities in an observation compared to the non-digital activities. Secondly, it was observed that with the non-digital activities in Phase 1, Phase 4 and Phase 5 combined; the numbers of non-digital activities that the children interacted with was one, two or three in an observation. However, this was a different situation with digital activities. In Phase 2, Phase 3 and Phase 6 combined; the number of non-digital activities the children interacted with in an observation was one to eight. This shows that some of the children interacted with more digital activities within the stipulated twenty minutes of observation than non-digital activities. A reason could be that because the iPad was a tool which had many digital activities for the children to choose from, it was easy and convenient for them to be in one place and interact with as many of the digital activity they wanted for any short period of time, giving them the

opportunity to search for an activity that would capture their attention and interest. And if that digital activity is not engaging enough, they could easily exit or stop the activity and find another one that would excite their curiosity. It is the same way a child can physically go through several non-digital activities in the nursery until they find the one that captures their attention. It could also be the individual preference of the children. For example, Child R1 spent twenty minutes interacting with two digital activities in Phase 2 meanwhile Child LY in the same phase spent two minutes each with eight digital activities she interacted with. It could be argued that Child LY could not focus her attention but by observing her non-digital activities that may not be the case. In Phase 5, it can be observed that she interacted with two non-digital activities for twenty minutes. The issue could be with the digital activities therefore a conclusion that Child LY lacked attention may not be appropriate but that instead she showed no effort in interacting with the digital activities. It could also be that she is a child who is very picky with digital activities and just needed time to discover her preferences.

6.8.2 LED AND INITIATED ACTIVITIES: It can be observed that child initiated activities were dominant with both digital and non-digital activities. However, with digital activities, adult initiated activities occurred more than child initiated activities in Phase 2 because the children were still getting used to the iPad but by Phase 6 the iPad had become one of their play and learning tools in the nursery. Therefore, it can be said that there was no major difference in the nature of the digital and non-digital activities. That is the children were able to initiate their non-digital activities as well as their digital activities. This shows that the children began to view the iPad as a part of their play and learning tools and not a different entity.

6.8.3 PREFERENCES: It can be observed that the children had preferences with digital and non-digital activities. The preferred non-digital activities were sand play, tower

building, drawing, arts and crafts, memory games and reading. The preferred digital activities were Max and Ruby, Peppa Pig Shopping, Peppa's Paint Box, Tiggly Chef, Disney Digital Books, Disney Junior and Stumpy. This shows that the children showed the same pattern of interaction with both digital and non-digital activities. Whether it was a physical activity or the iPad, they had a sense of control in their choices.

6.8.4 <u>MINUTES SPENT</u>: The amount of time the children spent interacting with digital and non-digital activities varied. It can be observed from the tables that there were similarities between the digital and non-digital activities in the amount of time the children spent. For example, many of the digital and non-digital observations lasted for twenty minutes. The shortest time that was spent with digital activities was four minutes and the time in minutes spent with a non-digital activity was four minutes. Also, when looking at the children's individual observations, some of the children spent similar amount of minutes with digital and non-digital activities. For example, Child R1 spent twenty minutes interacting with non-digital activities in seven out of nine of her observations. She also spent twenty minutes interacting with digital activities in seven out of nine of her observations. It can be observed here that her pattern did not change when digital activities were introduced to her. She was used to spending long periods of time with non-digital activities which she transferred to digital activities. Child LY's observations are also noteworthy. She spent twenty minutes in two out of her nine non-digital observations, the shortest being four minutes. She spent twenty minutes in one out of nine of her digital observations and the lowest being four minutes. It can be observed that she showed similar patterns with both digital and non-digital activities. These examples just show that the children's observations are unique in their own way.

SUMMARY OF RESULTS

This research aimed to answer the following research questions:

1) In what ways are children engaged while interacting with digital and non-digital activities?
2) Do children exhibit similar or different patterns of interaction between digital and non-digital activities?

To answer these research questions, an observation checklist was used to record the children's level of engagement with digital and non-digital activities numerically while the less-structured observation was employed to describe extensively how the children engaged and interacted with both digital and non-digital activities. The process of data analysis was discussed in Chapter 3 Section 3.10 and the Chapter 4.

Two key findings and discussion points emerged from this research:

1) There were four ways the children were engaged with digital and non-digital activities and they were behaviourally, emotionally, cognitively and socially. Some of the children were also observed to be disengaged with digital and non-digital activities.
2) The children exhibited similar and different patterns of interaction between the digital and non-digital activities.

In chapter 5, the quantitative and qualitative data of the children's engagement were presented in two different sections and described. In terms of engagement, the descriptive results of the quantitative data showed that the children had high engagement with digital activities and in-between moderate and high engagement with non-digital activities. The results which indicated the precise difference in the average level of engagement showed that the children's level of engagement with digital activities was higher than non-digital activities. This means that higher levels of engagement occurred with digital activities. In

terms of the minutes of engagement, the descriptive results of the quantitative data showed that the children spent more minutes with digital activities than non-digital activities. The less-structured observation provided an in-depth look into how the children were engaged with digital and non-digital activities. The thematic consistency with the different ways engagement emerged in the data showed that the children were engaged with digital and non-digital activities. Five major themes and twenty-three sub-themes emerged from the data. These themes were:

Table 6.20: Summary of Themes and Sub-themes.

Themes and Sub-themes	Non-Digital Activities	Digital Activities
Behavioural Engagement	✓	✓
Involvement	✓	✓
Persistence	✓	✓
Assertiveness	✓	✓
Cognitive Engagement	✓	✓
Problem Solving	✓	✓
Symbolic Representation	✓	✓
Creating and Constructing	✓	
Categorizing		✓
Selective Attention	✓	✓
Recalling		✓
Active Listening		✓
Working Memory		✓
Classifying		✓
Emotional Engagement	✓	✓
Happiness		✓
Enjoyment	✓	✓
Social Engagement	✓	✓
Peer Engagement	✓	✓
Active Discovery Play	✓	✓
Cooperation		✓
Adult Interaction	✓	✓
Conflict with Peers		✓
Disengagement	✓	✓
Distraction	✓	✓
Absence of Effort		✓
Withdrawal	✓	

From the table above, it can be observed that the five main themes that emerged from the data occurred with both digital and non-dizgital activities. This shows that these types of engagement and disengagement can take place with both digital and non-digital activities. As Plowright (2011) pointed out, a researcher should not always immediately accept explanations that other research has offered. The majority of the research studies that have studied children's engagement with digital technology have reported that it can engage children. However, this study has shown that children can also be disengaged with digital technology.

It can also be observed that with the sub-themes, there were some similarities and differences between the digital and non-digital activities. Some of the sub-themes occurred with both digital and non-digital activities, but some of the sub-themes that occurred with digital activities did not occur with non-digital activities and vice versa. However, this was what was observed. The digital activities had features like sounds, music and characters that facilitated or encouraged engagement in different ways. This thesis does not claim that these sub-themes do not exist with non-digital activities and vice versa, what this thesis claims is that the themes that occurred with non-digital activities can also appear with digital activities.

- **With behavioural engagement**: involvement, persistence and assertiveness were observed with both digital and non-digital activities. This shows that there were similarities between digital and non-digital activities in terms of behavioural engagement.
- **With cognitive engagement**: problem solving, symbolic representation, creating and constructing and selective attention were observed with non-digital activities while problem solving, symbolic representation, categorizing, selective attention, recalling, active listening, working memory and classifying were observed with

digital activities. This shows that the sub-themes that occurred with non-digital activities also occurred with digital activities with added sub-themes.

- **With emotional engagement:** happiness and enjoyment were observed with digital activities while enjoyment was observed with non-digital activities.
- **With social engagement:** peer engagement, cooperation, adult interaction and conflict with peers were observed with digital activities while peer engagement, adult interaction and active discovery play were observed with non-digital activities. There are similarities and differences between digital and non-digital activities. Peer engagement and adult interaction were observed with both digital and non-digital activities. However, cooperation was observed with digital activities and active discovery play with non-digital activities.
- **With disengagement:** distraction and absence of effort were observed with digital activities while distraction and withdrawal were observed with non-digital activities.

This research study has indicated that children can be engaged with digital and non-digital activities behaviourally, emotionally, cognitively and socially. It also indicated that children can be disengaged from digital and non-digital activities. This research also showed that digital activities can impact children's levels of engagement positively and has given an in-depth understanding of the different ways children can engage with both digital activities and non-digital activities. However, the quantitative data indicated that higher levels of engagement and more sub-themes from the qualitative data occurred with digital activities than non-digital activities. This comparison contributes to the field of early childhood research because there is relatively limited research that compares children's engagement between digital and non-digital activities. There is also limited research that explores the different ways children can be engaged with digital activities and that children

can be disengaged with digital and non-digital activities which this research has been able to explore.

In chapter 6, the quantitative and qualitative data were presented in phases. In terms of patterns of interaction, it was found that the children exhibited similar and different patterns while they interacted with digital and non-digital activities. The context of summary tables of the children's observations which can be found in Chapter 6 showed each child's digital and non-digital activities, minutes spent, nature of activities and their levels of engagement. The similarities were that in the same way the children had preferred non-digital activities, they also had preferred digital activities and were able to initiate their digital activities like they did with their non-digital activities. The difference was that more digital activities occurred than non-digital activities and the children spent more minutes with digital activities than non-digital activities.

It could also be observed from the tables that the children were individuals who had different likes and preferences; there were individual differences in the amount of time they spent and their levels of engagement. Eighteen observations were collated for each child. Each child had nine digital observations and nine non-digital observations. Below are the children who exhibited patterns of interaction in the types of digital and non-digital activities they interacted with, the amount of time they spent and their level of engagement.

- Child HB showed patterns of interaction with the digital and non-digital activities he interacted with. He enjoyed non-digital activities that he could do with his hands such as sand play, construction play, painting and messy play. He also had preferred digital activities such as Peppa Pig Shopping, Max and Ruby and Disney Digital Games.
- Child JB showed patterns in the amount of time he spent with the digital and non-digital activities he interacted with. He spent twenty minutes with non-digital activities in Phase 5 and with digital activities in Phase 6. Also, it can be observed

that some of the digital activities were numeracy based. These activities were Critter Math, Elmo 123, Endless 123 and Mini School. He also enjoyed reading story books and being read to.

- Child HG showed patterns of interaction with the non-digital activities she interacted with. There were nine observations where non-digital activities were observed, and in five out of these nine observations, she interacted with drawing.
- Child R1 showed patterns of interaction with the digital and non-digital activities she interacted with and the amount of time she spent. She interacted with tower building in four of her non-digital observations. She also interacted with digital activities that were numeracy and literacy based. The amount of time she spent with these activities are noteworthy. In her first and second observation in Phase 1 and her first and third observation in Phase 3, she interacted with two digital and non-digital activities and spent either eight or twelve minutes with each of them.
- Child LB showed patterns of interaction with the digital and non-digital activities he interacted with. He had preferred digital and non-digital activities in Phase 1, Phase 4 and Phase 5 where non-digital activities were observed, he interacted with drawing. In Phase 4, he interacted with drawing in the three observations. His non-digital activities were all child initiated. His preferred digital activities were Max and Ruby, Peppa Pig Shopping and Disney Digital Games.
- In Child JG's observations, a pattern with the nature of non-digital activities she interacted was observed. She interacted with an adult led, adult initiated and child initiated non-digital activities in Phase 1 and Phase 4.
- Child LG showed a pattern of interaction with the digital activities she interacted with. She preferred and interacted with Peppa Pig Shopping in five out of her nine digital observations.

- Child IP showed patterns of interaction with the digital and non-digital activities she interacted with, her level of engagement with these activities and the amount of time she spent. Firstly, with the non-digital activities, it can be observed in her individual profile (Page 375) how she transitioned from one non-digital activity to the other. In Phase 1, she interacted with drawing and tower building twice and reading once, in Phase 4 she interacted with drawing again but this time with sand play twice and role playing once, in Phase 5, she continued with sand play and transitioned to water play. Secondly, she had high and extremely high engagement with both digital and non-digital activities. This pattern can also be observed with digital activities. Thirdly, in some of the observations where she interacted with two activities, she either spent eight, nine or ten minutes each.
- Child LY showed a pattern in the amount of time she spent with digital and non-digital activities she interacted with. She spent either two, four or six minutes with each digital activity. Also, five out of the nine observations where non-digital activities were observed, the non-digital activities were noted to be outdoor activities which were sand play, sand and bricks (construction play) and mud pie bkitchen.
- Child R3's observations showed a pattern with the nature of non-digital activities she interacted was observed. It can be noted that the non-digital activities in Phase 4 were all adult led and this may be the reason why she had high engagement in these observations when compared to her child initiated activities in Phase 1.
- Child P showed patterns of interaction with the non-digital activities she interacted with and her level of engagement. Five out of the nine observations where non-digital activities were observed, she interacted with sand play. She also spent twenty minutes in her three observations in Phase 1 with sand play and spent more

minutes with non-digital activities than digital activities. She had high and extremely high engagement with digital and non-digital activities.

- Child JN showed patterns of interaction with the digital activities he interacted with. In seven out of the nine observations where digital activities were observed, he interacted with Stumpy and Disney Digital books in five of the observations.
- Child R2 showed patterns of interaction with the non-digital activities she interacted with. It can be observed that the non-digital activities she interacted with can be categorised as creative play. This is because in Phase 1, she interacted with drawing and arts and crafts. In Phase 4, she interacted with drawing in her three observations and painting in her first. In Phase 5, she interacted with drawing in her three observations.
- Child O showed a pattern with the digital and non-digital activities he interacted with. He had preferred digital activities. Peppa Pig Shopping and Peppa's Paint Box occurred five out of nine of his observations where digital activities were observed. Disney Junior occurred in eight out of nine of his observations. Similar patterns occurred with non-digital activities. He interacted with puzzles and tower building in two observations each.

The summary tables (Table 6.1, 6.4, 6.7, 6.10, 6.13 and 6.16 which can be seen in Chapter 6) showed that the children exhibited similar patterns with the nature of the digital and non-digital activities. This means that in the same way they were able to initiate their non-digital activities, they began to initiate their digital activities after they had become accustomed to having the iPad in their setting. In these contexts of summary tables, it could also be noted that the children exhibited similar patterns of interaction with their preferred activities between digital and non-digital activities. The same way they had preferred non-digital activities was the same way they had preferred digital activities. Finally, the summary tables showed a different pattern between the number of digital and

non-digital activities the children interacted with in their observations. With the non-digital activities, not more than three non-digital activities occurred in an observation, however with digital activities, more digital activities occurred with the highest being nine in an observation.

This research study indicated that digital activities can be assimilated into an early childhood setting because the data showed that the digital activities integrated with the non-digital activities in the setting where this research was conducted. It did not distract or disrupt the children's interactions with non-digital activities. The setting had adult led, adult initiated and child initiated play-based activities. The data showed that more of child initiated activities occurred with digital and non-digital activities. As Barber and Paul-Smith (2012) state, child initiated activities should be encouraged. This research adds to knowledge in this area because the data showed that the children were also able to initiate their digital activities after becoming familiar with them. Teachers can provide digital activities in their settings whereby children they can initiate and lead activities or allow the children to initiate their play.

The next chapter is going to discuss these findings in-depth.

CHAPTER 7

DISCUSSION

7.1 INTRODUCTION

This research study used a mixed methods approach in order to explore children's engagement and interactions with digital and non-digital activities. The data suggested that the children were engaged with these activities to an extent and that there were patterns of interaction that they exhibited while interacting with these activities. The major findings will be discussed according to the research questions in Section 6.2 and 6.3.

7.2 RESEARCH QUESTION ONE: IN WHAT WAYS ARE CHILDREN ENGAGED WHILE INTERACTING WITH DIGITAL AND NON-DIGITAL ACTIVITIES?

The aim of this study was to explore children's engagement and interactions with digital and non-digital activities. The key findings from the quantitative data showed that the children had high engagement with digital activities and in-between moderate and high engagement with non-digital activities. These findings as explained in the Summary of Results Page 259, indicated the precise difference in the average level of engagement and this difference showed that the children's level of engagement was higher than non-digital activities. The children responded positively to having the iPad in their setting because it was a new resource (Arnott, Grogan and Duncan, 2016) which could explain why the children had moderate to extremely high engagement with the digital activities compared to the non-digital activities that had already been present in the setting. This brought up the question of whether their levels of engagement would continue to be high after several months of observations. That said there were also higher levels of engagement with non-digital activities as well. The research study was conducted over a short period of time so it

could not be a case of the children maturing. This comes back to the individuality of the children because their individual levels of engagement varied. For example, Child R3 had low, moderate, high and extremely high engagement with non-digital activities and extremely high levels of engagement with digital activities. Child HG had high and extremely high engagement with non-digital activities and moderate and extremely high engagement levels with digital activities. It can be observed that both children's levels of engagement are quite different. As shown on Table 5.1 in Chapter 5, the average was found for each child's level of engagement in each phase. Finding the average showed that Child R3 had high levels of engagement with digital activities and Child HG had high levels of engagement with non-digital activities. There were some children like Child LY who had moderate engagement with both digital and non-digital activities. These examples given show that some of the children had higher engagement with digital activities than with non-digital activities and vice versa. However, because the mean was used to find the arithmetic average of the levels of engagement for digital and non-digital activities, the results show that there was high engagement with digital activities and non-digital activities but the difference in the average showed that digital activities seemed to be higher than non-digital activities.

The result of the digital activities confirms findings from several research studies that demonstrate digital technology engages children (Kurcikova et al., 2014; Disney et al., 2013). The children when engaged with the digital activities were absorbed, focused, attentive and challenged. The digital activities had specific features that could have played a role in the children's engagement. Research has shown that children are drawn to the 'modality' of the iPad (Yelland, 2015:227). And it was evident with the children in this research that they enjoyed interacting with the digital activities on the iPad. From their facial expressions, language and behaviours, the children showed that the tablet was welcomed in their nursery and that they enjoyed playing with the iPad. The features of the

iPad and the digital activities may have had influences on the children's engagement. The digital activities had interactive backgrounds that were bright and colourful which drew their attention and there was always music playing in the background which would attract other children to the iPad regularly. The apps had menus that helped the children navigate to a different activity. This made it easy for them to understand how to navigate the digital activities because they were usually large and colourful. The children also enjoyed getting feedback whenever they completed a task; that way they were engaged with the digital activity. Also, winning prizes, getting stars as rewards and moving to new levels usually made the children excited and kept them engaged. They would smile or verbally express themselves with the word 'Yaay'. Some of the digital activities had open content with opportunities for choice and creativity like Peppa's Paint Box. Others had closed content where there was a practice of particular skills like forming of letters and letter sounds (Dunn et al., 2016) like Endless Reader and Endless Word play and adding numbers and number sounds like Endless 123. I observed that some of the children enjoyed these digital activities. For example, Child R1 would tell me 'I want this one' while pointing at endless reader and would spend minutes interacting with that digital activity. However, Lieberman, Fisk and Biely (2009) argue that digital activities like this do not have the potential to provide children opportunities to experience learning and interactions that are possible with other digital activities. This is because they limit children's initiative and decision making (Johnson and Christie, 2009). Open-ended digital activities are better because they encourage children to be creative and extend their thinking (Fischer and Gillespie, 2003). The children also enjoyed digital activities where they took on domestic roles through an avatar such as shopping or travelling. Peppa Pig Shopping was one of the popular digital activities because it allowed the children experience shopping in a virtual world. Choice was an important aspect of this research because the children being able to choose what

digital activity they wanted allowed them a sense of freedom and exploration in their interactions with the iPad thereby encouraging engagement.

The data also showed that the children were equally engaged with non-digital activities. The setting where the research took place offered a rich and vibrant environment for the children and gave them the opportunities to explore and develop their interests and their interactions with others. The children were actively involved with different non-digital activities where they could develop and practise skills like drawing, painting, sand play and tower building. In the setting, the teachers had arranged the resources for the children in every corner of the room where they could easily access them. For example, the drawing room was always in the back room of the setting so whenever they wanted to draw, they knew where to find A4 papers and coloured pencils, they knew where the materials for arts and crafts were kept and could go at any time to interact with that activity, they knew where the puzzles were kept and where their favourite books were (Nutbrown, 2011). This encouraged them to explore their preferences. They were active and independent learners who were confident in trying out ideas in a safe and supportive setting (Drake, 2005). They had the freedom to choose any resources they wanted and as Stephen et al., (2008) stated, when children have freedom of choice, their engagement flows from the active involvement in choosing their non-digital activities. The children were intrinsically motivated by curiosity and interest. They used their minds, hearts and bodies during non-digital activities. For example, in Chapter 5 Section 5.2.1.3, Child HB in his second observation was playing in the sand pit. During this observation, he was pretending that the sand was snow and he was using his hands to mould the 'snow' into the snow balls. This play can be categorised as symbolic play because he was using sand to represent snow (Miller et al., 2005). He was making use of his imagination as well. His level of engagement during this observation was extremely high because he demonstrated behaviours of effort, involvement and concentration. Research has shown that children are

engaged when they are not just interacting with materials but are creating, designing and inventing with them (Papert, 1980; Resnick, 2002). For example, in Chapter 4 Section 4.4.1.1.1, Child HB was at the arts and crafts corner in the setting. He was taking part in a creative activity by using tools and materials to design a picture.

The key finding from the less structured observation showed that the children were engaged in different ways while they interacted with both digital and non-digital activities. Other studies have found similar results with digital activities (see Disney et al., 2013; Kucirkova et al., 2014; Milman et al., 2012) and non-digital activities (Williford et al., 2013; Vitiello et al., 2012). However, the use of the less-structured observation tool in this research thesis gave an in-depth exploration into the various ways engagement can occur with digital and non-digital activities. Through the thematic analysis of the qualitative data, five major themes emerged. They were behavioural, cognitive, emotional, social engagement and disengagement.

7.2.1 <u>BEHAVIOURAL ENGAGEMENT</u>: As discussed earlier in Chapter 2 Section 2.7.1, behavioural engagement refers to when children are physically involved in play and learning with digital and non-digital activities (Fredericks, Blumenfeld and Paris, 2004). It is recognised by involvement, persistence, concentration and occurs when the task in the activities matches the abilities of the child (Finn et al., 1995; Phethean and Clarke, 2014). The results showed that some of the children exhibited these types of behaviours with their digital activities. These children were observed to be involved, persistent and showed deep concentration while completing tasks. For example, in Chapter 5 Section 5.3.1.1.1 Child HB's observation showed involvement while he interacted with Peppa Pig Shopping. He was focused and was able to complete the task despite facing setbacks. When he completed the task, he reacted to this by saying 'we did it'. During his observations, he would express his excitement verbally just like he did in this example. This fits with Wood (2016)'s

statement that children's verbal utterances can indicate that they were involved through the comments they make. Another example is Child LB who was persistent during his interaction with a digital activity. As shown in Chapter 4 Section 5.3.1.1.2, he was having trouble completing the task; however instead of giving up, he persisted on completing the task. Even though he was not able to move the ball into the hole he was still happy that he made the ball move. This showed that he was persistent in understanding the concept by trying different ways to make the ball move into the hole thereby learning from his mistakes. Some of the children were observed to be assertive when they were interacting with digital activities. This was coded under behavioural engagement because it was an observable behaviour. The children who were assertive were able to speak up for themselves when they were faced with situations that they were not comfortable with. Although there were times when the children played co-operatively and took turns, there were times when they did not. With the digital activities, the data showed that sometimes when a child was interacting with the iPad, other children would gather and one of them would try and touch the screen of the iPad, distracting or interrupting the child's turn. Knowing that they only had a few minutes to interact with the digital activities, some of the children would want to have the iPad to themselves and not want another child to interrupt them. Like the example shown in Chapter 5 Section 5.3.1.1.2, Child HG exhibited assertive behaviour while she interacted with digital activities. She was able to speak up for herself without being aggressive.

The data also showed that behavioural engagement occurred with non-digital activities. For example, Child HB showed involvement during a craft activity in Chapter 5 Section 5.4.1.1.1. As Wood (2013) states, children love to create things when they play, they become experimenters and inventors and through this they are in control of their thoughts, actions and behaviours thereby becoming involved. This was evident in Child HB's observation as he created his craft. He was in control of the materials he used and how he

used them. He had the freedom to explore the materials in the way that interested him thereby encouraging not just involvement but creativity. Also, Wiltshire (2012) stated that resources that are provided for the children should be interesting and inviting for them to explore. This is true as Child HB showed much interest in creating something with the resources provided. The data also showed some of the children exhibited assertive behaviour while interacting with non-digital activities. As shown in Chapter 5 Section 5.4.1.1.2, Child R1 was playing with some trains and tracks when another child came and took some of the trains. Instead of crying or giving up, she spoke up for herself and asked for the trains back. This showed that with digital or non-digital activities, some of the children enjoy these activities and would not like to be interrupted. They know they have a short time to interact with these activities and would like to play thoroughly for as long as they can. Hegland and Rix (1990) argue that children who have been in the position to defend possessions or negotiate their rights with other children could be assertive rather than aggressive. It could be argued that Child HG's reaction was aggressive because she shouted no. However, she did not do anything that could cause a direct injury to the other child. She indeed ignored the other child's desire to play with the iPad. Therefore, this study suggests that children who exhibit these behaviours are behaviourally engaged (Trawler, 2010). When children are behaviourally engaged with digital and non-digital activities like this, they gain a sense of satisfaction, they will be keen to pursue their interests more and be confident in their learning (Moylett, 2010).

7.2.2 <u>COGNITIVE ENGAGEMENT</u>: As it has been previously defined, cognitive engagement is "the child's psychological investment in an effort directed toward learning, understanding or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Newmann et al., 1992:12). It takes place in the mind of the child making it difficult to measure, however it can be recognised by problem-solving, attention, memory, active listening, recalling and so on. The data showed that some of the children exhibited

these types of cognitive engagement with their digital activities. For example, in Chapter 5 Section 5.3.1.2.1 Child HB and Child JB's observations showed how they were able to problem-solve while interacting with a digital activity called Peppa Pig Shopping. They were faced with tricky problems and were engaged enough to brainstorm and try different solutions to solve their problems in fun ways. Problem solving has to do with children finding answers to questions, puzzles and situations that they face daily (MacNaughton and Williams, 2004). It's not just about mathematical problem solving; it can also occur in real contexts within a play based environment that promotes problem solving skills (Carruthers and Worthington, 2010). The children were able to do just that because they were able to note when an item that did not belong in the shopping cart was put there and were able to remove them before the time ran out. This is similar to Yelland's (2015) study where children were engaged in problem solving activities with digital technology.

The data showed some of the children exhibiting selective attention while interacting with digital activities. Selective attention has to do with children being able to select and focus on a particular stimulus while being able to suppress irrelevant information (Stevens and Bavelier, 2012) and in this research some of the children were observed being able to be selectively attentive. For example, in Chapter 5, Section 5.3.1.2.3, Child LG and Child P's observations showed how they were able to pay attention with digital activities. This showed that even with digital activities children can indirectly learn how to pay attention to stimuli for a period of time without being distracted by another stimulus. This could also be because of the immediate feedback they got from the digital activity (Shute and Miksad, 1997). The data also showed symbolic representation, categorizing and recalling with digital activities. These are also aspects of cognitive engagement which are important for children's cognitive development. This showed that the children were able to apply their cognitive skills with digital activities. These digital activities gave the children opportunities to remember shapes and colours, differentiate items on pictures by focusing

on attributes and represent events or situations through virtual painting. For example, in Chapter 5 Section 5.5.1.2.4, Child R2's observation showed how she was able to focus on pictures and figure out the attributes that made them different, thereby classifying. Through this digital activity, she was able to observe and compare the pictures. This is good because according to Fisher (2005) children need to be able to classify, differentiate and categorise as they grow older. The children achieved what the digital activities intended to promote with the tasks which is what Newmann et al., (1992) describe as cognitive engagement. The digital activities allowed them to draw on these skills so as to enable them to engage in higher thinking. This also showed that digital activities can cognitively engage children in different ways. Another example can be seen in Chapter 5 Section 5.3.1.2.4, Child JN was able to recall the given shapes because he had remembered what box they had been hidden in. Just like Read et al., (1993) stated, he paid attention to what he had to recall that was why he was able to do so. Therefore, with the digital activity called Critter Math that he interacted with, he was given the opportunity to learn about shapes. Shapes can be introduced through any toys, play equipment or games (Beckley et al., 2010) and this data shows that they can be digital or non-digital.

The data also showed that some of the children exhibited these types of cognitive engagement with their non-digital activities. For example, in Chapter 5 Section 5.4.1.2.1 Child LG and Child P's observations showed how they were able to problem-solve while interacting with non-digital activities. According to MacNaughton and Williams (2004) open ended materials like art materials, sand, water and blocks create opportunities for children to problem solve. Child LG and Child P were able to use open ended materials such as these to exhibit their problem solving skills. As Britz (1993) stated, children can be encouraged to problem solve if the early childhood practitioners create a time and place for problem solving and provide a variety of resources and materials that will encourage problem solving and this can be observed in Child LG's observation as the materials she

used created an opportunity for her to problem solve. These materials as my research shows can either be digital and non-digital. Apart from problem solving, other types of cognitive engagement were observed with non-digital activities. These were creating and constructing and selective attention. For example, in Chapter 5 Section 5.4.1.2.2, Child JG and Child R2 were observed while they were in the creative process of designing a picture. This process is important for children because they are able to think, use their imaginations, explore new ideas and bring those ideas to life through their art. Children are naturally creative, playful and curious (Isenberg and Quisenberry, 2002) and opportunities should be provided for them to exhibit this part of them. Not only can it encourage them to be involved and focused on their craft, it can encourage them to be cognitively engaged as well. As Compton et al., (2010) stated, creativity should be encouraged and nurtured in children so that they can become innovative thinkers in the future. Also, with non-digital activities like puzzles, arts and crafts, mazes and visual thinking games help build attention in young children. For example, Child HG and three other children were playing Slap Jack. This was a visual thinking game whereby she was able to focus her attention on the cards and think about the visual differences between cards using her memory.

Therefore, it can be observed that the children were cognitively engaged with digital and non-digital activities in different ways. It can also be noted that some of the sub-themes of cognitive engagement occurred with both digital and non-digital activities. As Stephen and Plowman (2014) stated, children can encounter similar cognitive functions with digital and non-digital activities and this statement is supported by this research. This buttresses my argument that whatever activities that early childhood practitioners engage children in, they should allow the children to the deeply involved, build knowledge, skills and understanding that will in turn aid their cognitive engagement.

7.2.3 <u>EMOTIONAL ENGAGEMENT</u>: As it has been previously defined, emotional engagement occurs when children enjoy the activities they are undertaking and have a positive attitude while they do it (Frederick, Blumenfeld and Paris, 2004). According to Trowler (2010), children who exhibit happiness, enjoyment, interest and a sense of belonging while interacting with digital and non-digital activities are said to be emotionally engaged. The data showed that some of the children in this research had emotionally engaging experiences with digital activities and they were coded as happiness and enjoyment. For example, in Chapter 5 Section 5.3.1.3.1, Child HB, Child O and Child LY's observations showed that they expressed delight in mastery of the activity they interacted with. They were expressing happiness which showed their emotional state while they interacted with digital activities. The children always had a smile on their faces and would laugh when they got a task right. For Child LY the features of the digital activity may have played a role in her emotional engagement. The digital activity was an interactive iPad application that claimed to teach children early addition concepts while the children helped the chef prepare meals. One of the features that got her attention was the munching sound that was made when she tapped on the screen and this elicited her verbal responses like "I ate it all up". She knew that the munching sound meant she was eating what she and the chef had prepared. Also, the food ingredients that appeared on the screen looked exactly like food ingredients that can be found in a kitchen so much that she recognised strawberries and was excited when she tapped them into the cooking bowl.

For Child O and Child HB, it was their facial expressions, behaviour and verbal responses that showed how emotionally engaged they were. Both of them would shake or wiggle their bodies when they completed a task correctly. They would also have big smiles on their faces. The data also showed some of the children enjoyed the digital activities. For example, Child IP and Child LB's observations in Chapter 5 Section 5.3.1.3.2 and Section 5.5.1.3.1 showed enjoyment. From their behaviours and facial expressions, they were

comfortable, relaxed with the iPad and enjoyed the activity. This showed that with digital activities children can experience positive emotions. As it can be observed with their observation, because they felt satisfied and happy, their motivation to interact with that digital activity increased (Al-Shara, 2015). They continued with that digital activity until they were satisfied. Dunn et al., (2016) study also showed that the children in their research had a sense of enjoyment when they were interacting with particular digital activities. Another research study reported high levels of enjoyment and engagement with digital activities (Liu, 1996). Liu's research showed that digital technology can engage children for a long period of time and this was demonstrated by their body language, verbal and facial expressions and attitudes.

The children in this research also had emotionally engaging experiences with non-digital activities. For example, in Chapter 5 Section 5.4.1.3.1, Child O's observation showed that he enjoyed the non-digital activity he interacted with. Therefore, it is important that children experience positive emotions with any activity they interact with. Enjoyment during an activity, whether digital or non-digital is a pleasant emotional state of the child due to experiencing a positive situation that motivates the child to finish or accomplish the task to sustain this feeling (Hartley, 2006; Kuppens, 2008). Children should enjoy interacting with activities and teachers and parents need to nurture this enjoyment. This is because when children feel satisfied and happy, their motivation to interact with that activity increases (Al-Shara, 2015). Studies have recommended that enjoyment is linked to a desire to participate and remain engaged (Scanlan, Stein and Ravizza, 1989). Engagement and enjoyment are important factors for playful learning activities (Malone, 1980).

7.2.4 <u>SOCIAL ENGAGEMENT:</u> Social engagement was not part of the multidimensional construct created by Frederick et al., (2004) however, the data in this research showed that the children exhibited social engagement while they interacted with

digital and non-digital activities. As it has been previously defined, social engagement is the extent to which a child participates in a range of social roles, relationships and activities with others (Avison, McLeod and Pescosolido, 2007) and this can be noted in this research study. Social engagement is recognised by the following in this research: peer engagement, adult interactions, cooperation, active discovery play and conflict with peers. Throughout the data collection, observations of children interacting with digital activities in isolation were rare. Most of the observations were of children using the iPad and interacting with me and other children in a variety of ways. It could be argued that the social context of the setting was enhanced through the use of the iPad. This counters arguments that digital technology isolates children and hinders them from developing social skills like Armstrong and Casement (2000) and Cordes and Miller (2000) claimed. A number of social skills were observed through the interactions the children had with digital activities. These skills include: sharing, taking turns, interactions, verbal and non-verbal communications. These skills were also observed with the non-digital activities. The data showed that peer engagement, adult interaction, cooperation and conflict with peers occurred with digital activities. For example, Child R1's observation in Chapter 5 Section 5.3.1.4.3 showed how adult interaction enabled her to understand the concept of the digital activity. This study suggests that the adult presence is still important with children's interactions with digital activities. Not all children are immediately familiar with the features of a digital activity and need help understanding them. The belief that children immediately understand the functions and features of a digital device as Prensky (2001) suggests is unrealistic. The assistance of an adult will help them overcome difficulty in performing tasks or learning (Wood, 1998). This is line with Vygotsky's belief that children are able to develop ability and knowledge when an adult helps them through scaffolding. Therefore, the essential role of scaffolding needs to be emphasised here because although these digital activities have the potential to engage children in learning,

these opportunities need to be appropriately and effectively harnessed (Highfield and Mulligan, 2008). The findings also indicated that some of the children engaged in peer engagement while interacting with digital activities. Although it was just one iPad that was available in the setting, it became a tool that mediated peer engagement. Examples were given in Chapter 4 where Child LG and Child R3 laughed and played together. Child R3 would make funny comments about the digital activity Child LG was interacting with and this made her laugh. This interaction lasted throughout the observed period. Peer engagement was frequent in the data and this emphasises the importance of social interactions when children are engaged with digital activities. The data also showed that some of the children cooperated while interaction with digital activities was taking place. Examples were given in Chapter 4 where Child JN and Child LB were having difficulty completing a task and the children sitting beside them and watching would offer advice on what they should do. Sometimes the children would even offer words of encouragement by saying "Yaaay" or "You did it" when the child would get the task right. This showed that children learn at different paces and that some of the children were more knowledgeable than others. This allowed the opportunity for one child to teach or help the other. The children were able to relate with each other, cooperate and engage in discussions. This is similar to other studies where the children were found to be taking turns with digital technology, sharing, integrating ideas and teaching and helping each other in constructive ways (Alexandersson et al., 2000; Clements et al., 1993; Kucirkova et al., 2014; Rojas-Drummond et al., 2008). Contrary to arguments that have been put forward about digital technology isolating children (Armstrong and Casement, 2000; Cordes and Miller, 2000), the data in my research shows otherwise. Most of the time, the children were not isolated. Instead the iPad brought children together in a cooperative and collaborative manner. They were able to comment on the other children's actions or help each other out with the digital activities. They were more likely to ask each other questions before asking me. The

children were able to communicate with each other about the digital activity or what the digital activity reminded them of. The iPad provided a context in which the children could interact and get help from other children thereby enabling them to complete the task in the digital activity. Lim's (2012) study also that showed children engaged in learning with computers while interacting with their peers. Also, when a child was interacting with the iPad, there were many occasions when one or more children would come over to where the child was sitting and watch. No child was hardly ever alone with the iPad. This is also similar to Yelland (2015) playful exploration research.

Some research studies have suggested that children prefer to work with others while interacting with digital device instead of working alone (Wolfe and Flewitt, 2010; Yelland, 2011). However, my research showed that there were times when some of the children wanted to be the only one interacting with the iPad. For example, Child JB was interacting with the iPad when Child R2 tried to touch the screen. He immediately told her that it was not her turn yet. This can be seen in Chapter 5 Section 5.5.1.1.2. Romeo et al., (2003)'s study demonstrated that touch screens promoted lack of collaboration because some of the children were observed to pursue their individual goals rather than cooperating with others. Although Child JB showed that he wanted to pursue his individual goal, he did not isolate himself with the iPad. He was still surrounded by other children and allowed them to watch what he was doing. However, he wanted to be the only one touching the iPad screen. I would argue that this was not lack of collaboration, because there were still opportunities for social interaction to take place. This is because even though he did not want the child to touch the screen, he was still comfortable with having the child by his side. He was also able to communicate to Child R2 that it was not her turn yet, which she respected and waited for her turn. This way Child R2 may have learned a new skill of waiting her turn. Also Child JB was not aggressive towards her by shouting or pushing her instead he spoke to her calmly.

Conflict was observed while interaction with digital activities took place. Conflict between children is normal because they have different personalities, preferences and needs. However, it is how they are able to self-regulate their emotions and solve the conflict that is important. This can be seen in Chapter 5 Section 5.5.1.4.3 where Child JN and Child HB had an argument. However, they were able to resolve the issue after I had explained what exactly happened. This way they may have learned how to understand each other's perspectives before reacting. This conflict was short lived and they went back to laughing with each other again. This is in line with Butovskaya et al., (2000) who say that children can make peace after conflict and as they grow older they tend to develop conflict resolution skills.

The data also showed that peer engagement, adult interaction, and active discovery play occurred with non-digital activities. For example, Child O's observations showed peer engagement occurring. In Chapter 5 Section 5.4.1.4.1, Child O was drawing with chalks on the ground that was made available on the playground and he was enjoying himself. Child R1 then joined him and began to draw on the ground as well. Instead of this play being solitary, they drew together. There was a lot of space on the playground so the ground was wide enough for them to draw together. Active discovery play was observed when Child HB, Child JN and Child LY were playing together on the playground. During this observation they were in the mud kitchen when Child HB discovered a beetle. This became an adventure for the three children. This was an opportunity that enabled them interact with each other. According to Vygotsky (1978) children learn most effectively within a social context. The outdoor environment can provide opportunities for this because it enables children to share their play and learning with other children. This could be seen with Child LY, Child JN and Child HB who were on the playground looking for bugs together. In the nursery, these children would usually not play together but the outdoor environment provided a way for these children to be social. Also, the outdoors inspired

them to investigate insects. This is why outdoor play is seen as the play that offers children the freedom to explore, be daring and adventurous like Child LY and Child HB were. The playground is a place where children gather and interact with each other and the resources available to them (Selbie and Wickett, 2010). As it can be seen in this research, the materials the children had access to on the playground was able to enhance their play and interactions and this could be observed in their verbal interactions and behaviours. Children's social interactions with each other and adults while interacting with digital or non-digital activities is therefore important because it enables children to interact appropriately with adults and other children, learn how to make and keep friends, cooperate and learn to understand different perspectives (Macintyre, 2012).

7.2.5 <u>DISENGAGEMENT:</u> As it has been discussed earlier, there are also situations whereby children may not be engaged in digital and non-digital activities. This can be seen as disengagement. The data showed that disengagement occurred while children interacted with digital and non-digital activities. Disengagement was recognised by the following: distraction, absence of effort and withdrawal. The data showed that some of the children exhibited this kind of behaviours with digital activities. For example, in Chapter 5 Section 5.3.1.5.1, Child JG was distracted while she was interacting with digital activities. She would stare into space after a few seconds of tapping on the iPad. According to Keenan and Evans (2009) children can easily be distracted and often pay limited attention to information and there are various reasons why this happens. They could have ADHD (Attention Deficit Hyperactivity Disorder), anxiety, major life changes and learning disabilities. As mentioned in Chapter 5 Section 5.3.1.5.1, I was informed by one of the teachers that Child JG was going through a life change during that period which may be what was causing her distraction.

Absence of effort was also observed with digital activities. Examples were given in Chapter 4 Section 5.5.1.2.1 which showed Child LY and Child JN not making an effort to

understand or complete a task in a digital activity. In Child LY's observation, she was not mastering the content of the digital activities she had opened on the iPad. She would just tap on icons and items on the screen. This showed that it is possible for children to interact with a digital activity without paying attention to the "substantive aspects of the activity" (Palmer, 2015:367). From this example, it can be observed that although the digital activities are created by experts to attend to the cognitive needs of children, the child may not use the digital technology to its full potential. Tapping on icons may show little or no engagement and not lead to learning. Child JN's observation is similar to Child LY's observation. He was interacting with a numeracy digital activity. This digital activity claimed to teach children numbers. He was only able to identify number 1. This could mean that he had knowledge of only that number. That means for the period he had been interacting with that digital activity, he was not listening to the voices in the game or focusing on the numbers jumping across the screen. This showed that having access to materials to explore mathematical concepts does not automatically make a child knowledgeable (Dowker, 2005). That is why the teacher's role in guiding the child with digital activities is important. The presence of the teacher during such activities can provide opportunities to discuss the activities with the children. Some children may just need an adult's assistance with some of these digital activities. It is not so different from learning mathematics with non-digital materials.

The data also showed that some of the children exhibited some of these behaviours with non-digital activities. For example, in Chapter 5 Section 5.4.1.5.1 Child LB was distracted while drawing. There were many things going on in the drawing room that took his attention away from the activity he was interacting with. He eventually stopped drawing and this could be due to the distractions. It is understood that he was in the nursery where other children were playing so well. So their noise or what they were doing could shift his attention from his drawing. This showed that children can be distracted due to certain

situations whether they are interacting with digital and non-digital activities. First of all, the activities whether digital or non-digital have to be interesting, fun and engaging. Secondly, if a child is distracted, the early childhood practitioner should be able to find out what is causing it and see if there is a solution or watch out for signs of children needing emotional support because they may feel anxious, scared or stressed which can cause distraction (Wiltshire, 2012). It is important for parents and teachers to know what reasons could be causing a child to be distracted in the classroom or at home so as to know how to help the child learn to be less distracted especially during classroom activities.

The data showed that some of the children would withdraw from a non-digital activity. For example, in Chapter 5 Section 5.4.1.5.2, Child JN was observed to have withdrawn from non-digital activities because his friend had upset him. This showed that negative emotions can affect a child's interest in interacting with an activity. Schaffer (2006) used the umbrella term 'emotional competence' as a child's ability to interpret his or her own emotions and respond appropriately. One of the important components of emotional competence is emotional self-regulation. These are strategies used to regulate the emotional state and allow achievement of goals (Doherty and Hughes, 2009). Although, such strategies are limited in younger children, by the third and fourth year they are able to verbalise their emotions. Child JN was able to verbally communicate how he was feeling to me but he allowed the negative emotions to hinder him from interacting with an activity. This may mean that he had not yet developed the strategies he needed for emotional self-regulation.

7.2.6 SUMMARY

It rapidly becomes clear that both the quantitative and qualitative analysis conducted in this study has made an important contribution to knowledge on children's engagement with digital and non-digital activities. The data showed that the children were engaged with both

digital and non-digital activities. However, there was a difference between the digital and non-digital activities. The quantitative data indicated that higher levels of engagement occurred with digital activities and more sub-themes with digital activities emerged from the qualitative data. However, this difference is not immense. There were also similarities in engagement between digital and non-digital activities. Thus, there is a strong argument for focus on implementing digital activities into early childhood settings. As previous research has shown that digital technology has a positive impact on children's engagement, play and learning, my research adds to this body of knowledge and shows that non-digital and digital activities can be integrated in an early years setting. Children should have the choice to choose any type of resource or tool for their play. The NAEYC and Fred Rogers Centre's statement below agrees with this. The statement:

> *"*To align and integrate technology and media with other core experiences and opportunities, young children need tools that help them explore, create, problem solve, consider, think, listen and view critically, make decisions, observe, document, research, investigate ideas, demonstrate learning, take turns and learn with and from one another*"*.
>
> NAEYC and Fred Rogers Centre (2012; pp 6-7).

As shown in this research, the resources that the children had access to were designed to motivate their interests, increase their desire to explore, be creative, socialise and communicate with each other. From the above discussion, it follows that the children were able to explore, problem-solve, interact with each other, be creative and enjoy the activities. It can be concluded that digital activities can engage children similarly to the ways non-digital activities engage children and even more.

7.3 RESEARCH QUESTION TWO: DO CHILDREN EXHIBIT SIMILAR OR DIFFERENT PATTERNS OF INTERACTION BETWEEN DIGITAL AND NON-DIGITAL ACTIVITIES?

This section aims to discuss the similarities and differences in the way the children interacted with digital and non-digital activities. As mentioned in the Prologue on Page 94, the patterns of interaction in this research are the children's engagement, the amount of time they spent interacting with the activities, the activities they interacted with and their initiated or adult initiated/ led activities. During analysis, it was discovered that the children exhibited some patterns of interaction with digital and non-digital activities when it came to child or adult initiated/led, minutes spent and the number of activities the children interacted with.

7.3.1 INDIVIDUAL PATTERNS OF INTERACTION

The quantitative and qualitative data revealed the individual patterns of interaction that the children exhibited while they interacted with digital and non-digital activities. The summary tables which can be found in Chapter 5 showed each child's personal identity through the different ways they interacted with the activities. According to Lindon (1993:11), "children are unique individuals, they share much with one another yet each child has a combination of skills, interests, experiences, feelings and attitudes that will never be repeated as a whole in another child". It could be observed from the data that each of the children although they interacted with the digital and non-digital activities, would often work out their own way of putting their own ideas into practice or completing the tasks. Even though they interacted with the same digital and non-digital activities, the amount of time they spent, their level of engagement and how they pursued their interests with these activities was different. This is because children tend to have different interests and unique patterns of development (Lindon, 1993). In an early years setting, the

availability of wide range of resources and toys for children to play with will encourage them to pursue their interests and express their likes and dislikes. The EYFS takes into account the individuality of children. The EYFS encourages early childhood practitioners to always be alert towards the diversity of children's needs, interests and inclinations and that provisions must be made available to ensure that children demonstrate their individuality and pursue their interests. From Table 6.1, Table 6.10 and 6.13, it can be observed that some of the children were able to pursue their interests with non-digital activities. For example, the non-digital activities that Child HB interacted with were activities that he could do with his hands and required thinking and creativity such as sand play, construction play, painting and messy play. Child HG also pursued her interest in drawing because her profile (see page 370) showed that she interacted with that activity in five of her non-digital observations. When the iPad was introduced, the children approached the new situation the same way, they were fascinated and interacted with the digital activities but their interactions were different. For example, Child LY flitted through as many digital activities as she could while Child R1 interacted with not more than three digital activities. Child JB preferred digital activities that were numeracy based while Child R1 preferred digital activities that were numeracy and literacy based. The number of minutes the children spent with the digital activities also varied. This will be discussed further in Section 7.3.5. Also, the children had preferred digital and non-digital activities, but each had a different activity they preferred. This will also be discussed in Section 7.3.4.

7.3.2 DIGITAL AND NON-DIGITAL ACTIVITIES

The results indicated that the children interacted with both digital and non-digital activities in the early years setting. The setting had a variety of non-digital activities which the children were able to choose from, both inside the setting and out on the playground. Indoors there was a book corner, a range of craft and painting materials, a construction

area, messy play area, home corner, games and puzzles, music corner and an IT area. All these activities were easily accessible to the children enabling them to initiate their interactions. Outdoors there was a sand pit, water play, tricycles, climbing frames, balls and a mud pit with a large tree. The non-digital activities presented opportunities for the children to build fine motor skills, be creative, improve physical development; build and construct, problem solve, communicate, and develop imaginative ideas and experiment. The digital activities were available on the iPad which was usually on a table inside the setting or with a child. Sometimes the children would take the iPad to the playground. The digital activities presented opportunities for the children to play, explore, foster interactions and build cognitive skills like problem solving.

Firstly, the data showed that the children interacted with more digital activities than non-digital activities. The children were used to interacting with the non-digital activities and the iPad was a new introduction to their setting. The children were fascinated by having the iPad and this kind of excitement can elicit such behaviour. The children loved the iPad and more importantly understood the functions of the device. It is user friendly, which made it easy for them to navigate. They were able to access the apps easily, tap, drag or swipe the screen to operate commands and enlarge or decrease the size of objects on the screen by pinching and dragging. They were able to move through the digital activities by using the home button.

Once a child was interacting with a digital activity and the music came on, it would attract one or more children to the iPad. The children enjoyed playing with majority of the digital activities (or the apps). The iPad had many digital activities which made it easy for the children to be seated in a particular position and choose as many digital activities as they wanted for a short period of time. And if that digital activity was not engaging enough, it was easy for the child to press the home button and swipe the screen in search for another digital activity. Also, the digital activities had music, bright colours, and familiar

characters, gave immediate response, and engaged them in thinking and problem solving, offered gifts and praises. These attributes corroborate with Lieberman, Fisk and Biely (2009) argument that for digital activities to engage children, they should incorporate strategies that were mentioned in Chapter 2 Section 2.6. A similar situation was conducted by Yelland (2015) where the children in her research would move from one app to another frequently by using the home button.

As discussed in Chapter 2, play is a way for children to explore, have experiences and be in control of what they are doing. Moyles (2013: 2) states that "play offers children choices and control over some aspects of their lives". As the data showed, the children had control over the digital activities they interacted with and could interact with as many as they wanted. For example, it can be observed from Child LY's profile Page 376, that there is a difference between the digital and non-digital activities she interacted with. With non-digital activities, the highest number she interacted with was two and this was in Phase 4 in her first observation. However, with digital activities it could be observed that she interacted with more digital activities with the highest being eight in her first observation in Phase 3. She flitted from one digital activity to another and sometimes back again during the observed period. It could be argued that she was flitting through as many digital activities as she could because she was in control, thereby pursuing her interests. And if she did not enjoy the digital activity, she would simply exit and swipe to search for another. In other words, her observation showed that just because a child is interacting with digital activities that are meant to help them learn alphabet, counting or shapes; it does not mean that they are actually cognitively engaged with those activities. However, this observation could have turned out differently if the digital activity was adult led. She may have been more focused and attentive or may not even see the digital activity as play.

The data also showed that the children had opportunities to explore shapes, numbers, puzzles and measures with digital and non-digital activities. Non-digital activities which are also referred to as 'traditional play' has been regarded as providing resources where children can explore concrete aspects of mathematics. Such non-digital activities are bricks and blocks, puzzles, sand and water and so on (Carruthers and Worthington, 2010). Toys like Lego, wooden building bricks, wooden cubes were available in the nursery which the children used to learn about shapes, to build and construct. For example, Child R1 and Child JB played with wooden cubes and bricks to build towers. By doing this they were exploring mathematical concepts such as shapes, numbers and space, developing their fine motor skills through manipulating these objects and developing language of comparison by arranging blocks according to size; from smallest to the biggest and vice versa. This non-digital activity was also encouraging creative ideas in the children because they were put in a position to create what they wanted. Child R1's favourite part of the activity was collapsing the tower when she was finished.

The data from this research also showed that the children were able to also explore mathematical concepts with digital activities. It has been argued that digital activities can contribute to children's early knowledge of mathematics (Lieberman, Bates and So., 2009). A number of children were observed interacting with digital activities that had to do with numbers, shapes and problem solving and exploring these can help them make sense of mathematics at their young ages (Carruthers and Worthington, 2010). Digital activities such as Critter Math was designed for children to help them learn basic shapes necessary for a foundation in the subject of Geometry. The idea behind this digital activity is beneficial for children because it introduces them to shapes at an early age. Children learning about shapes can help them understand two and three-dimensional structures. Learning about shapes at this stage can also help children to learn how to compare and contrast different shapes thereby developing observational skills. For example, in Child

JN's first observation in Phase 2, he interacted with Critter Math. He was able to show problem solving and observational skills. He was able to recall a number of given shapes shown after they had been hidden in boxes and he was able to do this by paying attention.

In addition, digital activities like endless 123 and edu math 1 were designed for children to learn about numbers and counting. Beckley et al., (2010) suggested that when children are learning to count, they should be encouraged to touch the objects used because moving the object from one area to another will help ensure that they count every object once. With iPads, learning about numbers is quite different. The child touches the screen (virtual objects). But with endless 123, the numbers moved from one side of the screen to the other when the child touched it while a voice repeats the number that is displayed on the screen. Although the children were not touching the objects like Beckley et al., (2010) suggested, they were given the opportunity to identify and match numbers on the screen. This showed that opportunities can be provided with both digital and non-digital activities for children to explore shapes, numbers, measures and space and develop reasoning, numeracy and problem solving skills (Beckley et al., 2010; Stevens, 2008). In other words, digital activities such as apps claim to have educational goals that are focused on children learning and having fun at the same time so that they will keep returning back to them in similar ways that they return to non-digital activities that they enjoy (Soute, Markopoulos and Magielse, 2010).

7.3.3 LED AND INITIATED ACTIVITIES

It has been argued that the balance of child initiated activities should outweigh adult led/initiated activities (Barber and Paul-Smith, 2009). The data shows that the children engaged in self-chosen pursuit with both digital and non-digital activities showing that in this setting, the balance of child initiated activities outweighed adult led and adult initiated activities. Before data collection began, I had visited the setting for five months to observe

their daily activities. I was able to observe that the children initiated most of their activities both indoors and outdoors. The teachers would also initiate and lead some of the activities. Therefore, it was observed that the balance of child initiated activities outweighed adult led and adult initiated activities before data collection began. In Phase 1, 4 and 5, as expected most of the non-digital activities were child initiated. In Phase 2 when the iPad was first introduced, most of the digital activities were adult initiated. Even though the iPad was on the table in the setting or with a child, sometimes I needed to observe a particular child and had to initiate the activity. This is because the children were still getting used to the iPad. By Phase 3 and 6, more child initiated activities began to occur.

According to Lindon (2008), to initiate means to 'start' so for an activity to be truly child initiated, it has to be genuinely chosen by the children. Although these activities were chosen from the resources that were made available by adults, it is therefore up to the practitioners to understand each child's preferences and be able to provide resources that will cater to these preferences. This is because the goal is that the children are enabled to learn and enjoy interacting with these activities (ibid). Based on the data, it can be observed that the children were already accustomed with initiating their non-digital activities before the digital activities were introduced. Therefore, it can be argued that the children were able to transfer that pattern of interaction from non-digital to the newly introduced digital activities. This showed that the digital activities did not change the dynamics of the setting or distract the children from non-digital activities. Instead, it fitted right into their daily activities. The fact that the children were able to initiate their digital activities as the phases progressed shows that the iPad incorporated well with the children's classroom activities.

7.3.4 PREFERENCES

The EYFS suggests that every child is a unique individual. Each child has their own characteristics, temperament, likes and dislikes and preferences. As Hutchin (2010) states, children respond differently to their environment, events and situations and the data showed just how differently the children responded to activities in their setting. Therefore, the data showed how unique and different some of the children's observations were with digital and non-digital activities. Firstly, the data showed that some of the children had particular interests and preferences in the digital and non-digital activities they interacted with. The children were encouraged to pursue their interests. The iPad just like the non-digital activities in the setting provided the children with choices on how they wanted to engage in particular learning experiences. They discovered digital activities they preferred and visited them often, consolidating their learning and understanding. For example, some of the children like Child O enjoyed interacting with puzzle digital activities as well as visiting the puzzle table in the setting. Yelland (2015) observed similar behaviours where the children also enjoyed completing puzzles on the iPad and 'traditional puzzles'. The children were able to choose the activities based on their mood or preferences. What attracts a child's interests during a particular period can be significant to him or her and this should not be ignored (Hutchin, 2010). For example, by looking at Child IP's observations, it can be observed that during particular periods, she would interact with digital and non-digital activities that caught her interest. Her individual profile in Page 375 showed how she transitioned from one activity to another, following a pattern. With non-digital activities in Phase 1, 4 and 5 she transitioned from drawing and tower building in Phase 1 and 4 to sand play and water play in phase 5. She also exhibited the same pattern with digital activities. She transitioned from Lego Land and Peppa's Paint Box in Phase 2 to Disney Digital Books in Phase 3 and Peppa Pig Shopping in Phase 5. Even though this pattern can be observed, not all the activities were child initiated. With the adult initiated

digital activities, they were still activities she had interest in because although I initiated the activity, she chose what digital activities she wanted to interact with. As discussed earlier, play allows children to explore and discover their preferences. Through play they are in control of what they are doing. As it can be observed, Child IP and the other children were given the opportunity to pursue their interests (Whitebread et al., 2015) thereby discovering their preferred activities. Therefore, activities should enable children's preferences and interests to come to light because they will be challenged and engaged by the possibilities that these activities offer (Wood, 2013).

Secondly, the data showed that some of the digital and non-digital activities occurred more frequently than others. The digital activities that occurred mostly are as follows: Peppa Pig Shopping, Peppa's Paint Box, Tiggly Chef, Disney Digital Books, Disney Junior and Stumpy meaning that these digital activities were the children's preferred activities. The non-digital activities that occurred mostly are as follows: sand play, tower building, drawing, arts and crafts, memory games and reading. It could be said that these non-digital activities were the preferred activities of the children. Also, the children's preferences can be seen in their individual profiles in Appendix 13 page 368-384. By looking at the children's individual profiles, it will be observed how each child is different, in their interests and preferences. Finally, some of the digital activities I found were disliked by the children. The children found these digital activities boring because they were not interactive and fun enough. I noticed that it was the digital activities that had bright colours, fun characters and music that the children showed more interest in. I also noticed that digital activities that had characters in them that the children were familiar with were favourites. For example, Peppa Pig shopping was familiar to the children because it is also a cartoon character that they probably watched at home.

7.3.5 MINUTES OF ENGAGEMENT

A significant body of research on children and digital technology focuses mainly on their interactions and uses with digital technology (Chau, 2014) but there is limited research that compares these interactions with non-digital activities. Although the potential benefits of children's interactions with digital technology has been recognised (Dunn et al., 2016), it is pertinent to understand first how children will interact with both digital and non-digital activities in the same place and at the same time. In this section, the amount of time the children spent with digital and non-digital activities will be discussed. As shown in Chapter 5 Section 5.2.2, the data revealed that the children spent more minutes with digital activities than non-digital activities. It is understandable for this to occur in Phase 2 and 3 because the iPad was still the new resource in the setting. Also, in Phase 4 and 5 their non-digital observations resumed so they did not interact with digital activities. However, when the iPad was re-introduced again in Phase 6, more minutes was still observed. It could be argued that this result was expected because the non-digital activities had always been constant before the iPad was introduced so the children would react different towards the digital activities. However, the data collection schedule was arranged in way that the digital and non-digital observations would be mixed rather than observing non-digital activities for a period of time then digital activities for another. This would not have given a valid comparison between the activities. Instead for this study, the way the phases were arranged, with non-digital activities in Phase 1, digital activities in Phase 2 and 3, non-digital activities in Phase 4 and 5 and digital activities in Phase 6, digital and non-digital activities can be compared because there were mixed. Therefore, it can be argued that the children enjoyed interacting with the iPad because even after they had four weeks without the iPad, they were still excited to interact with it when it was re-introduced and this can be noted through the number of minutes they spent with the digital activities. As Yelland (2015) stated, children have high levels of enthusiasm when it comes to playing with new

technologies because it extends playful explorations. Such technologies can be very appealing to children (ibid) which is why the children in this research reacted the way they did.

Also, as shown in Chapter 5 Section 5.2.2, the average number of minutes increased with each phase, in Phase 1, 4 and 5 with non-digital activities. It could be argued that my presence influenced the children's engagement with the non-digital activities therefore making them spend longer times through the phases, however most of the time I observed the children from a short distance. I did not want my writing to distract them from their activities, so I would sit close by and observe. This data is relevant because it is useful to think about the length of minutes' children spend with digital and non-digital activities because early childhood practitioners can use this research as a guide for moderating the amount of time their children spend with digital activities.

5.3.6 PLAY IN A DIGITAL CONTEXT

As discussed in Chapter 2 Section 2.6, play in a digital context has been challenging to define. Marsh et al., (2016) adapted Hughes (2002) taxonomy of play types in their study and were able to adapt play types in digital context. Some of these adaptations were identified in this research. For example, Socio-dramatic Play is the "enactment of real-life scenarios in a digital environment that are based on personal experiences and this can take place through avatars for example going shopping" (Marsh et al., 2016:6). In this instance, Child HB takes on the role as a shopper, tapping on a number of items on the shelves as his avatar Peppa Pig passed by them. Also, there were many instances of creative play where the children explored, developed ideas and pictures in a digital context when using Peppa Paint box and Leo's pad. Below is an example of a children's virtual painting:

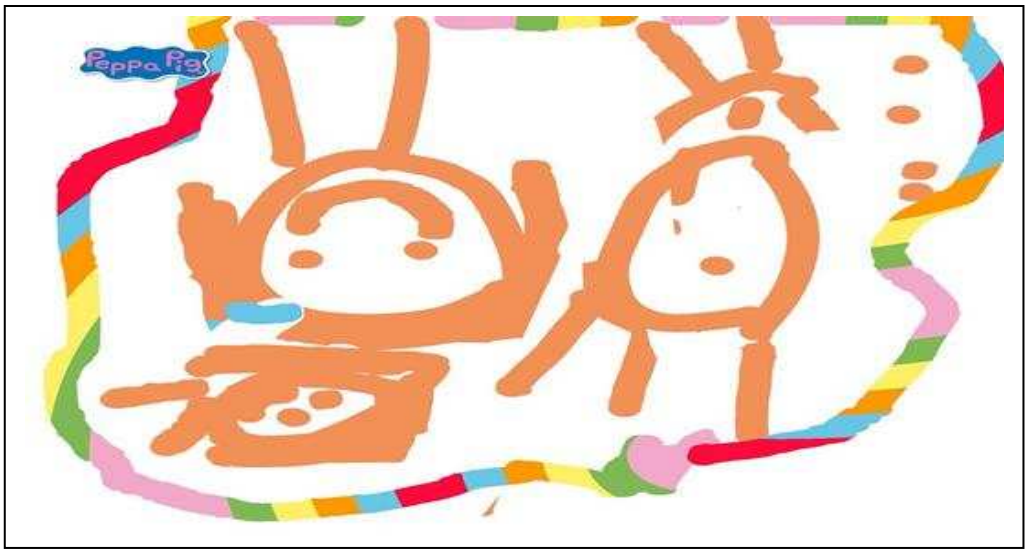


Figure 7.1: A Child's Virtual Painting.

Peppa's paint box was a favourite digital activity when it came to painting. This digital activity was one of the activities that occurred more in the observations. This showed that the children transferred their love of drawing and painting to the digital activity that provided them that stimulating environment to paint without getting paint on their fingers or having to wear an apron. And they could wipe it off and start again if they chose to. This was creative play where the children were able to explore, create and develop ideas in a digital context (Marsh et al., 2016). Just like their creative play with digital activities, this was similar for non-digital activities. The children spent a lot of time creating pictures and drawings; they were practising their abilities to hold pencils, use scissors, and glues. They were involved in the creative process. Creativity and play are of great importance to children's learning and development because play encourages children to use their imaginations (Bruce, 2010). And as this research shows, creative play can occur in a 'traditional' and 'digital' contexts. Child IP was even observed to have moved from painting with the iPad to painting on a paper with paint brush. Both digital and non-digital activities have been noted to teach skills for imaginative and artistic expression in children (Hughes, 2002; Lieberman, Bates and So., 2009). The setting where this research took place was a stimulating environment for the children because it was resourced with

materials that encouraged creativity in the children. Having the digital activities as part of these activities in which the children were able to create, explore and develop ideas created a variety of contexts for creativity to take place. However, emphasis has been placed on children developing skills of manipulating and handling writing tools because they will need this skill as a form of communication as they grow older (Langston and Doherty, 2012). Another example is role playing where the children took on roles with the use of an avatar as they engage in on-screen activities (Marsh et al., 2016). In this instance, Child JN took on the role of a cat that was to travel and needed to wash his car, buy fuel and pack a suitcase. He engaged in the on-screen activities that the cat was to do in the game by the tap of his finger. There were also instances of imaginative play; for example, some of the children treated Princess Sophia as a real princess and dressed her up in beautiful ball gowns when they were interacting with Disney Junior.

This research, just like Marsh et al., (2016) study, sheds light on the debate of children's play with digital technology not being real play. The data showed that what can be identified in children's interactions with digital activities are the characteristics of play. Children's play with digital technology is not fully understood and this has brought about concerns that it may bring disruption to children's play (Brown, 2009, Wortham and Reifel, 2008). However, there are a few studies which have investigated children's play with digital technology (Edwards and Bird, 2015; Marsh et al., 2016; Stephen and Plowman, 2014; Yelland, 2015). These studies showed that digital technology had a positive impact on children's play. These findings are important because many of the digital devices and software applications being developed claim to encourage play and are targeted at children. So it is necessary to investigate how these devices impact their play. What my research and the research previously mentioned have shown is that for children, play did not change; it was only the context in which the play was taking place that changed (Marsh et al., 2016). Therefore, it can be argued that digital technology may not

disrupt children's play. It can create opportunities for play to occur in a digital context. This also will depend on how the digital devices are used. Some children may require adult guidance while interacting with these activities. Also it is advisable that children should not spend a long period of time in front of screen media (Brown, 2011). Although these studies have shed a positive light on the debate that surrounds children's play with digital technology, moderation is key and adult guidance is still required.

7.4 SUMMARY

This study demonstrated that digital and non-digital activities can engage children and in different ways. It also showed that children exhibit patterns of interaction when they interact with these activities. Digital activities can provide play and learning opportunities for children the same way non-digital activities do. However, moderation is also important if integration of digital activities into an early years setting is to take place. This is to ensure that children get a proper balance of digital and non-digital activities. Also, children should be encouraged to play outdoors as well (Johnson, Christine and Wardle, 2005) and this can include digital activities. Therefore, early childhood practitioners should provide resources that will allow children the freedom to investigate, experiment and pursue personal interests and goals.

CHAPTER 8

CONCLUSION

This research has discussed the debate surrounding children's interactions with digital technology. It has been established that digital technology has a positive impact on children's cognitive (Clements and Samara, 2003; Klein, Nir-Gal and Darom, 2000; Vernadakis et al., 2005) and social development (Clements et al., 1993; Rojas-Drummond et al., 2008) and their engagement with play and learning (Disney et al., 2013; Kucirkova et al., 2014; McKenna, 2012). However, this research has noted that there are limited studies on the different ways children engage with digital and non-digital activities. Many of these studies have only focused on children's interactions with digital technology and this will continue to promote early childhood practitioners' scepticism on integrating digital technology in their settings because there is no evidence to show that digital technology can be successfully integrated with non-digital activities and that it will not distract the children from non-digital activities or isolate them. This study has been able to provide an understanding of the different ways children can be engaged and how they could interact with digital and non-digital activities. It has revealed that if done effectively and efficiently, digital technology could be integrated into an early years setting and engage children in play and learning.

8.1 RESEARCH QUESTIONS AND FINDINGS

This study employed the mixed method approach in order to answer two research questions and they are:

1) In what ways are children engaged while interacting with digital and non-digital activities?

2) Do children exhibit similar or different patterns of interaction between digital and non-digital activities?

The results of this study make an important contribution to existing literature by showing that digital activities such as applications on the iPad can impact children's engagement positively. As mentioned in Chapter 3, this study employed the mixed method approach in order to "obtain different but complimentary data on the same topic" (Morse, 1991:22) to answer the research questions mentioned above. The observation checklist and less structured observation were the tools used to collect the data for this research study. The observation checklist provided the numerical data on the children's levels of engagement and the less-structured observation gave an in-depth look into the different ways children were engaged with digital and non-digital activities. The data collected showed that the children were engaged with digital and non-digital activities however there was a difference between them. The quantitative data indicated that higher levels of engagement occurred with digital activities and more sub-themes with digital activities emerged from the qualitative data. However, this difference is not immense. The data from both tools also revealed that some of the children exhibited patterns of interaction while they interacted with digital and non-digital activities such as the activities they preferred, the nature of these activities, the amount of time they spent and their levels of engagement.

The debate surrounding children's interactions with digital activities has been ongoing. It has been argued that it can affect their physical, cognitive and social development therefore children should have little or no access to it. However, it rapidly becomes clear that this is not the case. Many studies including my research which have investigated children's interactions with digital technology have shown that digital technology has the potential to aid play and learning, engage children and develop their cognitive and social development. My research also goes in-depth to show that there could also be disengagement with both digital and non-digital activities. This is why it was important to explore children's engagement with digital and non-digital activities to be able to compare. My research goes beyond just stating the fact that children can be engaged with digital and non-digital

activities. Disengagement can also occur and this has not been highlighted in other research that has studied engagement.

The purpose of this research is not to suggest digital technology as a better option in comparison to non-digital activities but to shed light into what early childhood practitioners can expect when digital devices are integrated into their settings. The findings of this research have implications for early childhood practitioners who are interested in integrating digital activities with non-digital activities in their settings. Below are the following implications which are important for early childhood practice.

1) Teacher Training: Training should be available for early childhood practitioners on how they can integrate digital technology in their settings.
2) Education: Early childhood practitioners should consider digital activities that will engage children in play and learning in their settings.
3) Policies: It is essential that the EYFS handbook supports practitioners in making accurate judgements about using digital technology in their settings.

8.2 IMPLICATIONS FOR PRACTICE IN EARLY CHILDHOOD

The findings and implications from this study have contributed to the knowledge of what occurs when children engage with digital and non-digital activities in their setting. These implications can be a yardstick for early childhood practitioners to consider when making pedagogical and curriculum choices for their children and settings. The main reason why the implications for this study are important is because this study has focused on how digital and non-digital activities actually engage children in play and learning.

8.2.1 TEACHER TRAINING:

The primary responsibility of a teacher is to plan activities that can shape a child's experiences. With the emergence of integrating digital technology in settings, early childhood practitioners are doubtful about the potential of these devices in their settings.

Although many early childhood practitioners use and recognise the benefits of digital technology, they are reluctant to integrate some of these devices in their settings (Ertmer and Ottenbreit-Leftwich, 2010) and they lack the pedagogical and technological knowledge on how to effectively integrate digital technology into their teaching (Fenty and Anderson, 2014). One of the reasons for this is their existing belief systems (Ertmer, 2005), lack of relevant knowledge (Lawless and Pelligrino, 2007) and low self-efficacy (Mueller et al., 2008). In order to encourage practitioners, Borko and Putnam (1995:37) suggest that help should be given to them to change their practice and "help them expand and elaborate their knowledge systems". This can be done by providing training and professional development where practitioners can come together and share knowledge on how digital technology can be used in settings to engage children in play and learning. This knowledge enables them to identify, choose and use appropriate digital devices that can support specific curriculum goals (Cennamo, Ross and Ertmer, 2010). Therefore, it is important for practitioners to be provided training to be able to know how to use digital technology in their settings. Training will develop practitioners' understanding of digital technology in connection with their pedagogical beliefs and it will provide them the opportunities to explore new ways of making play experiences more enjoyable and fulfilling for children. Teacher training and teacher professional development should be considered as important tools for supporting practitioners understanding of digital technology. As the results of this study have shown, adult interaction is important when children use digital technology. Therefore, more research needs to be conducted on how practitioners can integrate digital technology with non-digital activities to contribute to the knowledge of children's interactions with digital technology. This is so that practitioners can have access to research evidence about workable approaches for integrating digital technology.

8.2.2 EDUCATION

The fact that the children in this research had particular apps as their preferred digital activities provides compelling evidence that early childhood educators should identify and use these apps to transform play and learning in their settings. App developers and early childhood practitioners should work together to create digital devices and apps that are in line with the early childhood curriculum so that they can have the appropriate content that they need to engage children in play and learning. There are many apps that claim to enhance children's cognitive development; however, it may not be so. Many of these digital activities that purport these claims may actually have no effects or lead to unexpected negative effects (Zimmerman et al., 2007). The content of the digital activities is very important as well as how much time children spend interacting with these activities (Guernsey, 2012). It is up to early childhood practitioners to choose apps and digital devices that are age appropriate for their children and that will engage them cognitively, emotionally, socially and behaviourally. As Dunn et al., (2016:9) states, there is "need to carefully construct playful learning experiences that position technology as facilitating tools which will enhance children's learning". Suggestions on how to choose appropriate apps for children have been provided by Hillman and Marshall (2010). They provided criteria questions that can be used for choosing apps such as: Is the role of the child integral to the activity? Does it increase the child's familiarity and ability with technology? Is it targeted at young children? Does it provide knowledge of results a child can understand and does it promote collaboration among children, parents and teachers? (ibid). This can be helpful for early childhood practitioners because they provide steps and ways of choosing age appropriate apps that will actually engage children in play and learning. Liebermann, Fisk and Biely (2009) also suggested a number of instructional strategies that can be incorporated in the development of apps for children's play and learning and this has been discussed in Chapter 2 Section 2.6.

8.2.3 POLICIES:

Considerations need to be made when provisions of digital devices like the iPad are provided for early childhood settings. They should be introduced not as a replacement but as a supplement for children's play and learning. A clear vision and policy statement on the role of digital technology in early childhood needs to be set in place. Decisions on how to use digital devices should be consistent with the principles and goals of the curriculum such as the in the EYFS in England. Moreover, pre-service and in-service training is needed on how these digital technologies can be used in early childhood education.

8.2.4 PERSONAL PROFESSIONAL REFLECTION

As it was mentioned in Chapter 1, being a teacher in Nigeria for a few years and working with children, I had always wondered about the impact that digital technology could have on their play and learning. However, the use of digital technology in early childhood education in Nigeria is not as predominant like it is in England and other countries. This is due to several issues like Adomi and Kpangban (2010) discovered in their research study such as limited/ poor infrastructure, poor digital technology implementation, lack of adequate ICT facilities, frequent electricity interruptions, lack of ICT skills among teachers, limited budget and poor management on the parts of the school administration and government. Despite the positive impact digital technology is seen to have on children's engagement, early childhood settings and even primary and secondary schools in Nigeria have yet to extensively integrate them for teaching and learning and when they do, they face these issues mentioned above. ICT facilities can usually be found in expensive private schools and well-funded public schools which are attended by the children of the rich and government officials. There are limited opportunities for children in Nigeria to experience play and learning with digital technology in the school setting. It is hoped that my research will pave the way for the integration of digital technology in the

early childhood curriculum. Not to be taught as a separate topic or subject only, but to be integrated with other aspects of the curriculum.

8.3 LIMITATIONS OF RESEARCH

The limitations of this study which are results of a series of decisions that I had to make during the research process need to be taken into consideration. Firstly, the results of this case study are not generalizable. As Stake (2005:460) states, "the purpose of a case report is not to represent the world, but to represent the case". Therefore, the results provided may be interpretable in a different early childhood setting. Secondly, having access to only one iPad was a limitation because I intended to provide at least three iPads in the setting. This was a limitation because there were times when arguments occurred among the children. However, this applies to other non-digital activities in the setting. For example, if there were one or two tricycles on the playground, it can bring about the same arguments among the children. This is a typical characteristic of children at this stage to learn how to wait for their turns and share. There have been other studies that have been discussed in the literature review i.e. Yelland (2015) who conducted a similar study of which she provided more than one iPad to the children in her research and the results from this study are similar to the results from this research. In both studies, the children were not isolated, instead it promoted taking turns, sharing, interactions and cooperation with other children, they displayed concentration and involvement and they discovered digital activities that they preferred and revisited which was similar to their revisiting non-digital activities.

8.4 RECOMMENDATION FOR FURTHER RESEARCH

This study has provided an initial exploration into children aged three and four year's engagement and interaction with digital and non-digital activities. Research with children of this age group with digital technology is still under researched and there is much scope for future study. Even though it is beyond my capacity to generalise the results of this

research study, I hope that it will be beneficial for early childhood settings around the world and early childhood researchers. Therefore, more mixed method studies from larger samples is essential for generating a more generalizable data on children's engagement and interactions with digital and non-digital activities.

8.5 CLOSING NOTE

This thesis explored the different ways children of three and four years old can be engaged and their patterns of interactions with digital and non-digital activities. The literature review indicated that there is limited research that looks at the different ways digital technology can engage children and the similarities or differences in their interactions between digital and non-digital activities. This thesis employed a mixed method approach by using observation checklist and less structured observation in order to answer the research questions stated in Section 7.1. The results revealed that digital activities such as application on an iPad can impact children's engagement positively. It showed that the children engaged with digital and non-digital activities in a similar. It also showed that the children could also be disengaged with digital and non-digital activities. Although the quantitative data indicated higher levels of engagement with digital activities, the qualitative data demonstrated that this difference in not immense. This thesis also showed that the children exhibited the similar and different patterns of interactions while they engaged with digital and non-digital activities in terms of the nature of the activities, the amount of time they spent, their levels of engagement and their preferences. The same way the children had preferred non-digital activities was the same way they had preferred digital activities and they were able to initiate their digital activities like they did with their non-digital activities. The difference was that more digital activities occurred than non-digital activities and the children spent more minutes with digital activities than non-digital activities. This thesis has demonstrated that for the generation of children between the ages of three and four years in the 21st century, digital technology is part of the repertoire of

activities and toys in the plethora of non-digital activities and toys. This research also demonstrated the children moved between non-digital activities and digital activities with continuity and their flow of play was not disturbed. It supports research of others such as Marsh et al., (2016) that digital activities have not replaced non-digital activities such as water play or sand play. But as mentioned above, young children are using them as part of their available resources. Children are engaged and interact with digital technology in their daily routine in a similar manner as with non-digital activities and toys. Thus as a closing note, it is suggested that the focus of research should shift towards how digital technology can be integrated in children's play and early childhood education pedagogy.

REFERENCES

Adomi, E.E and Kpangban, E. (2010) 'Application of ICTs in Nigerian Secondary Schools', Library Philosophy and Practice, 345, ISSN 1522-0222.

Ainley, M. (2004) 'What do we know about student motivations and engagement?', Annual meeting of the Australian association for research in education. Melbourne, Australia, 29th November to 2nd December. Melbourne, University of Melbourne, pp. 1-13. Available at: www.aare.edu.au/data/publications/2004/ain04760.pdf (Accessed: 7 June 2014).

Ainsa, P. (1989) 'Improving family literacy through technology in early childhood', Reading Improvement, 26(3) pp. 266-269.

Anderson, C.A. and Bushman, B.J. (2001) 'Effects of violent video games on aggressive behaviour, aggressive cognition, aggressive affect, physiological arousal and prosocial behaviour: a meta-analytic review of the scientific literature', Psychological Science, 12 (5), pp. 353-359.

Anning, A. (2015) 'Play and the legislated curriculum', in Moyles, J. (eds.) The excellence of play. 4th edn. England: Open Press University, pp. 3-13.

Alderson, P. (2005) 'Designing ethical research with children', in Farrell, A. (eds.) Ethical research with children. New York: Open University Press, pp. 27–36.

Aldhafeeri, F. and Palaiologou, I. (2016) 'Interactions with digital technologies of children from 3 to 6 in Kuwaiti homes', British Educational Studies Association, 7 (3), pp. 48-68.

Aldhafeeri, F., Palaiologou, I. and Folorunsho, A. (2016) 'Integration of digital technologies into play-based pedagogy in Kuwaiti early childhood education: Teachers' views, attitudes and aptitude', International Journal of Early Years Education, 24 (3), 342-360.

Alexandersson, M., Linderoth, J. and Lindo, R. (2000) "*Pull it there and put it there!" A study of children's encounters with the computer at school*. Sweden: University of Gothenburg.

Al-Shara, I. (2015) 'Learning and teaching between enjoyment and boredom as realised by the students: a survey from the educational field', European Scientific Journal, 11 (19), 146-168.

Appleton, J.J., Christenson, S.L., Kim, D. and Reschly, A.L. (2006) 'Measuring cognitive and psychological engagement: validation of the student engagement instrument', Journal of School Psychology, 44 (5), pp. 427-445.

Armstrong, A. and Casement, C. (2000) The child and the machine: how computers put *our children's education at risk.* Beltsville, MD: Robins Lane Press.

Arnott, L. (2013) 'Are we allowed to blink? Young children's leadership and ownership while mediating interactions around technologies', International Journal of Early Years Education, 21 (1), pp. 97-115.

Arnott, L. (2016) 'The role of digital technologies', in Palaiologou, I. (eds.) The early years foundation stage: theory and practice. London: Sage, pp. 329-341.

Arnott, L., Grogan, D. and Duncan, P. (2016) 'Lessons from using iPads to understand young children's creativity', Contemporary Issues in Early Childhood, 17(2), pp. 157-173.

Arrowood, D. and Overall, T. (2004) 'Using technology to motivate children to write: Changing attitudes in children and preservice teachers', in Ferdig, R, Crawford, C, Carlsen, R., Davis, N., Price, J., Weber, R., and Willis, D. (eds.) Society for information technology and teacher education international conference. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE), pp. 4985-4987.

Association of Teachers and Lecturers (2012) Digital technology and social media. Available at https://www.atl.org.uk/advice-and-resources/publications/digital-technology-and-social-media (Accessed: 19 December, 2015).

Aubrey, C., David, T., Godfrey, R. and Thompson, L. (2000) Early childhood educational research. London: Routledge.

Aubrey, C. and Dahl, S. (2008) 'A review of the evidence on the use of ICT in the early years foundation stage', British Educational Communications and Technology Agency, Available at: http://dera.ioe.ac.uk/1631/2/becta_2008_eyfsreview_report.pdf (Accessed: 28 March 2016)

Avison, W.R., McLeod, J.D. and Pescosolido, B.A. (ed.) (2007) Mental health, social mirror. New York: Springer.

Bangert-Drowns, R.L. and Pyke, C. (2001) 'A taxonomy of student engagement with educational software: An exploration of literate thinking with electronic text', Journal of Educational Computing Research, 24 (3), pp. 213-234.

Barber, J. and Paul-Smith, S. (2009) 'Hold a mirror to yourself', Early Years Educator, 11(4), pp. 35-37.

Barber, J. and Paul-Smith, S. (2012) Early years observation and planning in practice: your guide to best practice and use of different methods for planning and observation in the EYFS. 2nd edn. London: Practical Pre-School Books.

Barkatsas, A.T., Kasimatis, K. and Gialamas, V. (2009) 'Learning secondary mathematics with technology: Exploring the complex interrelationship between students' attitudes, engagement, gender and achievement', Computers and Education, 52 (3), 562-570.

Bassey, M. (1999) Case study research in educational settings. Buckingham: Open University Press.

Bavelier, D., Green, C.S. and Dye, M.W. (2010) 'Children, wired for better and for worse', Neuron, 67(5), pp. 692-701.

Bazeley, P. (2002) 'Issues in mixing qualitative and quantitative approaches in research', in Buber, R., Gadner, J. and Richards, L. (eds.) Applying qualitative methods to marketing management research. United Kingdom: Palgrave Macmillan, pp. 141-156.

Beastall, L. (2008) 'Enchanting a disenchanted child: Revolutionalizing the means of education using information technology and e-learning', British Journal of Sociology of Education, 27 (1), pp. 97-110.

Beckley, P., Compton, A., Johnston, J., and Marland, H. (2010) Problem solving, reasoning and numeracy. Continuum: London.

Bennet, S. and Maton, K. (2010) 'Beyond the digital natives' debate: towards a more nuanced understanding of students' technology experiences', Journal of Computer Assisted Learning, 26(5), pp. 321-331.

BERA (2011) Revised ethical guidelines for educational research. Available at: https://www.bera.ac.uk/researchers-resources/resources-for-researchers (Accessed 28 April, 2016).

Berson, I. R. and Berson, M.J. (ed.) (2010) High-tech tots: childhood in a digital world. North Carolina: Information Age Publishing.

Bertram, T and Pascal, C. (2008) Effective early learning child involvement scales. Worcester: University College Worcestershire

Bertram, T. And Pascal, C. (2010) '*Understanding child development'* in Bruce, T. (eds) Early Childhood: A guide for students. Los Angeles: Sage, pp. 57-71.

Bertram, T., Formosinho, J., Gray, C., Pascal, C. and Whalley, M. (2016) 'EECERA ethical code for early childhood researchers', European Early Childhood Education Research Journal, 24(1), pp. iii-xiii.

Beschoner, B. and Hutchinson, A. (2013) 'iPads as a literacy teaching tool in early childhood', International Journal of Education in Mathematics, Science and Technology, 1(1), pp. 16-24.

Biddle, C. and Schafft, K.A. (2014) 'Axiology and anomaly in the practice of mixed methods work pragmatism, valuation and the transformative paradigm', Journal of Mixed Methods Research, 9 (4), pp. 320-334.

Bird, J. (2012) *The rabbit ate the grass! Exploring children's activities on digital* technologies in an early childhood classroom. Master of Philosophy: Australian Catholic University, Melbourne Australia.

Bird, J. and Edwards, S. (2014) 'Children learning to use technologies through play: a digital framework', British Journal of Educational Technology, 46 (6), pp. 1149-1160.
Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', Qualitative Research in Psychology, 3 (2), pp. 77–101.

Blackwell, C.K., Lauricella, A.R., Wartella, E., Robb, M. and Schomburg, R. (2013) 'Adoption and use of technology in early education: the interplay of extrinsic barriers and teacher attitudes', Computers and education, 69, pp. 310-319.

Blackwell, C.K., Lauricella, A.R. and Wartella, E. (2014) 'Factors influencing digital technology use in early childhood education', Computers and Education, 77, pp. 82-90.

Blaikie, N. (2000) Designing social research: the logic of anticipation. Cambridge: Polity Press.

Borko, H. and Putnam, R. T. (1995) 'Expanding a teacher's knowledge base: A cognitive psychological perspective on professional development', in Guskey T.R. and Huberman, M. (eds.) Professional development in education: New paradigms & practices. New York: Teachers College Press, pp. 35-66.

Bredekamp, S. (1997) 'Developmentally appropriate practice in early childhood programs', Young Children, 52 (2), pp. 34-40.

Britz, J. (1993) Problem-solving in early childhood classroom. Available at: http://files.eric.ed.gov/fulltext/ED355040.pdf (Accessed: 29 December 2015).

Broadhead, P., Howard, J. and Wood, E.A. (ed.) (2010) Play and learning in the early years: from research to practice. London: Sage.

Brookson, M., Pimentel, R. and Parslow-Williams, P. (2010) 'E-learning: Using ICT to support your professional development and children's learning', in Bruce, T. (eds.) Early Childhood: A guide for students. Los Angeles: Sage, pp. 21-28.

Brotherson, S. (2009) What young children learn through play. Available at: https://library.ndsu.edu/repository/handle/10365/9347 (Accessed: 8 September 2015)

Brown, S. (2009) Play: How it shapes the brain, opens the imagination, and invigorates the soul. New York: Avery.

Brown, A. (2011) 'Media use by children younger than 2 years', Paediatrics, 128 (5), pp. 1040-1045.

Bruce, T. (2001) Learning through play: babies, toddlers and the foundation years. London: Hodder and Stoughton Educational.

Bruce, T. (2004) Developing learning in early childhood: zero to eight. London: Sage

Bruce, T. (2010) '*Creative development',* in Bruce, T. (eds.) Early Childhood: A guide for students. Los Angeles: Sage, pp. 168-172.

Bryman, A. (2007) 'Barriers to integrating quantitative and qualitative research', Journal of Mixed Methods Research, 1 (1), pp. 8-22.

Bryman, A. (2008) Social research methods. 3rd Edn. Oxford: Oxford University Press.

Buckingham, D. (2007) *Beyond technology: Children's learning in the age of digital* culture. Cambridge: Polity Press.

Burton, N., Brundrett, M., and Jones, M. (2008) Doing Your Education Research Project. 1st edn. London, England: Sage.

Bulger, M. E., Mayer, R. E., Almeroth, K. C., and Blau, S. D. (2008) Measuring Learner Engagement in Computer-Equipped College Classrooms', Journal of Educational Multimedia and Hypermedia, 17(2), pp. 129-143.

Burden, K., Hopkins, P., Male, T., and Trala, C. (2012) 'iPad Scotland evaluation', University of Hull, pp. 1-117. Available at: http://www.janhylen.se/wp-content/uploads/2013/01/Skottland.pdf (Accessed: 8 September 2015)

Burghardt, G. M. (2011) 'Defining and Recognizing Play', in Pellegrini, A. (eds.) The Oxford Handbook of the Development of Play. New York: Oxford University Press, pp. 9-18.

Burns, A.C. and Bush, R.F. (2004) Marketing research: online research applications. 4th edn. New York: Prentice Hall.

Bush, T. (2002) 'Authenticity in research: reliability, validity and triangulation', in Coleman, M. and Briggs, A.R.J. (eds.) Research methods in educational research. London: Sage, pp. 75-89.

Bushman, B.J. and Huesmann, L.R. (2001) ‘Effects of televised violence on aggression’, in Singer, D.G. and Singer, J.L. (eds.) Handbook of children and the media. United States of America: Sage, pp. 223-254.

Butovskaya, M., and Verbeek, P., Ljungberg, T, A. (2000) ‘A multicultural view of peace making among young children’, in Aureli, F. and de Waal, F.B.M. (eds) Natural conflict resolution. Berkeley and Los Angeles: University of California Press.

Carruthers, E. and Worthington, M. (2010) ‘Children’s mathematical development’, in Bruce, T. (eds.) Early childhood: a guide for students. Los Angeles: Sage, pp. 146-154.

Cennamo, K. S., Ross, J.D. and Ertmer, P. A. (2010) Technology integration for meaningful classroom use: A standards-based approach. Belmont, CA: Wadsworth, Cengage Learning.

Childwise (2015) The monitor pre-school report: key behaviour patterns among 0-4 year olds. London: Childwise.

Chau, C.L. (2014) Positive technological development for young children in the context of *children’s mobile app*, Doctoral Dissertation: Tufts University.

Chaudron, S. (2015) ‘Young children (0-8) and digital technology: a qualitative exploratory study across seven countries’, Joint Research Centre European Commission, doi:10.2788/00749

Chen, J.Q. and Chang, C. (2006) ‘Testing the whole teacher approach to professional development: a study of enhancing early childhood teachers’ technology proficiency’, Early Childhood Research and Practice, 8(1), pp. 1-18.

Chen, P.S.D., Gonyea, R., and Kuh, G. (2008) ‘Learning at a distance’, Journal of Online Education, 4(3), pp. 1-9.

Cherryholmes, C.H. (1992) 'Notes on pragmatism and scientific realism', Educational Researcher, 14, pp. 13-17.

Chien, N.C., Howes, C., Burchinal, M., Pianta, R.C., Ritchie, S., Bryant, D.M., Clifford, R.M., Early, D.M. and Barbarin, O.A. (2010) 'Classroom engagement and school readiness gains in prekindergarten', Society for Research in Child Development, 81(5), pp. 1534-1549.

Christakis, D.A. and Zimmerman, F.J. (2007) 'Violent television viewing during preschool is associated with antisocial behaviour during school age', Paediatrics, 120 (5), pp. 993-999.

Christakis, D.A., Zimmerman, F.J., DiGiuseppe, D.L., and McCarty, C.A. (2004) 'Early television exposure and subsequent attention problems in children', Paediatrics, 113 (4), pp. 708-713.

Christensen, P. and Prout, A. (2002) 'Working with ethical symmetry in social research with children', Childhood, 9 (4), pp. 477-497.

Chung, Y. and Walsh, D.J. (2006) 'Constructing a joint story-writing space: the dynamics of young children's collaboration at computers', Early Education and Development, 17 (3), pp. 337-420.

Clark, W., and Luckin, R. (2013) What the research says: iPads in the classroom. London: Institute of Education

Clements, D.H. and Nastasi, B., and Swaminathan, S. (1993) 'Young children and computers: crossroads and directions from research', Young Children, 48 (1), pp. 56-64.

Clements, D.H. (1994) 'The uniqueness of the computer as a learning tool: insights from research and practice', in Wright, J.L. and Shade, D.D. (eds.) Young children: active

learners in a technological age. Washington, DC: National Association for the Education of Young Children.

Clements, D.H. and Swaminathan, S. (1995) 'Technology and school change new lamps for old?', Childhood Education, 71 (5), pp. 275-281.

Clements, D.H. (1999) 'The effective use of computers with young children' in Copley, J.V. (eds.) Mathematics in the early years. VA: NCTM, pp. 119-128.

Clements, D.H. and Samara, J. (2003) 'Strip mining for gold: research and policy in educational technology- a response to "Fool's Gold", Educational Technology Review, 11 (1), pp. 7-69.

Cohen, L., Manion, L., and Morrison, K. (2011) Research methods in education. 7th edn. London: Routledge.

Compton, A., Johnston, J., Nahmad-Williams, L., and Taylor, K. (2010) Creative development. London: Continuum International Publishing Group.

Coolican, H. (2004) Research methods and statistics in psychology. 4th edn. Oxon: Hodder and Stoughton.

Cooper, D.R. and Schindler, P.S. (2001) Business research methods. New York: Irwin/McGraw-Hill.

Cooper, L., Johnson, J., Rotchell, E. and Woolley, R. (2010) Knowledge and understanding of the world. New York: Continuum International Publishing Group.

Coople, C. and Bredekamp, S. (eds.) (2009) Developmentally appropriate practice in early childhood programs serving children from birth through age 8. Washington, D.C: National Association for the Education of Young Children.

Courville, K. (2011) Technology and its use in education: present roles and future prospects. Online Submission: Eric.

Couse, L.J. and Chen, D.W. (2010) 'A tablet computer for young children? Exploring its viability for early childhood education', Journal of Research on Technology in Education, 43 (1), pp. 75-98.

Cordes, C. and Miller, E. (2000) *Fool's Gold: A critical look at computers in childhood.* College Park MD: Alliance for Childhood.

Creswell, J.W. and Plano-Clark, V.L. (2011) Designing and conducting mixed methods research. 2nd Edn. Thousand Oaks, CA: Sage.

Creswell, J.W. (2012) Educational research: planning, conducting and evaluating quantitative and qualitative research. 4th Edn. Boston: Pearson.

Denscombe, M. (2008) 'Communities of practice: a research paradigm for the mixed methods approach', Journal of Mixed Methods Research, 2 (3), pp. 270-283.

Denscombe, M. (2010) The good research guide: for small-scale social research projects. 4th edn. New York: Open University Press.

Department for Children, Schools and Families (DCSF (2009) Learning, playing and interacting: good practice in the early years foundation stage. Available at: http://www.foundationyears.org.uk/wpcontent/uploads/2011/10/Learning_Playing_Interacting.pdf (Accessed: 18 October, 2015).

Department for Children, Schools and Families (DCSF) (2008) Excellence and Enjoyment: Social and Emotional Aspects of Learning. Revised Early Years Foundation Stage Version. Available at: http://www.foundationyears.org.uk/files/2011/10/SEAL_-getonfallout.pdf (Accessed: 18 October, 2015).

Department for children, schools and families (2007a) Principles into practice cards for the early years foundation stage. Nottingham: DCSF.

Derryberry, D. and Tucker, D.M. (1994) 'Motivating the focus of attention', in Neidenthal, P.M. and Kitayama, D. (eds.) *The heart's eye: emotional influence in perception and* attention. San Diego: Academic Press, pp. 167-196.

Diemer, T.T., Fernandez, E. and Streepey, J.W. (2012) 'Student perceptions of classroom engagement and learning using iPads', Journal of Teaching and Learning with Technology, 1(2), pp. 13-25.

Disney, L., Barnes, A., McDowall, J. and Geng, G., (2013) 'Observation of children's engagement when playing iPads', The 21st International Conference on Computers in Education, Bali, Indonesia, 602-607 November.

Doherty, J. and Hughes, M. (2009) Child development: theory and practice 0-11. England: Pearson Education Limited.

Dowker, A. (2005) Individual differences in arithmetic: implications for psychology, Neuroscience and education. New York: Psychology Press.

Dowling, M. (2010) 'The learning environment: creating a learning environment indoors and outdoors', in Bruce, T. (eds.) Early Childhood: A guide for students. Los Angeles: Sage, pp. 46-51.

Drake, J. (2005) *Planning children's play and learning in the foundation stage: how to* meet the introduction standards. London: David Fulton Publishers.

Drake, J. (2005) *Planning children's play and* learning in the foundation stage. 2nd edn. London: David Fulton Publishers Ltd.

Dunn, J., Gray, C., Moffett, P. and Mitchell, D. (2016): 'It's more funner than doing work': children's perspectives on using tablet computers in the early years of school', Early Child Development and Care, pp.1-13. doi: 10.1080/03004430.2016.1238824

Edwards, S. (2013) 'Digital play in the early years: a contextual response to the problem of integrating digital technologies and play-based learning in the early childhood curriculum', European Early Childhood Educational Research Journal, 10(2), pp. 199-212.

Edwards, S. and Bird, J. (2015) 'Observing and assessing young children's digital play in the early years: using the digital play framework', Journal of Early Childhood Research, pp. 1-6. doi: 10.1177/1476718X15579746

Elkind, D. (2007) The power of play: how spontaneous, imaginative activities lead to happier, healthier children. Cambridge, MA: Da Capo Press.

Emenike, N. (2016) Third culture indigenous kids in Nigeria: Neo-colonial tensions and conflict identity. Unpublished PhD thesis. University of Hull.

Erikson, E. H. (1985) 'Play and actuality', in: Bruner, J.S., Jolly, A. and Sylva, K. (eds.), Play: its role in development and evolution. New York, NY: Penguin Books, pp. 688–704.

Ertmer, P.A. (2005) 'Teacher pedagogical beliefs: the final frontier in our quest for technology integration?' Educational Technology Research and Development, 53 (4), pp. 25-39.

Ertmer, P.A. and Ottenbreit-Leftwich, A. T. (2010) 'Teacher technology change: How knowledge, confidence, beliefs, and culture intersect', Journal of research on Technology in Education, 42(3), pp. 255-284.

Fargas Malet, M., McSherry, D., Larkin, E., and Robinson, C. (2010) 'Research with children: methodological issues and innovative techniques', Journal of Early Childhood Research, 8(2), pp. 175-192

Featherstone, S. and Featherstone, P. (ed.) (2008) Like bees, not butterflies: child initiated learning in the early years. London: A and C Black.

Feilzer, M. Y. (2010) 'Doing mixed methods research pragmatically: implications for the rediscovery of pragmatism as a research paradigm', Journal of Mixed Methods Research, 4 (1), pp. 6-16.

Fenty, N.S. and Anderson, E.M. (2014) 'Examining educators knowledge, beliefs and practices about using technology with young children', Journal of Early Childhood Teacher Education, 35(2), pp. 114-134.

Finn, J.D. Pannozzo, G., and Voelkl, K.E. (1995) 'Disruptive and inattentive-withdrawn behavior and achievement among fourth graders', The Elementary School Journal, 95, pp. 421–454.

Fischer, M. and Gillespie, C. (2003) 'One head start classroom's experiences: computers and young children's development', Young Children, 58 (4), pp. 85-91.

Fisher, J. (2008) Starting from the child. 3rd edn. England: Open University Press.

Fisher, R. (2005) Teaching children to think. 2nd edn. Cheltenham: Nelson Thornes.

Fogelman, K. and Comber, C. (2007) 'Surveys and sampling', in Briggs, A.R.J. and Coleman, M. (eds.) Research methods in educational leadership and management. London: Sage, pp. 93-107.

Fredericks, J. A., Blumenfeld, P. C., and Paris, A.H. (2004) 'School engagement: potential of the concept, sate of the evidence', Review of Educational Research, 74 (1), pp. 59-109.

Frost, J., Wortham, S. and Reifel, S. (2008) Play and child development. 3rd edn. Upper Saddle River, NJ: Pearson.

Furlong, M. J., Whipple, A.D., Jean, G. S., Simental, J., Soliz, A., and Punthuna, S. (2003) 'Multiple contexts of school engagement: moving toward a unifying framework for educational research and practice', The California School Psychologist, 8 (1), pp. 99-113.

Gall, M. D., Gall, J. P., and Borg, W. R. (2002) Educational research: an introduction. 6th edn. NY: England: Longman Publishing.

Georghiades, P. (2004) 'From the general to the situated: three decades of metacognition', International Journal of Science Education, 26(3), pp. 365-383.

Gimbert, B. and Cristol, D. (2004) 'Teaching curriculum with technology: enhancing children's technological competences during early childhood', Early Childhood Education Journal, 31 (3), pp. 207-216.

Golafshani, N. (2003) 'Understanding reliability and validity in qualitative research', The qualitative report, 8(4), pp. 597-606.

Goodwin, L. D., Goodwin, W. L., Nansel, A., and Helm, C. P. (1986) 'Cognitive and affective effects of various types of microcomputer use by pre-schoolers', American Educational Research Journal, 23 (3), pp. 348-356.

Gorard, S. and Taylor, C. (2004) Combining methods in educational and social research. Maidenhead: Open University Press

Greene, J. C., Kreider, H. and Mayer, E. (2005) 'Combining qualitative and quantitative methods in social inquiry', in Somekh, B. and Lewin, C. (eds.) Research methods in the social sciences. Thousand Oaks, CA: Sage, pp. 274-281.

Greene, J. and Hall, J. (2010) 'Dialectics and pragmatism: being of consequence', in Tashakkori, A. and Teddlie, C. (eds.) Sage handbook of mixed methods in social and behavioural research. California: Sage, pp. 119-143.

Guba, E.G. (1987) 'Naturalistic evaluation', New Directions for Program Evaluation, 1987 (34), pp. 23-43.

Guba, E. G. and Lincoln, Y. S. (1994) 'Competing paradigms in qualitative research', in Denzin, N.K. and Lincoln, Y. S. (eds.) Handbook of qualitative research. Thousand Oaks, C.A: Sage, pp. 105-117.

Guba, E. G. And Lincoln, Y. S. (2005) 'Paradigmatic controversies, contradictions, and emerging confluences', in Denzin, N. K. and Lincoln, Y. S. (eds.) The sage handbook of qualitative research. Thousand Oaks, C.A: Sage, pp. 191-216.

Guernsey, L. and Druin, A. (2009) 'It's mine: kids carrying their culture wherever they go' in Druin, A. (eds.) Mobile technology for children: designing for interaction and learning. United States of America: Elsevier, pp. 245-264.

Guernsey, L. (2012) Screen time: how screen time affects children from birth to age five. New York: Basic Books.

Gutnick, A., Robb, M., Takuechi, L. and Kottler, J. (2011) Always connected: the new digital media habits of young children. New York: The Joan Ganz Cooney Centre at Seasame Workshop.

Hadeed, J. and Sylva, K. (1995) '*Behavioural observations as predictors of children's* social and cognitive progress in day care', Fifth European Early Childhood Education Research Association Conference on the Quality of Early Childhood Education, September France, pp. 1- 28.

Hall, R. (2013) 'Mixed methods in search of a paradigm', in Thao, L. and Quynh, L. (eds.) Conducting research in a changing and challenging world. United States: Nova Science Publishers Inc, pp. 71- 78.

Hamel, J., Dufour, S., and Fortin, D. (1993) Case study methods. Newbury Park, CA: Sage Publications.

Hargreaves, D.H. (2006) 'A new shape for schooling?', London: Specialist Schools and Academies Trust.

Hart, S. (1995) 'Action-in-reflection', Educational Action Research, 3 (2), pp. 211- 232.

Hartley, D. (2006) 'Excellence and enjoyment: the logic of a contradiction', British Journal of Educational Studies, 54 (1) pp. 3- 14.

Haugland, S. W. (1992) 'The effect of computer software on preschool children's developmental gains', Journal of Computing in Childhood Education, 3 (1), pp. 15-30.

Haugland, S.W. (1999) 'What Role Should Technology Play in Young Children's Learning?', Young Children, 54(6), pp. 26-31.

Haugland, S. W. (2000) 'What role should technology play in young children's learning? Part two. Early childhood classrooms in the 21st century: using computers to maximise learning', Young Children, 55 (1), pp. 12-18.

Heaslip, P., Hurst, V., and Joseph, J. (1992) First things first, educating young children – a guide for parents and governors. Early Years Curriculum Group, Staffordshire: Boon Printers Ltd

Henderson, S. and Yeow, J. (2012) 'IPad in education: a case study of iPad adoption and use in a primary school'. 47th Hawaii International Conference on System Sciences. Hawaii, USA, 4-7 January. Washington, DC: USA: IEEE Computer Society, pp. 78-87.

Higgins, S., Beauchamp, G., and Miller, D. (2007) 'Reviewing the literature on interactive white boards', Learning, Media and Technology, 32 (3), pp. 213-225.

Highfield, K. and Mulligan, J. (2008) 'Young children's engagement with technological tools: the impact on mathematics learning', International Congress in Mathematical Education, 11, pp. 6-13.

Hillman, M. and Marshall, J. (2010) 'Evaluation of digital media for emergent literacy', Computers in Schools, 25 (4), pp. 256-270.

Hohmann, C. (1998) 'Evaluating and selecting software for children', Child Care Information Exchange, 123, pp. 60-62.

Hourcade, J.P., Beitler, D., Cormenzana, F. and Flores, P. (2008) 'Early OLPC experiences in rural Uruguayan school', Mobile Technology for Children, pp. 225-243.

Hughes, B. (2002) *A play worker's taxonomy of play types.* 2nd edn. London: PlayLink.

Hurwitz, S.C. (2003) "To be successful- let them play!" Childhood Education, 79(2), pp. 101-102.

Hutchin, V. (2010) 'Meeting individual needs', in Bruce, T. (eds.) Early childhood: a guide for students. 2nd edn. Los Angeles: Sage, pp. 37-52.

Hutt, C. (1966) 'Exploration and play in children', Paper presented at the Symposia of the Zoological Society of London, London, 81, pp. 61-81.

Isenberg, J. P. and Quisenberry, N. (2002) 'A position of the association for childhood education international play: essential for all children', Childhood Education, 79 (1), pp. 33- 39.

ISTE (International Society for Technology in Education) (2007) 'Using technology to learn' Available at: www.iste.org/standards/nets-for-students/nets-for-students-2007 (Assessed: 18 October 2015)

Johnson, B. and Turner, L.A. (2003) 'Data collection strategies in mixed methods research', in Tashakkori, A. and Teddlie, C. (eds.) Handbook of mixed methods in social and behavioural research. London: Sage, pp. 297-319.

Johnson, J. E., Christie, J. and Wardle, F. (2005) Play, development and early education. Allyn and Bacon, Boston: Pearson Education.

Johnson, J.E. and Christie, J.F. (2009) 'Play and Digital Media', Computers in the Schools, 26(4), pp. 284-289

Johnson, R. B and Onwuegbuzie, A. J. (2004) 'Mixed methods research: a research paradigm whose time has come', Educational Researcher, 33 (7), 14- 26.

Johnson, R. B., Onwuegbuzie, A. J., and Turner, L. (2007) 'Toward a definition of mixed methods research', Journal of Mixed Methods Research, 1 (2), pp. 112- 133.

Johnson, R.B. and Christensen, L. (2014) Educational research: quantitative, qualitative and mixed approaches. 5th edn. United States of America: Sage.

Kabali, H. K., Matilde Irigoyen, M., Nunez-Davis, R., Budacki, J.G., Mohanty, S.H., Leister, K.P. and R. L. Bonner Jr. (2015) 'Exposure and Use of Mobile Media Devices by Young Children', Pediatrics 136 (6), pp. 1044–1050.

Keenan, T. and Evans, S. (2009) An introduction to child development. 2nd edn. London: Sage.

Kelly, K. L. and Schorger, J. R. (2001) 'Let's play: expressive language use at the computer centre', Information Technology in Childhood Education Annual, 2001 (1), pp. 125- 138.

Kennedy, G., Dalgarno, B., Bennet, S., Judd, T., Gray, K., and Chang, R. (2008) 'Immigrants and natives: investigating differences between staff and students use of

technology'. Hello! Where are you in the landscape of educational technology? Ascilite Melbourne, pp. 484-492.

Kenny, R. (2010) 'Forest schools and the early years foundation stage: an exploratory case study'. Available at: http://www.academia.edu/666361/Forest_School_and_the_Early_Years_Foundation_Stage_An_Exploratory_Case_Study (Accessed: 19 September, 2015).

Kervin, L., Verenikina, I. and Rivera, M. (2015) 'Collaborative onscreen and off-screen play: examining meaning-making complexities', Digital Culture and Education, 7 (2), pp. 228-239.

Kincheloe, L. J. and Tobin, K. (2009) 'The much exaggerated death of positivism', Cultural Study of Science Education, 4, pp. 513- 528.

Kirkorian, H. L., Pempek, T.A., Murphy, L.A., Schmidt, M.E., and Anderson, D.R. (2009) 'The Impact of Background Television on Parent-Child Interaction', Child Development, 80 (5), pp. 1350–1359.

Klein, P., Nir-Gal, O. and Darom, E. (2000) 'The use of computers in kindergarten with or without adult mediation: effects on children's cognitive performance and behaviour', Computers in Human Behaviour, 16 (6), pp. 591 – 608.

Kosakowski, J. (1998) The benefits of information technology. ERIC Digest. Available at: http://files.eric.ed.gov/fulltext/ED420302.pdf (Accessed 20 September 2015)

Kucirkova, N. (2014) 'iPads in early education: separating assumptions and evidence', Frontiers in Psychology, 5 (715), pp. 1- 3.

Kucirkova, N., Messer, D., Sheehy, K. and Panadero, C. F. (2014) 'Children's engagement with educational iPad apps: insights from a Spanish classroom', Computers and Education, 71, pp. 175-184.

Kuhn, T.S. (1970) The structure of scientific revolutions. 2nd edn. Chicago: University of Chicago Press.

Kuppens, P. (2008) 'Individual differences in the relationship between pleasure and arousal', Journal of Research in Personality, 42 (4), pp. 1053- 1059.

Laevers, F. (2005) 'Well-being and involvement in care setting: a process oriented self-evaluation', Kind en Gezin; Research Centre for Experiential Education, ISBN: 978-90-77343-76-8.

Langston, A. and Doherty, J. (2012) The revised EYFS in practice: thinking, reflecting and doing. London: Featherstone Education.

Larson, L. C and Miller, T. N. (2011) '21st century skills: prepare students for the future', Kappa Delta Pi Record, 47 (3), pp. 121- 123.

Lawless, K.A. and Pelligrino, J.W. (2007) 'Professional development in integrating technology into teaching and learning: knowns, unknowns and ways to pursue better questions and answers', Review of Educational Research, 77(4), pp. 575-614.

Leech, N. L. and Onwuegbuzie, A. J. (2009) 'A typology of mixed methods research design', Quality and Quantity, 43 (5), pp. 265- 275.

Leeuw, R.N.H. and Buijzen, M. (2016) 'Introducing positive media psychology to the field of children, adolescents, and media', Journal of Children and Media, 10(1), pp. 39-46.

Lewis, A. (2010) 'Silence in the context of 'child voice', Children and Society, 24 (1), pp. 14- 23.

Li, X. and Atkins, M. S. (2004) 'Early childhood computer experience and cognitive and motor development', Paediatrics, 113 (6), pp. 1715- 1722.

Lieberman, D. A and Linn, M. (1991) ‘Learning to learn revisited: computers and the development of self-directed learning skills’, Journal of Research on Computing in Education, 23 (3), pp. 373- 395.

Lieberman, D.A., Bates, C.H. and So, J. (2009) ‘Young Children's Learning With Digital Media’, Computers in the Schools, 26 :(4), pp. 271-283.

Lieberman, D.A., Fisk, M.C. and Biely, E. (2009) ‘Digital Games for Young Children Ages Three to Six: From Research to Design’, Computers in the Schools, 26(4), pp. 299-313.

Lim, M.Y.S. (2010) ‘Reconsidering the play-work dichotomy in pedagogy’, in Ebbeck, M. and Waniganayake, M. (eds.) Play in early childhood education: Leaning in diverse contexts. South Melbourne: Oxford University Press, pp. 141-156.

Lincoln, Y. S and Guba, E. G. (1985) Naturalistic inquiry. Beverly Hills: Sage.

Lindon, J. (1993) Child development from birth to eight: a practical focus. London: National Children’s Bureau.

Lindon, J. (2008) ‘Child-initiated learning: what does it mean, where does it fit and why is it important for young children? Key messages from the Early Years Foundation Stage’, in Bayley, R., Featherstone, S. and Featherstone, P. (eds.) Like bees, not butterflies child initiated learning in the early years. London: A and C Black, pp. 9- 20.

Linnenbrink, E. A. and Pintrich, P. R. (2003) ‘The role of self-efficacy beliefs in student engagement and learning in the classroom’, Reading and Writing Quarterly, 19 (2), pp. 119- 137.

Liu, M. (1996) ‘An exploratory study of how pre-kindergarten children use the interactive multimedia technology: implications for multimedia software design’, Journal of Computing in Childhood Education, 7 (1-2), pp. 71- 92.

Livingstone, S., Marsh, J., Plowman, L., Ottovordemgentschenfelde, S. and Fletcher-Watson, B. (2014) 'Young children (0-8) and digital technology: a qualitative exploratory study- national report- UK', Joint Research Centre, European Commission, Luxembourg.

Macintyre, C. (2012) Enhancing learning through play: a developmental perspective for early years settings. 2nd edn. Oxon: Routledge.

Mack, L. (2010) 'The philosophical underpinnings of educational research', Polyglossia, 19, pp. 1-11.

MacNaughton, G. and Williams, G. (2004) Teaching young children: choices in theory and practice. England: Open University Press.

MacNaughton, G., Rolfe, S.A. and Siraj-Blatchford, I. (2010) Doing early childhood research. 2nd edn. England: Open University Press.

Malone, T.W. (1980) 'What makes things fun to learn? Heuristics for designing instructional computer games', 3rd ACM SIGSMALL symposium and the first SIGPC symposium on small systems. California, 18-19 September. USA: ACM, pp. 162-169.

Mango, O. (2015) 'iPad use and student engagement in the classroom', Turkish Online Journal of Educational Technology, 14 (1), pp. 53–57.

Marsh, J. (2010) 'Young children's play in online virtual worlds', Journal of Early Childhood Research, 8(1), pp. 23-39.

Marsh, J. and Bishop, J.C. (2014) Changing play: play, media and commercial culture from the 1950s to the present day. England: Open University Press/ McGraw-Hill.

Marsh, J., Brooks, G., Hughes, J., Ritchie, L., Roberts, S. and Wright, K. (2005) Digital *beginnings: Young people's use of popular culture, media and new technologies*, Sheffield: The University of Sheffield.

Masek, M., Murica, K.J. and Morrison, J.K. (2012) 'Getting serious with iPads: the intersection of game design and teaching principals, Australian Educational Computing, 27(2), pp. 34-38.

Maxwell, J.A. (1992) 'Understanding and validity in qualitative research', Harvard Educational Review, 62 (3), pp. 279-300.

Maxwell, S.E. and Delaney, H.D. (2004) Designing experiments and analysing data. Mahwah, NJ: Lawrence Erlbaum.

Maykut, P. and Morehouse, R. (1994) Beginning qualitative research: a philosophic and practical approach. London: UK The Falmer Press.

McCarrick, K. and Li, X. (2007) 'Buried treasure: the impact of computer use on young children's social, cognitive, language development and motivation', AACE Journal, 15 (1), pp. 73 – 95.

McKenna, C. (2012) 'There's an app for that: how two elementary classrooms used iPads to enhance student learning and achievement', Education, 2 (5), pp. 136 – 142.

McKenny, S. and Voogt, J. (2010) 'Technology and young children: how 4-7 year olds perceive their own use of computers', Computers in Human Behaviour, 26(4), pp. 14-24.

McManis, L. and Gunnewig, S. (2012) 'Finding the education in educational technology with early learners', Young Children, 67 (3), pp. 14- 24.

McPake, J., Plowman, L. and Stephen, C. (2013) 'Preschool children creating and communicating with digital technologies at home', British Journal of Educational Technology, 44 (3), pp. 421-431.

Merriam, S.B. (2009) Qualitative research: a guide to design and implementation. San Fransisco, C.A: Jossey- Bass.

Miles, M.B. and Huberman, A.M. (1994) Qualitative data analysis: an expanded sourcebook. 2nd edn. Thousand Oaks, California: Sage.

Miller, L., Cable, C. and Devereux, J. (2005) Developing early years practice. London: Open University Press.

Milman, N.B., Carlson-Bancroft, A. Boogart, A.V. (2012) 'iPads in prek-4th independent school -year 1- enhancing engagement, collaboration and differentiation across content areas', International society for technology in education conference. San Diego, 25 June.

Morgan, A. 2010. 'Interactive Whiteboards, Interactivity and Play in the Classroom with Children Aged Three to Seven Years', European Early Childhood Education Research Journal, 18, pp. 93–104.

Morse, J.M. (1991) 'Approaches to qualitative-quantitative methodological triangulation', Nursing Research, 40 (2), pp. 120-123.

Morse, J.M. (2003) 'Principles of mixed methods and multimethod research design', in Tashakkori, A. and Teddlie, C. (eds.) Handbook of mixed methods in social and behavioural research. London, England: Sage, pp. 189-208.

Moyles, J. (1989) Just playing?: the role and status of play in early childhood education. Milton Keynes: Open University Press.

Moyles, J. (2008) 'Empowering children and adults: play and child initiated learning', in Featherstone, S. and Featherstone, P. (eds.) Like Bees, not butterflies: child initiated learning in the early years. London: A and C Black, pp. 29 - 44.

Moyles, J. (2012) A to Z of play in early childhood. England: Open University Press.

Moylett, H. (2010) 'Supporting children's development and learning' in Bruce, T. (eds.) Early childhood: a guide for students. 2nd edn. Los Angeles: Sage.

Mukherji, P. and Albon, D. (2010) Research methods in early childhood: an introductory guide. London: Sage.

Murphy, J.P. (1990) Pragmatism: from Peirce to Davidson. Boulder, CO: Westview Press.

National Association for the Education of Young Children (NAEYC) (1996) Developmentally appropriate practice in early childhood programs serving children from birth through age 8. Washington, DC: National Association for the Education of Young Children (NAEYC).

National Association for the Education of Young Children (NAEYC) and Fred Rogers Centre for Early Learning and Children's Media (2012) Technology and interactive media as tools in early childhood programs serving children from birth through age 8 (Joint Position Statement). Available at: http://www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf. (Accessed: 7 August, 2014).

Neiderhauser, D. S. and Stoddart, T. (2001) 'Teachers' instructional perspectives and use of educational software', Teaching and Teacher Education, 17 (1), pp. 15-31.

Neumann, M.M. and Neumann, D.L. (2014) 'Touch screen tables and emergent literacy', Early Childhood Research, 42(4), pp. 231-9.

Newby, P. (2010) Research methods for education. Essex: Pearson.

Newmann, F.M., Wehlage, G.G. and Lamborn, S.D. (1992) 'The significance and sources of student engagement', in Newmann, F. (eds.) Student engagement and achievement in American secondary schools. New York, NY: Teachers College Press, pp. 11-39.

Noblit, G. and Eaker, D. J. (1987) 'Evaluation designs as political strategies', Annual Meeting of the American Education Research Association, Washington DC: 20-24 April.

Nutbrown, C. (2011) Key concepts in early childhood education and care. 2nd edn. London: Sage.

Nuttal, J., Edwards, S., Mantilla, A., Grieshaber, S. and Wood, E. (2015) 'The role of motive objects in early childhood teacher development concerning children's digital play and play-based learning in early childhood curricula', Professional Development in Education, 41 (2), pp. 222-235.

Ofcom. (2015) Children and parents: media use and attitudes report. London: Ofcom. Available at: http://stakeholders.ofcom.org.uk/market-data-research/other/research-pubications/childrens/children-parents-nov-15/ (Accesses: 28 January, 2016).

O'Leary, Z. (2010) The essential guide to doing your research project. London: Sage.

O'Hara, M. (2011) 'Young children's ICT experiences in the home: some parental perspectives', Journal of Early Childhood Research, 9(3), pp. 220-231.

O'Malley, P., Jenkins, S., Wesley, B., Donehower, C., Rabuck, D. and Lewis, M.E.B. (2013) 'Effectiveness of using iPads to build math fluency' Council for exceptional children annual meeting. San Antonio Texas, April. Kennedy Krieger Institute, Baltimore Maryland.

Onwuegbuzie, A.J. (2000) 'Expanding the framework of internal and external validity', Annual meeting of the association for the advancement of educational research (AAER), Ponte Verda Florida, November.

Onwuegbuzie, A.J. and Johnson, B. (2006) 'The validity issue in mixed methods research', Research in the schools, 13 (1), pp. 48-63.

Onwuegbuzie, A.J. and Leech, N.L. (2007) 'Validity and qualitative research: an oxymoron?', Quality and Quantity, 41 (2), pp. 233-249.

Onwuegbuzie, A.J. and Leech, N.J. (2005) 'On becoming a pragmatic researcher: the importance of combining quantitative and qualitative research methodologies', International Journal of Social Research Methodology, 8 (5), pp. 375-387.

Palaiologou, I. (2013) 'Observation' 12975: Leadership for learning. University of Hull. Unpublished.

Palaiologou, I. (2014) 'Do we hear what children want to say? ethical praxis when choosing research tools with children under five', Early Childhood Development and Care, 184 (5), pp. 689-705.

Palaiologou, I. (2016a) 'Children under five and digital technologies: implications for early years pedagogy ', European Early Childhood Education Research Journal, 24 (1), pp. 5-24.

Palaiologou, I. (2016b) 'Teachers' dispositions towards the role of digital devices in play-based pedagogy in early childhood education', Early Years, 36 (3), pp. 305–321.

Palmér, H. (2015) 'Using tablet computers in preschool: How does the design of applications influence participation, interaction and dialogues?', International Journal of Early Years Education, 23 (4), pp.365-381

Palmer, S. (2016) Why the iPad is a far bigger threat to our children than anyone realises. Available at: http://www.dailymail.co.uk/femail/article-3420064/Why-iPad-far-bigger-threat-children-realises-Ten-years-ago-psychologist-SUE-PALMER-predicted-toxic-effects-social-media-sees-worrying-new-danger.html (Accessed: 8 February, 2016).

Paley, V.G. (1990) The boy who would be a helicopter. United States of America: Harvard University Press.

Papert, S. (1980) Mindstorms: children, computers and powerful ideas. New York: Basic Books.

Peluso, D.C. (2012) 'The fast-paced iPad revolution: can educators stay up to date and relevant about these ubiquitous device?', British Journal of Educational Technology, 43(4) pp. 125-127.

Phethean, K. and Clarke, H. (2014) 'Understanding the world, including ICT', in Moyles, J., Payler., J. and Georgeson, J. (eds.) Early years foundation stage: critical issues. Milton Keynes: Open University Press, pp. 120-131.

Plowman, L., Stevenson, O., McPake, J., Stephen, C. and Adey, C. (2011) 'Parents, pre-schoolers and learning with technology at home: some implications for policy', Journal of Computer Assisted Learning, 27 (4), 361-371.

Plowman, L. and McPake, J. (2013) 'Seven myths about young children and technology', Childhood Education, 89 (1), pp. 27-33.

Plowright, D. (2011) Using mixed methods: frameworks for an integrated methodology. London: Sage.

Popper, K.R. (1959) The logic of scientific discovery. New York: Routledge.

Prensky, M. (2001) 'Digital natives, digital immigrants part 1', On the Horizon, 9 (5), pp. 1-6.

Price, S., Jewitt, C., and Crescenzi, L. (2015) 'The role of iPads in pre-school children's mark making development', Computers and Education, 87, pp. 131–141.

Read, K., Gardner, P. and Mahler, B. (1993) Early childhood programs: human relationships and learning. 9th edn. United States: Harcourt Publishers.

Reed, T. and Brown, M. (2000) 'The expression of care in the rough and tumble play of boys', Journal of Research in Childhood Education, 15(1), pp. 104-116.

Reinharz, S. (1997) 'Who am I? The need for *a variety of selves in the field'*, in Hertz, R. (eds.) Reflexibility and voice. London: Sage, pp. 3-20.

Resnick, M. (2002) 'Rethinking learning in digital age', in Kirkman, G.S., Cornelious, P.K., Sachs, J. and Schwab, K. (eds.) The global information technology report 2001-2002, readiness for the networked world. Oxford: Oxford University Press, pp. 32-37.

Riddal-Leech, S. (2008) How to observe children. 2nd Edn. England: Heinemann.

Rideout, V.J. and Saphir, M. (2013) *Zero to eight: Children's media* use in America. San Francisco: CA: Common Sense Media.

Robert-Holmes, G. (2011) Doing your early years research projects: a step-by-step guide. 2nd edn. Thousand Oaks, CA: Sage.

Robinson, V. and Lai, M.K. (2006) Practitioner research for educators: a guide to improving classroom and schools. United States: Corwin Press.

Rojas-Drummond, S., Albarran, C. and Littleton, K. (2008) 'Collaboration, creativity and the co-construction of oral and written texts', Thinking Skills and Creativity, 3 (3), 177-191.

Rolfe, S. and MacNaughton, G. (2001) 'Research as a tool', in MacNaughton, G., Rolfe, S. and Siraj-Blatchford (eds.) Doing early childhood research: international perspectives on theory and practice. Buckingham; Open University Press, pp. 3-11.

Romeo, G., Edwards, S., McNamara, S., Walker, I. and Ziguras, C. (2003) 'Touching the screen: issues related to the use of touch screen technology in early childhood education', British Journal of Educational Technology, 34 (3), pp. 329-339.

Rowan, C. (2014) 10 Reasons why handheld devices should be banned for children under the age of 12. Available at: http://www.huffingtonpost.com/cris-rowan/10-reasons-why-handheld-devices-should-be-banned_b_4899218.html (Accessed: 8 December, 2014).

Ryan, A.M. and Pintrich, P.R. (1998) 'Achievement and social motivational influences on help seeking in the classroom', in Karabenick, S.A. (eds.) Strategic help seeking: implications for learning and teaching. Mahwah, NJ, US: Lawrence Eribaum Associations Publishers, pp. 117-139.

Sagayadevan, V. and Jeyaraj, S. (2012) 'The role of emotional engagement in lecturer-student interaction and the impact on academic outcomes of student achievement and learning', Journal of the Scholarship of Teaching and Learning, 12 (3), pp. 1-30.

Saracho, O. (2012) 'Creativity theories and related teacher beliefs', Early Child Development and Care, 182(1), pp. 35-44.

Savin-Baden, M. and Major, C.H (2013) Qualitative research: the essential guide to theory and practice. London: Routledge.

Sayeed, Z. And Guerin, E. (2000) Early years play. London: David Fulton.

Scanlan, T.K., Stein, G.L. and Ravizza, K. (1989) 'An in-depth study of former elite figure skaters: ll, sources of enjoyment', Journal of Sport and Exercise Psychology, 11 (1), pp. 65-83.

Schaffer, H.R. (2006) Key concepts in developmental psychology. Great Britain: Sage.

Schmid, R.F., Miodrag, N. And DiFrancesco, N. (2008) 'A human-computer partnership: the tutor/child/computer triangle promoting the acquisition of early literacy skills', Journal of Research on Technology in Education, 41 (1), pp. 63-84.

Scotland's National Centre for Languages (SCILT) (2012) The Leuven scale for active engagement in learning by Ferre Laevers. Available at: http://www.scilt.org.uk/Portals/24/Library/resources/hmi/Leuven_Scale.pdf Accessed: 3 March, 2014).

Selbie, P. and Wickett, K. (2010) 'Providing an enabling environment', in Parker-Rees, R., Leeson, C., Willan, J. and Savage, J. (eds.) Early childhood studies. 3rd edn. Glasgow: Learning Matters.

Shahrimin, M. and Butterworth, D. (2002) 'Young children's collaborative interactions in a multimedia computer environment', The Internet and Higher Education, 4 (3), pp. 203-215.

Sharman, C., Cross, W. and Vennis, D. (2007) Observing children and young people. 4th edn. London: Continuum.

Shute, R. and Miksad, J. (1997) 'Computer assisted instructions and cognitive development in pre-schoolers', Child Study Journal, 27 (3), pp. 237-253.

Simon, T. (1985) 'Play and learning with computers', Early Child Development and Care, 19, pp. 69-78.

Simpson, M. and Tuson, J. (2003) Using observations in small-scale research: a beginn*er's guide (revised edition)*. Glasgow: University of Glasgow, the SCRE Centre.

Singer, D.G. and Singer, J.L. (2005) Imagination and play in the electronic age. Cambridge, MA: Harvard University Press.

Skinner, E.A., Furrer, C., Marchand, G. ad Kindermann, T. (2008) 'Engagement and disaffection in the classroom: part of a larger motivational dynamic?' Journal of Educational Psychology, 100 (4), pp. 765-781.

Skinner, E.A., Kindermann, T.A., Connell, J.P. and Wellborn, J.G. (2009) 'Engagement and disaffection as organisational constructs in the dynamics of motivational development', in Wentzel, K.R. and Wigfield, A. (eds.) Handbook of Motivation at School, New York: Routledge, pp. 223-245.

Smidt, S. (2011) Playing to learn: the role of play in the early years. Milton Park, Oxon: Routledge.

Smith, J.K. (1983) 'Quantitative versus qualitative research: an attempt to clarify the issue', Educational Researcher, 12 (3), pp. 6-13.

Smith, P. (2010) Children and Play. Oxford, UK: Wiley/Blackwell.

Smith, P.K., Cowie, H. and Blades, M. (2011) Unders*tanding children's development*. 5th edn. Oxford: Blackwell.

Soute, I., Markopoulos, P. and Magielse, R. (2010) 'Head up games: combining the best of both worlds by merging traditional and digital play', Personal and Ubiquitous Computing, 14(5), pp. 434-444.

Stake, R.E. (2005) 'Qualitative case studies', in Denzin, N.K. and Lincoln, Y. (eds.) The sage handbook of qualitative research. Thousand Oaks, USA: Sage, pp. 443-466.

Stephen, C. Cope, P. Obserki, I. and Shand, P. (2008) ''They should try to find out what the children like': exploring engagement in learning', Scottish Education Review, 40 (2), pp. 17-28.

Stephen, C. and Plowman, L. (2014) 'Digital play', in Brooker, L. Blaise, M. and Edwards, S. (eds.) Sage handbook of play and learning in early childhood. London: Sage, pp. 330-341.

Stout, K. (1983) 'Bringing up better babies', Families, 21(4), pp. 132-139.

Strasburger, V.C., Hogan, M.J., Mulligan, D.A., Ameenuddin, N., Christakis, D.A., Cross, C., Fagbuyi, D.B., Hill, D.L., Levine, A.E., McCarthy, C., and Moreno, M.A. (2013) 'Children, adolescents and the media', Paediatrics, 132 (5), pp. 958-961.

Suter, L.E. (2005) 'Multiple methods: research methods in education projects at NSF', International Journal of Research and Methods in Education, 28(2), pp. 171-181.

Swaminathan, S. and Wright, J.L (2003) 'Education technology in the early and primary years', in Isenberg, J.P and Jalongo, M.R. (eds.) Major trends and issues in early childhood education: challenges, controversies and insights. 2nd edn. New York: Teachers College Press, pp. 136-149.

Swan, K., Kratcoski, A. and Schenker, J. (2007) 'Ubiquitous computing and changing pedagogical possibilities: representations, conceptualizations and uses of knowledge', Journal of Educational Computing Research, 36 (4), pp. 481-515.

Tashakkori, A. and Teddlie, C. (1998) Mixed methodology: Combining qualitative and quantitative approaches. California: Sage Publications.

Tashakkori, A. and Teddlie, C. (2006) 'Validity issues in mixed methods research: calling for an integrative framework', Annual meeting of the American educational research association. San Francisco CA, April.

Taylor, A. (2000) 'The UN convention on the rights of the child: giving children a voice', in Lewis, A. and Lindsay, G. (eds.) *Researching children's perspectives.* Buckingham: Open University Press, pp. 21-32.

Teddlie, C. and Tashakkori, A. (2009) Foundations of mixed methods research: integrating quantitative and qualitative approaches in the social and behavioural sciences. United States of America: Sage.

Teddlie, C. and A. Tashakkori, A. (2010) 'Overview of contemporary issues in mixed methods research, in Tashakkori, A. and Teddlie, C. (eds.) Sage Handbook of Mixed Methods in Social & Behavioural Research. California: Sage, pp 1-41.

Teichart, L. and Anderson, A. (2014) ''I don't even know what blogging is': the role of digital media in a five-year-old girl's life', Early Child Development and Care, 184 (11), pp. 1677-1691.

Tekin, A.K. and Kotaman, H. (2013) 'The epistemological perspectives on action research', Journal of Educational and Social Research, 3 (1), pp. 81-91.

Thomson. P. (2015) 'What is a research warrant? Know how', Patter, 7 August. Available at: https://patthomson.net/2015/08/07/what-is-a-research-warrant-knowhow/ (Accessed: 5 July, 2016).

Tomar, B. (2014) 'Axiology in teacher education: implementation and challenges', Journal of Research and Method in Education, 4 (2), 51-54.

Trowler, V. (2010) 'Student engagement literature review', The Higher Education Academy, pp. 1-52.

United Nations (1989) The Convention on the rights of the child defence. Geneva: International and the United Nations Children's Fund. Available at: http://www.ohchr.org/en/professionalinterest/pages/crc.aspx (Accessed: 29 April, 2015)

VanderScoter, J., Ellis, D. and Railsback, J. (2001) Technology in early childhood education: finding the balance. Portland, OR: Northwest Regional Educational Laboratory.

Verenikina, I., Harris, P. and Lysaght, P. (2003) 'Child's play: computer games, theories of play and children's development', International federation for information processing working group 3.5 conference on young children and learning technologies, Australia, July. Australia, Australian Computer Society, pp. 99-106.

Verenikina, I. and Kervin, L. (2011) 'iPads, digital play and pre-schoolers', He Kupu, 2 (5), pp. 4-19.

Vernadakis, N., Avgerinos, A., Tsitskari, E. and Zachopoulou, E. (2005) 'The use of computer assisted instruction in pre-school education: making teaching meaningful', Early Childhood Education Journal, 33 (2), pp. 99-104.

Vitiello, V.E., Booren, L.M., Downer, J.T. and Williford, A.P. (2012) 'Variation in children's classroom engagement throughout a day in preschool: relations to classroom and child factors', Early Childhood Research Quarterly, 27(2), pp. 210-220.

Vygotsky, L.S. (1977) 'Play and its role in the mental development of the child', in Bruner, J.S., Jolly, A. and Sylva, K. (eds.) Play: its role in development and evolution. New York: Basic Books, pp.

Vygotsky, L.S. (1978) Mind in society: the development of higher mental processes. Cambridge, M.A: Harvard University Press.

Wahyuni, D. (2012) 'The research design maze: understanding paradigms, cases, methods and methodologies', Journal of Applied Management Accounting Research, 10 (1), 69-80.

Walliman, N. (2011) Your research project: designing and planning your work. 3rd edn. London: Sage.

Wartella, E., Schomburg, R.L., Lauricella, A.R. Robb, M., and Flynn, R. (2010) Technology in the lives of teachers and classrooms: surveys of classroom teachers and family child care providers. Latrobe, PA: The Fred Rogers Centre.

Wentzel, K.R. and Asher, S.R. (1995) 'The academic lives of neglected, rejected, popular and controversial children', Child Development, 66 (3), pp. 754-763.

White, R.E. (2012) The power of play: a research summary on play and learning. Minnesota children's museum. Smart Play.

Whitebread, D., Dawkins, R., Bingham, S., Rhodes, H. and Hemming, K. (2015) "Our classroom is like a little cosy house!" Organising the early years classroom to encourage self-regulated learning', in Whitebread, D. and Coltman, P. (eds.) Teaching and learning in the early years. New York: Routledge, pp. 25-76.

Wiersma, W. (2000) Research methods in education: an introduction. 7th edn. Boston: Allyn and Bacon.

Williams, B. (2010) 'Reflecting on child-initiated play', in Moyles, J. (eds.) Thinking about play: developing a reflective approach. Maidenhead: Open University Press, pp. 81-99.

Williford, A.P., Whittaker, J.E., Vitiello, V.E., and Downer, J.T. (2013) Children's engagement within the preschool classroom and their development of self-regulation', Early Education and Development, 24(2), pp. 162-187.

Wilshire, M. (2012) Understanding the highscope approach: early years education in practice. London: Routledge.

Wolfe, A. (1999) 'The missing pragmatic revival in American social science', in Dickstein, M. (eds.) The revival of pragmatism: new essays on social though, law and culture. Durham, NC: Duke University Press, pp. 119-206.

Wolfe, S. and Flewitt, R. (2010) 'New technologies, new multimodal literacy practices and young children's metacognitive development', Cambridge Journal of Education, 40(4), 387-399.

Wood, A. (2016) Examining levels of involvement in the early years: engaging with *children's possibilitie*s. New York: Routledge.

Wood, D.J. (1998) How children think and learn. 2nd edn. Oxford: Basil Blackwell.

Wood, E. (2010) 'Developing integrated pedagogical approaches to play and learning', in Broadhead, P., Howard, J. and Woods, E. (eds.) Play and learning in the early years: from research to practice. London: Sage, pp. 9-27.

Wood, E. (2013) Play, learning and the early childhood curriculum. 3rd edn. London: Sage.

Wood, E. (2014) ‘Reconceptualising the Play-pedagogy Relationship’, in Sage Handbook of Play and Learning in Early Childhood, (eds.) Brooker, L., Blaise, M. and Edwards, S. London: Sage, 145–156.

Yelland, N. (2005) ‘The future is now: a review of the literature on the use of computers in early childhood education’ Association for the Advancement of Computing in Education (AACE) Journal, 13 (3), pp. 201-232.

Yelland, N. (2007) Shift to the future: rethinking learning with New Technologies in Education. New York: Routledge.

Yelland, N., Neal, G. and Dakich, E. (2008) Rethinking education with ICT: new directions for effective practices. Rotterdam, Netherlands: Senses Publishing.

Yelland, N. (2011) ‘Reconceptualising play and learning in the lives of young children’, Australian Journal of Early Childhood, 36 (2) pp. 4-12.

Yelland, N. (2015) ‘Playful explorations and new technologies’, in Moyles, J. (eds.) The excellence of play. 4th edn. Berkshire, England: Open University Press, pp. 225-236.

Yin, R.K. (2009) Case study research: design and methods.4th edn. Thousand Oaks, California: Sage Publications.

Zevenvergen, R. (2007) ‘Digital natives come to preschool: implications for early childhood practice’, Contemporary issues in early childhood, 8 (1), pp. 19-29.

Zigler, F. E. and Bishop-Josef, S.J. (2006) ‘The cognitive versus the Whole Child: Lessons from 40 Years of Head Start’, in Singer, D., Golninkoff, K. and Hirsh-Pasek, K. (eds.) *Play=Learning: How Play Motivates and Enhances Children’s Cognitive and* Social – Emotional Growth. Oxford: Oxford University Press, pp. 15-35.

Zimmerman, F.J., Christakis, D.A. and Meltzoff, A.N. (2007) ‘Associations between media viewing and language development in children under age 2 years’, The Journal of Paediatrics, 151 (4), pp. 364-368.

APPENDICES

APPENDIX 1: CONSENT LETTER TO PARENTS

Dear Parents,

My name is Aderonke Folorunsho. I am a PhD student at Canterbury Christ Church University. I am writing to ask your permission to allow your child take part in my research. Your child's nursery has kindly agreed to allow me conduct my research in the nursery and now I am asking your permission for your child to take part.

The aim of this research is to explore the impact of iPads on your child's engagement levels. Your child will be observed while using the iPad and different educational apps to learn and play. They will be observed for 20 minutes, three times a week for two and a half months. This will enable me to know to what extent iPads actually engage children in learning and discover if learning is actually taking place while using iPads. The information from the observation schedules will help me learn more about how iPads can be used to engage children in learning activities. There are no known risks associated with the participation in this study and most children enjoy using digital technologies for entertainment and educational purposes.

The iPad will be provided as part of the activities in the classroom and your child is free to choose to play with the iPad or partake in the other activates. If your child chooses to play with the iPad, he or she will play for only twenty minutes and can choose to stop playing at any time before the twenty minutes is over. Your child also has the right to withdraw from the research if they do not want to play with the iPad.

All the information collected will be confidential. Your child's name will not be used on any of the observation schedules used and no information about your child will leave the school premises with a name attached. The observation schedules that will be used to observe your child will be marked with a letter. For example, Child A. The way the information is stored in my computer makes it impossible for individual children to be identified. No information will be made available to anyone else.

If you agree for your child to participate in this research, please return a signed copy of the consent form attached to this letter to your child's teacher.

Thank you for your help.

Aderonke Folorunsho,
PhD Student
Early Childhood Education
Canterbury Christ Church University
North Holmes Road
CT1 1QU

APPENDIX 2: CONSENT FORM

CONSENT FORM

Title of Project: EXPLORING THE USE OF IPADS AND ITS IMPACT ON LEARNING IN YOUNG CHILDREN
Name of Researcher: ADERONKE FOLORUNSHO
Contact details:

Address:	
Tel:	
Email:	

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.	
2. I understand that my child's participation is voluntary and that I am free to withdraw my child at any time, without giving any reason.	
3. I understand that any personal information that I provide to the researchers will be kept strictly confidential	
4. I agree for my child to take part in the above study.	

_____	_____	
Name of Participant	Date	Signature
_____	_____	
Name of Person taking consent (if different from researcher)	Date	Signature
Aderonke Folorunsho	_____	
Researcher	Date	Signature

APPENDIX 3: ETHICS APPROVAL

26th May 2015

Ref EDU/037

Dear Aderonke,

Project title: Exploring the impact of iPads on learning in young children.

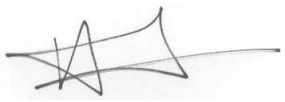
Following The Faculty of Education Research Ethics committee on 19th May 2015, which required you to meet certain conditions before commencing your research, we have now received your amendments and are pleased to grant approval.

I am therefore writing to confirm formally that you can commence your research. Please notify me (or my replacement as Chair of the committee), of any significant change in the question, design or conduct of the study over its course.

This approval is conditional on you informed me once your research has been completed.

With best wishes for a successful project,

Yours sincerely,



Dr Viv Wilson

Acting Chair, Faculty of Education Research Ethics Committee.

Canterbury Christ Church University
North Holmes Road, Canterbury, Kent, CT1 1QU
Landline: +44 (0)1227 782935 Fax +44 (0)1227 451739
www.canterbury.ac.uk

Registered Company No: 4793659
A Company limited by guarantee
Registered Charity No: 1098136

Professor Rama Thirunamachandran
Vice-Chancellor and Principal, Canterbury Christ Church University

APPENDIX 4: LEUVEN SCALE OF ENGAGEMENT

Level	Engagement	Signals
1	Extremely Low	The child shows hardly any activity or motivation to learn; No concentration; Stares into space, daydreaming or looking around to see what others are doing; An absent, passive attitude; Not taking anything in; No mental activity.
2	Low	The child shows some degree of activity which is often interrupted; Frequently interrupted activity; The child will be engaged in the activity for some of the time they are observed, but there will be moments of non-activity when they stare into space; Limited concentration; Is easily distracted
3	Moderate	The child is busy with the activity the whole time but at a fairly routine level and there are few signs of real involvement; The child makes some progress in the activity but does not show much energy and concentration; Can be easily distracted; Routine actions, attention is superficial; Is not absorbed in activity, activities are short lived; Limited motivation; The child does not gain deep-level experiences; Does not use his/her capabilities to full extent; The activity does not address the child's imagination.
4	High	Continuous activity with intense moments; The child has intense moments and at all times they seem involved. They are not easily distracted. The child feels challenged; There is a certain degree of motivation; Shows signs of motivation; The child's capabilities and his/her imagination to a certain extent are addressed in the activity.
5	Extremely High	During the observation of learning the child is engaged in the activity and completely absorbed in it; The child shows continuous and intense activity revealing greatest involvement; The child is concentrated, creative energetic and persistent throughout nearly all observed period; Is highly motivated, feels strongly appealed by the activity; Strong stimuli cannot distract the child; Mental activity and experiences are intense; The child constantly addresses all its capabilities; Imagination and mental capacity are in top gear; Obviously enjoys being engrossed in the activity.

Scotland's National Centre for Languages (SCILT) (2012) The Leuven scale for active engagement in learning by Ferre Laevers.

APPENDIX 5: OBSERVATION CHECKLIST

Name of Child:	**Age of Child:**
Observer:	**Gender:**
Date:	**Subject:**
Adult Led: Yes/No	**Child Initiated: Yes/No**

Observation of Engagement using Leuven Scale of Engagement

Interactions	**Time**	**Extremely Low**	**Low**	**Moderate**	**High**	**Extremely High**
Counting	**10:00**					
	10:02					
	10:04					
	10:08					
	10:10					
	10:12					
	10:14					
	10:16					
	10:18					
	10:20					

Brief description of setting:

APPENDIX 6: LESS-STRUCTURED OBSERVATION

Name of Child:	**Age of Child:**	**Gender:**
Adult/Child Led:	**Subject:**	**Date:**
Time Commenced:	**Time Completed:**	
Aim of Observation:		

APPENDIX 7
ETHICS APPROVAL FOR QUESTIONNAIRES

8 December, 2014 Ref: 14/EDU/CL59
Ms Aderonke Folorunsho

Dear Aderonke,

Confirmation of ethics compliance for your study *"Exploring the use of iPads and their impact on learning and development in young children. (Survey of parents.)"*

I have received a completed Ethics Review Checklist and supporting documents for the proportionate review of the above project. Because you have answered "No" to all of the questions in Section B of the form, no further ethical review will be required under the terms of this University's Research Ethics and Governance Procedures.

In confirming compliance for your study, I must remind you that it is your responsibility to follow, as appropriate, the policies and procedures set out in the Research Governance Handbook (http://www.canterbury.ac.uk/centres/red/ethics-governance/governance-and-ethics.asp) and any relevant academic or professional guidelines. This includes providing, if appropriate, information sheets and consent forms, and ensuring confidentiality in the storage and use of data. Any significant change in the question, design or conduct of the study over its course should be notified to the **Research Office**, and may require a new application for ethics approval. It is a condition of compliance that you **must** inform me once your research has been completed.

Wishing you every success with your research.

Yours sincerely

Roger Bone
Research Governance Manager
Tel: +44 (0)1227 782940 ext 3272 (enter at prompt)
Email: roger.bone@canterbury.ac.uk
cc: Dr Ioanna Palaiologou

North Holmes Road, Canterbury, Kent, CT1 1QU
Landline: +44 (0)1227 782935 Fax +44 (0)1227 451739
www.canterbury.ac.uk

Professor Rama Thirunamachandran
Vice-Chancellor and Principal, Canterbury Christ Church University

APPNEDIX 8: QUESTIONNAIRE SENT TO PARENTS

Digital technologies children are using at home.

Dear Parents,

My name is Aderonke Folorunsho and I am a PhD student at Christ Church University. My research is on iPads and its impact on children's learning and development. This questionnaire is to investigate if young children (especially children under five) are using digital technologies at home, to what extent and for what purposes. I would be grateful if you could spend about 30 minutes to complete this questionnaire and return it to your child's teacher at Canterbury Day Nursery. Thank you.

Q1. My age is

- ☐ 16-20
- ☐ 21-25
- ☐ 26-30
- ☐ 31-35
- ☐ 36-40

Other (please say):

Q2. What is the age and gender of your children?

Gender	Age

Q3. I am:

- ☐ The father
- ☐ The mother
- ☐ If none of the above, please describe your relationships to the child below

Q4. How many of the following do you have in your household:

Items	**1**	**2**	**3**	**More than 3**
Digital tablet (e.g. iPad)				
iPhone/smart phone /mobile phone with				

internet				
Digital TV				
Digital radio				
DVD				
DVD games				
TV set games (play station, wii, xbox, kinnect box etc)				
Desktop computer				
Computer games (ie gameboy etc)				
Laptop computer				
Digital camera				
Digital video camera				
Other digital devices (please describe)				

Q5. Do you have access to internet in your home?

- ☐ Yes
- ☐ No
- ☐ I do not know

Q6. Do you have broadband Wifi access to internet in your home?

- ☐ Yes
- ☐ No
- ☐ I do not know

Q7. Does your child own/have one of the following in his/her personal space (i.e. bedroom)

Items	**1**	**2**	**3**	**More than 3**
Digital tablets (e.g. iPads)				
Digital TV				
Digital radio				
DVD				
DVD games				
Desktop computer				
Computer games				
Laptop				

TV set games (play station, wii, xbox, kinnect box etc)				
Desktop computer				
Computer games (ie gameboy etc)				
Digital video camera				
Other digital devices (please mention)				

Q8. How does your child use the following?

Items	**Alone**	**With adult**	**With sibling/s**	**With a friend**	**Rarely does this**	**Never does this**
Use digital tablets (e.g. ipads, galaxy tablets)						
Play games with iPad/tablet/iPhone/smart phone						
Watch Digital TV						
Listen to Digital radio						
Watch DVD						
Play DVD games						
Desktop computer						
Play Computer games						
Laptop computer						
Play with apps						
Download apps						
Use Digital camera						
Use Digital video camera						
Access the internet						
Use other digital devices (please mention)						

Q9. How much time does your child spend on computer/laptop every day?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q10. How much time does your child spend on ipad/tablets every day?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q11. How much time does your child spend on iphone/smart phone?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q12. How much time does your child spend on the internet?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q13. How much time does your child spend playing ipad/tablets games?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q14. How much time does your child spend playing iphone/smart phone games?

- ☐ Less than 1 hour
- ☐ 1-hour
- ☐ 2 or more hours
- ☐ Never

Q15. Is your child eager to learn for educational purposes with an iPad/tablet?

- ☐ Yes

☐ Sometimes

☐ No

☐ I do not know

Q16. Is your child eager to play educational games with an iPad/tablet?

☐ Yes

☐ Sometimes

☐ No

☐ I do not know

Q17. My child is using one of the following for:

Items	**Homework/educational purposes**				
	Always	**Often**	**Sometimes**	**Rare**	**Never**
Digital TV					
Digital radio					
Watch DVD					
DVD games					
TV set games (play station, wii, xbox, kinect bok etc)					
Desktop computer					
Computer games					
Laptop					
IPad					
Digital tablets					
IPhone					
Smart phone					
Games with iPad/tablet/iPhone/smart phone					
Apps					
Download apps					
Digital camera					
Digital video camera					
Access the internet					
Use other digital devices (please mention)					

Q18. My child is using one of the following for:

Items	**Playing games**				
	Always	**Often**	**Sometimes**	**Rare**	**Never**
Digital TV					
Digital radio					

Watch DVD					
DVD games					
TV set games (play station, wii, xbox, kinect bok etc)					
Desktop computer					
Computer games					
Laptop					
IPad					
Digital tablets					
IPhone					
Smart phone					
Games with iPad/tablet/iPhone/smart phone					
Apps					
Download apps					
Digital camera					
Digital video camera					
Access the internet					
Use other digital devices (please mention)					

Q19. My child is using one of the following for:

Items	**Playing educational games**				
	Always	**Often**	**Sometimes**	**Rare**	**Never**
Digital TV					
Digital radio					
Watch DVD					
DVD games					
TV set games (play station, wii, xbox, kinect bok etc)					
Desktop computer					
Computer games					
Laptop					
IPad					
Digital tablets					
IPhone					
Smart phone					
Games with iPad/tablet/iPhone/smart phone					
Apps					
Download apps					
Digital camera					
Digital video camera					
Access the internet					
Use other digital devices (please mention)					

Q20. My child is using one of the following for:

Items	**Entertainment**				
	Always	**Often**	**Sometimes**	**Rare**	**Never**
Digital TV					
Digital radio					

Watch DVD					
DVD games					
TV set games (play station, wii, xbox, kinect bok etc)					
Desktop computer					
Computer games					
Laptop					
IPad					
Digital tablets					
IPhone					
Smart phone					
Games with iPad/tablet/iPhone/smart phone					
Apps					
Download apps					
Digital camera					
Digital video camera					
Access the internet					
Use other digital devices (please mention)					

Q21. My child is using one of the following for:

Items	**Accessing information**				
	Always	**Often**	**Sometimes**	**Rare**	**Never**
Digital TV					
Digital radio					
Watch DVD					
DVD games					
TV set games (play station, wii, xbox, kinect bok etc)					
Desktop computer					
Computer games					
Laptop					
IPad					
Digital tablets					
IPhone					
Smart phone					
Games with iPad/tablet/iPhone/smart phone					
Apps					
Download apps					
Digital camera					
Digital video camera					
Access the internet					
Use other digital devices (please mention)					

APPENDIX 9: MAJOR CRITERIA FOR CHOOSING DIGITAL ACTIVITIES BY HILLMAN AND MARSHALL (2010)

Domain	Central Question	Criteria Questions
Interactivity	Is the role of the child integral to the activity?	• Does it allow the child to actively participate? • Does it promote critical and creative thinking? • Does it model decision making and positive problem solving?
Digital Literacy	Does it increase the child's familiarity and ability with technology?	• Does it help the child make sense of the world? • Does it teach the child to explore?
Appropriateness	Is it targeted to young children?	• Does it allow the child to experience multiple domains? • Does it contain significant content and outcomes? • Is digital experience challenging but not frustrating? • Does the digital world present a positive virtual universe?
Results	Does it provide knowledge of results a child can understand?	• Is there a clear and understood connection between the child's actions and learning responses and the program (apps)'s results? • Is feedback incorporated regularly to guide the child's performance rather than as a display of success/failure or win/lose decision at the end? • Is the feedback easy to interpret?
Participation	Does the program participation (collaboration) among children, parents, and teachers?	• Are there program components that provide parents, caregivers, and teachers with information on the program's goals, ways to participate, the child's experiences and ways to evaluate the child's experiences? • Is the learning experience enhanced when parents, caregivers or teachers participate with the child?

APPENDIX 10: DIGITAL APPLICATIONS THE CHILDREN ENGAGED WITH DURING DIGITAL ACTIVITIES

1) Peppa Pig Shopping
2) Peppa's Paint Box
3) Max and Ruby
4) Hooked Phonics
5) Edu Kids Room
6) Endless Word Play
7) Endless 123
8) Wild Habitat
9) Animal Puzzle
10) Elmo 123
11) Mini School
12) House Hunt
13) Addition
14) Funbrain Jr.
15) Colour Book
16) Fit Brains
17) Literacy
18) Puzzle 123
19) Endless Reader
20) Lego Game
21) Tiggly Chef
22) Disney Junior
23) Nursery Rhymes
24) Stumpy
25) Leo's Pad
26) Edu Math 1
27) Mr Potato Head
28) Turtle Math
29) Critter Math
30) Road Trip
31) Monsters
32) Monki Birthday Party
33) Bird Collection Puzzle
34) Alphabet Tots
35) Tonia Colour Book
36) Pixie Dust Lite
37) Art Studo
38) The Garden
39) Not Like the Others
40) Play Kids
41) Lumi Kids
42) Disney Digital Books
43) Cardtoons
44) Bugs and Numbers
45) Farm 123

APPENDIX 11: NON-DIGITAL ACTIVITIES

1) Arts and Crafts
2) Tower Building
3) Drawing
4) Trains and Tracks
5) Reading
6) Water Play
7) Sand Play
8) Role Playing
9) Chalk Drawing
10) Painting
11) Slap Jack
12) Card Game/ Tummy Ache
13) Pasta Play
14) Playing with Toys
15) Puzzles
16) Story Time
17) Looking for Ladybirds (Exploratory Play)
18) Counting
19) Construction Play
20) Sculpting
21) Messy Play/ Flour Play
22) Memory Games/ Peppa Pig Tumble and Spin
23) Mud Pie Kitchen
24) Interactive Flash Card

APPENDIX 12: CHILDREN'S PROFILES

CHILD HB'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Painting	4	4	Sand Play	20	5	Construction Play (Sand and Blocks)	10	3
			Phase 2	**Digital**	**Activities**			
Peppa's Paint Box Max and Ruby Hooked Phonics Edu Kids Room	2 6 6 6		Endless Word Play Endless 123 Peppa Pig Shopping	6 4 10		Peppa Pig Shopping	18	
			Phase 3	**Digital**	**Activities**			
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Max and Ruby Tonia Colour book Road Trip Addition Funbrain Jr.	4 2 6 4 4	4	Peppa Pig Shopping Peppa's Paint Box Elmo 123 House Hunt	2 2 2 10	5	Road Trip Peppa Pig Shopping Max and Ruby	8 2 10	4
			Phase 4	**Non-Digital**	**Activities**			
Arts and Crafts	20		Reading	20		Sand Pit	18	
			Phase 5	**Non-Digital**	**Activities**			
Trains and Tower Building	20	3	Flour/Messy Play	14	4	Drawing	20	3
			Phase 6	**Digital**	**Activities**			
Stumpy Disney Digital Books Monsters Lego Game	2 6 4 6		Disney Digital Books Disney Junior Bugs and Numbers	8 2 8		Disney Junior Stumpy Tiggly Chef	2 4 2	

CHILD JB'S PROFILE

Phase 1	**Non-**	**Digital**	**Activities**					
Observation 1			**Observation 2**			**Observation 3**		
Interaction	**Time (Minutes)**	**Level Of Engagement**	**Interaction**	**Time (Minutes)**	**Level Of Engagement**	**Interaction**	**Time (Minutes)**	**Level Of Engagement**
Story Time	10	4	Water Play	20	4	Arts and Crafts	6	3
Phase 2	**Digital**	**Activities**						
Peppa Pig Shopping Wild Habitat	10 10		Peppa's Paint Box	18		Peppa Pig Shopping Wild Habitat Peppa's Paint Box Animal Puzzle Elmo 123 Mini School House Hunt	2 2 2 2 2 4 6	
Phase 3	**Digital**	**Activities**						
Peppa Pig Shopping Wild Habitat	8 8	5	Lego Forest	20	5	Lego Forest	20	5
Phase 4	**Non-**	**Digital**	**Activities**					
Tower Building	10		Drawing	18		Reading	6	
Phase 5	**Non-**	**Digital**	**Activities**					
Reading (Book on Wildlife)	20	4	Messy Play/Flour	20	5	Drawing	20	5
Phase 6	**Digital**	**Activities**						
Critter Math Stumpy	10 10		Critter Math	20		Endless 123 Endless Reader Stumpy Tiggly Chef	6 4 2 8	

CHILD HG'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Looking for Ladybirds(Exploring)	20	5	Role Playing (Making Mud pies)	10	4	Drawing Arts and Crafts	10 4	5
			Phase 2	**Digital**	**Activities**			
Edu Kids Room Peppa's Paint Box Wild Habitat Peppa Pig Shopping Addition	6 4 4 2 4		Edu Kids Room Funbrain Jr. Elmo 123 Peppa's Paint Box	4 2 4 8		EduMath 1 Peppa's Paint Box Colour Book	4 10 6	
			Phase 3	**Digital**	**Activities**			
Elmo 123 Endless Reader Peppa Pig Shopping Endless Wordplay	2 2 2 8	3	Endless Wordplay Pixie Dust Lite Literacy Peppa Pig Shopping Road Trip	4 4 4 2 6	5	Tiggly Chef Disney Junior Art Studio Endless 123 Road Trip The Garden Monsters Animal Puzzle	2 4 2 2 2 2 2 2	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing	16		Slap Jack	20		Drawing	10	
			Phase 5	**Non-Digital**	**Activities**			
Frozen Themed Puzzle	14	4	Drawing	20	5	Drawing	20	5
			Phase 6	**Digital**	**Activities**			
Leo's Pad Disney Digital Books Farm 123 Fun Brain Jr Art Studio	6 2 2 4 4		Edu Math 1 Puzzle 123 Disney Digital Books Fun Brain Jr	2 6 6 6		Critter Math Cardtoons Lego Game	6 4 8	

CHILD R1'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Tower Building Role Playing (with food)	12 8	4	Tower Building Trains and Tracks	8 12	4	Tower Building Puzzles	10 10	4
			Phase 2	**Digital**	**Activities**			
Endless Word Play Fit Brains	8 14		Endless Word Play	20		Literacy Puzzle 123	18	
			Phase 3	**Digital**	**Activities**			
Endless Reader EduKidsroom	12 8	5	Farm 123 Road Trip	8 12	4	Stumpy Tiggly Chef	8 12	5
			Phase 4	**Non-Digital**	**Activities**			
Trains and Tracks Reading	16 4		Reading	20		Tower Building	16	
			Phase 5	**Non-Digital**	**Activities**			
Sculpting	20	5	Drawing	14	4	Sand Play	20	4
			Phase 6	**Digital**	**Activities**			
Endless Reader' Puzzle 123 Addition	14 2 4		Edu Kids Room Endless 123 Critter Math	8 6 6		Alpha Tots Endless Reader	4 12	

CHILD LB'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Playing with Cars Drawing	2 10	3	Sand play	12	4	Sand Play Role Playing (a baby)	4 4	4
			Phase 2	**Digital**	**Activities**			
Puzzles 123 Max and Ruby	10 10		Max and Ruby Peppa Pig Shopping	6 14		Max and Ruby Peppa's Paint Box	4 16	
			Phase 3	**Digital**	**Activities**			
Peppa Pig Shopping Peppa's Paint Box Max and Ruby	8 2 8	5	Peppa Pig Shopping Road Trip	10 10	5	Road Trip Disney Junior Edu Math 1	8 8 4	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing	16		Drawing	20		Drawing Role Playing	4 16	
			Phase 5	**Non-Digital**	**Activities**			
Drawing	20	3	Drawing	12	3	Drawing	6	4
			Phase 6	**Digital**	**Activities**			
Alpha Tots Peppa Pig Shopping Animal Puzzle Disney Junior	4 6 2 4		Disney Digital Books Peppa's Paint Box Disney Digital Books	4 14 2		Stumpy Turtle Math Elmo 123	2 6 2	

CHILD JG'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Counting	6	1	Arts and Crafts(Father's day Card)	6	3	Sand Play Water Play	10 2	4
			Phase 2	**Digital**	**Activities**			
Peppa's Paint Box	14		Max and Ruby	18		Max and Ruby Reading Rainbow Farm 123	2 2 4	
			Phase 3	**Digital**	**Activities**			
Max and Ruby Edukids Room Peppa Pig Shopping Peppa's Paint Box	2 6 8 4	5	Max and Ruby Edukids Room	4 2	4	Disney Junior Art Studio Disney Puzzle Packs	6 2 4	4
			Phase 4	**Non-Digital**	**Activities**			
Reading	6		Drawing	16		Arts and Crafts	6	
			Phase 5	**Non-Digital**	**Activities**			
Messy/Flour Play	12	2	Sculpting	20	5	Drawing	20	5
			Phase 6	**Digital**	**Activities**			
Tiggly Chef Peppa's Paint Box Disney Digital Books Disney Junior Peppa Pig Shopping	6 4 6 2 2		Tiggly Chef Peppa's Paint Box Disney Junior Peppa Pig Shopping Max and Ruby Edu Kids Room Tiggly Chef	2 2 2 2 2 2 2		Tiggly Chef Disney Junior Peppa's Paint Box Stumpy Disney Digital Books Tiggly Chef Edu Math 1 Disney Junior	2 2 2 2 2 2 2 6	

CHILD LG'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Role Playing (with toys) Drawing	10 10	3	Reading	4	2	Tower Building	8	3
			Phase 2	**Digital**	**Activities**			
Endless Numbers Endless Reader	6 10		Peppa Pig Shopping Animal Puzzle Max and Ruby	6 8 6		Peppa's Paint Box Endless Reader Peppa's Pig Shopping	8 6 6	
			Phase 3	**Digital**	**Activities**			
Road Trip Max and Ruby: Water Blast	16 4	4	Road Trip Stumpy	8 12	5	Tiggly Chef Stumpy Peppa Pig Shopping Not like the others Play Kids	6 4 4 4 2	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing	16		Drawing	8		Drawing	14	
			Phase 5	**Non-Digital**	**Activities**			
Sculpting	20	3	Drawing	14	5	Drawing	14	4
			Phase 6	**Digital**	**Activities**			
Endless Wordplay Lego Game Disney Junior Leo's Pad	2 6 4 8		Peppa Pig Shopping Endless Wordplay Leo's Pad Disney Junior Disney Digital Books	2 4 10 2 2		Peppa Pig Shopping Animal Puzzle Max and Ruby	4 8 2	

CHILD IP'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Drawing Tower Building	9 9	5	Tower Building Reading	8 8	4	Drawing	14	5
			Phase 2	**Digital**	**Activities**			
Lego Game Peppa' Paint Box	10 10		Lego Game Peppa's Paint Box	9 9		Peppa's Paint Box	8	
			Phase 3	**Digital**	**Activities**			
Disney Digital Book	20	5	Disney Digital Books	14	5	Peppa Pig Shopping Peppa's Paint Box Disney Digital Books Mini School	8 2 4 6	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing Sand Play	14 6		Drawing Role Playing	14 6		Sand Play	18	
			Phase 5	**Non-Digital**	**Activities**			
Water Play Sand Play	8 10	5	Sand Play Water Play Sand Play	8 6 6	5	Sand Play	20	5
			Phase 6	**Digital**	**Activities**			
Disney Junior Art Studio	10 4		Lego Game Peppa Pig Shopping	10 10		Peppa Pig Shopping Critter Math	10 10	

CHILD LY'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Construction Play (Sand and Bricks)	6	3	Construction Play (Sand and Bricks)	4	2	Arts and Crafts	12	5
			Phase 2	**Digital**	**Activities**			
Peppa's Paint Box Elmo 123	2 2		Peppa's Paint Box Tiggly Chef Disney Junior Peppa Pig Shopping Nursery Rhymes	2 6 2 4 2		Disney Digital Books Peppa Pig Shopping Tiggly Chef Endless Reader Max and Ruby Peppa's Paint Box	2 2 2 2 2 6	
			Phase 3	**Digital**	**Activities**			
Peppa Pig Shopping Pixie Dust Lite Animal Puzzle Peppa Pig Shopping Bird Collection Peppa's Paint Box Tiggly Chef Endless Reader Leo's Pad	2 2 2 2 2 2 2 2 2	3	Peppa Pig Shopping Wild Habitat Leo's Pad Peppa Pig Shopping Lumi Kids Disney Digital Books	2 2 2 2 2 2	3	Disney Digital Books Peppa Pig Shopping Tiggly Chef Endless Reader Peppa's Paint Box	2 2 2 2 2	3
			Phase 4	**Non-Digital**	**Activities**			
Water Play Reading	6 4		Sand Play	16		Pasta Play	16	
			Phase 5	**Non-Digital**	**Activities**			

Drawing	14	1	Mud Pie Kitchen (Looking for bugs)	20	4	Sand Play	20	5
			Phase 6	**Digital**	**Activities**			
Peppa Pig Shopping Pixie Dust Lite Animal Puzzle Peppa Pig Shopping Bird Collection Peppa's Paint Box Tiggly Chef	2 2 2 2 2 2 2		Tiggly Chef Peppa Pig Shopping Endless Reader	2 2 4		Peppa Pig Shopping Nursery Rhymes Peppa Pig Shopping Peppa's Paint Box	4 2 4 4	

CHILD R3'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Role Playing (with toys)	20	2	Tower Building (Blocks) Reading Poems	6 6	3	Arts and Crafts	16	3
			Phase 2	**Digital**	**Activities**			
Stumpy Peppa Pig Shopping	4 16		Stumpy Peppa Pig Shopping Disney Junior	6 6 8		Stumpy Peppa Pig Shopping Disney Junior Max and Ruby Tiggly Chef Stumpy Max and Ruby Peppa's Paint Box Leo's Pad Disney Junior	2 2 2 2 2 2 2 2 2 2	
			Phase 3	**Digital**	**Activities**			
Peppa Pig Shopping Farm 123 Disney Junior Max and Ruby	6 2 6 6	5	Tiggly Chef Disney Junior Peppa Pig Shopping	6 6 8	5	Alphabet Tots Max and Ruby	10 4	5
			Phase 4	**Non-Digital**	**Activities**			
Role Playing	16		Card Game/ Tummy Ache	12		Drawing	20	
			Phase 5	**Non-Digital**	**Activities**			
Memory Game/Peppa Pig	18	4	Memory Game/Things that	6	4	Role Playing (Travel Agent)	20	5

Tumble and Spin			go together					
			Phase 6	**Digital**	**Activities**			
Disney Digital Books Stumpy Peppa Pig Shopping	10 4 6		Tiggly Chef Disney Digital Books Fun Brain Jr Pixie Dust Lite Fun Brain Jr Disney Junior Play	2 4 4 4 2 4		Peppa Pig Shopping Pixie Dust Lite Stumpy Disney Digital Books Elmo 123 Tiggly Chef Fun Brain Jr Peppa Pig Shopping	2 2 2 2 2 2 2 2	

CHILD P'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Sand Play	20	5	Sand Play	20	4	Sand Play	20	4
			Phase 2	**Digital**	**Activities**			
Elmo 123 Edu Math 1 Disney Junior Mr Potato Head	6 6 4 4		Stumpy Puzzle 123 Peppa's Paint Box Leo's Pad	2 12 4 2		Stumpy Turtle Math Peppa's Paint Box Disney Digital Books Edu Kids Room Puzzle 123	4 4 2 2 2 4	
			Phase 3	**Digital**	**Activities**			
Stumpy Animal Puzzle Alphabet Tots	6 6 4	4	Peppa's Paint Box Stumpy Max and Ruby	8 8 4	4	Disney Junior Animal Puzzle Peppa Pig Shopping Peppa's Paint Box Tiggly Chef	4 4 4 2 4	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing	18		Sand Pit Water Play Painting	8 6 8		Painting	20	
			Phase 5	**Non-Digital**	**Activities**			
Arts and Crafts	18	4	Sand Play	20	4	Interactive Flash Cards (Opposite sides)	20	4
			Phase 6	**Digital**	**Activities**			
Tiggly Chef Disney Digital Books Turtle Math Stumpy	4 12 2 2		Tiggly Chef Max and Ruby	4 4		Tiggly Chef Stumpy Peppa's Paint Box Edu Math 1 Elmo 123 Disney Junior Play	2 6 4 2 4 6	

CHILD JN'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level of Engagement	Interaction	Time (Minutes)	Level of Engagement	Interaction	Time (Minutes)	Level of Engagement
Water Play	20	4	Reading	6	2	Role Playing with tools	14	4
			Phase 2	**Digital**	**Activities**			
Critter Math Road Trip Disney Junior Stumpy	2 6 4 8		Monsters Peppa Pig Shopping Nursery Rhymes Puzzle 123 Stumpy	2 4 2 6 4		Nursery Rhymes Stumpy Disney Digital Books Mini School Tiggly Chef	2 8 4 4 2	
			Phase 3	**Digital**	**Activities**			
Nursery Rhymes Peppa Pig Shopping Cardtoons Math Literacy Stumpy	2 4 4 4 2 4	5	Leo's Pad Disney Digital Books	10 6	5	Max and Ruby Stumpy Disney Digital Books Alphabet Tots	2 4 2 12	3
			Phase 4	**Non-Digital**	**Activities**			
Walking around	6		Water Play	20		Pasta Play	20	
			Phase 5	**Non-Digital**	**Activities**			
Memory Game/Peppa Pig Tumble and Spin	12	3	Arts and Crafts	16	5	Tower Building (Blocks)	16	4
			Phase 6	**Digital**	**Activities**			
Nursery Rhymes Peppa Pig Shopping Stumpy Disney Digital Books Endless 123 Endless Reader	2 6 2 4 4 2		Leo's Pad	20		Leo's Pad Disney Digital Books Tiggly Chef Stumpy	4 4 10 2	

CHILD R2'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Drawing	20	4	Reading	16	3	Arts and Crafts Tower Building(Blocks)	10 10	5
			Phase 2	**Digital**	**Activities**			
Monki Birthday Party Nursery Rhymes Bird Collection Puzzle Wild Habitat Disney Junior	2 4 2 6 2		Lego Game Disney Junior Alphabet Tots Tiggly Chef Max and Ruby	2 6 4 2 4		Lego Game Alphabet Tots Disney Junior	2 12 6	
			Phase 3	**Digital**	**Activities**			
Doddle Critter Math Addition Tiggly Chef Nursery Rhymes	8 4 2 4	4	Mini School Critter Math Addition Edu Kids Room	6 2 2 4	4	Endless Word Play Addition Fun brain Junior	8 4 8	5
			Phase 4	**Non-Digital**	**Activities**			
Drawing Painting	2 18		Drawing	20		Drawing	8	
			Phase 5	**Non-Digital**	**Activities**			
Drawing Memory Game/Peppa Pig Tumble and Spin	4 10	4	Arts and Crafts Drawing	6 14	4	Drawing	20	4
			Phase 6	**Digital**	**Activities**			
Leo's Pad Critter Math Bird Collection Monsters	14 2 2 2		Leo's Pad	16		Disney Digital Books Puzzle 123 Endless Wordplay	6 4 10	

CHILD O'S PROFILE

			Phase 1	**Non-Digital**	**Activities**			
Observation 1			Observation 2			Observation 3		
Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement	Interaction	Time (Minutes)	Level Of Engagement
Tower Building	10	4	Tower Building	8	4	Puzzles	10	4
			Phase 2	**Digital**	**Activities**			
Disney Junior Peppa Pig Shopping Monster Endless 123 Edu Kids Room	2 2 2 2 4		Stumpy Disney Junior Peppa's Paint Box Tiggly Chef	8 8 2 2		Peppa's Paint Box Endless Reader Edu Math 1 Disney Books Peppa's Paint Box Monsters Max and Ruby Peppa Pig Shopping	6 2 2 2 2 2 2 2	
			Phase 3	**Digital**	**Activities**			
Disney Junior Play Mickey Mouse Stumpy Disney Junior Play	2 4 2 8	3	Disney Junior Peppa's Paint Box Max and Ruby Disney Digital Books Peppa's Paint Box Stumpy	2 2 2 2 6 4	4	Endless Reader Peppa's Paint Box Endless Wordplay Disney Junior Peppa Pig Shopping	2 2 2 2 6	4
			Phase 4	**Non-Digital**	**Activities**			
Sand Play Chalk Drawing	10 10		Trains and Tracks	20		Playing with toys	8	
			Phase 5	**Non-Digital**	**Activities**			
Memory Game/Peppa Pig Tumble and Spin	12	3	Role Playing (Home Corner) Puzzles	8 12	1	Drawing	20	3

			Phase 6	**Digital**	**Activities**			
Disney Junior Peppa Pig Shopping Disney Junior	4 12 4		EduMath 1 Peppa Pig Shopping Disney Junior Peppa Pig Shopping	2 2 2 2		Disney Junior Tiggly Chef Peppa Paint Box Animal Puzzle Stumpy Endless 123	2 4 2 2 4 6	