UNIVERSITY OF NEW ENGLAND

"*This is pretend. We are just playing*." Exploring young children's imaginative play with, and educators' provision of, digital technologies in play-based settings.

Jo Bird

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Doctor of Philosophy

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Certification of Dissertation

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

[redacted] __20 July 2018______________

Signature of Candidate Date

ENDORSEMENT

[redacted]________________ ___20 July 2018____

Signature of Supervisor/s Date

[redacted]______________ 20 July 2018

Signature of Supervisor/s Date

Abstract

Digital technologies have become commonplace in nearly all areas of the modern life in Western society. Mobile phone users now have the ability to watch movies, surf the internet and perform all the functionalities of a computer on increasingly smaller devices. Children are capable of not only taking photos and movies, but they can successfully upload them to social media. They now have an online presence from a very early age, sometimes even before they are born. What does this mean for early childhood educational settings, where play is valued as the way children learn? Children are arriving at these services with a wide range of prior experiences including more technical knowledge than ever before, and sometimes, more than their educators.

The early childhood field began by debating the appropriateness of using technologies with young children, but current literature has moved on to now focus on exploring their engagement with technologies, and on the positive benefits of building children's knowledge of technologies, prior to formal schooling. What is not clearly defined is how children engage with these devices when they are provided in play-based, learning settings. Educators often struggle to integrate these technologies into their play-based pedagogies, and to support children's meaning making when their play involves these devices. While some targeted professional development for educators aims to build their knowledge around how to provide technologies for young children, these efforts have not been very effective when integrating them into play-based pedagogy. What is needed is greater understanding of how to provide technologies in meaningful ways, and how to implement child-focused pedagogies incorporating technologies that support children's play and learning.

This thesis aims to explore the integration between children's imaginative play with digital technologies, and the influences on educators' provision of these devices in play-based settings. The research was conducted in two kindergarten settings, in suburbs of Melbourne, Australia. The children were aged four to six years and were attending kindergarten in the year prior to school entry. An ethnographic study was conducted over a 12-week period, with data being collected via video recordings, photographs, observations, conversations with children, interviews with educators and a researcher journal. The first contribution to knowledge that this thesis makes is the introduction of the *Imaginative Affordance Framework*, which combines Vygotsky's (1966) concepts of mediation and imagination with Gibson's (1979) concept of affordance. The framework was used to analyse the data

collected and establish the findings related to the children's imaginative play with digital technologies and to understand the educators' provision of these devices.

The findings were presented and discussed as six paradoxes: working technologies versus non-working technologies; solitary individuals working with devices versus groups of children on devices; play-based, child centred programmes versus adult controlled programmes; nature discourse versus technologies as not natural; traditional kindergarten activities versus newer technological activities; and, children learning to navigate the rules pertaining to working technologies versus their desire to play according to their own volition. Based on the findings three recommendations were presented. These related to the children, the educators and the wider community and policy makers.

The second contribution to knowledge filled the gap in current understanding, established in the literature review, around how children engage with digital technologies in their imaginative play, influenced by what and how the devices are provided by their educators. The reasons behind the educators' provision are discussed and their position as neoliberal subjects is recognised and explored. A diagram of provision is presented and suggestions for professional learning to address the intervention points within the diagram are made. The thesis concludes with recommendations of potential research that would further extend the knowledge base of this topic.

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I am thankful for the financial contribution of the Australian Commonwealth Government in funding my research project through an RTP scholarship at both ACU and UNE. Without it I would still be working and attempting to undertake study at the same time.

At the end of the acknowledgments in my Masters thesis, I wrote "to anyone who is reading this as they travel along the thesis path, good luck and enjoy the bumps." My PhD road has been full of bumps and while I can't say I have enjoyed every one of them, I survived and I know I am a stronger person for it.

Table of Contents

Table of Figures

List of Tables

Publications and Presentations

Peer-reviewed articles

Edwards, S., & **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*. doi:10.1177/1476718x15579746

- This article explains how the Digital Play Framework can be used to assess children's digital play and incorporates the understand I gained through my PhD data collection.

Bird, J., & Edwards, S. (2015). Children learning to use technologies through play: A Digital Play Framework. *British Journal of Educational Technology, 46*(6), 1149-1160. doi:10.1111/bjet.12191

- In this article, we develop the Digital Play Framework building on my Masters experiences and reinforced through the understanding I gained through my PhD data collection.

Bird, J., Colliver, Y., & Edwards, S. (2014). The camera is not a methodology: towards a framework for understanding young children's use of video cameras. *Early Child Development and Care, 184*(11-12), 1741-1756. doi:10.1080/03004430.2013.878711

- The experiences from my Masters study were combined with my colleagues to build understanding around how children learn to use technologies through play. These experiences informed my PhD research.

Thesis

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.

- The future research idea presented in my Masters thesis informed the direction for this thesis.

Book Chapters

Scott, F. & **Bird, J.** (2018 (In press)). Adults researching pre-schoolers in more-than-human contexts. Rethinking ethnographer roles in the age of the Anthropocene. In V. Reyes, J. Charteris, A. Nye and S. Mavropoulou (Eds.), *Educational Research in the Age of Anthropocene.* Hershey, PA: IGI Global

- Based on my role my PhD during data collection, this book chapter analyses my changing role through this process.

Bird, J. (2018 (In press)). How children engage with provided technologies in early childhood settings. Perth, Australia: Digitising Early Childhood.

- This book chapter is based on the findings related to how the children engaged with the working and non-working technologies during my PhD data collection.

Bird, J. (2018 (in press)). Perceiving affordance with working technologies in early childhood settings. In A. Jones (Ed.), *Encyclopedia of Education and Information Systems*. New York, NY: Springer.

- This book chapter is based on the findings related to how the children engaged with the working technologies during my PhD data collection.

Bird, J. (2017). Children's Responses to Working and Non-Working Technologies. In L. Arnott (Ed.), *Digital Technologies and Learning in the Early Years* (pp. 101-113). London, England: SAGE Publications.

- This book chapter is based on the findings related to how the children engaged with the working and non-working technologies during my PhD data collection.

Practitioner articles (non peer-reviewed)

Bird, J. (2015). When technology dominates. *Teacher Learning Network Journal*, 22(1), 25-26.

- This article presents my knowledge, gained from both my Masters and early PhD data collection, to educators working directly with children.

Edwards, S., & **Bird, J.** (2014). The Digital Play Framework: Helping Early Childhood Educators Integrate Technologies with Play-Based Learning. *The Journal of Digital Learning and Teaching Victoria*, 1(2), 54-56. Retrieved from https://dltv.vic.edu.au/publications/journals/journal-11

- This article presents my knowledge, gained from both my Masters and early PhD data collection, to educators working directly with children.

Bird, J. (2013). A world of digital possibilities. *Every Child*, 19(4), 14-15.

- This article presents my knowledge, gained from both my Masters and early PhD data collection, to educators working directly with children.

Presentations

Bird, J (2018, February 16th) *Combining theoretical concepts to explore technological agency in early childhood.* Paper presented at the Australian Journal of Early Childhood (AJEC) Symposium. Brisbane, Australia: Early Childhood Australia.

- In this presentation, I discussed my conceptual model outlined and used within my PhD to analyse and discuss my findings.

Bird, J. & Rogers, M. (2017, November 28). *Exploring educators' perceptions and future visions of technologies in early childhood settings.* Paper presented at the Australian Association for Research in Education Conference (AARE). Canberra, Australia: AARE.

- This presentation combined findings from a recent survey of educators with data gathered during my PhD to present educators' perceptions of technologies in early childhood settings.

Bird, J. (2017, November 27). *Do Vygotskian concepts explain children's play with technologies?* Paper presented at the Australian Association for Research in Education Conference (AARE). Canberra, Australia: AARE.

- In this presentation, I explored my PhD findings in relation to Vygotskian theories.

Bird, J (2017, September 14) *Considering how children engage with provided technologies in early childhood settings.* Paper presented at the Digitising Early Childhood Conference. Perth, Australia: Edith Cowen University.

- This presentation was based on the findings related to how the children engaged with the working and non-working technologies during my PhD data collection.

Bird, J. (2016, December 1). *"This is pretend."* Paper presented at the Australian Association for Research in Education Conference (AARE). Melbourne, Australia: AARE.

- The presentation discussed my initial PhD findings and considered the implications of these findings.

Bird, J. & Scott, F. (2016, December 1). *Messy roles and fluid identities: reflections on the experiences of ethnographic children's researchers.* Paper presented at the Australian Association for Research in Education Conference (AARE). Melbourne, Australia: AARE.

- Based on my role my PhD during data collection, this book chapter analyses my changing role through this process.

Bird, J. (2016, November 2nd). *"This is pretend. We are just playing": Exploring children's use of working and non-working technologies in imaginative play and the educators' provision of these devices in early childhood settings.* Paper presented at the University of New England (UNE), School of Education (SoE) Seminar Series. Armidale, Australia: UNE SoE.

- In this presentation, I outlined the findings, discussion and implications from my PhD research.

Bird, J. (2015, December 1st). *Children's play on working and non-working technologies: Perceptions of technological affordance in kindergartens*. Paper presented at the Australian Association for Research in Education Conference (AARE). Fremantle, Australia: AARE.

- This session presented the findings from my PhD research.

Bird, J. (2015, July 24th). *Technological play is real play. Recognising traditional concepts of play in children's activities*. Paper presented at the Digital Learning and Teaching Victoria (DLTV) Conference. Melbourne, Australia: DLTV.

- This presentation outlined tradition concepts of play within my PhD data.

Bird, J. (2015, July 24th). *Spark Talk: Children's play and learning in early childhood*. Paper presented at the Digital Learning and Teaching Victoria (DLTV) Conference. Melbourne, Australia: DLTV.

- This presentation outlined children's play and learning within my PhD data.

One: Introduction

1.1 Introduction

This thesis considers young children's use of working and non-working technologies in their imaginative play and the influences on the early childhood educators' provision of these technologies[1] in play-based learning settings. As a context, it seems that the integration of technologies into children's play-based learning is rather haphazard, with settings not maintaining pace with the play and learning in which children engage in during their lives outside their homes. Current curriculum documents do not help educators support children's technological engagement, as they present technologies separately to children's play and not in ways that support learning. As Australia continues to have a major technological focus, research is needed to meaningfully understand how young children engage with digital tools and how to enable educators to provide these devices in ways that support children's play and learning.

This chapter introduces the research study including the journey that led me to consider this topic. It outlines the research questions, the aim of the study, defines terms used throughout and introduces the current state of technologies within the early childhood education field. The contribution of new knowledge that this research study makes is stated and there is a brief overview of each chapter within the thesis.

1.2 Personal orientation to this research

The journey that led me to explore children's use of digital technologies in their imaginative play began when I was teaching in a multicultural, low socioeconomic area of Melbourne, Victoria, Australia. I had embraced digital technologies in my teaching as a way to reduce my workload of paper-based administration and planning and to capture and document the children's learning. When our office computer was upgraded, I moved the old one into the children's playroom. I added a few 'educational' games and the children used it during the 'free play' times during each session. I did not extend the children's learning nor encourage their imaginative play around the computer. I just provided it and thought that was sufficient. This all changed one day when four-year-old Mark showed me what was possible. While playing *Tux Paint* (New Breed Software, 2002, p. 7) a free drawing

[1] The terms technologies, digital technologies and digital tools have been used interchangeably throughout this thesis.

program, Mark had made a picture with rabbits, grass, the sky, sun and fences. He changed the curser into an eraser and started rubbing out the grass. Observing him, I asked what he was doing. He looked at me with a 'really, you have no idea?' look on his face and said, "The rabbit is eating the grass!" (Bird, 2011, p. 1). He had constructed an imaginative play scenario on the computer screen, just as he would with plastic rabbits and fake grass. At the time, I did not comprehend the significance of our discussion or 'the turn' my teaching and career would take.

The interaction with Mark led me to consider further study. My first research in the area of digital technologies with young children involved the kindergarten class where I was the teacher. Working with four and five-year-olds, my aim was to explore the children's activities and forms of engagement on digital devices in a kindergarten context (Bird, 2012). During the project, I provided iPads, digital still and video cameras, and a computer. The data was collected by both the children and the educators and included: the video footage children created, video footage of the children using the devices, photographs, plus educator observations. My research contradicted the myth of the digital native (Prensky, 2001), as the children in my study needed to be shown how to use the iPad, even though many were experienced in using their parents' iPhones. I needed to scaffold the children's use of the video camera: how to make it start and stop videoing, and how to zoom in and out. They also needed time to practice these skills before becoming quite competent and confident. My research also revealed four important findings. These were: 1) digital devices are supportive cultural tools for fostering social interactions; 2) time is needed to explore the technology before being able to competently use it; 3) digital devices assist children to move from the leading activity of experimenting to play; and 4) children shift from recording artefacts to recording imaginative episodes (Bird, 2012). Based on the findings, I developed four implications for practice that could assist other educators in their provision of technologies in early childhood education curricula. These were: 1) to encourage educators to provide children with the time and knowledge to appropriately use information and communication technologies (ICT) and to extend their learning; 2) to support educators to plan, provide for and encourage social interactions between children while using digital technologies; 3) to encourage educators to help children develop skills as mentors for each other during their ICT use; and 4) to support and encourage educators to consider and provide apps (applications on an iPad) that encourage young children's imaginative play.

In the conclusion of my Masters, I outlined possible future research in the same area. One of the proposed projects included the idea of exploring "children's learning through play with digital technologies in early childhood settings" (Bird, 2012, p. 94). The study presented here aimed to meet the proposed outcome that I identified during my Masters research.

1.3 Research aim and questions

The aim of this thesis is to explore children's imaginative play with both working and non-working technologies and the influences of early childhood educators' provision of these technologies in play-based learning settings. Currently, there is little research into children's imaginative play with both working and non-working technologies. This is an educational problem and pedagogical challenge creating curricula dilemmas for educators, because many educators across the early childhood field do not fully understand children's play with working and non-working technologies. Therefore, it is difficult to support early childhood educators in their provision of digital technologies in ways that encourage children's imaginative play with these devices. Traditionally, early childhood education has valued play as the way children learn and supported children's play-based learning (Brooker, 2011; Lillemyr, Dockett, & Perry, 2013; Wood, 2013; Yelland, 2011), and such digital tools have been regarded as outside these values. This educational problem raised two research questions:

1) What characterises children's imaginative play with working and non-working technologies?
2) What influences early childhood educators' provision of working and non-working technologies in play-based learning settings?

In this study, I will explore children's imaginative play with working and non-working technologies using a cultural-historical theoretical framework. Vygotsky's (1978) cultural-historical theory argues children's learning occurs in their social context and through their interactions with those who are more knowledgeable. These interactions include those with cultural tools and this theory fits well with my proposed aim and research questions.

1.4 The current state of play regarding children's imaginative use of technologies in early childhood educational settings

The issues raised from the research aim and questions are significant because digital technologies are prevalent in today's society and are also becoming more common in early childhood settings. This research study is based in Australia and within two early childhood settings that provide technologies for children's use. I acknowledge that this isn't the case for all communities, where different levels of access and priority are placed on these devices. The early childhood education field has moved on from the appropriateness debate (Zevenbergen, 2007) where authors presented the negative effects of digital technologies on young children and their play (Rich, 2014; Smirnova, 2011). In this appropriateness debate researchers argued that digital technology did not enhance young children's play. However, these presented negative effects of technologies on children's play have not deterred the infiltration of these devices into early childhood settings or the reporting of positive outcomes for children's learning and development (Alper, 2011; Cicconi, 2014; Neumann, 2014; Price, Jewitt, & Crescenzi, 2015).

The recognition of the value of digital technologies in early childhood has resulted in several international curriculum documents encouraging educators to provide technologies in ways that support children's learning, with no mention of play (Department for Education, 2012; Department of Education Employment and Workplace Relations (DEEWR), 2009; Skolverket: Swedish National Agency for Education, 2010). This recognition and encouragement seems impractical when there is no clear understanding as to how children use them, thus supporting my educational concern. These documents do not add to the understanding of how children use digital tools (Edwards, 2013), and alone, they neither support educators in their work with children nor support educators to extend children's play and learning. Instead, they include statements akin to: "technologies can enable children to access global connections and resources, and encourage new ways of thinking" (DEEWR, p. 16); children "represent their own ideas, thoughts and feelings through design and technology" (Department for Education, 2012, p. 9); and, children "develop their ability to identify technology in everyday life, and explore how simple technology works" (Skolverket: Swedish National Agency for Education, 2010, p. 10). Another issue raised about these curriculum documents is their lack of links between technologies and play. If play is valued as the main way children learn in early childhood, surely curriculum documents would support children's play with technologies and provide guidelines for educators to effectively incorporate them? Unfortunately, this is not the case.

Some research into children's use of digital technology within early childhood education settings has often blamed the educators, stating that they do not understand children's play and therefore need more professional development on approaches to provide digital technologies and in appropriate ways to enhance children's learning (Aubrey & Dahl, 2014; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). Authors including Nuttall, Edwards, Mantilla, Grieshaber, and Wood (2015); Yelland (2011); Marsh (2014b); and Stephen and Plowman (2014) have disagreed and called for research that explores children's active engagement with digital technologies with the aim of defining meaningful digital play. Once digital play is defined and better understood, researchers can assist with supporting educators by providing relevant ways that children's technological learning can be facilitated. This thesis will address these issues through providing more understanding about how children engage with technologies in play-based learning environments and ways in which educators can support their play.

1.5 Defining terms

Throughout this thesis I use a variety of terms that need defining upfront. The definition of digital technologies within literature is quite diverse, similar to the range of what is provided and used within various early childhood settings. Through her research, Bolstad (2004) listed a range of technologies that were being used within early childhood classrooms more than a decade ago, including:

> computers (including desktop, laptop, and handheld computers); digital cameras and digital video cameras; creativity and communication software and tools; the Internet; telephones, fax machines, mobile telephones, tape recorders; interactive stories, simulated environments, and computer games; programmable toys and "control" technologies; videoconferencing technologies and closed-circuit television; data projectors, electronic whiteboards, and more. (p. 2)

Her list was published before compact disc players were popular and before iPads and tablets were considered. Rapid technological advancements result in new and improved products frequently emerging. Keeping up with these advancements can be a challenge for some educators. However, there is also the positive benefit of a reduction in prices due to the release of more up-to-date and sophisticated hardware and software. While the list of available technologies is quite large, the list of provided technologies discussed in this thesis was determined from what was presented in the two research settings. The available technologies will be discussed in Technology Audit section (p.108).

In this study, two focal terms for digital tools have been used throughout – working and non-working technologies. *Working technologies* are those technologies that have a digital element, which require batteries or a power source in order to function. These include, but are not limited to: computers, iPads and tablets, digital still and video cameras, digital photo frames and phones. In 2006, Plowman and Stephen (2006) encouraged early childhood practitioners to expand their definition of 'information and communicative technologies' (ICT) "to include digital still and video cameras, mobile phones, electronic keyboards" (p. 3), rather than referring to ICT just as computers. In a more recent definition, Arnott (2013) considers working technologies to be "everyday electronic objects and toys that generate a response when stimulated by the child" (p. 99). While Arnott's description refers to working toys that will respond to the children's input, in this thesis I categorise toys as non-working technologies.

Non-working technologies are those technologies that are no longer working, broken or decommissioned. These include, but are not limited to: non-functional mobile phones, corded and cordless telephones, digital still and video cameras, analogue still and video cameras, keyboards and computer mice and manual typewriters. They also included toy versions of technologies that imitate the full-sized, adult versions used in community contexts. These are often marketed specifically to children, made from bright colours and usually plastic; examples include telephones and mobiles, cash registers and cameras. Within the literature around technologies, Arnott (2013) states finding one clear definition can be difficult. To exemplify the difficulties in establishing boundaries between working and non-working technologies she described a toy microwave, which would light up and make noise when buttons were pressed. A similar example in this study was a doll's house with an electronic doorbell, which, when pressed, would sound a chime. For this study, I have included these items in the non-working category.

Throughout this thesis I will refer particularly to iPads, acknowledging that they are one type of computer tablet and not the only one. iPads were used in this study by both research educators and in no way am I making generalisations about other tablet technologies or how they can or cannot perform. Thus, when I refer to iPads, I am not generalising to all tablets, as this study did not look at the other devices. I also refer to ‘apps’, the computer programs or applications loaded on an iPad that are especially designed for mobile technology. Another distinction I made was between ‘program’ and ‘programme’. A ‘program’ is a piece of computer software and ‘programme’ refers to the experiences for play and learning an educator plans and implements in an early childhood setting.

My academic career has taken me away from my home city and state. This shift has also expanded my thinking and reinforced to me the different terms used for early childhood services, in particular the use of kindergarten and preschool. In this study, the research sites were kindergartens located in Melbourne, Victoria. Children attending were four to six years old in the year before formal schooling.

Another distinction in terms that must be outlined upfront is the use of ‘educator’. Kindergarten settings in Melbourne, Victoria, are staffed by both a degree-qualified teacher and an assistant. I refer to both as educators. Throughout this thesis I refer to each individual educator by name and in the first instance I will clarify their role. When referring to both the degree-qualified teacher and the assistant at a particular centre, I will refer to them as ‘the educators’. When I am generally discussing degree-qualified educators, I will indicate to whom I am specifically referring to, for example qualified educators. Similarly, when I refer to assistants generally, I will indicate as such.

1.6 New contribution to knowledge made by this thesis

This is the first study of its kind that looks at the intersection of children’s imaginative play with working and non-working technologies and the influences on early childhood educators’ provision of these technologies on children’s play-based learning. This thesis provides the field with insights around the children’s imaginative play with working and non-working technologies through detailing their responses to what was provided in their kindergartens by their educators. This thesis also explores why the educators provided the technologies in the ways that they did and details the influences on their provision of these devices for children’s imaginative play. The topic is significant because it adds to the knowledge base around children’s imaginative play with technologies. This new contribution to knowledge will assist educators to better and more fully understand how children engage in imaginative play with the devices that they provide. In understanding the resources that children can use, represent and create what they require for their imaginative play, educators can support and extend the children's learning around technologies. I also suggest ways that technologies may be used to teach children to be ethical digital citizens and prepare them for their future.

Another contribution to knowledge this thesis makes is the *Imaginative Affordance Framework*. It is the first time that the Vygotskian (1966) concepts of mediation and imagination (2004) have been combined with J. J. Gibson's (1979) concept of affordance to form one framework with an associated model to be used for illustration purposes. This combination of theories can be used as an analytical tool to explore children's technology engagement, as well the educators' provision of devices. The framework also has potential for exploring other areas of early childhood activity such as imaginative play experiences, art experiences, outdoor environments or group time activities.

1.7 Chapter outlines

In the first chapter, the *Introduction,* I introduced the problem of understanding children's imaginative play with working and non-working technologies. To date, there has not been enough research that specifically investigates children's imaginative play with working and non-working technologies in early childhood educational settings. This situation creates a pedagogical challenge when educators are expected to provide these technologies in their settings. As an educator myself, I was and continue to be, interested in providing digital technologies for children's imaginative play. Therefore, to explore children's imaginative play with working and non-working technologies and to investigate how educators can support this, is a topic that will inform the field and one that also benefits my interests. My previous Masters research that explored a similar topic was briefly discussed in this chapter. I outlined the research aim and questions, stated my contribution to knowledge produced in this thesis and I now give a brief introduction to each chapter.

The second chapter, the *Literature Review* [see p.12], explored how children's imaginative play with working and non-working technologies is presented in current literature. There is a paucity of attention in research literature that relates to children's use of non-working technologies and when it is there, only one line is included. Often children's use of working technologies is presented but not in relation to imaginative play. This lack of research-based evidence makes it difficult for educators to integrate these technologies in their programme in ways that support imaginative play. This research study is valuable, in that it specifically explores the intersection between children's imaginative play with working and non-working technologies, and the influences on educators' provision of these technologies.

In chapter two, the literature around professional learning for educators in relation to integrating technologies in their programmes was discussed and a concern was raised about what educators say they believe not always marrying with their practice (Mama & Hennessy, 2013; Phillips, 2015). Also explored within this literature section was the concept that play-based learning is the basis for early childhood educational programmes throughout Australia, juxtaposed with the EYLF presenting intentional teaching as a requirement for early childhood educators. I explored the barriers to provision and look to the primary and secondary school sectors for ideas. More specifically, I explored what influence these barriers have on children's imaginative play with digital technologies. I then presented an explanation of how various authors are tackling the issue of defining how children engage with digital technologies, before acknowledging the gap in the literature that this thesis addresses.

The third chapter is the *Theoretical frame* [see p.38] which outlines the theoretical basis and background for this study. The overarching framework was cultural-historical theory, and as this study answers two research questions, the first being related to children and the second to educators, it required two theoretical lenses. In chapter three, I explained how I combined concepts from Vygotsky and J. J. Gibson to create a new framework. In particular, I detailed the amalgamation of Vygotsky's concepts of mediation (1978), the four ways of imagination (Vygotsky, 2004), and J. J. Gibson's (1979) concept of affordance. Leveraging Gibson's work involved looking at both affordances and constraints within the environment, as well as the effects of stimulus information and technological affordances. I combined these concepts to create a conceptual framework that was useful for exploring and analysing the research data. The Imaginative Affordance Framework was used to structure a discussion of findings. This was the first time Vygotsky and Gibson's concepts have been illustrated together and this forms another contribution to knowledge made by this thesis.

In the fourth chapter, *Methodology* [see p.87], I explained my own ontological, epistemological and axiological positions and justified each in relation to the research study. I then described and justified the methodological choices, including the use of qualitative research and ethnography. This research was conducted as an ethnographic study, where I remained at each kindergarten for 12 weeks. The two research sites were kindergartens in Melbourne, Victoria, Australia. The data was collected via video footage, photographs, observations, conversations with the children, interviews with the educators and my researcher journal. The data was then analysed using the Imaginative Affordance Framework. Ethics clearance was granted by both the Australian Catholic University (ACU) [see Appendix 1 Australian Catholic University Ethics Approval, p.228] and the Victorian Department of Education, Employment and Early Childhood Development (DEECD) [see Appendix 2 DEECD Ethics Approval, p.229]. Educator [see Appendix 4 Educator Participant Information Letter and Consent Form, p.231] and parental consent [see Appendix 5 Parent Information for Participants and Consent Form, p.234] was sought. I gave careful consideration to how I researched with children and the process by which children gave their assent to participate in the research [see Appendix 6 Children's Assent Form, p.238]. The children completed a daily assent form before the research was carried out each day [see Appendix 7 Children's Daily Assent Form, p.239].

The fifth chapter, the *Results* [see, p.139], presented the findings as paradoxes between two elements witnessed in the two research kindergartens. The paradoxes illustrate how the technologies were positioned differently to other experiences within the kindergartens. The data was used to illustrate the findings and each was discussed in turn. To conclude the chapter, I discussed the term *non-working technologies* and consider a more appropriate term given what I've learnt throughout this research study. I change to *imaginative technologies* and then use this term for the rest of the thesis.

In the sixth chapter, the *Discussion* [see p.167], I discussed what these paradoxes mean for the early childhood field. I highlighted the influences on educators' work and how these influences shape technology provision, and the value placed on these devices. I made suggestions for curriculum documents and proposed points of intervention that educators can use to support children's play with technologies in ways that will encourage learning. These points of intervention and are then linked to ideas for professional development that could assist educators in their integration of technologies into their play-based learning settings. Thus, I provided a significant contribution to knowledge, that could potentially influence educators' everyday practices and result in early childhood programmes that are reflective of children's interests.

In the seventh and final chapter, the *Conclusion: issues, approach and future ideas* [see p.190], I revisit my research aim which was to explore children's imaginative play with both working and non-working technologies and investigate the influences on early childhood educators' provision of these technologies in play-based learning settings. I briefly recap the findings related to the paradoxes presented and redescribe the conclusions drawn in the discussion chapter. From this synthesised discussion, I present my contributions to early childhood technological curricula and pedagogical knowledge, as well as outline further worthy research required in this area.

1.8 Conclusion

This introductory chapter set the scene for the thesis by introducing what led me to undertake this research study. I detailed the research aim and research questions with an explanation of the current position of children's use of digital technologies in their imaginative play. I then defined the terms used throughout this thesis in the context of this study, outlined the significant contribution to knowledge that thesis makes, and signalled the outline of each chapter. The next chapter, the *Literature Review*, provides an exploration of historic and contemporary literature related to both children's use of technologies in their imaginary play, and the roles of educators in the provision of these devices.

Two: Literature Review

2.1 Introduction

Technologies have made dramatic changes to life in Western society (Arnott, 2017) from their influence on televisions, washing machines to retail services and traffic lights. Not a day goes by where we do not interact with a form of technology or an item controlled by technology and it is now impossible to avoid them. Along with these changes comes the need for literacy skills so that children not only understand these devices, but interact with them in a way that supports children to thrive in this progressive society. The necessary skills for the 21st century learner are different to those of previous generations, requiring new pedagogies and educational outcomes to prepare children for the future as learners and workers (World Economic Forum, 2018). However I claim children also need skills beyond neoliberal ideals of the future employment proficiences to function in a technology driven world. This review follows two threads – the children's use and experiences with technologies and the educators' experiences and provision. It then explores how digital technologies are researched and presented, with a clear focus on the experiences of young children and within early childhood settings. Working and non-working technologies are explored with differences in the ways that these devices are presented in the literature. Next, I move to the educators and the influences on their provision of technologies and the potential reasons for their beliefs and pedagogies that are presented in the literature. I look to primary and secondary schools to investigate if the experiences in these settings can provide insights relevant to the early childhood field. Through this review I then outline the gap in current research that the early childhood field has and one that this thesis aims to address.

2.2 Digital technologies

Digital technologies have become prevalent in many Western, privileged countries. While not universal across the world, the context of this study situates technologies as provided, common and increasingly available. This thesis refers to the context in which it is situated and I acknowledge the privilege that exists and that the assumptions around the prevalence of technologies cannot be generalised to all communities internationally. In the Australian context, the increase in digital technologies and the fast moving developments in this area, "create a new landscape of knowledge, learning and growing up for young children"

(Arnott, 2017, p. 7). The resulting changes influence the way individuals interact, conduct business and how children are taught as school. In “affluent societies,” technologies are part of children’s daily lives and research illustrates how these devices can support children’s learning (Palaiologou, 2016, p. 1; Yelland & Gilbert, 2016b; Yelland & Kilderry, 2010), with some more cautious accounts of their benefits (Falloon, 2013).

The introduction of the World Wide Web has seen the focus of literacy shift from text based to one that favours “multiple forms of intelligence – abstract, textual, visual, musical, social and kinaesthetic” and allows children to practice their preferred way of learning (J. S. Brown, 2000). Being ‘multiliterate’ (The New London Group, 1996) requires children to be navigators of not only text and images, but to have the ability to navigate the information present to them via the web, media and through their interactions in society (J. S. Brown, 2000). Recent studies into digital literacy explore the concept and related pedagogies. Marsh (2016) states digital literacy includes “the acquisition of skills, including traditional skills related to alphabetic print, but also skills related to accessing and using digital technologies” (p. 199). It has also become “difficult for research to keep pace with technological change” (Buckingham, 2013, p. 15) but research is needed to inform educational practices now and into the future.

2.3 Digital technologies in children’s lives

As the children attend Western, early childhood settings, they arrive with “funds of knowledge” (Llopart & Esteban-Guitart, 2018; Moll, Amanti, Neff, & Gonzalez, 1992, p. 133) from copious experiences, many involving technologies. The notion of *funds of knowledge* refers to the “historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning” (Moll et al., 1992, p. 133). The children of today interact with digital devices daily and in most cases without formal instruction (Nikolopoulou & Gialamas, 2015; Zevenbergen, 2007). These children only know cameras and video recorders, and do not define them as digital like their parents and many educators (Arnott, 2013). They have not known a time without television, DVD players or computers and the handheld devices they experience now easily outpace those of previous generations, not only in capability but also in size (Selwyn & Facer, 2010). The digital boom that commenced last century continues to rapidly advance (Romeo, 2015) and the effects of these dramatic and fast-paced changes are still being investigated and understood.

As children's experiences with technologies continue to progress and the functionality of these devices continue to advance, children's skills and creativity will also progress, influencing what they are capable of (Nikolopoulou & Gialamas, 2015). Therefore, the challenge for parents and educators is to both understand what children are currently doing and find ways to support their learning to more fully equip them for success in a digital society (Palaiologou, 2016; Plowman, Stephen, & McPake, 2010b). Not every child will be mesmerised by technologies, just as not every adult will struggle to learn and master[2] technological devices (Buckingham, 2013), individual preferences and interests will continue to influence children's daily lives. Regardless, technologies have made an impact on the tools available now and how educators can use these tools for the benefit of the children being taught.

As technologies become more common within Western societies, they are also ubiquitous within early childhood settings (Fenty & Anderson, 2014). This being the case, concern has been expressed about the effects of exposure to technologies in young lives (See for example, Cordes & Miller, 2000; Rich, 2014; Smirnova, 2011) and the role technologies will have in shaping children's learning and development (House, 2012). The body of literature exploring children's use of digital technologies is growing, with the focus shifting from the appropriateness debate to the possibilities for children's learning, in recent years (Zevenbergen, 2007). Earlier this century, much of the literature debated the appropriateness of technologies with young children, with concerns around children's physical, social and emotional health (Cordes & Miller, 2000; Sigman, 2011), the reduction in children's play abilities (Smirnova, 2011), and the increase of technologies resulting in a decrease of children's physical activity resulting in a rise of obesity levels (Cox, Skouteris, Dell'Aquila, Hardy, & Rutherford, 2013). Now research takes a different perspective and aims to understand children's use of technologies in their early years (Edwards, 2013; Espinosa, Laffey, Whittaker, & Sheng, 2006; Murray & Olcese, 2011). The focus is now on research that explores children's digital play (Edwards, Nuttall, Mantilla, Wood, & Grieshaber, 2015; Marsh, Plowman, Yamada-Rice, Bishop, & Scott, 2016), through:

[2] The term 'master' is used in translations of Vygotsky's work. He wrote in a time where gendered language was unchallenged. I note that the term may create tension for some readers but this is not my intention.

- exploring how educators in early childhood settings develop children's multimodal learning (Stagg Peterson, Rajendram, & Eisazadeh, 2017; Yelland & Gilbert, 2016b; Yelland & Kilderry, 2010);
- navigating digital literacies or the ability to understand digital content (Scott & Marsh, 2018; Slavin & Chambers, 2016);
- increasing social interactions (Arnott, 2018; Lawrence, 2018)
- using technologies to increase children's language learning (McPake & Stephen, 2016; Price et al., 2015);
- increasing their knowledge of mathematics and science concepts (Furman, De Angelis, Dominguez Prost, & Taylor, 2018); and,
- supporting their meaning making (Goncu & Gaskins, 2012).

This shift in perception results in new understandings around children's use of digital technologies that no longer separate their experiences into a dichotomy of the real or the virtual (Marsh, 2010; Plowman, McPake, & Stephen, 2012). Marsh (2010) advocates for viewing their "experiences on a continuum in which children's online and offline experiences merge" (p. 25). Examples from current literature include: O'Mara and Laidlow's (2011) description of a brother and sister who play tea parties using an iPad app, along with their real teddies and real tea set; and, Plowman, McPake and Stephen's (2010) example of a boy who prints out *Lord of the Rings* characters to increase the number of figures he can use in his pretend play. These examples illustrate children's ability to move seamlessly across the real – virtual continuum and to create the items that they need for their play which are based on their digital experiences. This is no different to the children of the 1960s who created play scenarios based on the television show *Davy Crocket* or the more recent play around the Disney movie *Frozen* (Marsh, 2014a). Children will play out the themes that interest them and often these are taken from their exposure to technologies and media (Arthur, Beecher, Death, Dockett, & Farmer, 2017).

2.3.1 Children re-enacting social practices

Children's use of technologies can be viewed as an apprenticeship into the practices of their cultural context (Rogoff, 1990). Children witness social practices in their everyday lives that involve technologies and they mediate these devices to build their repertoire of the observed social practices (Holzman, 2006). In their research, Plowman and colleagues (2010a) found technological experiences were one of the many activities in which children engaged in every day. This idea was echoed in my Masters research when the children were outside playing and the technologies were inside, abandoned on tables (Bird, 2012). The technologies were not constantly played with, instead they were just like the other activities in the kindergarten - sometimes popular and sometimes not, just another area of interest (Alper, 2011). These findings raised the following questions. Is the children's interest in technologies a reflection of the value adults unconsciously place on the same devices? To what extent do the children need to practice and learn about and use the tools of their cultural context?

With the increase of technologies in the lives of children, understanding how they engage with them is necessary. In 1999, Yelland encouraged early childhood educators to explore the role digital technologies would play in the lives of young children. She called for educators to provide technologies and support children's exploration with them so they can "make sense of their world" (p. 220). Over a decade later, she renewed the call for more understanding of play with technologies and for the field to rethink the early childhood pedagogies that support children's meaning making (Yelland, 2011). Despite years of research and "pockets of success" (Edwards et al., 2015, p. 1), it seems that the field still does not have a clear understanding of how children play with technologies or how they can best be provided in early childhood settings to support children's play and learning (See for example, Fleer, 2017; Marsh et al., 2016; Rogowsky, Terwilliger, Young, & Kribbs, 2017). Edwards (2013) proposed children's social context prompts a change in the way their behaviours are viewed. Context is important for understanding children's play with technologies and because context also impacts behaviour. Waller (2011) agrees, positing when educators use technologies to co-construct learning based on the children's interests, they acknowledge media and the children as consumers, a result of their context. In one example Waller provides, technologies were used to record children's play in local bushland and then viewed on an electronic whiteboard. The educator and children then co-constructed narratives that progressed to creating a dramatic play scene in their classroom around the theme of *Bob the Builder*™. The children linked real life, cultural experiences with their understandings based on an animated character.

Over the years, different authors have presented their ideas about how educators can get involved in children's technological engagement. For example, in 2007, Yelland and Masters theorized about the different scaffolding techniques needed in relation to children's technology use. The three levels included “cognitive, technical and affective” (p. 362). These levels of scaffolding depend on the context, the children’s play and of course, their needs (Lawrence, 2018). To support children’s meaning making around their social experiences several approaches have been suggested. These include: “guided interaction,” which is where the educator supports the child in their interactions with the technology (Plowman & Stephen, 2007, p. 14) and “sustained shared thinking,” which involves co-constructing thinking over an extended time period (Siraj-Blatchford, 2009, p. 1). Both require educator input and to date these approaches have not been embraced by educators across the early childhood field and one reason cited was that technology provision disrupts their beliefs and norms (Lindahl & Folkesson, 2012).

2.3.2 Learning from the home context

Comparing early childhood educational settings with home contexts, researchers found that many children were not only provided with more diverse devices at home (Plowman, Stephen, et al., 2010b) but their technological practices were more advanced in the home mainly due to positive support from parents (Verenikina & Kervin, 2011). While advocating against comparing the two settings, Edwards, Henderson, Gronn, Scott, and Mirkhil (2016) call for better understanding of home settings, the context specific experiences children have there, as well as encouraging educators to recognise and build on children’s prior funds of knowledge. Instead, children are often “asked to leave their technologies at the door” (Parette, Quesenberry, & Blum, 2010, p. 336) when they arrive at early childhood centres and their prior experiences are not recognised or even acknowledged. This creates a divide between the two contexts (McPake, Plowman, & Stephen, 2013). Over 10 years ago, Zevenbergen (2007) forecasted that a collision was about to occur between children’s technology-rich world in their home settings and the technology-poor world of their early childhood settings. Therefore researchers question if educational settings are ready for the twenty-first century learner, and are they “open and receptive to the learning that has gone on at home?” (Dunn, Gray, Moffett, & Mitchell, 2016, p. 9). Children “come to early childhood settings with a digital habitus” due to their previous technological experiences (Zevenbergen, 2007, p. 19) and therefore it is important that this prior knowledge is acknowledged and built on for children to learn “to participate fully and actively in society” (DEEWR, 2009, p. 7).

Children's digital habitus is built on their experiences prior to entering an early childhood setting. These experiences are situated in their technologically rich households (Livingstone, Marsh, Plowman, Ottovordemgentschenfelde, & Fletcher-Watson, 2015), and so when parents are encouraged to limit their children's screen time by guidelines such as those set by the American Academy of Pediatrics (2001, 2013, 2016), they often struggle. The Academy states 'no screen time' for children under two years of age and a maximum of two hours a day for children between two and five years (American Academy of Pediatrics, 2013). Australia followed America releasing similar guidelines, but for children aged two to five years, the Department of Health (2017) recommended less that one hour a day of screen time. In Australia, four and five-year-old children were found to use internet-based technologies more than the recommended two hours (Edwards, Skouteris, Rutherford, & Cutter-Mackenzie, 2013), in fact, parents are often reluctant to admit their child's screen usage (Chaudron, 2015), with many actually using digital technologies as a babysitter to keep children entertained as they complete household duties (Rideout & Hamel, 2006). However it is important to note the American Academy of Pediatrics (2013) recommendations apply to screen time used for entertainment and therefore, quality educational screen time falls outside these recommendations. The Australian guidelines were more specific and listed "sitting and watching" screens to be limited (Department of Health and Ageing, 2010, p. 4). I believe educational screen time is not part of this limitation, but the emphasis needs to be on quality, educational content.

How technologies are used and understanding the risks of these devices is under investigation. Radesky, Schumacher, and Zuckerman (2015) discourage parents from using technologies as a "shut up toy" stating children need to develop self-soothing skills and when routinely provided with a technological device these skills are never learned (p. 2). While noting health related concerns (Cox et al., 2013), researchers are recognising the benefits active technologies can have on young children, including increased literacy skills (Neumann, 2014), promoting interactions through video links (Radesky et al., 2015) and strengthening mark making (Price et al., 2015). In support of parents and educators, the Erikson Institute (2016) cautioned against using time as the only metric to determine an appropriate amount for children's screen time use. The Institute surveyed parents to better understand their children's usage, with surprising results as they found parents were allowing the children's technological screen time to exceed the recommendation from the American Academy of Pediatrics (2013). Erikson Institute's focus is on educating parents about developmentally appropriate technology use, active involvement rather than passive consumption of technologies and promoting co-viewing with children engaged in play with technologies: a notion supported by other research in the field (Kervin, 2016; Miller, Paciga, Danby, Beaudoin-Ryan, & Kaldor, 2017; Neumann, 2017a, 2017b).

2.3.1 Children and working technologies

In 2006, Plowman and Stephen encouraged researchers to expand the definition of information and communicative technologies (ICT) from computers to include the range of devices that were being provided in early childhood settings [see, Defining terms, p.5]. For example, when educators were asked about the technologies they used, Gialamas and Nikolopoulou (2010) found that most only contemplated their computer practice and provision. Reminiscing of times where technology provision consisted of one computer in the corner of the classroom for one child's use, Arnott (2013) espouses, now technology provision includes computers, iPads and tablets, interactive whiteboards, still cameras, video cameras and simple robotics and involves social interactions more and more. The various technologies presented in current literature, along with examples of how they are being used meaningfully in early childhood settings are important for this research project because they begin to paint a general picture of possibilities within the field.

When exploring the use of computers in early childhood settings, Plowman (2013) found that the issues they encountered were similar to those reported a decade earlier (Plowman, 2003). Educators expressed concerns that children's technological skills were more advanced than theirs; however, through observation Plowman (2013) found children still needed the interactions of adults to mediate the interface before they were capable of independently navigating the operations of the device. Palaiologou (2016) in her study aimed to determine if children were "digitally literate" (p. 11). What she found was early childhood pedagogies involving technologies need "to create participatory learning environments alongside other activities" (p. 19), where children are encouraged to be "active participants" (Moore & Adair, 2015, p. 365); designing and creating their technological experiences, rather than just responding to repetitive apps on devices (O'Mara & Laidlaw, 2011). In a study by Ljung-Djärf (2008) on the roles children enact with computers, she found these roles are continuously being redefined by the children as they interact with each other and with the computers. What children are learning with technologies has also become a research focus. Couse and Chen (2010) found that when children used computers they displayed greater improvement in "intelligence, structural knowledge, problem solving, and language skills" compared to those who did not have access to computers in their early childhood setting (p. 76). Negative effects of technologies on children's play abilities have been reported (Smirnova, 2011), yet Edwards (2013) argues that children's ability to "symbolically" see themselves represented on a screen is a "sophisticated" understanding of separating meaning from object and it facilitates a strong grasp on the reality that they are exposed to everyday (p. 204). The notion that children's engagement with working technologies has positive effects on their learning is a key tenet that underpins this research.

The release of the Apple™ iPad in 2010 marked an important time in the provision of technologies for young children. The iPad, with its touch-screen interface has meant that children can easily navigate its controls, and its size and weight has resulted in a portable device that can be easily handled by children (Merchant, 2014). The use of icons also added to its appeal for young children who were at a pre-reading stage (Neumann & Neumann, 2014), enabling them to engage with the device without formal reading skills or extensive adult mediation. Young children, even toddlers, can navigate an iPad through "finger taps, pinches and stretches" (Wohlwend, 2015, p. 157). In the study of children's drawing on stylus based tablets verses computers, Couse and Chen (2010) found children had better control of the stylus compared to the mouse. They also found most children preferred the screen-based tablet over the traditional drawing materials on offer in their early childhood settings. Their finding was similar to a boy discussed in my Masters research, who happily completed complex puzzles on an iPad and refused to even attempt a physical one (Bird, 2012). The children's interest in iPads and technologies in general, can encourage engagement in educational apps and support their literacy practices and meaning making (Wohlwend, 2015).

Research around the educators' use of iPads to encourage the children's learning reveals mixed results. Sandvik, Smordal, and Osterud (2012) found that when preschool educators used an iPad during teaching times, it encouraged children's language learning because it was easy for them to cooperate, participate and share the device. In their study, they found "peer support was extensive" (p. 216), which they believed contradicts the findings from Plowman and colleagues (2010b). For example, Plowman and colleagues (2010b) found technologies were provided with no aim or pedagogical considerations. In the earlier

Plowman and Stephen (2005) study, adults in early childhood settings rarely interacted with the children using the technologies and peer support was limited. What Sandvik and colleagues (2012) did not mention was that their study focused on children's engagement with iPads, whereas the other two studies explored technologies in general, with more of a focus on computers. In fact, the Plowman and Stephen (2005) study was undertaken before the release of the iPad. What is noteworthy from all three studies though, is the role of the educator in mediating children's engagement with the technologies and how their involvement can increase children's learning on these devices. This idea was also supported by Yelland and Gilbert (2013) who recommended that research was needed to extend educators' pedagogical repertoires in order to effectively support children's learning with iPads, something they admit was not occurring. Another contribution Yelland and Gilbert (2013) made, was in highlighting the need to move away from the "narrow focus on concept and skill building" apps to ones that encourage children's creativity and deep learning (p. 1). The categories used in the *App Store*™ (Apple's online application ordering site), do not assist educators with selecting appropriate apps for children's use (Goodwin & Highfield, 2012). The "fast evolving and chaotic Wild West of digital apps" mean educators and parents struggle to recognise appropriate apps (Guernsey, Levine, Chiong, & Severns, 2012, p. 15), often relying on the descriptions issued by the producers, not reliable sources. In Goodwin and Highfield's (2012) study of the apps listed in the 'educational' section of the *App Store*, only 4% were classed as "Constructive or Constructive/Manipulable" (p. 3), the ones considered most beneficial for children's creative and imaginative learning (Bird, 2013). Educators must be able to provide children with apps that encourage ludic play (Bird & Edwards, 2015; Edwards & Bird, 2015), allowing them to be creative and control the progression of the app rather than just learning concepts via repetition (Kucirkova, Messer, Sheehy, & Fernández Panadero, 2014; O'Mara & Laidlaw, 2011). Apps where children are engaged as "active participants" (Moore & Adair, 2015, p. 365) rather than "passive responders" (O'Mara & Laidlaw, 2011, p. 152) encourage the ludic play for which Bird and Edwards (2015) advocate. Furthermore, O'Mara and Laidlaw (2011) compared children's engagement with "skill and drill" apps as being the same as worksheets in a classroom (p. 156). They also found children's play was sophisticated, with the children recognising a good app, and moving on quickly from repetitive, skill and drill apps (O'Mara & Laidlaw, 2011; Yelland & Gilbert, 2013). Cherner, Dix, and Lee (2014) introduced a framework for categorising educational apps, exploring the apps in primary school classrooms, rather than early childhood settings. Other literature related to evaluating early childhood apps include those that are literacy based (Kucirkova et al., 2014), general educational focused (Cherner et al., 2014), and designing apps especially for pre-schoolers (Shoukry, Sturm, & Galal-Edeen, 2015). Again, these are not clearly labelled in the App Store, which makes selecting appropriate resources difficult.

With many governments recognising the need for including Science, Technology, Engineering and Mathematics (STEM) earlier in the curriculum (Sullivan & Bers, 2016), educational settings are preparing children for life in the technological society. Both simple drag and drop devices (Akcaoglu, 2014) and robots that teach young children the basics of coding (Highfield, 2010b) have flooded the market. The robots include: *Cubetto*™ (see https://www.primotoys.com), *BeeBots*™ (see https://www.bee-bot.us/), *Code-a-pillar*™ (see http://www.fisher-price.com/en_US/brands/think-and-learn/index.html) and *Code and Go the coding mouse*™ (see https://www.learningresources.com/product/learning+essentials--8482-+stem+robot+mouse+coding+activity+set.do). These coding robots record a series of directional instructions and then move, following the instructions. Sullivan, Kazakoff, and Bers (2013) found that four-year-old children were able to successfully build and program simple robots, with increases in their counting and estimating abilities through guessing how far the robot could go. While research around the benefits of these devices is limited (Manches, Duncan, Plowman, & Sabeti, 2015), Kazakoff, Sullivan, and Bers (2013) found children's sequencing ability was enhanced through the involvement in a one-week, early childhood robotics and programming workshop. This was echoed by Highfield (2010a) who found the use of *BeeBots*™ and *ProBots*™ (a programmable car, see https://www.bee-bot.us/probot.html) developed children's mathematical concepts including: spatial awareness, measurement, structure, number, problem solving and representation. Flannery and Bers (2013) used robotics to evaluate children's programming capabilities with the task of teaching a robot to do the 'Hokey-Pokey'. From early research, robots appear to engage children and in doing so also teach them sophisticated concepts, which is being recognised by early childhood educators who see the benefits to children's early mathematical learning (Aladé, Lauricella, Beaudoin-Ryan, & Wartella, 2016). After their research in robotic construction with kindergarten aged children, Sullivan and Bers (2016) found that the use of robotics addressed the technology and engineering elements that are often ignored in early childhood STEM education.

2.3.2 Children and non-working technologies

Within current literature, there are limited detailed examples of children using non-working technologies, namely, devices that no longer work or are a replica of the working tool used in society [see, Defining terms, p.5]. Literature and research often focus on working technologies, and non-working technologies (for example, phones with cords removed, ex-display mobiles, broken computers, keyboards and mice) are often seen just like any other prop in the kindergarten environment (Alper, 2011) and not described in detail. In one study, Plowman, McPake and colleagues (2012) included toys, acknowledging that these devices do not often feature in the literature. They state that the working versions "have more educational potential" but the non-working varieties allow children to role-play experiences from everyday life (p. 96). This is important for early childhood settings where play is valued as the predominant way in which children learn (Brooker, 2011; Lillemyr et al., 2013; Wood, 2013; Yelland, 2011). Providing non-working technologies as props for children's play engages them in re-enacting the cultural practices they witness everyday (Rogoff, 1990).

Non-working technologies are typically inexpensive to provide because they are usually broken, a superseded model or no longer working as they should and so they are donated to the early childhood setting to be used by the children in play (Alper, 2011). The paucity of research into non-working technologies in current literature is not a true reflection of the prevalence of them in early childhood settings (Bird, 2012). One reason they are not described in detail in the literature could be because they are not distinguished from other objects and artefacts children use in their play (Alper, 2011). Imaginative play objects are replicas of the items seen in the majority of households, including kitchen items, laundry items and increasingly, technologies (O'Mara & Laidlaw, 2011). When non-working technologies are discussed, researchers usually only mention these in passing. For example, Plowman and Stephen (2006) mention "toys that simulate technologies" in their description of technologies in early childhood, then only cite one specific reference to non-working technologies in their list of examples (p. 3). Their singular reference to non-working technologies, was described under modelling, as the educator "used a play phone to order a taxi" (p. 8), but they did not include toy technologies under their recommendation to "broaden their focus from computers to other forms of ICT" (p. 11). In the conclusion of another study, Plowman, Stevenson, Stephen, and McPake (2012) describe children's home practices that included "using old computers and non-functioning mobile phones as props for play in imaginary offices, shops and schools" (p. 36). While not early childhood setting specific, their example does briefly describe how children use non-working technologies. Unfortunately, this is all the detail they provide.

Another situation that has appeared in literature describes how the children created the desired technology, when the desired item was not provide for them. For example, Wohlwend (2009) described a boy who made a flip phone out of a piece of paper, taking care to ensure the details and symbols were correct on his phone. So, whilst the early childhood setting did not provide what the children wanted for their play, the children were creative and found other ways around the limited provision of non-working, or even working technologies in their centre. In another example, Wohlwend (2009) described a situation in her research where a girl "picked up a plastic carrot, held it next to her ear, and began chatting with her imagined caller" (p. 24). This girl separated meaning from object as described by Vygotsky (1978), when she substituted an object for the desired technology. According to Bodrova and Leong (2007), this beahviour is symbolic representation and displays a mature play skill.

2.4 Play

Play has a long history, not only in children's lives, but in early childhood education (Pellegrini, 2009). Historically, the purpose of play was to practice hunting and gathering skills that would establish children as worthwhile members of their tribe (van Oers, 2010). While these skills are no longer necessary, children still practice the behaviours they see adults performing (Rogoff, 1990) and many of these now involve technologies. In a way this behaviour is not dissimilar to that seen in years gone by, as children continue to re-enact the practices of their social context and gather their play themes from the experiences they have.

2.4.1 Play-based learning

In early childhood education, play is seen as the way children learn (Brooker, 2011; Lillemyr et al., 2013; Wood, 2013; Yelland, 2011) and settings are designed and structured to foster play and playful exploration to enhance the children's learning outcomes. Research has explored the role of the educator in designing the educational spaces (Wood, 2013), scaffolding play (Leong & Bodrova, 2012) and providing the best possible learning outcomes for children (van Oers, 2003). Gone are the days where early childhood settings, staffed by women (Hammond, Powell, & Smith, 2015), were there to care and nurture children (Fenech & Lotz, 2016; Stonehouse & Woodrow, 1992). Now the requirements for the provision of education are being forced down on children younger and younger, with early childhood educators expected to obtain higher qualifications (Fenech, Giugni, & Bown, 2012) and "be compliant" to increasing standards and measures (Sims & Waniganayake, 2015, p. 333). Hirsh-Pasek, Golinkoff, Berk, and Singer (2009) are concerned that the demands to perform and achieve high standards of learning will reduce the amount of time children are allowed to play, creating a vicious circle that results in more pressure to perform and less time allocated to play.

Part of the educators' role in fostering learning environments is to observe the children's play and build on their interests. Hedges (2011) found that when children are interested in a topic not only is their play sustained and more mature, but the educators' ability to extend their learning, based on the topic of their interest, is increased. The published planning cycle of observing children's play interests, evaluating their play and then extending this play through planned activities, taught to many pre-service teachers features heavily in the *Belonging, Being and Becoming the Early Years Learning Framework* (EYLF) (DEEWR, 2009). The continuous cycle comprises of observing play, getting to know the children and then providing the activities that will increase their learning, before doing it all again. One issue that causes friction between children and educators is when children's interests do not meet with the educators' approval. This often occurs with superheroes or popular culture themes and educators find themselves playing referee to violent children (Hedges, 2011). Instead, harnessing children's superhero play as a vehicle to teach them other concepts such as empathy, digital literacy and critical literacy that will enable them to navigate the messages being presented to them in the media has merit and is something of which educators are capable (Skouteris et al., 2014). This is already being done in early childhood around sensitive issues such as being friends, sustainability and medical procedures, where children are encouraged to play out the possibilities, therefore reducing their anxiety and learning about new concepts or ideas.

The early childhood educational context is often governed by curriculum frameworks that shape how early childhood programmes are presented (Sumsion & Grieshaber, 2012). In Victoria, Australia where this study was conducted, there is both a state and national curriculum framework that supports the educators in their provision of their service. In Victoria, the *Victorian Early Years Learning and Development Framework* (VEYLDF) (Department of Education and Training Victoria (DETV), 2016) covers curriculum for children from birth to eight years of age, whereas the national document, affectionately known as the EYLF (Nuttall & Edwards, 2013), covers curriculum for children birth to five years of age (DEEWR, 2009). In 2012, the principles and standards of the EYLF became mandatory for all early childhood services in Australia as part of the *National Quality Standard* (Australian Children's Education and Care Quality Authority [ACECQA], 2018; Sumsion, Grieshaber, McArdle, & Shield, 2014). In Australia, play-based learning is recognised as the way children learn in early childhood settings (Brooker, 2011; Lillemyr et al., 2013; Wood, 2013; Yelland, 2011) and the EYLF encourages educators to engage in a balance of child-initiated experiences and educator-led instruction, where children's learning needs are recognised and supported (DEEWR, 2009). The EYLF also states that children use technologies "to access information, investigate ideas and represent their thinking" (p. 44). While the framework does encourage the "use of both real and imaginary technologies as props in their play", this is the only reference to technologies being used in play (p. 44). In the VEYLDF (DETV, 2016), technologies are rarely mentioned, one section states children use technologies to "communicate, learn and play" (p. 22), but does not go into detail about what that would actually look like. This is a gap that could be addressed on a political level and furthermore, this study speaks to that gap and then educators would be able to rely on the EYLF in their work.

Internationally, curriculum documents are equally insubstantial in relation to technologies in early childhood education. For instance, Finland's *National Curriculum Guidelines on Early Childhood Education and Care* (Ministry of Social Affairs and Health, 2004) does not mention technologies. Other countries mention play and technologies separately (Department for Education, 2012; Ministry of Education New Zealand, 1996; Ministry of Education Singapore, 2012; Skolverket: Swedish National Agency for Education, 2010). The various international curriculum documents that support children's play either omit their technology use or discuss technology provision but not in conjunction with play (Edwards, 2013). Unfortunately, this is a common oversight and displays the lack of understanding of children's technology use in play-based settings. Despite 30 years of research into technologies in early childhood settings, technologies have not been integrated into early childhood educators' play-based pedagogies (Yelland, 2011).

Educators rely on these various curriculum documents to support their provision and pedagogical decisions around technologies, and regrettably, they are left wondering.

2.5 Educators' provision of technologies

Maintaining pace with the rapid change in technologies is difficult for educators (Clements & Sarama, 2002). Educators appear to fall into two categories, those who embrace technologies and use them in their teaching and those who believe technologies go against their philosophy and do not recognise their place in early childhood education (Aldhafeeri, Palaiologou, & Folorunsho, 2016; Lindahl & Folkesson, 2012). Those educators who do use technologies, appear to operate on a scale that ranges from providing technologies for children's limited use and those who fully integrate them successfully (See for example, Hedges, 2011; Mawson, 2011). Plowman and colleagues (2012) reported that educators lack the confidence to judge where the children are at in terms of their technology skills, hence incorporating methods to support the children's learning is difficult. Edwards and Bird (2015) argue that educators do not have the underlying knowledge about how children learn to use technologies through play to support their understanding of children's technological use. When the early childhood field moved from a developmental, summative observation and assessment model, to a more formative model with the influence of sociocultural theory (Anning, Cullen, & Fleer, 2009), educators maintained the developmental theory they previously relied upon to support their observations and assessments (Edwards & Bird, 2015). To support progression past this practice, the Digital Play Framework (DPF) was developed when the authors combined Hutt's (1966) ideas of epistemic and ludic play with a novel object and Vygotsky's (1978) concept of tool mediation. The resulting framework illustrates observable play behaviours that indicate how children are learning to use a range of technologies. Educators can use the framework to determine whether the children are demonstrating epistemic or ludic play behaviours and then provide targeted support to assist the children to develop more technological skills.

Investigations have compared children's experiences and skills from their home context to their early learning setting (Kalliala & Pramling Samuelsson, 2014; Lindgren, 2012; Quinn & Manning, 2013; Zevenbergen, 2007) [see Learning from the home context, p.17]. Zevenbergen (2007) found the children were often permitted to do more with technologies in their home context and that technologies were often restricted to educators' programming needs in settings. In a study of parents' attitudes and understandings of children's use of technologies in early childhood settings, one parent commented that his child was not even allowed to touch the computers in his early childhood setting because they were the domain of the educators (Verenikina & Kervin, 2011). Modelling, a valued pedagogy in early childhood, involves educators displaying the behaviours that they want the children to learn (Evangelou, Coxon, Sylva, Smith, & Chan, 2013), therefore, conducting technology related practices in the office away from the watching children, means that modelling does not occur (Plowman, Stephen, et al., 2010b). This contradicts what is happening in children's lives outside the early childhood setting (Lauricella, Wartella, & Rideout, 2015). When children observe adults using technologies throughout their daily lives, they see that value is placed on technologies by adults and then the children want to imitate this behaviour through their social learning (Rogoff, 1990).

Educators' technology use in their personal lives appears not translate to their professional lives. Many educators are digitally literate (Lafton, 2015), as they can successfully use technologies in their lives outside of the early childhood setting. An issue occurs when they attempt to provide them for children's use because their technology use appears to contradict their views on play-based pedagogies (Liu & Pange, 2015) or challenge their Piagetian beliefs around providing a range of resources that are adequate for learning to occur (Roberts-Holmes, 2013). Even though the discourse around technologies is mainly positive, educator's own personal and professional histories influences their provision (Ingleby, 2016). Educators with years of experience delivering play-based learning programmes may find it difficult to successfully integrate technologies into their repertoire, whereas new educators are more positive about using technologies in their programmes, but frequently do not possess the pedagogical knowledge and experience around how to efficaciously integrate them into their practice (Blackwell, Lauricella, & Wartella, 2014; J. Hughes, 2005). Reluctance to integrate technologies may have to do with educators having to *learn* about technologies while also *teaching* about technologies (Britzman, 2009). It stands to reason that the educators who do not feel comfortable using technologies themselves are less likely to provide technologies for the children they teach (Britzman, 2009), but this does not make up for the many who use them successfully in their personal lives, but do not provide them for the children they teach.

When technology provision does occurr, many educators have not had any formal training in how to provide them. Bourbour and Masoumi (2016) assert that most educators developed their technological competencies through trial and error rather than attending specific professional development on their use. As Parette and colleagues (2013) found, most educators acquired the skills they needed only after they had started teaching in their own classroom, rather than through pre-service teacher training or professional development programs. The other way educators developed their skills was through sharing ideas and experiences with colleagues. This idea was presented by Mueller, Wood, Willoughby, Ross, and Specht (2008) who researched discriminating variables between those who fully integrated computers into their practice and those who did not. They found that sharing ideas can build educator capacity in utilising technologies in their teaching, something Orlando (2014) referred to as "pooling the strengths of team members" (p. 435). Her example, from the primary school context, works well when staff numbers mean there are more than two educators sharing their experiences. For this idea to work in the early childhood context, educators would often need to travel to form communities of practice (Wegner, 1998), share their experiences, challenge existing beliefs (K. Macfarlane & Cartmel, 2012) and benefit from this type of learning.

2.5.1 Technology integration: what stops educators?

Several studies present reasons why educators do not provide technologies for children's play. The reasons covered in early childhood specific literature include: educator confidence (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013); technological and pedagogical knowledge (Koehler & Mishra, 2009); and access to appropriate hardware and software (Liu & Pange, 2015; Nikolopoulou & Gialamas, 2015). In their research around the barriers to technology provision in primary schools, Ertmer, Gopalakrishnan, and Ross (2001) discovered what they called first order barriers, for example, the technical devices, adequate software and administrative support, and second order barriers which included educators' beliefs about technologies and their own ability. Reducing second order barriers involves changing educators' beliefs, which is not so easy because it relies on personal changes to the educator, and this is seen as riskier and harder to achieve (Ertmer, 2005). One barrier that impedes educators from fully integrating technologies into their practice is the need for them to learn about technologies as they try to teach about technologies (Britzman, 2009). Many educators do not feel comfortable or confident to use technologies in their classrooms (Blackwell et al., 2014; Ertmer et al., 2012). Way and Webb (2007) suggest that professional development can prepare educators to use technologies and provide the skills to pedagogically use them with children. Nuttall and colleagues (2015) disagree, stating that this kind of professional development has not met the needs of these educators in the past. Instead, they call for understanding children's contemporary play as a way to build educator capacity, "a form of consciousness-raising" (p. 233; Thoma, Hutchison, Johnson, Johnson, & Stromer, 2017). Other authors agree, calling for a reconceptualising of play in relation to the changing world and in terms of the experiences of the children who are playing (B. Barron et al., 2011; Edwards et al., 2015; Marsh et al., 2005; Yelland, 2011). For example, children from developed countries will be exposed to digital technologies and digital practices from the moment they are born, or before if you include the digital ultrasound while in utero (Merchant, 2015). Children will then use these experiences as building blocks for their imaginative play (Edwards, 2011), and consequently their early childhood settings need to reflect the experiences that they are having in their social contexts. This requires educators who not only know the children they are teaching, but also know how to provide a stimulating environment that encourages cultural re-enactment and based on children's interests.

There are many ways an educator can support children's cultural re-enactment. The role of the educator in contemporary early childhood education contexts is to support children's imaginative play through re-enacting their cultural experiences (Singer, 2013; Wragg, 2013), yet given educators may not recognise the potential technologies have for children's imaginative play, this kind of play is less likely to be supported. Instead, some educators have concerns that technologies may actually have a negative impact on children's imaginative play and creativity (Dunn et al., 2016; Palaiologou, 2016). Educator attitudes appear to play an important role in their use of technologies within their classroom, and unfortunately, often the educators' espoused beliefs do not reflect their practice (Ertmer et al., 2012; Fisher & Wood, 2012; Mama & Hennessy, 2013). Plowman and Stephen (2007) believe the pedagogical approaches educators already use can easily be transferred to technologies. In contrast, Roberts-Holmes (2013) posited educators find it hard to "articulate their pedagogical understandings within the context of ICT" (p. 2) and instead these pedagogies need to be expanded to support children's learning with technologies (Yelland & Gilbert, 2013). One of those pedagogical tools is intentional teaching and it could easily be used in the context of technology use.

2.5.2 Intentional teaching and play-based learning

Increased national and international attention around the value of the early years has brought the field under closer scrutiny, with an increased focus on educator pedagogy and interactions. The current early childhood discourse presents educators as those who notice, recognise and respond (Carr et al., 1999; McLachlan, Fleer, & Edwards, 2010); engage in "sustained shared thinking" (Grieshaber, 2008); and "support, challenge and extend" (Arthur et al., 2017) children's learning. Intentional teaching is seen as opposite to play-based learning and silences (Thomas, Warren, & deVries, 2011) educators in their role as teachers (Grieshaber, 2008; McArdle & McWilliam, 2005). This "pedagogical binary" (Thomas et al., 2011, p. 69) has been brought to the fore, especially in Australia with the introduction of the EYLF in 2009, "sparking a debate about the relationship" of the two elements: play-based learning and intentional teaching (Leggett & Ford, 2013, p. 42). Recently, authors have questioned "how play-based learning and teacher-directed learning [can] sit together" (Thomas et al., 2011, p.69) and whether they are "forever different?" (Edwards, 2017, p.4).

As already stated, the value of play for children's learning has been a constant rhetoric in early childhood education (Brooker, 2011; Lillemyr et al., 2013; Wood, 2013; Yelland, 2011). In their earlier paper, McArdle and McWilliam (2005) question 'balance' in early childhood education, as they found that educators' narratives did not always match what occurred in practice. This mismatch between narratives and practice was especially true in relation to their provision of technologies, where both intentional teaching and play-based learning did not occur. The "challenge for educators is to learn how to balance intentional teaching and free play approaches in ways that promote children's educational progress and achievement" (Grieshaber, 2010a, p. 40).

The current discourse has been formulated through years of repeated actions and long held beliefs of educators who are indoctrinated into the field and become part of the history of the early childhood field. Thomas and colleagues (2011) state the construction of this particular discourse in early childhood education built its foundations from the ideas of several historic theorists and their notions about how learning occurs in early childhood. For instance, Rousseau (1712-1778) "presented education as a natural occurrence" and children's learning should and will happen naturally without educator involvement. Froebel (1782-1852) agreed, stating that "children's learning unfolds naturally through play" and early childhood educational settings should be home-like, as that is where the learning occurs and where children develop, and the continuation of the popular narrative in early childhood that educators' identity includes being "nurturing, mother or carer" (as cited in Thomas et al., 2011, p. 70). In contrast, other early childhood authors present a different view and encourage looking beyond these limiting and out of date discourses (Rogoff, 2003). The cultural-historical perspective (Vygotsky, 1978) offers another way of looking at early childhood education. Here, the educators' role is to provide social environments and nurturing relationships that encourage and support children's learning. In early childhood education, learning can be explored both from the perspective of the children learning and from the teaching educators. Leggett and Ford (2013) stress the importance of exploring the intentionality of educators in their teaching practice, as a precursor to understanding their role in intentional teaching. In their writing, the learner is also considered knowledgeable and Leggett and Ford's research posits understanding intentional teaching from both the educators' perspective and the child's position in their own learning. Thinking about educators' intentionality in this way allows for "consideration to be given to how pedagogy is framed, conceptualised and enacted" (Kilderry, 2015b, p. 22). Rather than viewing play-based learning and intentional teaching as two extremes, balance can be achieved and the role of early childhood educators can be legitimised, strengthened and valued.

In the EYLF, the discourse of intentional teaching positions the "educator [as] being deliberate, purposeful and thoughtful in their decisions and actions" (DEEWR, 2009, p,15), on the other hand, it the framework also emphasises play-based learning, recognising communication and language, as well as social and emotional development (p. 5). In New Zealand, McLaughlin, Aspden, and Snyder (2016) argue intentional teaching is one factor that can increase quality, with educators drawing "on both their knowledge of individual children and professional knowledge and skills to provide meaningful and appropriate curricular experiences for all children" (McLaughlin et al., 2016, p. 176). Intentional teaching can assist educators in building positive relationships with children, which is an indicator of quality.

Educators observe each child's activity and interactions and activities then make an in-the-moment decision on whether to intervene or just observe (Grieshaber, 2010a). The EYLF recognises that "intentional teaching is the opposite of teaching by rote or continuing with traditions simply because things have always been done that way" (DEEWR, 2009, p. 15), and I am left to wonder, if the traditional narratives around programmes being based solely on children's interests are a realistic representation of what actually occurs in practice, or do educators regularly engage in intentional teaching but are too afraid to admit they go against the early childhood discourse?

2.5.3 Technologies in schools: does it improve learning?

Just as exploring children's use of technologies in their home context can provide insight into their early childhood setting use, technology research in schools may provide beneficial information that could be used to influence provision in early childhood settings. While research examples from schools are becoming more common than those from the early childhood field, the foci of these studies does not appear to include how children use them for their imaginative play (Slutsky & DeShetler, 2016). More research has been completed in schools than early childhood settings but there has been limited transfer of this learning (Aldhafeeri et al., 2016).

The introduction of digital technologies in schools came with the promise of revolutionising learning (Connell, 2007) but the revolution seems to be decades in the making (Laurillard, 2008). Just as in early childhood settings, there are differences in what technologies individual teachers are using, and within the same school some teachers may will be using them in creative and imaginative ways, while another down the corridor may not use any technologies at all in their teaching (Phillips, 2015). Selwyn (2008) called this the "state of the actual" (p. 83), the difference between what is published as current practice and what is actually occurring in schools (Mama & Hennessy, 2013; Phillips, 2015). The question whether technology does improve learning is a difficult one to answer, mainly because of the many influences on learning and that learning itself is difficult to measure (Newhouse, 2015). Current research presents mixed results. Lei and Zhao (2007) presented a study which illustrated that middle school students had a significant increase in their grade point average over the course of a year through technology use. The activities that Lei and Zhao termed the "meaningful technology uses" had the most impact on student outcomes, yet these activities were not always the students' favourites (p. 385). In another study, Weston and Bain (2010) state the cognitive tool of the technologies increases secondary school student learning through improving "gathering, sharing, and managing of feedback" (p. 13). What comes through much of the research is the concern that technologies should not be an add-on to current teaching; instead what needs to be explored is ways that technology can be integrated into educational activities (Newhouse, 2015). This is the same for early childhood settings. Forcing technologies into current pedagogies or understandings of play does not work (B. Barron et al., 2011; Edwards et al., 2015; Marsh et al., 2005; Yelland, 2011). Therefore, technologies should not replace current practices entirely, instead they should provide another option or way of doing things.

The description of barriers to technology provision in primary schools appears to be similar to their early childhood counterparts. With the discussion of first and second order barriers (Ertmer, 1999) comes further understanding as to why teachers may or may not use technologies in their teaching (Phillips, 2015). In Cyprus, Mama and Hennessy (2013) explored the relationships between teachers' beliefs about technology integration and what was occurring in practice; but often these were two different scenarios. While technology integration in Cyprus is still in its embryonic stage, Mama and Hennessy developed a typology as a way to challenge teachers' beliefs about the value of technologies and in an effort to increase integration. In Australian schools, several attempts have been made to overcome the lack of technology use in classrooms including: "Diffusion of Innovations", where new ideas are presented or diffused amongst a group of teachers (Rogers, 1965, p. 1); the Substitution Augmentation, Modification and Redefinition (SAMR) model (Puentedura, 2006) [see Figure 2:2 SAMR model , p.35], that illustrates the various levels of technological integration within classrooms; and Technical Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) [see Figure 2:1 TPACK model (Reproduced with permission of the publisher, © 2012 by tpack.org), p.35], which addresses and amalgamates teachers' pedagogical and content knowledge.

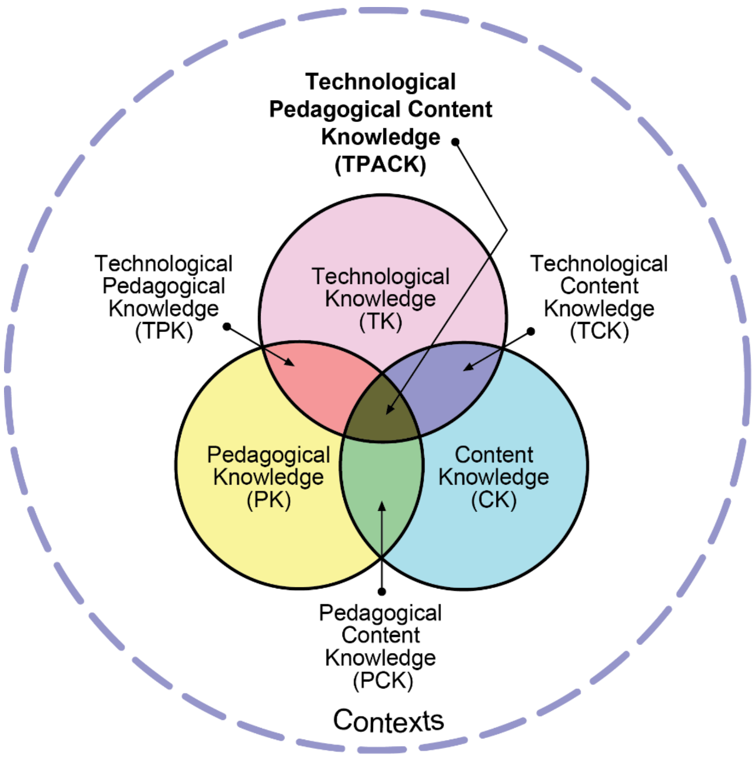

Figure 2:1 TPACK model (Reproduced with permission of the publisher, © 2012 by tpack.org)

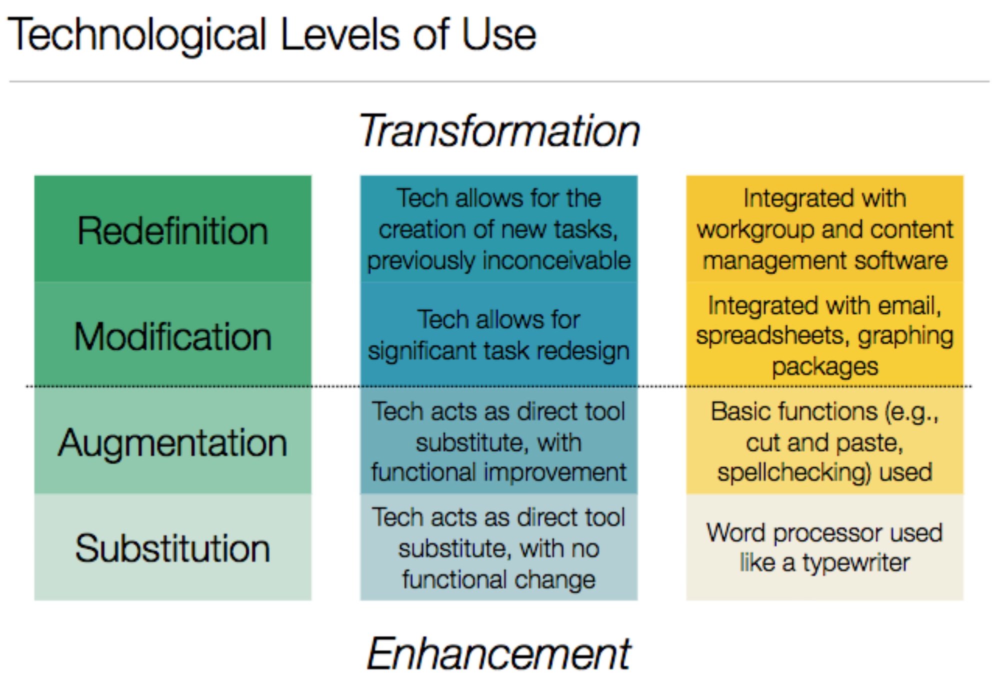

Figure 2:2 SAMR model (Puentedura, 2006) [see Appendix 23, p.228]

TPACK involves understanding the complex relationship between the three components of "technology knowledge, content expertise and pedagogical expertise" (Blackwell, Lauricella, & Wartella, 2016, p. 58). The model was used by Muir, Callingham, and Beswick (2016) to explore the use of an interactive whiteboard to teach mathematical concepts. They found the teacher's lesson successful, largely based on her confidence and her own TPACK in using the interactive whiteboard. The reporting of this lesson was aimed at addressing the paucity of research investigating TPACK and young children. The example is based on a primary school maths lesson, which is not the same type of context as prior to school educational settings. In a preschool example of the use of an interactive whiteboard, Bourbour and Masoumi (2016) found that it was not the "preschool teachers' pedagogical and technological knowledge" that shaped the whiteboard use in the classroom activities, instead it was the interaction between the teacher and the children (p. 11). Despite these examples, Edwards et al. (2015) found that the use of the TPACK model has not seen any huge impact in the early childhood field. The findings of each of these presented studies do however provide insights into what can influence educators' provision of technologies and this literature can inform practice in early childhood settings.

2.6 Identifying the gap

As the two literature review threads reveal, research and literature has focused on either the children's play and learning with technologies, or the educators' provision and the factors that impact it. An obvious fissure in the literature concerns the interplay between the integration of children's imaginative play with working and non-working technologies and the influences on the educators' provision of these devices within play-based learning settings. I believe that both of these issues need to be explored to develop a more comprehensive understanding concerning the integration of technologies to support children's learning. As a primary aim for this thesis, I am therefore advocating for the need to explore both the children's imaginative play with working and non-working technologies and the influences on the educators' provision of these devices in play-based learning settings. No other study has looked at both of these strands and this gap in the literature informs the focus of this research.

2.7 Conclusion

This literature review chapter commenced by exploring the literature around children's use of working and non-working technologies in early childhood settings, influenced by their experiences in their home context. I concluded the chapter by clarifying the gap between the two stands of literature relating to the children's use and the educators' provision of technologies in early childhood settings. This identified gap in literature provides the foundations and aim of this study which centres on the integration of the children's use and the educators' provision of technologies in play-based settings and looking to schools for insights, the barriers to educators' provision of technologies were discussed. I concluded when the gap between the two were clarified, providing the foundations and the development of the aim of this study which centres on the integration of the children's use and the educators' provision of technologies in play-based settings. The next chapter will explore the theoretical concepts that will frame this study and justify why they were selected.

Three: Theoretical frame

3.1 Introduction

The overarching framework of this study is cultural-historical theory and this perspective guided the study's methodology and data collection choices. This framework also influenced the data analysis process and how the findings were shaped, represented and discussed. To explore and answer the research questions (to understand children's use of digital technologies in their imaginative play and the educators' provision of these devices) two different yet complementary theoretical frameworks were incorporated. To begin the chapter, I discuss the origins of cultural-historical theory and explore the similarities and differences between cultural-historical and sociocultural theories. I then explore how the concepts of Vygotsky (1978) and J. J. Gibson (1979) frame this thesis. In doing so, I have created a new conceptual framework that incorporates both theoretical perspectives which will be used to analyse and discuss the data collected. The literature review identified a gap in current understanding and practice around understanding children's use of digital technologies in their play and how the educators consider providing these devices for the children they teach. This thesis, along with my newly developed framework will address this gap. The chapter concludes with a justification for the selected theoretical framework.

3.2 Lev Semenovich Vygotsky

Lev Semenovich Vygotsky was born into a Jewish family in Orsha (what is now Belarus) in 1896 and died of tuberculosis in 1934. Considered a "genius" (Luria, 1979, p. 38) by some, he wrote across several disciplines and influenced fields including education (both curriculum and teaching); psychology; geography and cognitive science (Holzman, 2006). He is believed to have published up to 190 works in his life, with most of these written in the 10 years prior to his death (Daniels, Coles, & Wertsch, 2007). In the 1960s his writings were suppressed by Stalin (Holzman, 2006); while some appeared in underground publications, most did not influence the West until the 1970s (Daniels, 2005). His original texts required translating into English and did not surface in chronological order, thus making understanding his complete thesis more difficult (Daniels et al., 2007). Yasnitsky and Ferrari (2008) commented on how interesting it is that various "psychological schools, despite their differences, fall under the broad framework laid down by Vygotsky" (p. 134). While Vygotsky has been credited with laying the foundations for cultural-historical theory, others, including his former students, have continued building on his concepts; and, even today these concepts are being followed, used and extended. One example is the concept of 'mediation' extended through the many generations of cultural-historical activity theory (Engestrom, 2001, 2015).

3.2.1 Cultural-historical theory

Vygotsky was the instigator of cultural-historical theory (Bodrova & Leong, 2007; Kozulin, Gindis, Ageyev, & Millier, 2003; Van Der Veer, 2007; Yasnitsky & Ferrari, 2008). The cultural-historical perspective focuses on individuals' activity within a community and through the use and appropriation of cultural tools. One of the main tenants of cultural-historical theory, is that activity is central to understanding the culture of a particular group of people (Holzman, 2006). People learn through their interactions within their community and as a result, their community also changes (Rogoff, 2003). This understanding is the basis of the theory, which takes into account the history of the social context and its influence on its participants over time. Therefore, cultural-historical theory focuses not on the individual per se, but the interactions between the individual and others in their community, the artefacts created in the community and the interactions with these over time (Holzman, 2006). The continuous cycle of interactions between individuals and between individuals and artefacts changes those who interact and the community in which the interactions occur (Dewey, 1938). Vygotsky and his followers created "a rich and vivid palette of theoretical and methodological ideas" that continue to influence the process of understanding the human mind (Daniels, 2008, p. 1). This theory does not focus on the individual in isolation, it instead explores individuals in relation to their community and the artefacts available in each community. In acknowledging the social experience, Dewey (1938) stated that every experience is influenced by the history of that experience and the individuals involved and also has an effect on those individuals who come after. The idea of culture from a cultural-historical lens is explained by Vygotsky (1987b) himself:

> Culture is in fact the product of human social life and the social activity of human beings, and therefore the very act of putting the question about cultural development of behaviour already leads us directly into the social plane of activity. (pp. 145-146)

Viewing activity in relation to the individual's cultural and social context has influenced early childhood education. During the late 1990s and early 2000s, the early childhood field underwent a theoretical shift (Edwards & Bird, 2015) and educators began viewing children and their experiences in the context in which they occurred. Previously, the field was dominated by developmental theories (Dahlberg & Moss, 2005; Edwards, 2011; Edwards & Bird, 2015), where children were viewed as following biological paths of development that also dictated the learning that would occur. Vygotsky's theory of child development was different and encouraged viewing the child in their social context not as an individual on a predetermined path (Kozulin, 2003). In this thesis, the children are viewed as individuals in their social context of the kindergarten classroom, and also as a group of children interacting with each other and the tools of their context.

3.2.2 Cultural-historical verses sociocultural

It is here that I need to acknowledge and justify my use of the term *cultural-historical* when outlining my theoretical stance. Some authors use the terms cultural-historical theory and sociocultural theory interchangeably, others select one over the other and other authors use a different term each time they write about it; illustrating their change in thinking or the focus of that particular piece of work (Cole, 1995). The perspective, "known variously as activity theory, the cultural-historical theory of activity, CHAT (cultural historical activity theory), socio-cultural psychology and cultural historical psychology" (Holzman, 2006, p. 5), is considered a semantic issue, but one that needs to be considered and clearly defined (Cole, 1995). According to Holzman (2006) there are more iterations of cultural-historical than postmodern theory, but theorists seem to have less disagreement about the different views of cultural-historical theory and its iterations. Zinchenko (1995) outlined the similarities and differences between *cultural-historical psychology* and *the psychological theory of activity,* stating "the first gave birth to the second" (p. 50). Vygotsky, acknowledged by many as the founder of both (Bodrova & Leong, 2007; Engestrom, 2001; Kozulin et al., 2003; Van Der Veer, 2007; Yasnitsky & Ferrari, 2008), created the paradigm that then branched off to a psychological theory of activity (Zinchenko, 1995), later to be known as activity theory (Engestrom, 2001). For this thesis, I am using cultural-historical theory to frame my study and to inform my methodological choices.

My choice is based on my perception that the sociocultural perspective does not overtly acknowledge the influence of history on individuals or their activities. Instead, the aim of the sociocultural approach is to explore human relationships and "the cultural, institutional, and historical situations" in which these relationships occur (Wertsch, Del Rio, & Alvaez, 1995). Cole (1995) used the term "socio-cultural-historical" to privilege all areas of the paradigm and encompass each tenet (p. 187). In his earlier work, he used the term "sociohistorical," as did Leont'ev (1981), but in his more recent work, Cole acknowledged that by using this term he was doing "a disservice to the historical record and fails to add conceptual clarity" (p. 212). This precision in his definition is because he argued all that cultural activities are actually social, and so, social does not need to be in the title. The importance of both history and social experiences are emphasised by Vianna and Stetsenko (2006) who view "history as a continuous flux of social practices, to which each new generation contributes, while inevitably transforming it" (p. 82) Therefore, a cultural-historical perspective acknowledges the important role history plays in all social experiences and the influence of culture on all social activity.

Children learn to be active members of a cultural community through their interactions with others and through their social activities. In the beginning, an infant's behaviour is dictated by their reflexes and the natural responses to stimulus. These behaviours, that begin as natural, shift to cultural as the infant is exposed to the social influences of their context (Ratner, 2004). A person's behaviour is influenced by their interactions with other individuals and with artefacts in their cultural context, and these interactions are determined by "the historical development of society" (Vygotsky & Luria, 1993, p. 78). It is the history that shapes a culture and in turn, an individual's behaviour. The cultural-historical perspective acknowledges the effect of both natural and social influences (Daniels, 2005). To investigate a phenomenon, consideration needs to be made of the cultural and social situation in which it occurs, as well as "the ways that serve people's functioning in the world" (Correa-Chávez & Rogoff, 2005, p. 8). These elements are not separate from each other and all need to be considered to understand the phenomenon.

The cultural-historical perspective acknowledges the effect history has had on one's previous experiences and the ongoing influence it has on individuals and their current activities. History can be viewed as "an ongoing fluid and dynamic process that is always here in the present, existing in the unending and ever-expanding dynamic layering of social practices in which the past and the present interpenetrate each other" (Vianna & Stetsenko, 2006, p. 82). According to Rogoff (2003), from a "sociocultural perspective, culture is not an entity that *influences* individuals" (p. 51, author's emphasis). Instead, people, as a collective, create their culture and the resulting cultural processes contribute to the people involved. In her work, she emphasizes the notion that "human development is a process of *people's changing participation in sociocultural activities of their communities"* (p. 52, author's emphasis). She argues that people develop as they participate in the culture of their context, and that the culture was developed by previous generations and at the same time, people contribute to the ongoing transformation of the culture in which they are a part. While not clearly stated, this idea infers participation occurs over time, creating a 'history' of the community.

For a researcher, a consideration of the history of the phenomenon under investigation provides a foundation to explore what is occurring for the individuals involved. Moreover, Holzman (2009) advocates for researchers to look beyond the theories presented and consider "new ways of seeing" (p. 3). She states Vygotsky's theory allowed her to advance her own work through challenging the ways of interpreting human development. Ratner (2004) agrees:

> What is true of one stage and one species is not true of other stages and other species, because fundamentally new processes have arisen. In dialectical qualitative transformations, new processes are not added onto antecedent, 'primitive' ones. Rather, a new integration occurs in which the older ones are subsumed within the new ones and alter their function to make way for them. (p. 411)

In other words, current activities are not just historical experiences with new ideas connected around the outside, instead current activities are mixed together with the history of the activities and a new, and slightly different activity exists, which was influenced by the history of it and the current individuals who enact it. While reading this I am inspired because within the early childhood field, technologies are being provided in settings and the implications have not been fully investigated. For instance, the history of play and the provision of items for children's play and learning are being subsumed into the practice of providing technological devices for children's play. Technologies have been incorporated into current practices, but also not fully meshing with other activities. It is this lack of full integration into current practice that was discussed in the literature review. Instead, what needs to occur is a mixing of old and new practices, where technologies are fully integrated and new practices emerge based on the history of technologies and the early childhood field. New theories around how children engage with devices and their learning potential are needed that reflect the current social context in which children are growing and learning. Perhaps by not acknowledging the ubiquitous nature of technologies in children's lives we are doing children a disservice and trying to view them in isolation, separate from their social experiences. Children are citizens within their communities and these communities are increasingly digital, therefore, their experiences both with objects and with other members of their cultural context are having an impact on them, their play and learning. The following quote from Dewey (1938) reinforces this idea.

> Experience does not go on simply inside a person… In a word, we live from birth to death in a world of persons and things which in large measure what it is because of what has been done and transmitted from previous human activities. When this fact is ignored, experience is treated as if it were something which goes on exclusively inside an individual's body and mind. It ought not to be necessary to say that experience does not occur in a vacuum. There are sources outside an individual which give rise to experience. (pp. 33-34)

Research into children's technology use in imaginative play calls for an exploration of the history of children's play and the history of technologies. Taking up a cultural-historical perspective, I acknowledge that children's play with technologies is influenced by not only the history of the child and the history of the technologies, but also by the interactions of these histories and the child on the social context in which it is occurring. Thus, the research settings for in my research study include the children and their interactions and also the history of the educators, their interactions with technologies and their social context. All of these histories are mixed together within the social context of each early childhood classroom to form the culture specific to that classroom and to its participants. This study explored the technologies in relation to the culture in each research setting, while also taking into account the history of technologies and play in early childhood settings, presented in the body of knowledge within current literature. The literature review included insights into the history of children's imaginative play, technologies in general and technologies in early childhood settings. While I did not explore each individual child's technological history [for more detail see Limitations, p.124], I pondered the history of each early childhood context. I also considered the history of the educators in relation to their own education, their technology use, and some reasons why they held the beliefs they expressed.

3.2.3 Cultural-historical theory for this study

This thesis will be framed by cultural-historical theory. In order to do justice to the framework of this thesis, several of Vygotsky's ideas and concepts need explaining. Not all will be directly referred to in relation to the findings, but they provide the background required to gain a full understanding of his theory. These "interlocking" concepts (Kozulin, 1990, p. 112) include tool mediation, higher mental functions, culturally situated learning, play, separating meaning from object, imagination, zone of proximal development (ZPD) and the relationship between learning and development.

3.2.4 Tool mediation

One of the most important contributions Vygotsky made was his concept of tool mediation (Daniels, 2001). When Vygotsky died, he did not leave behind a "coherent and systematically elaborated theory" (Van Der Veer, 2009, p. 15), instead explanations of individual concepts were presented and not always cohesively linked together. Understanding these concepts is like replacing pieces of a puzzle, remove one piece or concept makes the overall picture hard to distinguish, as "each one is intimately related to the meaning of the other" (Stetsenko, 1999, p. 235). Therefore, understanding Vygotsky's concept of tool mediation is the foundation that enables other concepts to be illustrated and allows new research and new iterations of related work to be undertaken. Learning occurs through a child acquiring cultural tools in the context of their social situation; "[sic] the child's entire social world shapes not just what he knows but how he thinks" (Bodrova & Leong, 2007, p. 11). An individual learns to mediate a tool in order to achieve their object of activity. Activity can be seen as an experience between individuals or between individuals and objects within a social context (Greeno, 1998). The object of activity is the reason or goal of that activity. For example, language is a tool that is used to convey meaning as the object of activity, a hammer is the tool that forces a nail into wood to achieve the object of activity of hammering in a nail and children mediate toys to achieve their object of activity in their play. Vygotsky (1978) took the stimulus – response formula, where a stimulus is applied to an object resulting in a response, recorded as S------R, and added another element to create a triangular equation [see Figure 3:1 Mediating act , p.45]. In the mediating act, the tool does not respond to external stimulus, instead the individual learns to control the tool to achieve their object of activity.

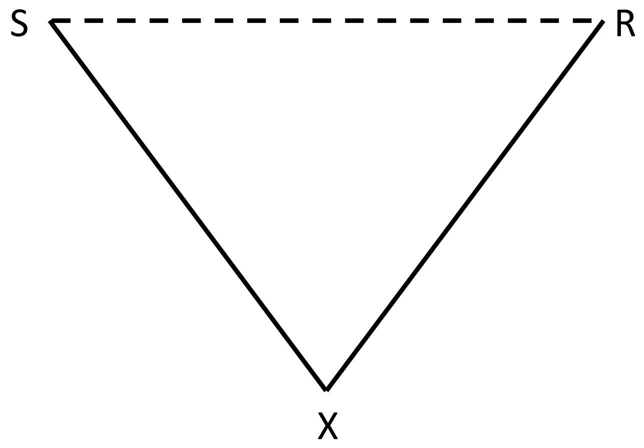

Figure 3:1 Mediating act (Vygotsky, 1978, p. 40)

The difference between the stimulus – response formula and the mediated act, is the difference between higher and lower mental functions. Vygotsky (1978) explains how tool mediation exerts power over objects, rather than the object responding to stimulus. He stated, "because this auxiliary stimulus possesses the specific function of reverse action, it transfers the psychological operation to higher and qualitatively new forms and permits humans, by the aid of extrinsic stimuli, *to control their behavior from the outside"* (p. 40, emphasis in the original). Higher mental functions [as discussed shortly] rely on the individual's knowledge of cultural understandings and are viewed as voluntary, as opposed to natural, biological instincts (Bird, Colliver, & Edwards, 2014). Natural, biological instincts follow the stimulus – response formula described above, whereas the mediating act requires deliberate action by the individual on the tool or sign. Vygotsky (1997b) explained, "[sic] the tool serves for conveying man's activity to the object of his activity, it is directed outward" and the sign "changes nothing in the object of the psychological operation, it is a means of psychological action on behavior…a means of internal activity directed toward mastering man himself" (Vygotsky, p. 62). Tools are aimed at the object of activity, influencing the activity through "achievement of, or participation in" the cultural activity (Bird et al., 2014, p. 3). One important fact about tool mediation is that "when man [sic] changes nature he [sic] changes the nature of man [sic] himself" (Vygotsky, 1997b, p. 63), in other words, as an individual masters the tool it changes the individual and results in a need for a new object of activity.

The community or cultural group influences the tools that its participants use and also create. It is in the acquiring of cultural tools that results in changes to individuals and through the cyclic process of tool mediation, individuals achieve their object of activity that results in the need for a new object of activity and the mediation of new cultural tools. In this way, individuals can move beyond their natural responses and biological reflexes, mediate tools, resulting in changes to themselves and their cultural community. Vygotsky (1978) explains:

> The use of notched sticks and knots, the beginnings of writing and simple memory aids all demonstrate that even at early stages of historical development humans went beyond the limits of the psychological functions given to them by nature and proceeded to a new culturally-elaborated organization of their behaviour. (p. 39)

The invention of computers is the result of the development of cultural tools. The need for computer language and coding speech is a direct response to the changing social context and the evolving of cultural tools, where a language is needed to mediate these cultural tools. Without the invention of computers, individuals would not need computer language, but with advances in computer technology come lifesaving tools, for example, traffic lights and heart defibrillators, which also results in changes to the environment in which they are used. Traffic lights allow more cars to safely travel on roads and heart defibrillators can prolong a person's life after a heart attack. Both inventions have been created to achieve an object of activity that is a reflection of the needs of the social community in which they were created.

Vygotsky's concept of tool mediation is commonly illustrated as a triangle of subject, object and tool (Engestrom, 2001) [see Figure 3:1 Mediating act , p. 47]. Tool mediation becomes the basis for other activity and higher mental functions, for example, as a child learns language they begin to mediate a pencil in order to achieve their object of activity which is to write language. Therefore, when cultural tools are mediated, a change in the individual's object of activity results, where the new object of activity signifies learning. It is this process that encourages new skill development through the individual mediating the tools of their culture.

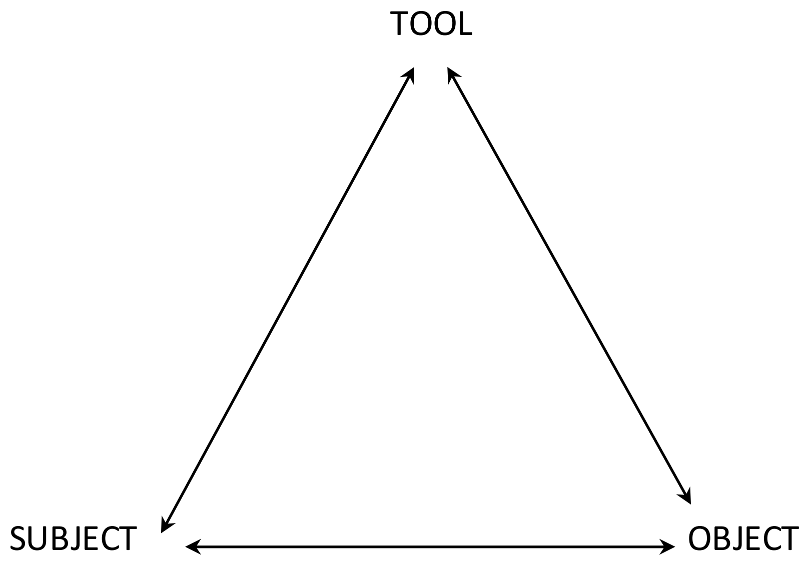

Figure 3:2 Tool mediation (Engestrom, 2001)

The concept of tool mediation influences other parts of Vygotsky's overall thesis. For example, tool mediation assists with learning the cultural activities of a community. Furthermore, tool mediation helps to explain higher mental functions and the extension of a child's zone of proximal development through the social instruction of a more capable other.

The concept of tool mediation is also the origin of many other theories and concepts. For example, Engestrom (1987) extended Vygotsky's ideas of tool mediation and developed human activity systems through adding 'community', 'rules', 'division of labor' and 'outcome' (Engestrom, 2001, p. 135). The extended system took into account the interactions of the individual within their community and the other aspects that influence activity. Engestrom (2001) combined two activity systems in a third generation of activity theory entitled cultural-historical activity theory (CHAT). The combination of two activity systems allows two separate but interrelated activity systems to be explored. For example, exploring the teacher and students' activity systems in a particular classroom (See for example, Gutiérrez, Baquedano López, & Tejeda, 1999) or patient and doctor activity systems within a hospital (See for example, Engestrom, 2001) looks at how both separate but interrelated systems interact. CHAT is one example of how Vygotsky's concept of tool mediation can be extended, resulting in the creation of a new theory. Another example is where tool mediation is combined with another theory to extend ideas around both. For example, while discussing data around children using video cameras in my Masters research, colleagues and I developed a framework to understand how children learn to use video cameras through play (Bird et al., 2014). We combined Vygotsky's (1978) tool mediation and Hutt's (1966) concepts of epistemic and ludic play (Bird et al., 2014). Then with a colleague, we further expanded this idea to create the Digital Play Framework (DPF), which consists of indicators that children display as they are exploring and learning to use various technologies (Bird & Edwards, 2015). As the children master the use of technologies as tools for epistemic play, the children change in their abilities and skills, resulting in the need for a new object of activity, which is ludic or imaginary play. Tool mediation also forms the basis of my theoretical framework, which I will introduce towards the end of this chapter.

3.2.5 Higher mental functions

Mental functions are those actions a person can do with their mind, and socially mediated higher mental functions are often a progression from lower mental functions. The development of mental functions or processes, is a combination of history and culture. Culture involves one generation passing "knowledge and skills on to the next" (Bodrova & Leong, 2007, p. 11) and then that generation appropriates this historical knowledge through their social experiences and acquisition of cultural tools. Vygotsky (2007) stated, children "appropriate the rich body of knowledge accumulated in their culture" (p. 11) and influence the body of knowledge passed on to future generations. Through this appropriation of knowledge, history "influences not just our knowledge, but our very thought processes" (Bodrova & Leong, 2007, p. 11). For instance, a child may learn to ride a bicycle, but the skills to complete the ride are culturally situated because not all cultures use bicycles and therefore not all people would know how to use one. The thought process that underpins understanding how to ride a bike and the benefits of this new skill are thus related to the culture in which the riding occurs. Similarly, for the use of technologies; different forms of technology are commonly used in different cultures thus the learning needed to master a technological device and to then use that technology in imaginative play are culturally bound. The use of technologies requires higher mental processes. Some actions with technologies are reflexes and conscious acts (lower mental functions), while others require developed attention and movements (higher mental functions).

Mental process can be divided into two separate categories; the lower mental functions are instincts or habits and include "reflexes and spontaneous, rudimentary conscious processes," whereas, the higher mental functions include "developed, voluntary mental functions, categorical perception, voluntary attention and voluntary movements" (Daniels, 2008, p. 25). The "higher mental functions are mediated processes" (Vygotsky, 1987b, p. 126), meaning they originate in the social and cultural experiences of the individual and come with a history of their own. As Vygotsky (1997a) posited, "the lower form is the basis and content of the higher form, that the higher form appears only at a certain stage of development and in turn itself continuously passes into the lower form" (p. 81). Meaning that once achieved the higher form becomes a lower form. The higher mental functions link with the concept of the zone of proximal development, in that children can achieve more through the social interactions and scaffolding of more capable others (Wertsch, 2008). When these interactions slowly reduce, the child can be capable of forming these functions independently. Vygotsky (1978) was interested in an individual's current ability or understanding of a concept, not in the complete form, but the difference between what they could presently achieve assisted, that would become their actual ability in the future. According to Wertsch (2008), the concept of the zone of proximal development suggests two features of Vygotsky's theoretical framework. Firstly, there is the idea that every psychological function has a cultural history, and secondly, the role social interactions play in the progress of higher mental functions is emphasised. The concept of the zone of proximal development will be explained further shortly [see Zone of proximal development, p.51]. Higher mental functions do not directly influence this study, but the notion that children are developing these functions during their preschool years through play, is important to remember when observing children's behaviour.

3.2.6 Culturally situated learning

From a cultural-historical perspective, learning occurs through an individual's participation in socially constructed activities. Knowledge is not imparted into young children and they are not positioned as "containers that must be filled with knowledge and skills by teachers" (Kozulin, 2003, p. 16). Instead, young children learn through activities that are meaningful to their communities (Rogoff, 2003) and they both shape, and are shaped by their experiences in these social contexts (Daniels, 2001). For instance, a child will learn about counting through allocating the utensils used at lunchtime to the number of people at the table (a one-to-one matching exercise) or learn about numbers and literacy through cooking with an adult when asked to measure ingredients and follow the written recipe (Bodrova & Leong, 2007).

Learning occurs in the social context the child is in and these experiences in turn, encourage the child's development. As Vygotsky (1997b) posited, every higher mental function was first social to the child, meaning that it occurred during their interactions with others in their cultural contexts. Through learning and the mediation of the cultural tools being used, the child internalises the activity where it becomes "an internal, strictly mental function" (p. 105). For example, children learning to calculate simple additions will learn to use their fingers, counting beads or stones on the ground; these are cultural tools deployed to achieve their object of activity, reflecting the cultural context in which it is occurring. As the children practice these behaviours and master the cultural tools available to them, they achieve the object of the counting activity. Once the children master the tools for counting and addition, the behaviour will turn inward, becoming an internal action, and they will be able to count and add in their minds. In this same way, a group of children in a kindergarten context will play to explore ideas about their social community and through their experiences in the imaginary situation, will test their assumptions to make meaning of their world (Fleer, 2011). The children will socially construct meaning together and then individually internalise this meaning to learn concepts that are related to their world. In this way, learning begins as a socially constructed, culturally meaningful experience and then moves to an individual, internalised concept (Vygotsky, 1997b).

Another feature of the cultural-historical view of learning is the significantly different way Vygotsky and Piaget saw the connection between learning and development. Also considered from a cultural-historical perspective, are the ways in which they can influence each other. Both theorists have been taken up by educationalists and influenced educational theory. Piaget (1964) specified a child needed to acquire a certain developmental level before learning would occur. Vygotsky's writing posed a different view. He posited that learning could lead development (Stetsenko, 1999). For example, when given assistance by a more capable other to learn the concepts of big and small, a child will feed that learning into the development of categorical thinking (Bodrova & Leong, 2007). In this way, learning leads development. The social experiences and the influence of more experienced others, assist the child to learn and develop concepts. This notion of the influence of more experienced others is detailed in the following explanation of the zone of proximal development.

3.2.7 Zone of proximal development

The zone of proximal development (ZPD) is one of Vygotsky's most well-known concepts. It is the difference between what a child can accomplish independently and what the same child can do with the guidance or assistance of an adult or more capable other (Vygotsky, 1978). It is a way of understanding the interaction between learning and development (Bodrova & Leong, 2007), because the tasks a child can complete independently shows their *"actual developmental level"* and what they can achieve with assistance can be seen as their ZPD (Vygotsky, 1978, p. 86, emphasis in the original). Vygotsky (1978) stated the zone of proximal development "defines those functions that will mature tomorrow but are currently in an embryonic state" (p. 86). In this way, learning through the interactions with a more capable other can actually "lead developmental change" (Glick, 2004, p. 351).

A child's ZPD has an impact on teaching and learning. What a child can do today with maximum assistance, is something she or he can do tomorrow with less instruction (Vygotsky, 1966). As with mediating a cultural tool described above, the assistance is reduced as the child's skills increase. Therefore, an educator would reduce the scaffolding a child needs over time and as the child develops the skills to be able to achieve the task independently (Bodrova & Leong, 2007). Again, this Vygotskian concept emphasises the relationship the social context plays on children's learning and development. Vygotsky (1978) stated learning created the ZPD and stimulates internal developmental processes that only occur during social interactions with people and peers in the environment and once internalised, "they become part of the child's independent developmental achievement" (p. 90). Without the social context, the ZPD would not be created and the learning associated would not occur.

Findings from my Masters research demonstrated that children needed at least one or two interactions with an educator or more capable other to learn the functions of devices before being able to independently use the technology (Bird, 2012). Even though children can start from a similar basis, depending on their experiences with technologies, their ZPDs can be different. In this previous study, two children displayed different ZPDs which was due to the time available for practice with the devices and their overall interest in learning to use it (Bird, 2012). The concept of the ZPD is used in this current study to understand how children can be supported by others to learn new behaviours that are outside of those that they can achieve independently. A child's ZPD occurs with technologies and within imaginative play. As Vygotsky (1966) explains, “in play a child always behaves beyond his average age, above his daily behaviour; in play it is as though he were a head taller than himself” (p. 16). Play is a leading activity for the preschool age child and has a central role in shaping development. A leading activity is where the child psychologically develops, resulting in changes to their social context and the interactions that occur within it (Duncan & Tarulli, 2003).

3.2.8 Play

While play may seem universal (van Oers, 2012), how it is understood varies and no one formal definition has been agreed upon. While people have trouble defining it, they are less hesitant to recognise it (Pellegrini, 2009). From a cultural-historical point of view, play involves hands-on exploration of artefacts and interactions with others in their social setting (van Oers, 2013). Traditionally, play has “an idealized status in early childhood” (Wood, 2013, p. 13) whereas, in the wider society it is often trivialised; for example, “when we say something is ‘child’s play’, we mean that something is easy and requires little effort” (p. 13). While Vygotsky did not release a formal theory pertaining to play (Stetsenko, 1999; Van Der Veer, 2009), his descriptions of play and elements of play are widely discussed and still influence practice in today’s early childhood education settings.

3.2.8.1 Vygotsky and play

When discussing the application of Vygotsky’s theoretical literature on play for the preschool child, one particular idea is often referenced – that play is the leading activity for preschool children. Scholars discuss how children spend most of their time playing, and while it may seem pedantic, what Vygotsky (1976) actually posited was that play is “the leading source of development in the pre-school years” (p. 537). He was clear to state that play is not the predominant form of activity; instead it is the activity that has the most profound influence on the mental development of the preschool age child (Vygotsky, 2004). Play, as the ‘leading activity’ for the preschool child will be discussed in detail later in this chapter [see Imagination supports leading activity, p.62]. Vygotsky specified that a child’s reasons for playing is more complicated than the pleasure it provides a child. Instead, he argued that children’s play is determined by changes in their incentives and motives.

> What is of the greatest interest to the infant has almost ceased to interest the toddler. This maturing of new needs and new motives for action is, of course,

> the dominant factor, especially as it is impossible to ignore the fact that a child satisfies certain needs and incentives in play, and without understanding the special character of these incentives we cannot imagine the uniqueness of that type of activity which we call play. (Vygotsky, 1976, p. 538)

For preschool aged children, the needs and incentives that arise through play can influence all areas of their development. A child of this age may play to realise his or her desires. Vygotsky (1966) used the example of a boy who wanted to ride in a cab. His desire was unfulfilled so he went to his room and played cabs. While play is not always as simple as this, Vygotsky argued that it is in the preschool age where imagination is a new formation and begins to impact the child's play capabilities. Children "learn through their observation and contributions to shared activities of importance in their community" (Correa-Chávez & Rogoff, 2005, p. 8). Smirnova (2011) highlights how children want to pretend to be adults. "Encouraged by this very general desire, children start to act as if they were adults, initially assisted and guided by adults or older children" and then playing out their own understandings of what it means to be an adult (p. 36). This quotation aligns with cultural-historical theory, in that children play to practice the cultural actions of their community and learn through the interactions with more experienced community members (Paradise & Rogoff, 2009; Rogoff, 2014). Three elements theorised by Vygotsky as requirements for play will now be discussed.

3.2.8.2 Three requirements of play

According to Vygotsky (1966), for children's activity to be labelled as play three elements are required. These are: (a) an imaginary situation, (b) roles and (c) rules related to the roles enacted. Going back to the cab example from above, when the child's mother denies him the privilege of riding in a cab, he returns home and creates an imaginary situation where he could pretend riding in a cab (Vygotsky, 1966). He lived out his wish to ride in a cab by creating a cab in his imaginary play. It is through the creation of an imaginary situation that the second and third requirements – rules and roles - are established. In the imaginary situation the roles are enacted. In the above example, the child may become the cab driver or the passenger; the child will act out the role desired for the imaginary situation. Once the role is established, rules become apparent for that particular role. Thus, the child pretending to be the cab driver would need to follow the rules of being a cab driver. For instance, the cab driver would drive the vehicle, collect passengers, deliver them to their required location and be paid. Therefore, the child would follow these cultural rules, sit in the driver's seat, not the back seat, collect passengers not drive past them and so forth. Similarly, the example used by Vygotsky (1966), a child enacting the role of a mother, would follow the general rules for maternal behaviour that have been observed through the experiences of living in their culture, community and family. The imaginary situation could be one of 'playing families' with each role containing its own rules.

The rules are determined by the roles which are required to act out the imaginary situation. For Vygotsky (1966), rules will always be contained within an imaginary situation and he used games with rules (played by school children and late pre-schoolers) to explain his idea further. Vygotsky (1966) stated "just as the imaginary situation has to contain rules of behavior, so every game with rules contain an imaginary situation" (p. 10). Both rules and their situation cannot be separated. Vygotsky used chess as an example; all the pieces have rules related to which way they can be moved across the board and the imaginary situation of capturing the opposition's pieces is the aim of the game. Nicolopoulou, Barbosa de Sá, Ilgaz, and Brockmeyer (2009) explain that chess is a structured imaginary world where the roles of kings, queens and knights are bound by the rules of each one's role. Roles and rules are negotiated by the participants, sometimes openly discussed, and at other times determined by the role being enacted. When young children play, their negotiation occurs verbally, requiring language to support their ideas.

Language is an important component of play, both when children play with others and by themselves. Perhaps, this high level of reasoning helps children think about and explain the role they are going to play, what objects they are going to use and how the play will continue (Bodrova & Leong, 1998). In their solitary play, children can display great complexity through assuming two roles at once. Japiassu (2008) explains that children can act out the roles of both the mother and the child, verbalising the speech for each one. In doing so, the child follows the rules of each character, making sure the rules are maintained for each role. The child's ability to explain their play scenario, the rules, and particular roles, indicates a mastery of play as a leading activity, as described later on [see Imagination supports leading activity, p.62].

Play has enormous benefits for a child. In play, children learn to control their own behaviour (Vygotsky, 1966), which is determined by the imaginary situation. Play also assists in the development of higher mental functions. For Bodrova and Leong (2011), play contributes to a child's development by encouraging the development of "intentional, self-regulated behaviour" (p. 61). They explain that play promotes children's ability to perform both internal and external actions. While still dependent on external operations of objects, children progress towards internal actions, where they can separate the meaning of objects from the actual object [see Separating meaning from object, p.55]. This shift signals that the child is capable of advanced, symbolic thought and they have moved on from early forms or sensory-motor and visual representational thought, for instance, imagination. In short, play prepares children for higher mental functions and it is play as a leading activity that supports children to master their activity and move to the next psychological area of development.

3.2.9 Separating meaning from object

The concept of separating meaning from object is also important for children's play, learning and development. Play is a "transitional stage", where the child develops the skills and psychological processes to be ready for more complex situations (Vygotsky, 1976, p. 546). One of these more complex, psychological processes is being able to separate meaning from object, where a child's actions can be based on ideas rather than the specific object. For example, a block can become a mobile phone when the child can separate the meaning of the block from the actual block. This psychological development results in the child's changed understanding of the world, where reality is "radically altered" (p. 546) and objects can take on new meanings. For instance, in play a stick can become a pivot to separate the meaning of horse from a real horse. When a child can separate meaning from objects in this way, they can pretend the stick really is a horse. Therefore, in play, object can substitute for other objects and the child can "act independently" of what they see or the objects they are using in their play (Vygotsky, 1976, p. 545).

Preschool aged children can continue to play even when they do not have the prop they require for their play. In these situations, children can either substitute on object for another or they can invent what they need (Bodrova & Leong, 2007). For example, a child might use a banana as a telephone or create a telephone in the pasting area. Elkonin (2005b) claimed that children's ability to transfer the meaning of one object to another is an important concept that assists with developing social relationships. Referring to the work of Buytendijk (1933), Elkonin (2005a) stated that play objects need to have an image, where they are value laden with possibilities and potential fantasies before they will be used in play. He explains further, that when an object returns to being just the object, it loses its ability and significance in being a symbol of the desired object. This is where the horse in children's play returns to being a stick in reality or the car returns to just being a box.

In group play, children will discuss events that might occur rather than acting them out. For example, they may discuss whether their building will fall down without having to knock it down in order to play out the situation. This process extends the possibilities for play because children can engage in pretend activities through discussing what could happen. The concept of separating meaning from object has implications for my research because if the children have reached the level of development where they can separate meaning form object, then they may substitute or create technologies if they are not provided. Also, children's play with working technologies requires them to understand themselves in abstract terms as a character on the screen (Edwards, 2013). This is the digital form of separating meaning from object and is a psychological step required before children are able to engage in digital games.

3.2.10 Imagination

As discussed above, an imaginary situation is required before a child's activity can be labelled play. Vygotsky (2004) was very clear to distinguish his idea of imagination from the general definition of imagination as being fantasy, or something removed from reality. Instead, he emphasised the link between imagination and reality. When describing imagination, Vygotsky (2004) referenced the brain with its ability to recall and recreate memories or elements of reality. He valued the brain and saw it as fundamental to the process of imagination, stating that it is an organ that collects and stores our previous experience, ready to reproduce that experience when called upon. The brain does not just remember what has occurred previously, that is memory; instead, imagination is different to other mental activity in "that it does not repeat combinations of accumulated impressions but builds a new series of impressions from them" (Vygotsky, 1987a, p. 339). It is not just the fact that the mind can remember experiences and items from reality but it uses these memories to create new understandings, impressions and through the creative act – new objects for reality. Imagination is dependent on reality; images are recreated in consciousness that have been experienced in reality. This differs from an act of true memory where previous images are recalled due to a trigger, for example when viewing a landscape, memories of a previous and similar landscape are triggered (Vygotsky, 1987a).

The act of imagination occurs when there is no trigger but the mind recalls these images and creates an imaginative impression. The difference between imagination and memory relates to the process that enables us to recall images. For example, memory involves recalling impressions and images from reality, whereas imagination produces new images that are a recreation of these images in never before seen ways. (Vygotsky, 1987a) identified creativity is the product of imagination; thus, without imagination human beings would not create anything new; instead our brains would just recall previous impressions and images over and over. Therefore, imagination is vital for children's pretend play in two ways; it is not only necessary for play, but it is "constituted, strengthened, and amplified by it" (Japiassu, 2008, p. 386).

3.2.10.1 The links between imagination and reality

When discussing how imagination links with reality, Vygotsky used several phrases to explain the concept, or more accurately, the translators of his work from Russian to English used various phrases [for more discussion on translations of his work see Limitations, p.124]. In the following section, I refer to Vygotsky's theorisation as what he stated, yet I acknowledge that the different terms are used by the individuals who translated his concepts into English and these have been criticised by other authors and translators (Cole, 2009; Van Der Veer & Yasnitsky, 2011). In the first instance he posits "the four basic *ways* in which the operation of imagination is associated with reality," then stated "the first *type* of association" (Vygotsky, 2004, p. 13, my emphasis), then referred to "the first and most important *law* governing the operation of the imagination" (p. 14, my emphasis). Moving on to the second way, he stated "the second *linkage* between fantasy and reality is quite different" using a different term again (p. 16, my emphasis). Within his paper *Imagination and Creativity in Childhood*, Vygotsky (2004) used the terms 'ways', 'types', 'laws' and 'linkages' to describe the connection to reality. Other scholars writing about imagination based on Vygotsky's theorisation, select their favourite term, for example Eckhoff and Urbach (2008) use 'laws'; whereas Fleer (2010) and Edwards (2011) use 'ways'. For this thesis, the term 'ways' will be used when describing the links between imagination and reality.

3.2.10.2 The first way of imagination

The first way of imagination is where the person creates an activity using elements of their reality. This activity is a transformation of elements from reality; it is nothing new, it is just a new combination of the elements through the imaginative act (Vygotsky, 2004). The person needs to have experienced the elements to be able to create their activity. For children, the first way of imagination is visible when they create a play scenario based on things they have experienced within their reality. For example, in the block corner children take the elements of roads, cars and buildings to create a city in which they re-enact their previous experiences. Edwards (2011) explains that reality provides the "building blocks of imagination" and children use them to create a new scenario (p. 199). The level or depth of how these building blocks are constructed, depends on the play ability of the child. The children's play scenario is dependent on the richness of their experiences or the "fuel" to provide the building blocks for their imagination (Eckhoff & Urbach, 2008, p. 182). The more experiences a child is exposed to, the more elements of reality he or she can draw on within their imagination (Vygotsky, 2004).

The first way of imagination is influenced by the social and cultural setting in which one is immersed. So in response, the elements of reality the child has to draw upon for his or her imaginative acts will reflect the context in which these experiences occur (Japiassu, 2008). The child cannot create a new culture, or a culture he or she has not experienced. The imaginative act needs to be built on reality and the elements need to be taken from that reality.

3.2.10.3 The second way of imagination

Vygotsky's (2004) second way of imagination is built on a combination of one's own reality and the reality of another person. In the second way, a person is not limited by his or her own experience and they can use the reality of another as elements in their imaginative act. This is where through the imaginative act, a person's experiences are broadened. Following on from the example above, in the second way a child's experience of roads and cars can be expanded through the social experiences of another. Another person may describe bridges that cross over large expanses of water or over other roads and highways to the child. The child then uses the reality of another and their experiences of bridges in his or her own play scenario. Without the other person and their social interaction, the child would not expand their reality through the use of social imagination. The first and second ways of imagination are linked, with the elements in the first way connected with another's socially experienced reality in the second way. This is where the child's reality is expanded, through taking on the reality of the other (Vygotsky, 2004).

The second way can also be called the social way of imagination, as it is through the social interactions and the experiences of others that reality is expanded. Social experiences can also be drawn through books, personal narratives, artworks or even oral stories (Eckhoff & Urbach, 2008). Vygotsky (2004) used the examples of reading a newspaper or studying geography or history; a person may not directly experience these events but through the imagination and experiences of others their reality is expanded. This is where imagination relies on reality in the first way, and then expands a person's reality in the second way. In the second way a person's reality is expanded because of their imagination, whereas in the first way their imagination is expanded because of their reality.

3.2.10.4 The third way of imagination

The third way links imagination to reality through an emotional connection. In this way, the person responds to the imaginative act with real emotions (Vygotsky, 2004). Vygotsky (2004) identified that the imagination selects elements from reality, then without logic combines them in a way that creates an emotional response. He used the example of a child, who when walking into a room in the dark sees the clothes hanging up as a person who has broken into their house. Although the image of the robber is a product of the child's imagination, the fear felt by the child is real. The emotions felt when one is totally absorbed in a movie, novel or play are another example. The images are creations of the writer's imagination but the emotions felt by the audience or readers are indeed real (Vygotsky, 2004).

When discussing the third way, Vygotsky (2004) recognised that emotions can also help select the thoughts, impressions and images that create a certain mood at a particular time. In this case, when a person is happy, their imagination is going to select images, thoughts and impressions from other happy times. Emotions cannot be separated from reality, in fact, they are part of reality and can in turn influence a person's imagination (Eckhoff & Urbach, 2008).

3.2.10.5 The fourth way of imagination

The fourth way of imagination is where the creative act comes to fulfilment or where the connection between imagination and reality comes full circle (Vygotsky, 2004). It is in the fourth way that people will create new elements of reality to then feed back into the first way as elements to create new scenarios. Eckhoff and Urbach (2008) simplify the process, stating the invention of new objects follows a circular path as it comes to fruition. The circular path starts with elements of reality that are used to create an imaginative act. These elements are drawn upon to create a product of imagination that become real and this new object becomes an element to start the process again. Without the fourth way and the creation of new things, a person can only draw on her/his own experiences and their current reality as imaginative building blocks (Edwards, 2011). Without the fourth way, society would not move forward and create new items; instead, it would be stuck in the current reality and new objects would not be created.

Imagination can free children from the restrictions of their current reality. It is through the sharing of other people's reality and experiences, that children can expand their own reality and have more resources and experiences to draw on for their imaginative scenarios. As Bodrova and Leong (2007) explain, children invent new worlds that exist only in their minds. Although children are often seen as being able to use their imagination more than adults, Vygotskian theory states a person's ability to use their imagination is built on the richness of their experiences, for instance, "a child has a less rich imagination than an adult, because his [sic] experience has not been as rich" (Vygotsky, 2004, p. 15). By providing a child with a variety of experiences, the elements of reality in which they can draw on are increased.

Not only do children need elements of reality to draw on for their imaginative act, they also need their world not to be in equilibrium in order for them to need to be creative. It is through this unsettled time that children have the need or desire to be creative. In Vygotsky's (2004) words, "creation is always based on lack of adaptation, which gives rise to needs, motives, and desires" (pp. 28-29). It is these needs, motives and desires that children have the drive to use their imagination and create new objects for their reality. Without the four ways of imagination children would not be creative and individuals would not create new items for their cultural community.

The role of culture is embedded in the fourth way of imagination, as imaginative creations are formed when the community is in need and a person is psychologically ready to create the needed object (Fleer, 2010). Fleer illustrates this point by describing how clotheslines were created to meet the needs of two different cultural groups. In Australia, the types of clothesline created took advantage of the vast space available, whereas in Singapore vertical clotheslines sprung out of windows due to the limited space available. This is an example of where the cultural tools created were dependant on the materials, needs and conditions of the culture in which the need arose. Returning to the example above, children create new objects and then use them as elements to draw upon to create his or her imaginative scenarios. What the child creates is dependent on the experiences in her or his cultural context. The four ways of imagination are "inextricably intertwined in real life" (Eckhoff & Urbach, 2008, p. 182); as the child's daily experiences are what fuel his or her imagination. Educators can help develop children's imaginations and encourage them to use their imagination to make sense of their world.

Emotion has a stronger connection to imagination than just the third way. My illustration of the four ways of imagination illustrates the cyclic process and the influence of emotions on the other three ways [see Figure 3:3, p.62]. In his final year of life, Vygotsky began to focus on *perezhivanie* (Van Der Veer, 2001), the Russian term understood as the "integration of cognitive and affective elements, which always presupposes the presence of emotions" (Daniels, 2008, p. 43). Vygotsky (1994) indicated that the "essential factors which explain the influence of environment on the psychological development of children…are made up by of their emotional experiences" (p. 339). The emotional effect is how people experience the imaginative act; how it is felt (Edwards, 2011). We can see that emotions play an important role in psychological development when we examine each way of imagination separately. In each of Vygotsky's (2004) descriptions, he discusses individual's experiences that include an emotional element. For instance, in the first way he discusses "impressions made by the real world" (p. 14). These impressions may be either positive or negative and will create emotional responses in the individual. In the second way description, Vygotsky refers to the imagination as being directed by another's experiences, and the image formed is based on their explanation of their reality. In this way, the imaginative act is influenced by the emotional description another person provides. Emotion is not a separate process to imagination but rather is embedded in it (Fleer, 2010). One can gain an understanding of "how a child becomes aware of, interprets, and emotionally relates to a certain event" (Vygotsky, 1994, p. 339) through valuing the connection between emotions and imagination (Fleer, 2010). Therefore, in the first way of imagination described above, the elements of reality also have an emotional connection. For example, the boy with his cars and roads will experience emotions when thinking about cars and roads. Whether he is happy or fearful, there will be an emotional connection. Furthermore, the four ways of imagination are not a linear process. Instead, the four ways can be observed within the one play scenario, or one or two of the ways can be identified in the play scenario without the others being involved.

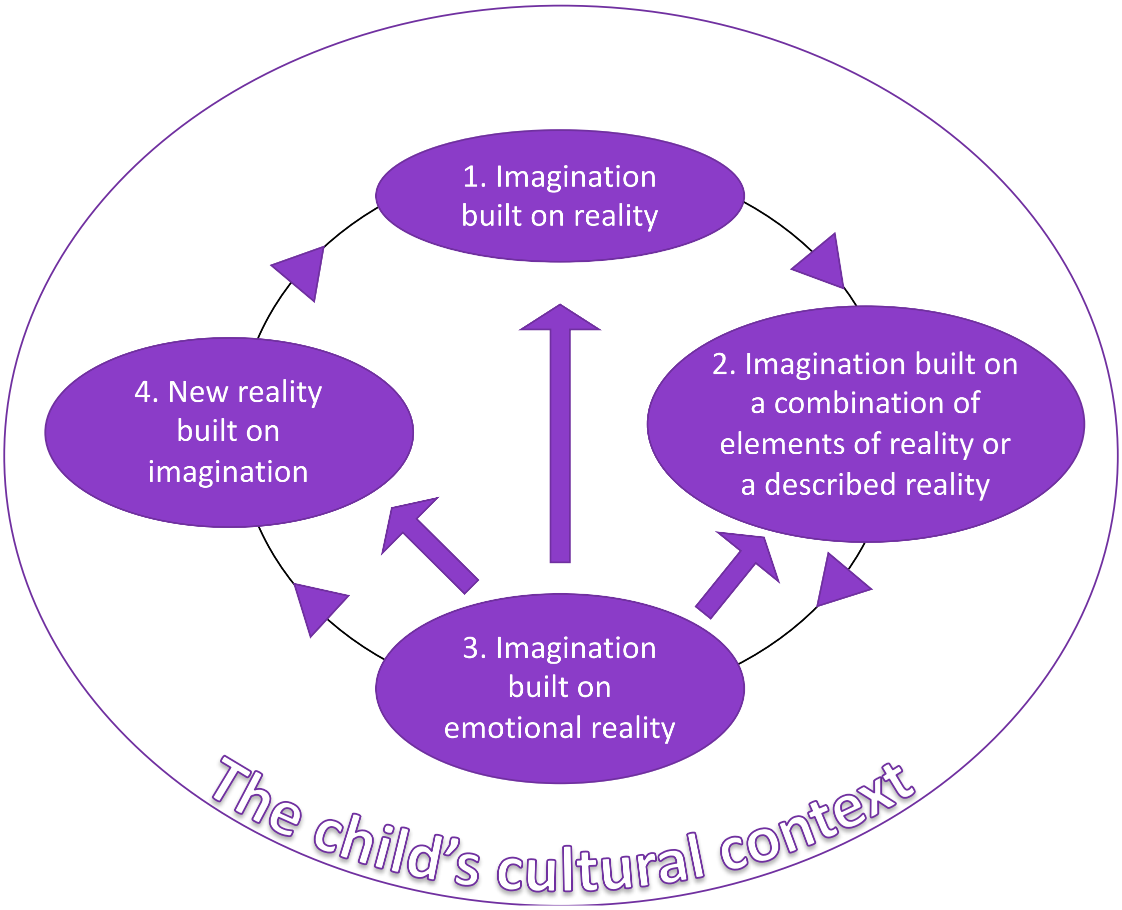

Figure 3:3 Illustration of the four ways of imaginative play based on Vygotsky's (2004) four ways of imagination.

3.2.10.6 Imagination supports leading activity

Imagination supports play and therefore learning for young children. As discussed above, Vygotsky (1976) argued that play is "the leading source of development in pre-school years" (p. 537) [see Vygotsky and play, p.52]. Imagination acts like a bridge between play and the next leading activity in children's development (Fleer, 2011). A leading activity is determined by the psychological stage a child is at. Achieving a leading activity results in changes to the child's social context and the interactions that occur within it (Duncan & Tarulli, 2003). Often linked to chronological age, the change in leading activity is what marks the transition from one psychological function to the next. For example, engagement in play moves a child from the psychological function of *emotions* to the next psychological function of *memory* (Edwards, 2011). Play defines the specific development that will occur at the child's particular age (Kravtsova, 2006). Leading activities are "organizers" that move a child from one central psychological function to the next (Japiassu, 2008, p. 393). This cognitive restructuring is supported by new psychological functions, and only through mastering one leading activity, supported by the psychological functions of that leading activity, does the child progress to the next mental function. *Speech* supports the leading activity of *experimenting* in younger children, and only through mastering *experimenting* do changes in the child occur and she/he can begin to use their *imagination* to support the mastering of the next leading activity - *play*.

Speech development allows a child to use their imagination (Vygotsky, 1987a). It is through speech that the child can represent what they think and transcend what they can see. Speech allows a child to separate meaning from object [see Separating meaning from object, p.55], and it is speech that supports the leading activity of *experimenting* in younger children. Without the ability to use speech when separating meaning from object, the child cannot go on to use his or her imagination in a way that can then support *play* as the next leading activity. Once the child masters *speech*, and masters the leading activity of *experimenting*, the child's social situation with those around him (especially adults) changes, resulting in a new social situation of *imagination in action.* The child can then use *speech*, *experimenting* and *imagination in action* to develop the skills of *imagination* that then supports *play* as the next leading activity. Without mastering one leading activity and its supporting psychological functions, a child cannot progress towards mastering the next leading activity.

Children master *play* as their leading activity in the preschool years and move on towards *learning activity* as their next leading activity (Kravstov, 2008). *Learning activity* is supported by the new psychological function of *attention*. *Learning activity* also prepares children for the learning that will take place in the school years. The change in social situation as a result of a child mastering one leading activity is apparent when the child can verbalise what is occurring. When a child can *collectively theorise*, the next social situation allows for the mastering of the next leading activity and they can then demonstrate they have mastered *play* as a leading activity (Kravstov, 2008). For example, Edwards (2011) describes how a child theorised with his mother about their pretending to be woolly mammoths. Together they *collectively theorised* and the boy was able to display his understanding of their play being an accurate representation of woolly mammoths from their previous night's reading. He had mastered *play* as a leading activity and was moving towards *learning activity* as his next leading activity. Children use their imagination to support their play with technologies. When they can verbalise what they are doing and the process behind their play, it demonstrates that they are psychologically ready to move to the next leading activity – *learning activity*.

3.2.11 Justification of cultural-historical theory and Vygotsky's concepts

Cultural-historical theory is an appropriate choice for the theoretical framework for this thesis. This is because children's imaginative play with working and non-working technologies within the kindergarten context is shaped and extended by their interactions with peers and educators, and through their hands-on experiences with technologies. It is their interactions and experiences within their social setting that exposes them to the cultural practices valued by their community. The children mediate both working and non-working technologies and their engagement with these devices can be explained using Vygotsky's concept of the four ways of imagination and understood through the use of the concept of affordance, which will be explored now.

3.3 Gibson's concept of affordance

For this thesis, the definition of *affordance* will be based on James Jerome Gibson's (1979) writings. Windsor's (2004) research builds on J. J. Gibson's original work and also adds to my theoretical understanding of the concept. To understand the term affordance and its use within this thesis, I will now explain the notions of affordance and constraints, stimulus information and the triadic relationship of affordance.

In his creation of the concept of affordance, J. J. Gibson (1979) devised the term when he could not find a word that adequately described the relationship between an animal and its environment. An affordance of the environment is "what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (p. 127, italics in the original). Affordances are functional meanings or actions that relate to both the animal and to the environment (Windsor, 2004). J. J. Gibson (1979) used the example of a surface to illustrate the term, explaining that some surfaces provide animals support and allow the animal to walk on them. Another surface, like the surface of water would not provide the same potential action, as most animals would not be able to walk on the surface of water. For example, water bugs could walk on water, but a larger animal or human would not. Thus, the surface of water *affords* a water bug a surface for walking on, but for other animals it does not afford the same ability, or it constrains their ability to walk on the surface of the water.

Affordances are relative to the animal; as different environments afford different resources to different animals. They are not based on scientific understandings, as in what the eye can see or what is perceived on a physical plane. Instead, J. J. Gibson proposed that affordances are based on what the environment can do or provide as perceived by the animal. Therefore, an affordance is related to the perceiver – the person or animal wanting to use it. For example, an object that is flat and is sit-on-able would be classified as a chair for an adult. This is because, in relation to the adult's leg size, the chair can provide a place to sit. For a child, whose legs are considerably shorter, the chair may not afford sitting. It an important part of the concept of affordance that the user's behaviour is influenced by what they perceive rather than the object's potential affordances (Pols, 2012). Affordances are part of the environment and the animal has to perceive the potential affordance and have the capabilities for using them (E. J. Gibson & Pick, 2003). As in the above example, a water bug needs to perceive the water will provide it a surface to walk on, for the surface to afford the bug walking. For an individual to perceive an affordance, they need to realise that the environment will allow them that action. If there is not this recognition, the affordance is not possible.

Norman (2002) discussed affordance in relation to the object, rather than focusing on the individual or the environment. He described how affordances relate to the actual properties of the object and how it can be used. While Norman's (2002) underlying concept was the same as J. J. Gibson's (1979), he focused on the object, whereas J. J. Gibson focused on the individual. In keeping with the location of the subject in cultural-historical theory, I use J. J. Gibson's explanation, which acknowledges that an affordance is related to the individual, rather than the object.

When describing affordances, J. J. Gibson (1979) used a linguistic construct where he added *–able* to the verb. For example, stand-on-able, walk-on-able, run-over-able and sink-into-able when discussing the affordances of water. Scarantino (2003) categorised affordances as either "*goal affordances* (their manifestation is a *doing*) or *happening affordances* (their manifestation is in a *happening*)" (p. 958, italics in the original). Pols (2012) provided an example where a fire affords cooking meat (a goal affordance) but can also afford burning yourself (a happening affordance). The *goal affordance* is a possible affordance, an aim or potential action, whereas a happening affordance is the realisation of a goal, it occurs and becomes reality. The concept of affordance has implications for my study. In exploring the affordances of educational settings, it is important to make a distinction between what educators perceive and what the environment actually affords the children, as they may be two different things. The concepts of *goal* and *happening* affordances are also important as the educators may perceive goal affordances but these may not actually happen. The children and the educators may perceive the *goal* affordances related to technologies, but the *happening* affordance may not eventuate.

There are links between affordance and cultural-historical theory. Daniels (2008) highlights the similarities between J. J. Gibson's (1979) concept of affordance and Vygotsky's (1978) ideas around the social situation and its influence on the individual. Both theorists explore objects in relation to the individuals. J. J. Gibson explored affordances in relation to the individual rather than properties of the objects. Vygotsky investigated the effect on the individual of mastering cultural tools. I forge similarities and links between these two theorists that enable me to partner these theoretical concepts together as a new conceptual framework for this thesis [see Bringing the concepts together, p.81].

3.3.1 To afford or not to afford?

The classification of objects is often according to their characteristics or qualities. J. J. Gibson (1979) argued that people pay attention to the affordance of an object and that is how we classify them. Although a knife, fork and spoon could be all classified as cutlery, whereas J. J. Gibson would classify them according to their affordance – a knife could afford cutting food, whereas the fork and spoon could afford the movement of food to the mouth. He further justifies this idea in relation to children. He states that an infant will discriminate between objects according to what they afford him or her, rather than the qualities of objects. An infant will perceive an object as graspable because it can afford the ability to be grasped, rather than because of the characteristics of its surface, colour or form. Affordances are determined through structured stimulus information collected from one's environment. Stimulus information will be explained further later on [see Stimulus information, p.76].

The properties of an object assist the individual in determining the possible affordance of that object. According to Windsor (2004), the characteristics of an object are what makes the action in the particular environment possible. He calls them "effectivities", which are the "capabilities for action" (p. 181). For example, a rock may afford an adult throwing or as an object to throw. For a child, due to their effectivities (namely their size and muscle structure), the same rock may not afford a throwing opportunity. As Windsor and de Bézenac (2012) explain, a pen would only afford writing to the person who has the ability to write. Without that ability the pen does not afford writing, instead it just affords scribbling. An affordance becomes an affordance when the individual has the skills and abilities to perceive that the object can provide the possible action (Scarantino, 2003). The affordance of an object needs to match with the effectivities of the individual. For example, 'cook-with-ability' is not a property of fire. Instead, people have developed the equipment and skills in using fires to cook with, making them 'cook-with-able'. People also have the ability to restrain fires as cooking fires, so they do not develop into house or bush fires (Bloomfield, Latham, & Vurdubakis, 2010). In my research there may be a number of possible affordances for particular technologies, but the perception of the child, their abilities, and/or skills determine if those affordances are realised.

Sometimes an object requires other elements before it can afford a particular behaviour. The surface of a lake, for example, may appear flat but it is not rigid, so it does not afford support for standing. It may afford a person swimming but only if that person is equipped for swimming, if he or she has learnt to swim (J. J. Gibson, 1979). The notion of other skills or abilities being present in the individual for an affordance to be realised is important for my research because technologies alone may not afford a child imaginative play. There may be other components in the early childhood setting that provide the necessary features to make affordances possible. Components such as the child's knowledge and skills or the apps and programs available on iPads and computers can be the difference between the device affording imaginative play or not. Alone, an iPad will not afford imaginative play, but with the added element of open-ended apps and the skills to use them, it is possible.

3.3.2 Changing affordance

When individuals perceive that an object offers affordances, they constantly reassess the object and its potential affordances. This is a "continuous perception-action cycle" where people's perception of affordances alter when environmental conditions change (E. J. Gibson & Pick, 2003, p. 16). Children do this all the time and from a very early age. As they grow and develop, their perceptions of affordances change, which in turn impacts the stimulus information available to them to perceive further affordances [see Stimulus information, p.76]. One of the skills children need to develop is body scaling of resources, thus, as they grow and change in size and strength, they adjust their perceived affordances. E. J. Gibson and Pick (2003) use '*Goldilocks and the Three Bears*' as an example of the need to understand size relativity in order to perceive the affordances of the furniture. Goldilocks did not know her own size and strength and perceived Baby Bear's chair would afford her sitting. When she did attempt to sit on it however, it broke. Continuing with this example, when Goldilocks was younger, she may have perceived that the chair would afford her sit-on-ability, and when she sat on it in the past it may have held her weight. She perceived that the goal affordance was the chair's sit-on-ability, and when she was younger and smaller, she may have achieved the affordance of sitting on the chair. As she grew, the actual affordance of the chair has changed, and no longer afforded her sit-on-ability.

Affordances change as the person changes. Sanders (1997) described the example of an infant and an electron microscope. As a young infant, the microscope may afford grasping but not moveability, depending on the child's size in relation to the size of the microscope. As the child grew, the affordances of the microscope changed and new affordances become clear. This concept can be transferred to many objects in the child's context, because as the child grows and learns, new affordances come into existence; just as the affordances of the chair changed as Goldilocks grew. This idea is also important in relation to working technologies. As demonstrated in my previous research, children can learn to use the working technologies through their epistemic play behaviours, the technology changes from affording only epistemic play behaviours to ludic or imaginative play behaviours as the child learns and develops (Bird & Edwards, 2015). This change in affordances only applies if other components are available in the setting (for example, open-ended apps and programs). The technology does not actually change, instead it is the child who grows and develops, resulting in changes to the perceived affordances of the technologies.

3.3.3 Affordance and constraints

When discussing affordances, some theorists separate affordances and constraints, while others see them as complementary or necessary. For J. J. Gibson (1979), an affordance includes both the subjective and objective and involves the inadequacies of both. He discussed the positive and the negative affordances of objects. For example, a cliff could afford a place to walk and a place to fall off, a knife could afford cutting food and also an unpleasant cut to the hand, and a person's hand could afford both caresses and blows. J. J. Gibson includes the constraints in his explanation of affordances. Likewise, Kennewell (2001) concurs that constraints are a part of affordances and the two cannot be separated. They are complementary and both are needed in his description of affordance. Conversely, Greeno (1998) separates affordances and constraints. He describes them as "if-then relations" between individuals, objects and their environment. Goldilocks can be used as an example again. *If* Goldilocks was the right size, *then* the chair would *afford* sitting. In relation to a constraint, *if* Goldilocks was not the right size, *then* the chair would *constrain* sitting.

Affordance and constraints can be seen as binaries. For instance, Greeno (1998) describes affordances and constraints as the positive and negative; the affordance is the positive action, the constraint the negative or non-action. Greeno (1998) used a situational perspective and argued that an affordance is dependent on the activity of the individual and the environment (Reynolds, 2010). For Greeno (1998), affordance is stable and consistent, whereas J. J. Gibson (1979) argued that changes in both the individual and their environment result in different affordances being perceived. This thesis leverages J. J. Gibson's understanding, which fits with the cultural-historical perspective that sees individuals influencing their environment and in turn, the environment influencing the individuals within it.

Some descriptions of affordance outline the constraints as separate or another feature of an object. J. J. Gibson (1979) described both affordances and constraints. An example is a door; it can afford entry if open, or if it is closed it constrains entry (Kennewell, 2001). Whereas, Reynolds (2010) rephrases the constraints as positives within the affordances of the objects. Rather than describing both the affordances and the constraints, as J. J. Gibson (1979) does, Reynolds (2010) focused on all the possible actions as affordances of the door. For example, the door could afford entry and non-entry or security and imprisonment. The affordances of the door relate to what the person perceives are the affordances of the door are. One person may perceive the door affords them entry, whereas another may perceive the door affords non-entry. Individuals looking at the same door might perceive it affording them entry, protection from outside weather, or somewhere to hang a Christmas wreath. All of these are valid examples and are dependent on the individual and their perceived affordances of the same door. In formulating the argument of this thesis, I describe both the affordances and constraints of an object. When looking at a constraint, it might be then that some affordances become perceivable. In other situations, one affordance leads to other affordances needed to be realised before a final affordance occurs (Pols, 2012). The types of affordances and affordances contingent on other affordances are explained in the next section.

3.3.4 Understanding actions, understanding affordances

It is the individual's perception, in relationship with the object, that results in the affordance of an object. Without the individual perceiving an affordance it would not exist. Individuals require knowledge of the object in order to know the actions needed to make an affordance possible. For example, to perceive that a switch affords lighting a room, an individual requires information that the switch affords flipping. Actions are things individuals do intentionally and are often described in terms of their consequences. The consequences might be physical, while others may be social. In the light switch example, the switch affords the basic action of moving your hand against it, with the consequence of another affordance of turning on the light. If the first basic action is not afforded, then neither are the other actions or consequences. The execution of a plan involves several actions that are performed for the one consequence (Pols, 2012). For example, in order for the consequence to be realised, the execution of the plan of calling a friend requires the action of dialling each number, pressing the call button on the phone, and then waiting for the call to be connected, in order for the consequence to be realised (Pols, 2012). Calling a friend also relies on the individual having the cultural knowledge of the phone system and the friend to actually call. The notion of one or more affordances leading to other affordances is useful for my research because if the basic action of ‘free play’ with technologies is not afforded to the children, then the further affordance of imaginative play may not be available to them either.

When looking at the notion of the execution of a plan, an artefact affords several actions that are required to execute the plan and then they culminate into one large action or affordance. For instance, dialling a friend requires the phone to afford several actions, including pressing each number and the dial key before the affordance of dialling a friend can be realised. The actions or plan can have both physical and social consequences and the affordance can be described in terms of the social consequence, rather than just the physical. Pols (2012) used the example of an airport luggage monitoring system. It has both social and physical consequences when it affords safer travel for plane passengers. The physical consequence is around people’s physical safety and mortality. The social consequence has to do with controlling people’s behaviour and reducing the risks that may negatively impact others in the social context.

When encountering a new or unknown artefact, individuals will begin by perceiving the object’s manipulation opportunities. They then move into real affordances through interacting and experimenting with the artefact. Pols (2012) calls these “*manipulation opportunities*” because they afford basic actions like grasping, pushing etc. (p. 117, italics in the original). The basic affordances are based on basic actions. Hutt (1966) explored this idea when she studied children’s reactions and interactions with a novel object. These were basic actions or basic affordances of the object. Firstly, the children’s behaviours explored “what can this *object* do?” before they moved to behaviours that explored “what can *I* do with this object?” (Hutt, 1966, p. 76, italics in the original). The second type of behaviours displayed more detailed affordances and more in-depth actions. This notion of experimentation is significant for my research, in that children explore and manipulate technologies, displaying epistemic play behaviours before they can use the technologies for ludic or imaginary play (Bird & Edwards, 2015). When children perceive basic affordances, they can use these when they start to experiment (Pols, 2012). For example, a child may perceive that the computer mouse affords controlling the character on the screen before exploring *where* they can move the character to or *what* they can make the character do.

Through manipulation and experimentation children learn what affect their actions have on the mouse, computer and the program being played. Pols (2012) called these types of actions "*effect manipulations*" (p. 117, italics in the original) because the individual also needs an understanding of cause and effect in order to perceive the affordances of an object. As stated earlier, an object will not afford an activity if the perceiver does not see the potential possibilities because affordance relies on the relationship between the individual and the environment. In terms of children's use of working technologies, before they can perceive the mouse affording the character's movement, a child needs to be able to separate meaning from object in order to understand that they are embodying the character on the screen (Edwards, 2013). If the child has not yet mastered the ability to separate meaning from object in this digital sense, they will not be able to use the mouse to control the character.

Often what an individual can do with an object, or its affordances, require a string of basic affordances to be realised. Pols (2012) describes "*use opportunities*" in terms of what the user can do with the object (p. 118, italics in the original). For example, Pols' computer affords him writing an article. Through the basic affordances of typing or deleting letters until they are cohesively joined together to form words, it can be said the computer affords him writing an article. The present or sequential basic affordances, when perceived, can create other affordances. It is similar to a drop-down menu on a computer, where once an item is selected another becomes available. An object can also offer actions as part of a system of objects. Pols (2012) calls these affordances "*activity opportunities*" (p. 119, italics in the original) and refers to J. J. Gibson's (1979) example of a post box. Without the understanding of the postal system, the post box would remain a box on the side of a street, rather than a box that affords the sending of a letter. Without the social and cultural knowledge of systems, individuals would not be able to perceive activity opportunities.

Just as activity affordances require knowledge as well as the affordances an object can provide, systems can require several objects, actions and individuals to ensure the affordances of a system are realised. For instance, the example of the airport luggage monitoring system described above. It needs several parts including: an artefact (the scanner), a human (the operator, other workers and the passengers), and institutional parts (the laws or regulations around luggage handling) in order to afford the plane passengers' flight safety. Each individual part has its own affordances and together the parts function as a system that also provides affordances. The ideas around the notion of system affordances as a combination of objects and other affordances, also has implications for understanding educational practices. Early childhood education is a complex system that contains objects, individuals, and institutional parts that work together to fulfil its intended functions. The environment affords the children and educators different actions and each in turn influences the affordances of the other. Pols' (2012) four different descriptions of actions are useful for educators who aim to understand educational systems and the associated affordances in the various contexts. They are used in this research to understand the systems that are present in early childhood settings and the affordances involved in each.

3.3.5 The triadic affordance relationship

Windsor and de Bézenac (2012) proposed viewing affordance as a triadic relationship between the organism, environment, and stimulus information [see Figure 3:4 Triadic affordance relationship, p.74]. Just like Vygotsky's (1978) concept of mediation, where the subject's relationship with the object of activity is mediated by their tool use, the relationships between the *organism* [see Organism, p.74] and their *environment* [see The environment, p.74] in the affordance triad is influenced by the *stimulus information* [see Stimulus information, p.76]. The stimulus information of an environment is dependent on the organism's presence in that environment. The organism does not just react to stimulus, or interpret them, "rather, the organism discovers the affordances of events and objects through the pick-up of stimulus information" (Windsor & de Bézenac, 2012, p. 103). It is through understanding these three terms and their relationship, that educators and researchers can learn how affordances can happen. These three terms and their relationship within this study will now be explored and explained.

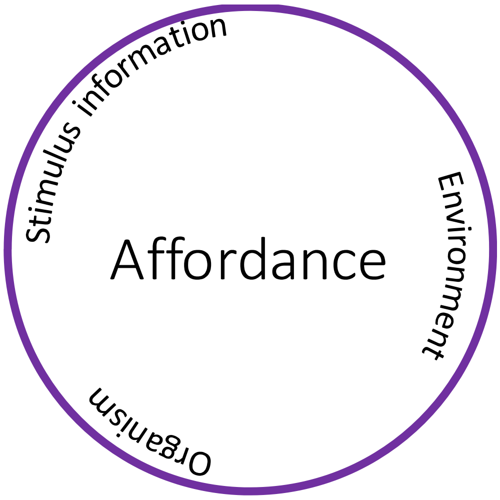

Figure 3:4 Triadic affordance relationship

3.3.6 Organism

The organism in the affordance triad is the individual or animal under investigation or whose behaviour is being explored. J. J. Gibson (1979) often referred to animals in his articles about the ecological approach to perception. In Vygotsky's literature about mediation he referred to the subject. In this thesis I use the terms 'subject' or 'children' when referring to or explaining the broad concepts of affordance or mediation and other concepts, for example, technologies in general, play, learning, or early childhood education. I use the terms child, educator, or a child or educator's specific name (or their pseudonym), when referring to particular individuals in a specific context or when discussing broad concepts. The subject is important in this study, as they need to perceive affordance for it to exist. To reiterate a point made above, if an individual does not perceive an object can provide a particular action, then the affordance is not there (J. J. Gibson, 1979).

3.3.7 The environment

The environment is central to the concept of affordance. Noble (1981) argued that J. J. Gibson positions affordance too much in the environment and fails to take into account the individual's own potential actions in determining what the affordances are. I believe it is through an individual's experiences in their cultural context that determines the affordances they perceive of an object. For instance, J. J. Gibson (1979) describes the affordance of a mailbox, it affords 'posting of letters' because it is perceived within the understanding of the social conventions of a particular culture. If one was to move a mailbox to a cultural environment that does not have a working mail system, the mailbox would not produce the same affordance. Just as a non-working mobile phone in a kindergarten home corner could afford a child imaginative play, if the same mobile phone was relocated into a working office, it may just afford clutter to the office person or constrain their ability to perform their duties in a messy office. The way that an individual perceives the affordances of an object reflects their understanding of the social context or environment in which the activity occurs. Affordances are not static, instead they change as the environment and the individuals change, explained in the Goldilocks example above (Windsor & de Bézenac, 2012). For example, a kindergarten home corner may not afford children imaginative play because it does not serve their interests. If an educator changed the objects available in the home corner, for instance, adding some non-working technologies, then changes to the environment could change the perceived affordances of that environment. If before the educator made changes to the kindergarten home corner, the child changed and developed the concept of separating meaning from object (Vygotsky, 1966) [see Separating meaning from object, p.55], then a banana could become a telephone for that child. The environment was unchanged, but the child had changed, resulting in new affordances. Changes to environments may provide more affordances for some, but constrain opportunities for others.

Over the centuries, humans have made changes to their environments in the understanding that these adaptations will provide more affordances (J. J. Gibson, 1979). While these changes may have made it easier for individuals, the effects are not so positive on other species on the planet. For example, logging rainforests has increased crop growing areas but has reduced the natural habitat for many animals. In kindergartens, educators make changes to the environment, which in turn influences the affordances for themselves and the children they teach. The children also make changes to their environment to afford their ability to play or enact the practices of their culture. The educators, in providing objects that suit their own needs, may in fact be denying children the objects that they need for their play and play scenarios. Furthermore, the play objects that the educators provide will be based on their understandings of digital play and their perception of what technologies can afford children. These expectations are significant for this study because how the educators perceive technologies in affording play can influence how they provided devices and the rules and restrictions (the constraints) they apply.

3.3.8 Stimulus information

Stimulus information is the information gathered by an individual about the environment and the objects contained within it. Stimulus information provides the knowledge to perceive an affordance. This knowledge is gathered from the environment and used to perceive affordance with particular objects (Windsor, 2004). The affordance is realised when all the stimulus information is gathered together. For example, the perception of gender both affords and constrains behaviour, and is based on all of the stimulus information gathered in the environment. In some cultures, being male might afford the wearing of pants and constrain the male's ability to wear a dress, whereas in other cultures, being male affords wearing a skirt or kilt, instead of or as well as affording the wearing of pants. Affordances are also influenced by the cultural context, as the behaviours gender affords in one culture are vastly different to the behaviours the same gender affords in another. These cultural differences are relevant for this research, as the behaviours that technologies afford one individual may be different for another. All of the stimulus information needs to be taken into account to perceive possible affordances and to interpret the affordances in relation to the individuals concerned.

A stimulus is different to stimulus information. J. J. Gibson (1979) was clear to distinguish the difference between a stimulus and stimulus information. For him, a stimulus related to the firing of nerve cells, a reflex or impulse. He argued that a stimulus was temporary and did not provide any information about its source or its place in the world. In contrast, stimulus information resides in the object and is a continuing presence that does not taper off. He argued that affordance perception is not just a "response to a stimuli but an act of information pickup" (J. J. Gibson, 1979, p. 57). Other information is needed by the individual in order to perceive the stimulus information as an affordance. Sensory awareness can reach a threshold, unlike stimulus information, which can continue to provide an individual with information that can influence the possible affordances. The influence of the stimulus information on affordance relates to other factors including the age and abilities of the perceiver, their level of perceiving ability, and their level of motivation to perceive the possible affordances (J. J. Gibson, 1979).

Contexts influence stimulus information and how perceivers interpret it. For example, hearing a lion roar might afford the need to hide, while on the other hand, hearing a lion roar could afford satisfaction at hearing the sound. Technologies operate in a similar way in that they provide several different affordances depending on other stimulus information present in the context. Windsor (2004) provided the example of a rock approaching an individual. The stimulus information that the individual perceives as the rock approaches is different to the information that someone shouting, "look out" will have. However, each may result in the same or a different affordance. Other information is needed to determine the affordances, including the perceiver's knowledge of gravity and physics and whether or not they are able to understand English in order to heed the warning. Providing non-working technologies to children may afford them different opportunities, depending on other factors including the child's play skills for instance, their ability to separate meaning from object, their level of imagination and their prior social experiences with the technology.

Stimulus information links with cultural-historical theory, in that the information received by the individual about the object, is based on the individual's cultural understandings and history of experiences. For example, in an office, a person may sit at a desk. On the desk may be a pen that can afford writing. The stimulus information about the pen is dependent on the person's cultural and historical knowledge about pens. If the person does not perceive that the pen affords writing, then the pen will not elicit that response. Whereas, if the person wants to write something, they receive the stimulus information about the pen, and perceive the affordance of the pen. The person will then use the pen for writing. Similar ideas have been expressed in different ways in the past. For example, according to Pavlov (1902), who researched behaviour conditioning, a dog salivates when a bell is rung because he has been conditioned with food to do so. It is not the noise of the bell that causes the action; it is the dog's perception of what the ring of the bell affords him that creates the action (Eco, 1979). As Windsor (2004) explains, an organism does not react to stimuli, instead it "discovers the affordances of events and objects through the pick-up of stimulus information" (p. 183). If the dog did not know the ringing of the bell would signal food was on its way, then the affordance would not be perceived.

3.3.9 Technological affordance

In 2000, Carr explored the affordances of computers in early childhood settings. She found that there were three categories of affordances – "transparency, challenge and accessibility" (p. 63). Transparency relates to the inner workings of the computer as a tool and how understanding of these workings is needed before the tool can be successfully used. This aligns with Hutt's (1966) description of epistemic play with a novel object. Once children have explored the novel object, they can move to ludic play. Likewise, once children have mastered the functions of the computer, then they can move to being creative with it (Bird & Edwards, 2015). The second technological affordance category, according to Carr (2000), is challenge. This category relates to how open-ended a technology is. Carr's research was conducted prior to the introduction of the iPad and is therefore limited in its transferability. She refers to other objects in the early childhood environment that are open-ended, like sand, water and blocks, believing their open-endedness is why they are so common in early childhood settings. Her research explored computers generally, she did not review the computer programs on each device. Therefore, she states computers are either closed or restrictive. Computers, and for that matter iPads in their working forms, are only as open-ended as the programs or apps that are loaded on them. It is not necessarily the device that is open-ended; instead it is the software that impacts the children's ability to be creative and imaginative with them.

The final category of technological affordance is accessibility. This category relates to the level of participation and affordance that a technology allows. For Carr (2000), a technology that is not transparent can become accessible if a more knowledgeable other demonstrates how to use it. She also refers to how the physicality of technologies may afford or restrict children's access and ability to engage with the device. Again, her findings may have been different if iPads were invented and if she included iPad research in her data set. However, her findings relating to 'more knowledgeable others' assisting the child have been demonstrated in further studies that deployed the use of iPads. For example, accessibility of the technology was also evident in my Masters research [see Personal orientation to this research, p.1]. It was common to see a group of children around the computer or iPad watching the child having their turn. They were afforded watching the game, but they were also constrained by the device that often required just a single user. Not only can the device afford or constrain learning, the apps and programs provided can add another layer of affordance or constraints.

3.3.10 Affordance under the umbrella of cultural-historical theory

The concept of affordance fits comfortably within the overarching theoretical framework for this study - cultural-historical theory. While there are parallels between the notion of affordance and cultural-historical theory, the theory of affordance as defined by J. J. Gibson (1979); Pols (2012); Windsor (2004) or E. J. Gibson and Pick (2003), does not include reference to the psychological functions that an object may afford (Daniels, 2008). Baerentsen and Trettvik (2002) contest that J. J. Gibson focused "on the perceptual side of the concept" ignoring an individual's activity or the psychological functions in the concept (p. 51). As explored above, the affordance of an object is dependent on the individual perceiving the possible affordance and their perception is based on their knowledge, experiences and understanding (Oshlyansky, Thimbleby, & Cairns, 2004). From a cultural-historical perspective, the individual's knowledge is based on their social interactions within their culture. J. J. Gibson (1979) did not specifically discuss culture and its influence on affordances in his work. This varied emphasis on culture has since become a difference among authors who use affordance theory in their work (J. Hu, 2012). Culture is an important part of this research; recognising the knowledge and understanding participants have is determined by the interactions with others and the cultural objects they have in their social context and forms the culture of each research site.

J. J. Gibson did not specify culture in his description of affordance, but the way he outlines stimulus information gained in the individual's environment, culture is evident. The reason for this "vagueness" (Windsor, 2004, p. 181) in J. J. Gibson's (1979) own writing was the concept that affordances can be either directly or indirectly perceived, or both. Direct perception is when the individual interprets all information received firsthand, through sight, touch, sound, smell and taste. Indirect perception allows individuals "to perceive objects and events that are not directly and immediately specified in stimulus information" (Windsor, 2004, p. 181). Indirect perception works just as the second way of imagination does (Vygotsky, 1987a), where individuals can use the reality of others for their own imaginings, so too with perception can individuals use information acquired from others to build their own perception. In this way affordance can include the influence of the cultural context and those within it. Windsor and de Bézenac (2012) concur with Sanders' (1997) interpretation that the perception of affordance needs to include an account of cultural contexts. Sanders clarifies:

> Affordances are opportunities for action in the environment of an organism, the opportunities in question include everything the organism can do, and the environment includes the entire realm of potential activity for that organism. (p. 108)

Possible affordances are dependent on the environment, the culture of the context, the individual and their history, skills and abilities. Culture and history are both important concepts within cultural-historical theory and both are embedded in the stimulus information available in an environment when an individual perceives a possible affordance. Windsor (2004) describes culture by stating that it is like anything else we perceive in our environment. It is specific to the particular environment of the individual and is perceived when continuously exploring that environment. He explains this further using the example of a screwdriver. A screwdriver is embedded with a history and cultural implications that the individual navigates when using the tool. In other words, the affordances of the screwdriver are influenced by the cultural context in which the individual is situated and where the tool is being used. While the individual may not give history or context a passing thought, both are automatically understood. To explain further, the individual using the screwdriver knows the tool and perceives what it can afford, due to their knowledge of screwdrivers gained from their experiences within their cultural context. Whereas, a person from a country without screwdrivers, when given the tool, would not perceive any affordances, due to the lack of historical and cultural knowledge of the tool.

Perception and affordances include past knowledge and when viewing perception from a cultural-historical perspective, the cultural context and its history are taken into account (Pols, 2012). For example, depending on the context, the individual and the social conventions, technologies may afford a child imaginative play, cultural representation, and learning, but moved to another context, the same technologies might afford another individual something different, or in turn, may not afford anything. History and context are important in cultural-historical theory and both are explored, reflected on and discussed throughout this thesis. History and context are valued in the theory of affordances, just as they are in cultural-historical theory. The two constructs of cultural-historical theory and the theory of affordances, are complementary and both play an important part in this thesis.

All individuals in a social context need to be taken into account. An individual perceives the affordances of their social context through their interactions with others and through being exposed to social events (Windsor, 2004). A kindergarten is a social context and the affordances within it are influenced by the children, educators and families that are involved in the centre. Activity can be seen as a negotiation between the individuals and between the individuals and objects within the social context (Greeno, 1998). This continual negotiation between people and resources means that the affordances of the environment are influenced by the activity that occurs in the environment, and through influencing the affordances, changes in the activity are possible. In the kindergartens involved in this research, if perceived technological affordances are to be understood, knowledge is required of the activities that can possibly occur, including the educators' behaviour and their provision of the technologies for the children's play.

3.3.11 Affordance in relation to this study

As described, affordances are perceived by the individual in relation to the stimulus information collected within the particular environment (Windsor, 2004). There is a need to look beyond objects in the early childhood education environment - the computers, the programs and the students, to see what these environments can afford and what new affordances are possible (Reynolds, 2008). The same is true in the context of this research. The environment under investigation or the context was explored in regard to what it afforded the children in each setting, the educators' perceived affordances, and the components that impacted the children's imaginative play. The educators' provision of technologies was part of an environment in which the children engaged in imaginative play. Therefore, the affordances and constraints around the educators' provision of the technologies in their kindergartens were perceived when I analysed the research data.

3.4 Bringing the concepts together

This research leverages the notion in cultural-historical theory that all interactions between individuals and between individuals and objects occur within a specific cultural context. It is through these interactions that individuals expand their own knowledge and learn the values of their community. This chapter has outlined three main cultural-historical concepts of importance for this study. These include Vygotsky's concepts of tool mediation and the four ways of imagination, and J. J. Gibson's theory of affordance. Through the combination of these three concepts, I illustrate an innovative conceptual framework that can be deployed for cultural-historical research in early childhood education settings [see Figure 3:5 My theoretical concepts illustrated, p.82]. By integrating these elements into one system within the one cultural context, I demonstrate that the concepts are interrelated and moreover that changes in one of the components influences the others. Berman and Smyth (2015) explore the use of conceptual frameworks within Doctoral studies, stating "the conceptual framework usually develops from relational thinking about core concepts" (p. 127). A conceptual framework is more than a theoretical framework, it takes concepts from the theory or theories being used and manipulates them in order to explore the phenomenon under study. In this way, I have taken the concepts from Vygotsky and Gibson, manipulated them and illustrated my conceptual framework. I will now explain why I have illustrated these concepts in the way I have.

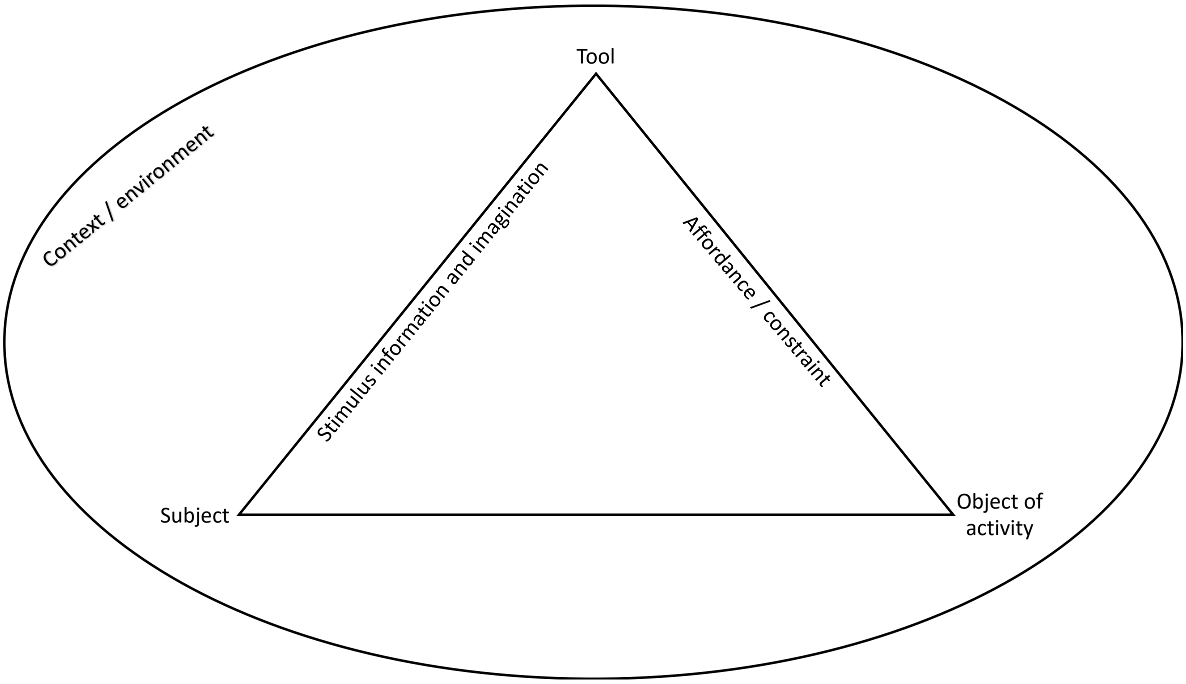

Figure 3:5 My theoretical concepts illustrated as the *Imaginative Affordance Framework*

I believe this is the first time that these concepts have been brought together to explore the one phenomenon. As discussed above, affordance and cultural-historical theory have been linked and these ideas have been published, but never before has tool mediation and affordance been linked or the inclusion of imagination been published. This forms a new contribution to theoretical knowledge and I will now outline how these three concepts influence each other and will be used throughout this research study.

An important feature of the cultural-historical perspective is the cultural context. All the interactions that occur within this context are influenced by the history and beliefs of the community in which the activity is happening. For instance, in Fleer's (2010) example of the different clotheslines described above, the needs of the community influenced what was created. In hunting communities, the historical knowledge of animal behaviour is passed down to each generation, allowing younger members of the community to benefit from the cultural, contextual knowledge of elders – their cultural history (Leont'ev, 1977). The context is important to take into consideration when researching a particular phenomenon because the history, affordances and understandings will be different, depending on where it is occurring. Context in relation to this study is important due to the differences that occur in each early childhood setting. For example, in this instance I am looking at technological play in two Australian early childhood settings whereas in a setting where technologies are scarce, the context, knowledge and interactions could be different and may influence the research findings. So, in my illustration of these three concepts all are inside the cultural context, indicating that they are all embedded within the context being studied.

The concept of tool mediation is illustrated next and is represented as the triangle of subject, tool and object. In order to mediate the tool, stimulus information needs to be taken into account. The stimulus information includes the four ways of imagination (Vygotsky, 2004) and the child's play skills and interests. The stimulus information is included on one side of the triangle. On the opposite side are the affordances and constraints that the environment or context could afford. These affordances and constraints are also in relation to the tool being mediated by the subject. The subject mediates the tool in order to achieve their object of activity. The affordances and constraints either help or hinder the subject's ability to achieve their object of activity and mediate the cultural tool. To illustrate, I return to my example of the boy playing with cars [see Imagination, p.56]. We can use the four ways of imagination (Vygotsky, 2004) from the example above to illustrate the relationship between tool mediation and play. Before the boy can create a new element that can become part of his reality and used in the first way of imagination, he needs to perceive that the current objects are not affording him the play that he wants. He then creates a new object that can become an element in his reality (or an object in his environment). He could then return to the first way of imagination and create his imaginary scenario. In addition, he would need to master this new object in order to achieve his object of activity, being the imaginative play scenario involving cars and his new object. By mastering the new object as a tool in his imaginative play, he would also perceive a different affordance of that object and his environment. In this way, all three concepts are interrelated and influence each other.

The following observation has been created to illustrate the boy's play with his car and roads. I have then used the elements and added them to an Imaginative Affordance Framework [see Figure 3:6 An Imaginative Affordance Framework for the boy playing with cars, p.84].

> In block corner, a boy is playing with cars. He has used blocks to create roads and buildings as part of a city. His educator explains about bridges and helps him create a bridge in his play scenario. He is happy with his creation and drives his car over the roads and bridge. He creates a new object and includes it in his play. [created observation for illustration purposes]

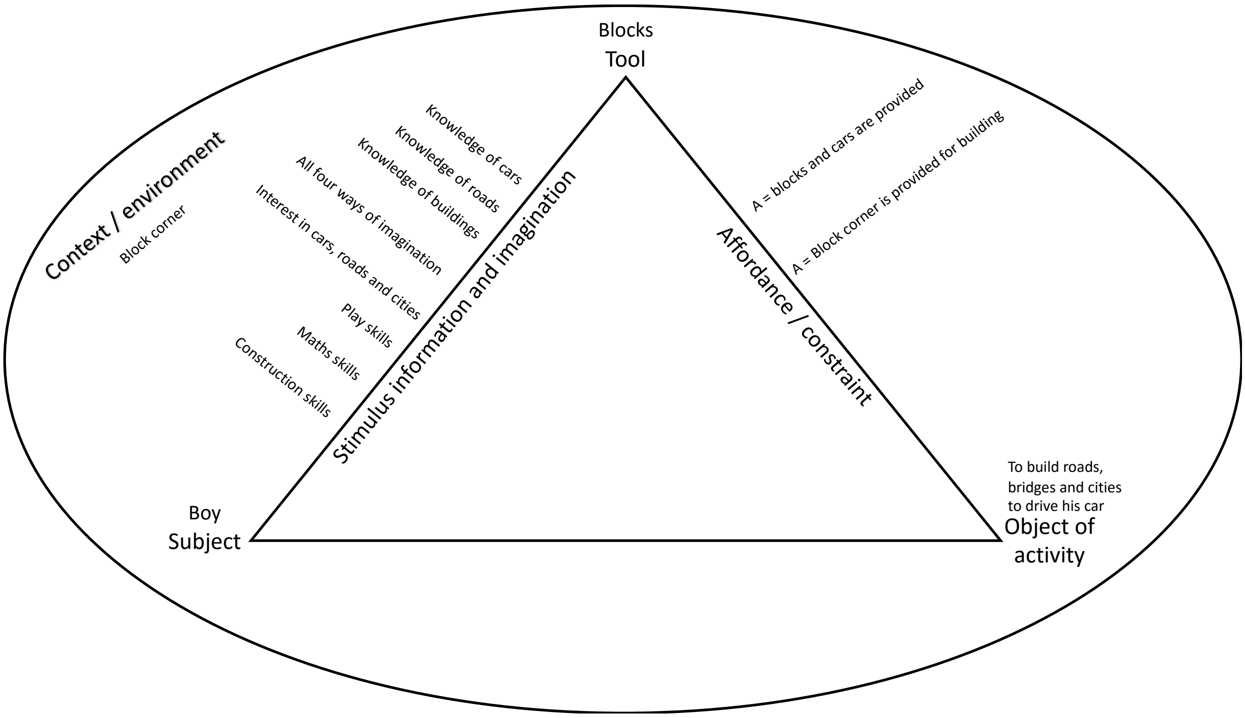

Figure 3:6 An Imaginative Affordance Framework for the boy playing with cars

The relationships and interactions between individuals within a cultural context are an important idea within cultural-historical theory. These relationships are often seen in children's play where individual children provide stimulus information to other children, and change the perceived affordance of objects. For instance, a child playing in home corner may bring knowledge of a wok from their home experience, and through sharing what a wok is and how it is used with a peer, changes how this other child perceives the affordances of the wok. With the help and knowledge of woks gained from the child, the second child would then be able to master the use of the wok to achieve the object of their imaginative play which is cooking with a wok. This can be illustrated by including the

Imaginative Affordance Framework for each child, within the one cultural context [see Figure 3:7 My Imaginative Affordance Framework in relation to social interactions, p.85]. In my illustration, I have included four individual systems to illustrate how four individuals can influence the others' perception of affordance, the mastering of tools and the four ways of imagination. In a classroom situation there would be a system for each individual child and also a system for each educator.

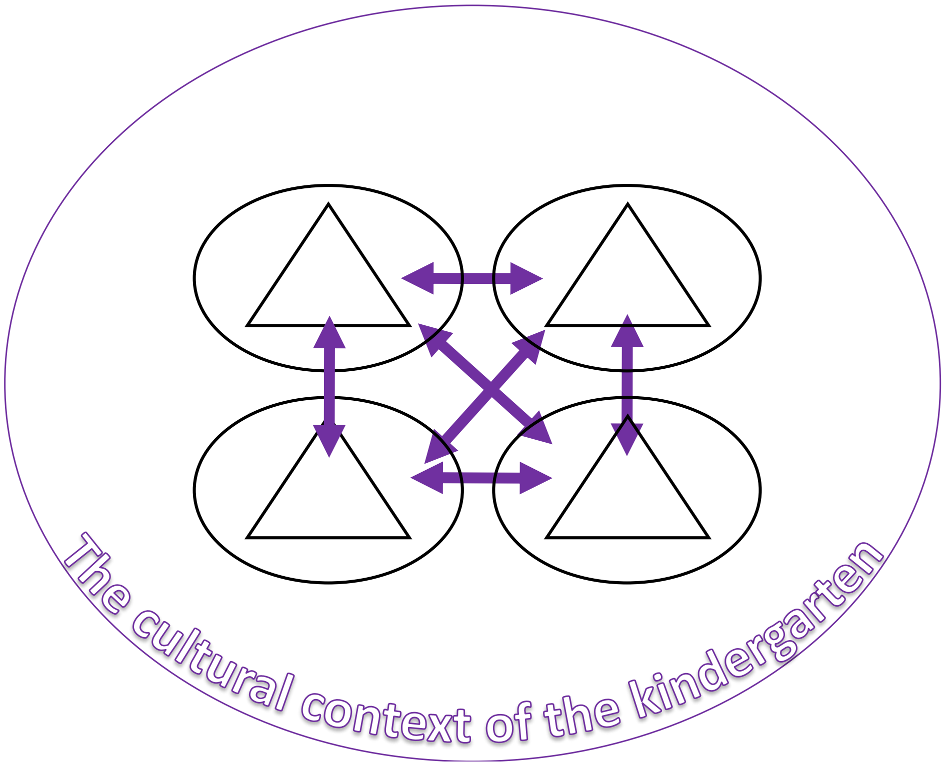

Figure 3:7 My Imaginative Affordance Framework in relation to social interactions within the one cultural context

Educators can also be represented within the Imaginative Affordance Framework within the cultural context because they also perceive affordance with objects, they master objects within the cultural context, and influence the four ways of imagination enacted by children. When educators plan and establish their setting, they perceive the affordances of the objects within the environment and predict how the children may use these objects for their imaginative play needs. They also master objects as tools within the environment, but often their tools are different to those of the children. For instance, the EYLF (DEEWR, 2009) is one tool that the educators master which also influences their pedagogy and behaviour within their classroom. Their pedagogy and behaviour in turn also influences the children's experiences and play within the classroom environment and what the environment affords or constrains.

3.5 Summary

This chapter outlined the theoretical stance I took when conducting this study. I explored Vygotsky's concepts of tool mediation, the requirements of play, separating meaning from object and imagination and then discussed J. J. Gibson's concept of affordance. For the first time in research literature, I combine the interrelated concepts of affordance, tool mediation and the four ways of imagination to outline, with the support of an illustration, and explain how they impact and influence each other. This new conceptual framework will be used to report the findings and as a platform for the discussion chapter. The following chapter – the Methodology, will explore how the theoretical framework of cultural-historical theory informed how the study was conducted and influenced the research methods chosen.

Four: Methodology

4.1 Introduction

The methodology chapter explains the research study, how it was conducted and how the critical findings were reached. This chapter introduces my ontological beliefs, my epistemology, the methodology for this study and then the specific methods employed to collect all the research data. I also provide a description of how the data was analysed, which foregrounds the results chapter. The chapter concludes with ethical considerations, including my role as a researcher and how it evolved throughout the research period. The two research sites, the participants and their selection are described and justified.

A paradigm includes the history, experience and knowledge an individual brings to any situation. A paradigm is a set of basic principles that "defines for its holder, the nature of the 'world'" (Guba & Lincoln, 2004, p. 21) and contains a "collection of beliefs about knowledge and about our relationships with knowledge, together with practices based upon these beliefs" (P. Hughes, 2001, p. 32). P. Hughes (2001) considers the metaphor of a picture frame to explain the meaning. Within the frame, various parts of the picture influence how the picture is viewed: for instance, the art medium used, the composition of the picture and the style of the picture; just as the ontological, epistemological, axiological and methodological beliefs or perspectives influence a research study. The question of paradigm informs the methods chosen for a particular study (Guba & Lincoln, 2004), and encompass the ontological, epistemological and axiological beliefs of the researcher. Quite simply, the methods are the way data is collected and analysed, methodology justifies the whole research approach, and as well, the methods and epistemology justify the knowledge that is produced from the data collection and analysis (Carter & Little, 2007).

4.2 Interpretivist ontology

As a beginning doctoral level researcher, I had never contemplated my ontological stance. I believed reality was reality, not considering that others viewed reality from a totally different perspective than my own. When asked to consider my stance, state my stance and then define my choices based on this stance, I became unstuck. My own ontological beliefs included the idea that reality is constructed through the interactions between people and between people and their social contexts. I had just assumed that this was everyone's belief and I would not need to explain or define it. Through my apprenticeship in academia, this view shifted and I realised others' views were sometimes very different from my own.

Ontology relates to "how the world is understood: what reality is" (Walter, 2013, p. 14), pictured along a continuum with *etic* (universal) and *emic* (subjective) at either end (Hays, 2012). In other words, is reality universal, with everyone believing the same thing or is it subjective and related to particular contexts? Hays (2012) uses the example of family discord to explain her position. On the etic side of the continuum are the researchers who believe that there is one universal truth about family discord, regardless of context. At the other end are the researchers who believe family discord can be viewed through many different lenses and must be explored in relation to the context in which it occurs. Ontological questions include those that inform how things work and how things are (Guba & Lincoln, 2004). For family discord, this would involve understanding what is occurring and what influences the disharmony.

My ontological beliefs are based on an interpretivist perspective. Interpretivism seeks to explain how individuals make sense of their social experiences of the world (P. Hughes, 2001) or "a world of meaning in which our actions take place on the basis of shared understandings" (Walter, 2013, p. 17). In this perspective, there are "multiply realities" (Denzin & Lincoln, 2008, p. 32), in that every individual constructs their own truth and interpretation of reality. Sherwood and Reifel (2010) suggest "humans live in a 'real' world but how they understand that world varies" (p. 325) An interpretivist ontology fits with a cultural-historical theoretical framework in that meanings are created by individuals through their interactions with others in their social context. Walter (2013) asserts that "we need to understand people's motives and interpretations of the world" and this thesis does this through the collection of data of educators' beliefs and practices that surround their digital technology provision (p. 17). While conducting this research, my beliefs about the world and reality were in a constant state of revision as I interacted with the children and educators; therefore, I constructed my understanding (epistemology) of the world through my experiences within the social context in which this research was undertaken (Bryman, 2012).

4.3 Socially constructed epistemology

Epistemology explores how we know what we know. It is the production of knowledge about the social world (Day, 2012), or the relationship between the knower and the known. "Derived from the Greek words episteme (knowledge) and logos (reason)," epistemology refers to the process of gathering knowledge and developing new theories to explain what is known (Grix, 2002, p. 177). In a simple explanation, epistemology is "justification of knowledge;" and, in practice, it influences research as the creation of knowledge (Carter & Little, 2007, p. 1317). An individual cannot be separated from their epistemological beliefs and therefore, I carry my epistemological values and these can affect the study.

How we learn and create knowledge is through being part of a cultural context, while interacting with other people and learning from our experiences. This social constructivist perspective argues "learners mediate knowledge within a social context" (Jeannine St. Pierre, 1996, p. 91). This study is a direct response to my epistemological beliefs in that we learn and create knowledge through being part of social contexts. The methodological decisions and the methods selected for this study also reflect this knowledge creating belief. Packer and Jessie (2000) discuss how learning involves "picking up the jargon, behavior, and norms of a new social group; adopting its belief systems to become a member of the culture" (p. 29). This process is ongoing and continues to refresh and reinvent itself as the culture goes through a continuous learning and evolving cycle. Just as I learn from my experiences within my cultural context, I also influence my cultural context through the experiences of which I am part (a process identified by Rogoff, 2003).

I believe I have constructed my understanding of the world (ontology) from my positioning as a white female Australian, growing up in the late 20th century when technological development and change began to become a prominent and pervasive discourse, as well as from my professional experiences as an early childhood educator and a researcher. I understand children and their imaginative play through years of watching, interpreting and assessing their learning through play. Through my own research, I have expanded my understanding of children's play and especially their play that involves both worth working and non-working technologies. As I explore children's play and learning with technologies, I am also building my own knowledge, that I will share with the early childhood field. This reinforces the cultural-historical view of knowledge construction, in that knowledge is produced through the experiences of the children and educators and between these participants and myself as the researcher. This understanding is also shaped by my theoretical beliefs situated within a cultural-historical framework, influenced largely by Vygotsky and his thesis. Through exploring the "thinking, doing and evaluation of qualitative methodology," (Day, 2012, p. 61) and through asking questions about how we know what we know (epistemology), we can be reflexive in our research. The role our history, culture and values (axiology) play in this construction of knowledge, also adds to our ability to undertake reflexive research.

In relating epistemology with my study, it is important to note that presently there are limited theories around children's use of digital technologies particularly within their imaginative play. This gap in current literature provides one justification for this study, as the early childhood field requires a more comprehensive understanding of children's imaginative play with various technological devices. For this study, following a cultural-historical theoretical perspective meant being close to and observing children's imaginative play with both working and non-working technologies – gaining knowledge about their imaginative play. I also needed to observe the educators to understand what influenced their provision of technologies in their play-based learning settings. This was achieved through both close interactions with each educator and observing what and how each individual incorporated technology within their kindergarten. Looking at the educators' provision of technologies through the lens of affordance, allowed me to understand what was occurring for the educators and why they provided the technologies they did and in the way, they did.

The theory of affordance (J. J. Gibson, 1979) also fits with my epistemological beliefs. What an object can afford is influenced by the individual perceiving its affordance. This is determined by the context in which the object and individual are situated. As the individual interacts with the object their perception of the object's affordances changes. For me, technologies afford me connection to my interstate friends and family through the use of video chat, social media and mobile calls. My perception of these technological affordances increased when I moved, as the change to my social context meant I now needed to rely on technologies to maintain my relationships, rather than the face-to-face interactions in which I had engaged in previously.

4.4 My axiological beliefs

Axiology refers to the ethics and values of the researcher (Baptiste, 2001) and how they influence the research study (Denzin & Lincoln, 2011). The design, conduct and findings of a research study are viewed, discussed, and analysed according to the researcher's ontological and epistemological views, and then interpreted by each audience member in relation to their individual beliefs and values and the values and assumptions of the social context (Carter & Little, 2007). All researchers bring their values into their study. In qualitative research, researchers are upfront about their values and they make them known (Creswell, 2013). In regard to my own axiology, this study was designed because it values both play as the touchstone for children's learning, and digital technologies which are integral to children's current realities. Through my social constructivist epistemology, I value knowledge constructed through interactions with others in my social context. As an extension of the view, I value the potential this study has for informing professional learning for early childhood educators. The study has the potential to improve the play and technological experiences of children and the pedagogy and provision beliefs of educators.

4.5 Methodological assumptions

My understanding of my own ontological, epistemological and axiological assumptions, foregrounds the methodological assumptions that I use to frame the study, as I have noted above. Often used interchangeably, methodology and methods are different and serve different purposes (Walter, 2013). Walter (2013) emphasises, methodology is "the lens through which we view, undertake, and translate our research" whereas, method is the "technique for gathering information" (p. 10). All parts of the research study influence each other. Not only does the methodology provide "justification for the methods of a research project" (Carter & Little, 2007, p. 1317), but it helps with fine-tuning the research questions and objectives. In turn, the research questions and objectives help shape the methodology. For example, if I wanted to investigate the children's understanding of digital technologies in their kindergarten I might have interviewed a child; and, if I wanted to investigate parental beliefs around children's digital technology use, I might have employed focus groups; or, if I wanted to count the instances of children using digital technologies in playful ways, I might have conducted an observational quantitative study. The research questions might also be shaped by how the knowledge would be created through data collection methods and they might change slightly as the study progresses. Through placing the research questions at the fore, I ensured that the methods used explicitly support the study. As already noted, the two research questions for this study were:

1. What characterises children's imaginative play with working and non-working technologies?
2. What influences early childhood educators' provision of working and non-working technologies in play-based learning settings?

As discussed in the previous chapter [see Theoretical frame, p.38], the overarching theoretical framework was cultural-historical theory (Vygotsky, 1966), along with my conceptual framework that combines the concepts of tool mediation, imagination and affordance [see Bringing the concepts together, p.81]. The supporting theoretical and conceptual frameworks, and the research questions, direct the ways in which the research will be conducted.

The research questions of this study called for methods that would assist me to investigate children's imaginative play with technologies and the educators' provision of the technological devices. Inviting children to be co-producers of data (Moss & Petrie, 2002) is a desirable way to empower children and respects children as knowledgeable of their own experiences (Corsaro, 1997). However, this approach would have impacted the data and potentially changed children's behaviour and what was recorded. Therefore, this approach was not used. Instead, I collected the data and captured the children's imaginative play with working and non-working digital technologies through observational data collection methods. To capture data around the educators' provision of technologies, I decided to employ methods that would most accurately record their underlying beliefs and also capture what they did in everyday practice. The methods selected also needed to be reflexive to ensure data accuracy. The methods to ensure reflexivity are discussed later [see Qualitative reflexivity, p.96]. In addition, the epistemology of this study called for methods that supported children's knowledge construction through the social relationships and interactions between participants and between the participants and the researcher. The overall approach had to be one that acknowledged the importance of context in this construction of knowledge (Hesse-Biber, Guba, & Lincoln, 2004). This knowledge construction relied on my observations of the phenomenon as it occurred. It was for these reasons I decided to do an ethnographic qualitative research study.

4.6 Qualitative ethnographic research

Broadly, qualitative research explores the social reality and experiences of people in a particular community (Denzin & Lincoln, 2011). Unlike quantitative research that relies on counting occurrences and numbers (Spencer, Pryce, & Walsh, 2014), qualitative research focuses on describing what is occurring for the social participants under study (Denzin & Lincoln, 2011). With the aim being to provide insights into particular human behaviour, the final thesis becomes a "*richly descriptive*" product that describes in detail, what was occurring and tries to make sense of the experiences of the participants (Merriam, 2009, p. 16, italics in the original). The words and pictures that are used in this thesis aimed to create the picture for the reader which clearly captured the social constructed knowledge about technological provision in the research study. In order to understand and adequately describe the relationships between the children, educators and the researcher, the research methodology and methods chosen had to capture more than numbers and statistics. A qualitative study allowed me to describe what was occurring in the research settings, including the relationships between the children, educators and the technologies in depth; and, to explore the reasons and beliefs of the participants that underpinned the practices that I observed and recorded.

I determined to use a research methodology that would allow me to submerse myself in the social and cultural context of my participants. To study the meaning people construct of their reality, requires the researcher to immerse herself within the context being studied (Yin, 2011). To achieve this immersion, an ethnographic methodology was employed and used to frame the research methods. Ethnography enabled me to describe "the socially constructed nature of reality," in a kindergarten context where digital technologies were provided and played with (Denzin & Lincoln, 2011, p.8). The need to label and explain the various parts of this research study, including my ontology, epistemology, axiology and methodology, were partly self-imposed and partly due to the requirements placed on researchers and research by institutions, as well as the history of academic investigations (Wolcott, 1995). I was drawn to ethnography because of the ability to be immersed in the research setting and to build relationships with the participants. This closeness was something I realised was missing since my move from early childhood teaching to academia. I had taught in centres for the 20 years prior to undertaking this study and looked forward to having direct contact with children and educators again.

Ethnography involves studying a phenomenon from the inside, where researchers immerse themselves in the field they are attempting to study (Wolcott, 1995). Ethnographic studies explore the "everyday experiences of other people" (Emerson, Fretz, & Shaw, 1995, p. 1), through "an *emic* (native, insider) perspective rather than from an *etic* (external, outsider) perspective" (Bloome, 2012, p. 9, italics in the original). Ethnography was developed by anthropologists who investigated interactions and experiences of various cultural groups through spending extended periods of time collecting data (Hatch, 2002). According to Neuman (2011) "*ethno* means people or folk, and *graphy* refers to writing about or describing something" (p. 423, italics in the original). For this ethnographic study, I explored and wrote about children and educators' experiences with working and non-working technologies in play-based learning settings. As a *process*, the "face-to-face interaction with people in the research community" (Hatch, 2002, p. 4) were observed and recorded. The study resulted in a *product,* of a descriptive story that "paints a picture of people going about their daily lives as they happen" (p. 4). The *product* arising from this study, this descriptive thesis, addresses a gap in current knowledge through painting the picture of children's use of working and non-working technologies in their imaginative play. It was also as a *process* as I built relationships with the participants through spending an extended amount of time in each of their kindergartens.

Ethnography attempts to make sense of what is occurring, yet I found this methodology "maddeningly ambiguous" in its lack of clarity around how to go about it (Wolcott, 1995, p. 83). One notion that literature presented was that observation and participation in the culture being studied is paramount (Atkinson, Coffey, Delamont, Lofland, & Lofland, 2001); but Wolcott (1995) warns this does not mean just spending more time and collecting more notes. Instead, ethnographers spend focused time in settings to delve deeper into the culture to understand the behaviours and relationships that are present and being displayed. Ethnography is "a deliberate inquiry process guided by a point of view" (Erickson, 1984, p. 51), where the researcher is immersed in the context and explores the research phenomena. Monahan and Fisher (2010) describes the process of ethnography and states,

> Meaning is not out there to be found by the researcher; it is continuously made and remade through social practice and the give-and-take of social interaction, including interaction with the researcher. (p. 263)

This view that meaning is constructed through the social interactions of the participants and with the researcher, fits with the cultural-historical perspective and the theoretical framework of this study. Through the process of ethnography, and the length of time spent in the research settings, "understandings and interpretations change over time," as they are constructed, questioned and reconstructed (Emerson et al., 1995, p. 4). The "closeness to others' daily lives and activities heightens sensitivity to social life as process" (Emerson et al., 1995, p. 4) and allows the research to construct an accurate representation of the phenomenon under study. The choice of ethnography as a methodology was appropriate in order for me to understand the children and educators' play and provision of digital technologies in their kindergartens. Without extended time in each kindergarten, my limited observations would have provided a snapshot of the phenomenon rather than a detailed account of what was accruing, the main characteristic of ethnography.

I entered the research settings as a *friendly observer* [see Identity of the researcher, p.98]. I collected data from an emic perspective, being part of the research site and the social group; but, I made sense of the data and wrote the thesis from an etic perspective (Fetterman, 1998). This means that the description that I present needs to explain the whole system being studied not just recording and recounting events (Wolcott, 1995). The collected data, including verbatim participant quotations and examples of video footage were used to validate my perspective and to build new theories to explain what occurred (Merriam, 2009). It is the "argument and discussion" which bring together the data examples to explain the phenomena in the results and discussion chapters (Holliday, 2007, p. 101). I became a "bricoleur" (Lévi-Strauss, 1966), a handywoman who assembled the different data (Willett, 2015) and constructed meaning from my participation in the social context of each of the research kindergartens. A bricoleur "uses whatever tools are at hand," a concept adept for use in research with young children as strategies for capturing data can be adjusted to suit the situation and the participants (Merewether, 2018, p. 16). This was evident in my research when I included interviews with the educators [see Interviews, p.120], conversations with children [see Conversations, p.122], and when I switched form video recordings to observation depending on the consent of individual participants [see Video recordings, p.115].

The aim of ethnography is to build a theory around what the participants think, do and believe, all situated within a particular context, time and space (LeCompte & Schensul, 1999). Developing a description of the culture of a particular setting, requires researchers to observe the participants' behaviour, listen to their explanations of the behaviour and represent these in a logical, literate thesis (Wolcott, 1995). In this research, I describe the two kindergarten settings under study, encompassing both explaining the 'rules' and affordances that surrounded children's imaginative play while using working and non-working technologies as well as the values and beliefs the educators hold around the provision of these technologies.

Ethnographic researchers get to know their participants in their social context, so data collection occurs when they are submerged in their participants' work and lives (Creswell, 2013). This justified ethnography as the appropriate methodological choice. I entered the research settings to build relationships with the children and their educators and collect data. I explored the children's use of digital technologies and the educators' provision of these devices, becoming part of the research context myself [see Researcher membership, p.104]. Ethnography is also justified because it aligns with my interpretivist ontology, my social constructivist epistemology and the methods chosen for this research study (Purcell-Gates, 2011). Through exploring the "thinking, doing and evaluation of qualitative methodology," through asking questions about how we know what we know (epistemology) and the role our history, culture and beliefs (axiology) play in this production of knowledge, ensures that the research undertaken is reflexive (Day, 2012, p. 61).

4.7 Qualitative reflexivity

Reflexivity in qualitative research is a critical concept and one that encompasses a wide range of processes within the various methodologies (Day, 2012). By simple definition, reflexivity is "self-reflection by the researcher on his or her biases and predispositions" (Johnson & Christensen, 2008, p. 275). It is the researcher's explicit awareness of the ways in which one's personal position influences how the data is examined and the inferences are drawn from it (Agbenyega, 2014). This includes being aware of how their researcher presence may impact the study and its participants (Underwood, Satterthwait, & Bartlett, 2010). While there is no set formula for undertaking reflexivity, there is a corpus of research published on how to conduct reflexive research and ensure perspectives are transparent and acknowledged (Pillow, 2003). A researcher's beliefs around reflexivity will impact their study design and the data the collected (Day, 2012). For many researchers, they will be reflexive within their study without actually defining the concept or outlining the measures they will take in their research (Pillow, 2003). To be reflexive, I needed to define what reflexivity means to me and how I will illustrate my reflexive behaviours throughout my study.

Reflexivity is a technique that researchers can use to account for themselves during the entire research process, making sure their values and beliefs are transparent (Etherington, 2007). For Johnson and Christensen (2008) their strategy for reflexivity is for researchers to acknowledge their values and beliefs, discuss their background and outline the approaches for overcoming any issues that may arise (p. 276). This "*autobiographical reflection*" is described by Maton (2003) as a tokenistic approach that lacks deep analysis of the issues and how they impact the data collected (p. 54, italics in the original). His approach can often leave audiences wondering "how this personal history relates" to the phenomenon being investigated (p. 54). While researchers may intend to be reflexive, what occurs in practice can be another thing. Pillow (2003) is concerned that the debate on reflexivity has overtaken the act of data collection. The examination of reflexivity is due to the focus on justifying one's beliefs and acknowledging how these beliefs impact the research being investigated. From the cultural-historical perspective framing this thesis, individuals approach a situation with history and knowledge, which for reflexive research like this one, needs to be recognised.

4.7.1 Reflexivity in ethnography

Good ethnographers explain how issues or concerns were addressed, either implicitly or explicitly and in a way that satisfies the reader (Denzin & Lincoln, 2011). The researcher needs to present their findings in a way that leaves the reader without unanswered questions or concerns around how the researcher's ontology, epistemology and axiology impact data collected and the analysis of the data. Denzin and Lincoln (2011) explained ethnographic researchers acknowledge if issues throughout their study were problematic and how those problems were dealt with, clearly presenting how they were "addressed, resolved, compromised, avoided, and so forth" (p. 591). The discussion around issues within a study can identify problems that are later identified as limitations needing to be addressed.

Denzin and Lincoln's (2011) description of reflexivity seems to aim for a finished or polished product, whereas Pillow (2003) describes the process as ongoing and unfinished.

To further explain, she theorises reflexivity involves a process of disruptions, involving times when our language and descriptions fail to make sense. One strategy is to make evident how the Other is explained and justified and as Trinh (1991) claims, how the image of the Other is presented. One way, amongst the plethora of writings about reflexivity in research methodology, presented in currently literature is around how the participants' voice is attributed and presented in the final research thesis (Pillow, 2003). To ensure I adequately and correctly captured the educators' voice, the transcripts of their interviews were passed on to each educator and they could make changes and identify any comments that did not accurately capture their intent. My aim was to embed reflexivity within all parts of this thesis, and to explain my thinking as I prepared, conducted and presented my research project, which justifies my decisions and illustrates how my own beliefs impacted the research.

4.8 Identity of the researcher

Researchers come to each new project with a history, past experiences and theories that not only shape their identity but can also impact what they see in the current project (Graue & Walsh, 1988). Having been an early childhood educator for many years, I came to this research project with years of experience and knowledge. Having completed my Master of Philosophy on a similar topic – an exploration of the activities children engage in around their use of digital technologies (Bird, 2012) [see also Personal orientation to this research, p.1], I have knowledge from that study, that informs this new research project. While this previous research experience can assist in this current project, there is a downside to a researcher also being an early childhood educator; in that the legal and ethical requirements or personal instincts to protect children and enforce the 'rules' are often difficult to ignore (Sargeant & Harcourt, 2012). Presenting oneself to the research participants is an important part of the research process, especially when working with children (Harwood, 2010). To fully explore the identity of the researcher, understanding is needed in relation to the research roles and the affects these have on educational research. I will now discuss my role before and during the research study.

4.8.1 Insider – outsider, or both?

Outsiders have 'fresh eyes' that can provide a detached view of the research setting, but they can miss valuable insights because of their lack of local or cultural awareness

(Thomson & Gunter, 2011). In contrast, insiders have cultural knowledge, but can lack the perspective needed to provide an objective view due to their close proximity to their research participants. This binary is not static or continuous in a research project because over time outsiders can get to know the participants and culture of their research setting and become insiders. Within their own research in schools, Thomson and Gunter (2011) found that they "were neither inside nor outside of the school, but rather were engaged in messy, continuously shifting relationships" (p. 18). Their identities changed depending on the particular person with whom they were interacting. For example, in one research project, their identity began as instigators of change as they worked on behalf of the head of school, but later in the project they became advocates for the students' views on the changes occurring. Their identity changed not only throughout the research project but also as the requirements of their researcher role changed (Thomson & Gunter, 2011). The notion of *liquid identity* includes the shift between insider and outsider and the change in both the researcher's perceived and actual role (Bauman, 2000). Being either an insider or an outsider can have both positive and negative effects on the research outcomes, (that does not affect the type of researcher a person may be), and can change the type of research data that is collected (Corbin Dwyer & Buckle, 2009). Both have their benefits and, as stated above, these can shift within the one research project. In ethnographic studies this shift occurs as the researcher becomes embedded in the setting under investigation, moving from outsider to insider, and through inadvertently influencing the research setting. This is largely unavoidable, but a skilled ethnographer will weave explanations throughout their thesis that account for these influences. Ethnographic researchers have two parts to their researcher role; not only are they invited into the activities of the research setting, they are also investigating the activities in which they are now participating (Hedegaard, 2008).

4.8.2 Liquid identity

Often presented in literature is the assumption that a researcher's identity is stable from the beginning to the end of a project. Instead, Bauman (2004) provides the notion of *liquid identity* that accurately reflects a researcher's changing identity within a research project. He states that in recent times identity has become a talked about topic rather than just a philosophical quandary of decades past, and thus, needs to be explored further in the research process. For Bauman (2000), identity is a difficult concept to define, like attempting to squash a square into a circle. His history is a prime example of liquid identity. He was born in Poland but after his right to teach was taken away, due to the political unrest in the country, he accepted a job in Britain and immigrated there. Years later, when awarded an honorary doctorate, he had to choose between the Polish and British national anthems, a task he found difficult. In this example, his identity was shaped by his nationality, even though he was born in Poland, he chose to live in Britain, so his nationality was not clear cut. Believing that identity is shaped by the community and people we interact with, Bauman only questioned his identity when he found himself not fitting in. He explains this daunting task:

> One becomes aware the 'belonging' and 'identity' are not cut in rock, that they are not secured by a lifelong guarantee, that they are eminently negotiable and revocable; and that one's own decisions, the steps one takes, the way one acts – and the determination to stick by all that – are crucial factors of both. In other words, the thought of 'having identity' will not occur to people as long as 'belonging' remains their fate, a condition with no alternative. They will begin to entertain such a thought only in the form of a task to be performed, and to be performed over and over again rather than in a one-off fashion (pp. 11-12).

The idea that a person's identity is set in childhood and then remains the same until they die, does not reflect what actually occurs (Thomson & Gunter, 2011). Instead, identities change, sometimes these changes are the person's choice, while at other times, their identities are constructed by those around them and who they interact with (Bauman, 2004). In research contexts, the researcher portrays their identity, which is then interpreted and shaped by the participants and those they come in contact with. Part of the researcher's identity is the role they will enact during the research project. The researcher presents their role at the beginning of the project and this role may not always remain the same as they undertake the study. This notion will now be discussed further.

4.9 Researcher roles

The two roles of participant and researcher can be broken down even further. As a participant in the everyday activities, the researcher may take on an active role or be submissive and follow the direction of the children. The researcher role may entail being an observer, video recorder and/or expert on the subject being investigated. This is where the notion of liquid identity can better capture a researcher's fluid movement between roles within the research project and often, within the one research session (Bauman, 2004).

As researchers strive to build relationships with their participants, they also need to acknowledge that this process in itself changes the activity (Denzin & Lincoln, 2011). In ethnographic studies, the aim is to be immersed within the research context, to capture data of the culture being studied. Self-aware reflexivity is a balancing act between how much a researcher embeds themselves within the research context, while also maintaining enough distance to be able to offer an informed, yet objective interpretation of the researched activity (Walter, 2013). A clear research aim and a detailed description of how data collection was approached, supported me in balancing my emersion in the kindergartens with constructing understanding, taking into account each participant's perspective. This balance assisted me to reflexively account for what occurred during the research process.

Researchers select their role at the beginning of the study and present this role to their participants. Fine and Sandstrom (1988) described the various roles researchers can take in their relationship with child participants. The relationship is determined by two main factors, firstly there are the positive interactions between the child and the researcher, and secondly, there are the amount of direct authority the researcher has over the child (Fine & Sandstrom, 1988). Historically, research has been conducted with the view that children are "incompetent, unreliable, and developmentally incomplete" (Fine & Sandstrom, 1988, p. 110). Recently, children have been positioned as experts in their own lives who can provide valuable insights into their experiences (Harcourt, Perry, & Waller, 2011). In any research project, there will always be a generational power struggle when the researcher is the adult, but there are ways to minimise this impact. The identity the researcher portrays and their role within the research setting can reduce the power imbalance between the researcher and the child participants. When researchers acknowledge children are capable of making a valuable contribution to their research, they will assume a role that reflects their beliefs that children are proficient child participants (Mayall, 2008).

Viewing children as capable will influences the type of role researchers will enact during their research studies. Fine and Sandstrom (1988) describe four participant observational roles, however not all are suited to ethnographic research or research with children. Each role may elicit and capture different data; which is also influenced by the view participants have of the researcher. The *supervisor* role is a position of authority where the researcher directs, disciplines and often has a duty of care for the child participants. The child participants will often display behaviours that they believe the researcher wants or avoid other behaviours that they believe the researcher will disapprove of, all of this to please the researcher or to avoid reprimand. On the other hand, a researcher who takes on a *leader* role displays "the presence of positive contact with the child, although legitimate authority remains" (p. 15). With this role, children are often on their best behaviour, avoiding feelings or behaviours that would embarrass their leader, portraying only the image they want their leader to see. This is the role I took on during my Masters research. As I was also the teacher of the children, I had a responsibility for them, but I interacted with them positively and encouraged their creative behaviour. The *observer* role is where the researcher purely observes without forming relationships with participants or having any authority over them. This role does not aid in observing the participant's natural behaviour but "may be used where a record of overt behaviour is more important" than how the children explain the behaviours that occur (p. 16). Children will often retreat and hide the behaviours they believe adults will object to, influencing the data collected. The *friend* role involves becoming the child's trusted friend, interacting with them but without reprimanding them or taking an authoritarian role. Fine and Sandstrom (1988) believe this is the ideal way to present oneself in research with children. To present oneself as a *friend* in research and develop the associated trust with the child participants, the researcher needs to justify why they are present in the child's classroom. In research with young children, the researcher needs to satisfy the many various gatekeepers. For example, in this research, the gate keepers were the children, parents, educators, the managing body, the Department of Education and Early Childhood Development, and the Australian Catholic University ethics committee. The justification provided to each gatekeeper depended on their level of understanding and is covered in more depth in the ethical considerations [see

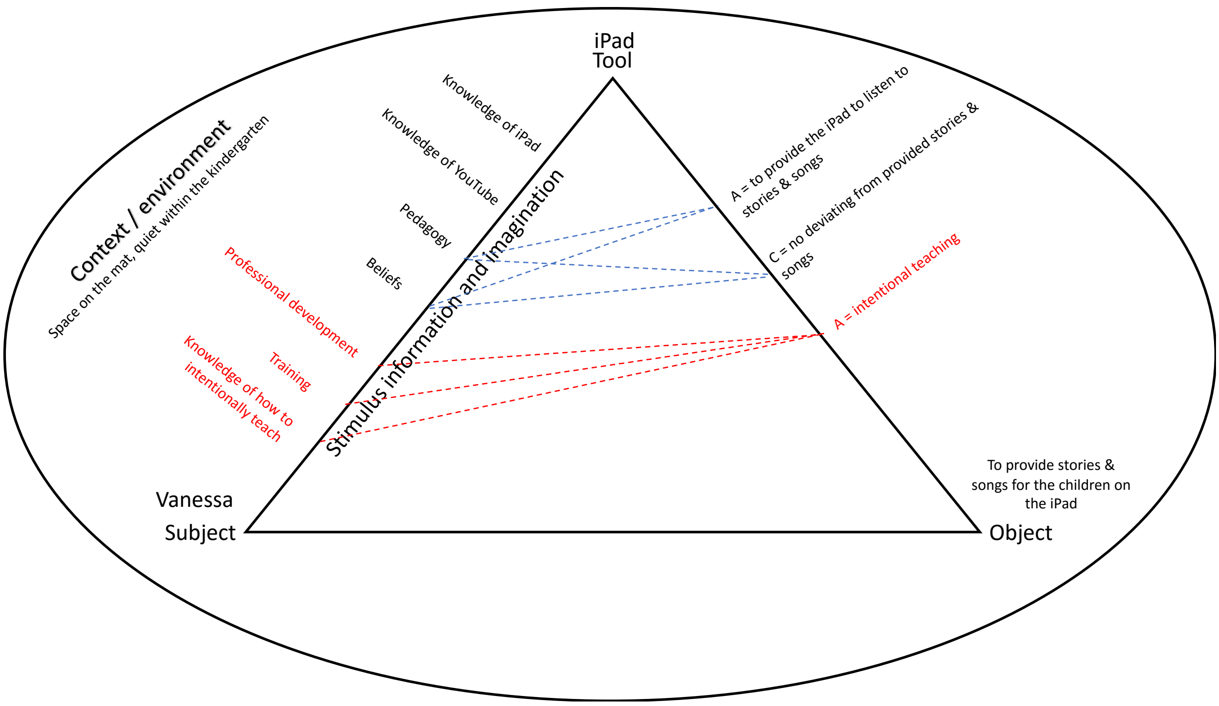

Figure 4:9 Vanessa's Imaginative Affordance Framework for providing stories and songs on the iPad including potential elements

I divided the data into categories of Cosmic Kindergarten Videos, Cosmic Kindergarten Observations, Creative Kindergarten Videos, Creative Kindergarten Observations and Educators. Rather than including each element for every scenario in an illustration of the Imaginative Affordance Framework, I then listed them all in a table, under the headings of *Context*, *Stimulus Information and Imagination*, *Tool*, *Affordance and Constraints*, and *Object of Activity* [see Appendix 18 Table of Imaginative Affordance Framework Data, p.254]. I also added a column for my initial *Notes and Thoughts*. This is where I began to interpret the scenarios in terms of the Imaginative Affordance Framework and what it could mean. The Imaginative Affordance Frameworks will be discussed further in the results chapter [see Results Chapter, p.139].

Ethics, p.131].

The role the researcher plays within the research setting influences their ability to see the phenomenon from the child's point of view. For example, a *supervisor* role does not encourage understanding from the child's point of view. Also, placing adult constraints and authority on a given situation will influence how the children act in front of the researcher and thus the data collected. Whereas the role of *friendly observer* provides children with a safe "least-adult" figure who will observe them and record their play (Mandell, 1988). These researcher roles can be seen on a continuum or a fluid space, where the role may change throughout a research session or study (Pillow, 2003), which reinforces the notion of researchers having a liquid identity (Bauman, 2004). For this research study, I decided to take on a 'friendly observer' role. This will be discussed fully later [see My researcher role, p.104].

A focus on the similarities between children and adults rather than differences informs Mandell's (1988) research with young children. While her ideas were published last century, they provide a solid base from which research with children can be tackled. Both the children and the adult researchers have a different perspective of the activity under study within a research project. For this study, the social object was the technologies and my aim was to see how children use them, so I could develop assertions and recommendations based on my results. I also explored the educators' provision of technologies to determine their understanding of technologies and their reasons for providing them how they did.

4.9.1 Researcher membership

As *insiders* enter research settings and build relationships with their participants they acquire a *membership* status (Alder & Alder, 1987). Alder and Alder (1987) assert three types of memberships - *peripheral*, *active* and *complete*, and just like identity, membership can be liquid flowing between these types; dependant on the context, situation and who the researcher is interacting with.

A *peripheral* member limits their involvement in the research setting; they do not assume functional roles and will avoid specific activities of the group. For example, Alder and Alder (1987) researched the activities of drug dealers and smugglers. They found that when they socialised with group members, they were accepted as trustworthy, but they refrained from trafficking, which meant they were always considered peripheral members. Peripheral members are often aligned with the group but not part of it. An *active* member is an insider from the beginning; they contribute to the setting and take part in the core activities of the group. These members assume functional roles beyond research tasks and interact socially with members. *Complete* members and their participants "relate to each other as status equals, dedicated to sharing in a common set of experiences, feelings, and goals" (p. 67). *Complete* members are fully immersed in the research setting. Alder and Alder (1987) describe complete membership as being a continuum between those who are immersed within the group they are studying but still maintain ties to their "former world" and those "who become so committed to the group that they abandon their ties to the scientific community and fail to return from the field" (p. 67).

4.9.2 My researcher role

Before embarking on any project, researchers need to design the project, decide their role, and contemplate their motives (Hedegaard, 2008). I set out with my aim, my research questions and my intended role for my study of both children's imaginative play with working and non-working technologies, and the influences on educators' provision of these technologies in play-based settings. My aim was to be a mixture of *observer* and *"as if* *friend"* (Stone, 1995, p. 184), building trust with the children (Fine & Sandstrom, 1988) and breaking down any age and power related imbalances (Sargeant & Harcourt, 2012). Stone (1995) presents the notion of "*as if friend*" (p. 184) as a researcher who is "not now friends, who might never be friends – or who might just be friends" with their participants (p. 184). They act as friends but there is a distance between them, however they "exhibit openness to different opinions and perspectives" (p. 184). I aimed to build a trusted relationship with the children throughout the familiarisation period and through rejecting taking on a power role. As an *observer*, I planned to capture behaviours the children may not normally display in front of their educators that could provide insight into their technology use. My intended role was to be a *friendly observer*, one who enters the children's play when invited and who also observes their play from a distance. I intended to avoid a disciplinary role and planned to direct children to their educators to sort out any issues they may have. As a *friendly observer* I planned to refrain from educator duties and responsibilities, remaining in my researcher role. The researcher identity I promoted to the participants in this project was vastly different to how I presented myself to participants in my previous project [see Personal orientation to this research, p.1]. During my previous project, I was also the educator and therefore, I was an insider from the onset, participating in what I was researching (Atkinson-Lopez, 2010). I was already a complete member (Alder & Alder, 1987), which created other issues for that data collection. My role as educator had to take precedence over the research, as my responsibility was for the safety and learning of the children. In contrast, in this project, I saw myself as an *insider* due to the general knowledge and experience I hold about kindergartens, but as an *outsider* because I was unfamiliar with the particular research settings into which I was venturing into. My role was influenced by my experience from my Masters project, but also by the participants and the actual settings of this current project.

During the familiarisation period, I presented myself to the children as a *friendly observer* who was going to be attending their kindergarten to observe their play. Time was spent getting to know the children, asking questions about their kindergarten, the rules and with what they enjoyed playing. As they completed their assent forms, discussions occurred around the kinds of play scenarios that I intended to observe and video record. Prior to the commencement of the project, I reflected on possibilities for interaction with the children during data collection, I envisioned there would be times where the children would invite me into their play. I planned to participate but would always follow the children's lead and

I would also document these times. These play scenarios would be collected as data and later analysed, as they too, carry with them the meanings attributed by the social context in which they are constructed (Hedegaard, 2008). I went into the project conscious that if I interacted too heavily, leading or directing the participants, it may alter what the children did, resulting in data that was not natural, or not what the children would normally do (Graue & Walsh, 1988). If this occurred, I would be seen as influencing data to suit my objectives. Instead, as an ethnographer, I attempted to capture the social world from the view of the people who inhabit it (Siraj-Blatchford, 2010), with a view to ensure that my aims and my beliefs did not take precedence. While I did not set out to alter the children's behaviour, there was a realistic understanding that it might occur. Therefore, my aim was to take a submissive role when invited into the children's play (Mandell, 1988), to follow their direction, to not take the lead and to avoid influencing data. I adopted the "least-adult role" (p. 434), which required "blending in to the social world of the children, not siding with adults, operating physically and metaphorically on the children's level in their social worlds" (Mayall, 2008, p. 110). This process began during the familiarisation period and continued throughout the data collection relationship (in a manner similar to that recommended by Mandell, 1988).

4.10 Recruitment and participants

To undertake this research project, I needed a research setting that provided both working and non-working technologies with which the children could engage (a process recommended by Sharp et al., 2012). I followed a similar process to Patton (2002), who used *purposeful sampling* in his study on how American teachers implement a new curriculum. His study was limited to a particular school district and they then approached interested teachers, stopping once they recruited a teacher who met the requirements of the study. *Purposeful sampling* involves the researcher selecting or recruiting participants who meet the requirements of their study (Creswell & Planco Clark, 2011; Gall, Gall, & Borg, 2007), or as Pettigrew (1990) posits, researchers "go for high experience levels of the phenomena under study" (p. 276). I followed a similar process; I recruited participants who met the requirements of the study, which involved researching in centres that provided both working and non-working technologies for the children to use throughout the day. To begin the recruitment process, I approached the managers of a large kindergarten cluster because due to the high number of centres they managed, they were likely to have some that met my criteria.

Once permission was granted from the Australian Catholic University's ethics board [see Appendix 1 Australian Catholic University Ethics Approval, p.228] and the Department of Education and Early Childhood Development [see Appendix 2 DEECD Ethics Approval, p.229], I began my *purposeful sampling* recruitment process. I contacted the manager of a kindergarten cluster located in the south-eastern suburbs of Melbourne, Australia. The manager emailed their educators and invited them to participate in my study. From this email, I had one interested part-time kindergarten [this kindergarten is henceforth given the pseudonym Cosmic Kindergarten, see Cosmic Kindergarten, p.108]. Kim and her assistant Toula consented to be part of the study and for their first names to be used. The children attended Cosmic Kindergarten for five hours on Tuesdays, Wednesdays and Thursdays. I attended this kindergarten for four hours each day because the technologies were packed up at lunchtime and therefore, the imaginative play I was targeting could not be observed. I completed a Technology Audit Interview [see Technology Audit, p.108 and Appendix 8 Technology Audit, p.240] in order to ensure that this site met my research criteria.

I attended the educators' meeting presented by the managing body I first contacted, where I introduced myself and the study to solicit participation. In this introduction, I explained the objectives of the research, the requirements placed on participating educators, and verbally invited them to be part of the study. There was interest in the project topic and one educator volunteered for the study [the kindergarten they are from will henceforth be given the pseudonym Creative Kindergarten, see Creative Kindergarten, p.111]. Vanessa and her assistant Louise consented to be part of the study and for their first names to be used. This centre worked a rotational model with children attending three out of five days. This aligned with the days in the other volunteer centre. My data collection occurred at Cosmic Kindergarten Tuesdays, Wednesdays and Thursdays, and Creative Kindergarten on Mondays and Fridays. The difference in data collection time between the two centres was due to Cosmic kindergarten volunteering first and the timing to fit visits to both centres into the week. In addition, Creative Kindergarten provided a flexible lunch routine, so the technologies were available for longer. This flexibility increased the potential for capturing the imaginative play I was after. I attended Cosmic Kindergarten for 12 hours per week and Creative Kindergarten for 10 hours per week (Figure 4:1 Attendance at the two research settings).

Monday	Tuesday	Wednesday	Thursday	Friday
Creative Kindergarten	Cosmic Kindergarten	Cosmic Kindergarten	Cosmic Kindergarten	Creative Kindergarten
5 hours	4 hours	4 hours	4 hours	5 hours

Figure 4:1 Attendance at the two research settings

4.10.1 Technology Audit

Using the purposeful sampling technique, I ensured that the two centres provided working and non-working technologies for children's use. I conducted an over-the-phone, technology audit with both educators, prior to formally accepting their kindergarten as a research site [see Appendix 9 Kim's Technology Audit Answers, p.241 Kim and Appendix 10 Vanessa's Technology Audit Answers, p.242]. The purpose of this audit was to ascertain the range of technologies available at each setting (a process recommended by Nikolopoulou & Gialamas, 2009). The questions in the audit were based on my own experience as a kindergarten educator, combined with my experience of technology provision across a range of other settings. A summary of the participants and relevant centre demographic data is presented in Table 4.1.

4.10.1 Cosmic Kindergarten

At Cosmic Kindergarten, the participating educators were Kim as the qualified teacher and Toula her assistant. After leaving school, Kim had studied an Arts Degree and then travelled. She returned to study and completed a Graduate Diploma in Education (Early Childhood) and had been working as a kindergarten educator for 17 years at the times of data collection. Her position at Cosmic Kindergarten was a temporary one until the end of that year. While I was there Kim was absent for several days and Susan stepped in as a relieving qualified educator during these times. Toula holds a Certificate III in Children's Services and at the time of data collection had been working at Cosmic Kindergarten for five years. Prior to this position, she was an integration aide in various local primary schools.

The children at Cosmic Kindergarten were mostly four and five years old, except one child who was six and attending a second year of funded kindergarten [see Table 4.2 Age and sex of the child participants at Cosmic Kindergarten, p.110]. At Cosmic Kindergarten, 28 children consented to participate, out of a possible 29 children and of these, 24 consented to being video recorded throughout the study. This number of assenting children changed each day when the children were invited to complete the daily assent form [see Children's assent, p.134]. The children attended the kindergarten from 9:15am till 2:15pm on the three days. The children's snack time was flexible. Whenever the children were hungry, they could take their snack from the trolley and eat at the tables outside. Snacks were available between the beginning of the session and 12:30pm and lunchtime was at 1pm. I collected data from 9:15am till approximately 1:00pm when the children and educators stopped to have lunch together. Kim led a group time to conclude the session and the children went home after this group time. During the last hour and a half (from the start of pre-lunch pack up time), the computers were turned off and home corner was packed up. This meant that imaginative play with technologies did not occur so I stopped collecting data from this time.

Details	Creative Kindergarten	Cosmic Kindergarten
Centre location	Eastern suburb of Melbourne	Eastern suburb of Melbourne
Centre characteristics	Middle class, working suburb Rotational centre Parent run committee	Middle class, working suburb Part time centre Parent run committee Also runs a 3-year-old group
Educator	Vanessa	Kim
Qualifications	Bachelor of Teaching (Early Childhood Education)	Bachelor of Arts Graduate Diploma in Education (Early Childhood)
Experience	15 years	17 years
Time at centre	8.5 years	One month
Assistant Educator	Louise	Toula
Qualifications	Diploma of Community Services (Child Care) Certificate III in Child Care	Certificate III in Children's Services
Experience	15 years	5 years
Time at centre	8.5 years	5 years
Child Participants	31 (21 females and 10 males)	28 (18 females and 10 males)
Child Participants' ages	4 and 5-years old	4 - 6 years old

Table 4.1 Summary of centres, educators and participants

	4 year olds	5 year olds	6 year olds	Totals
Females	6 (1 no video)	12 (2 no video)	0	18 (3 no video)
Males	3 (1 no video)	6	1	10 (1 no video)
Total	9 (2 no video)	18 (2 no video)	1	28 (4 no video)

Table 4.2 Age and sex of the child participants at Cosmic Kindergarten

At the conclusion of the assent process, 24 children assented to be observed and video recorded and a further four assented to be just observed. The video recording occurred when assenting children were playing with the provided technologies. This meant that some children engaged in the desired play and were captured on video, while others elected to engage in play activities that did not involve technologies. The selection of reported videos and examples of play will be further discussed in the data analysis section [see Data analysis, p.126].

After several weeks, a mother came and spoke to me and said that she would like to change her consent. Her twin boys were enjoying using the computers and she wanted them to be videoed and participate in the study. She admitted that she was reluctant in the beginning because she did not know me, but after watching me interact with the children and hearing what her boys would tell her after each session, she decided that they could participate. As Barron (2013) asserts, ethnographic researchers need to get to know their participants before conducting their study and this was evident here. Whilst the aim of the familiarisation period was to build rapport with the children and families this can take longer than anticipated as this example shows. The familiarisation period will be discussed in more detail later on [see Familiarisation period, p.113]. The twins were included in the Table 4.2 Age and sex of the child participants at Cosmic Kindergarten.

4.10.2 Creative Kindergarten

At Creative Kindergarten, the participating educators were Vanessa, the qualified teacher and Louise, her assistant. Vanessa holds a Bachelor of Teaching (Early Childhood Education) and worked in child care for 15 years before joining Creative Kindergarten as the director. Louise holds a Diploma of Community Services (Child Care) and a Certificate III in Child Care. Like Vanessa, Louise had worked in child care for 15 years before becoming the assistant at Creative Kindergarten. Both Vanessa and Louise have been at Creative Kindergarten for over eight and a half years at the time of data collection. The sessions ran from 8:30am till 1:30pm. Vanessa ran an indoor-outdoor programme until the last 15 minutes, when the children engaged in quiet activities before their parents collected them. Due to the fact that the children had opportunities to engage in digital technology play across the session, I remained the centre the whole time the children attended. Both lunch and snack times were flexible, with the children deciding when they wanted to eat. A dedicated table was set up inside for refreshments, and outside the children could have a picnic on the grass or eat at one of the various tables around the yard.

The children at Creative Kindergarten were four and five years of age. Of a possible 40 children that attended on Mondays and Fridays or both, 36 children consented to participate. Of these, 35 agreed to be observed [see Table 4.3 Age and sex of participants at Creative Kindergarten, p.112]. Due to Creative Kindergarten's rotational model, the children's attendance was not uniform [see Table 4.4 Rotational model days and times at Creative Kindergarten, p.112]. Of the children who consented to be observed, 31 attended on data collection days, consequently, I was not able to include five children for whom consent was given. Six children did not provide consent to be video recorded.

	4 year olds	5 year olds	6 year olds	Totals
Females	8 (1 no video)	2 (1 no video)	0	10 (2 no video)
Males	9 (1 no video)	12 (3 no video)	0	21 (4 no video)
Total	17 (2 no video)	14 (4 no video)	0	31 (6 no video)

Table 4.3 Age and sex of participants at Creative Kindergarten

	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 – 1:30		A B E	A D E		B C D
11:30 – 4:30	A B C			C D E	

Table 4.4 Rotational model days and times at Creative Kindergarten

At the conclusion of the assent process, 25 children assented to be observed and video recorded and six assented to be just observed. As at Cosmic Kindergarten, the video recording occurred when assenting children were playing with the provided technologies. Therefore, only some assenting children were captured on video. The selection of reported videos and examples of play will further be discussed in the data analysis section [see Data analysis, p.126].

4.10.3 Children's creative pseudonyms

All participants were offered the opportunity to use a pseudonym rather than their real name. This was offered to the parents and educators on their consent form and to the children on their assent form [see Children's assent, p.134]. Whilst the use of pseudonyms is considered important in protecting anonymity, Harcourt and colleagues (2011) suggest an alternative positioning in their report on a study where the children wanted to use their real names as a way of owning their answers. In my study, the educators elected to use their first name as long as their centre's name was a pseudonym. The centres' pseudonyms were chosen by the educators and reflected aspects of themselves or what they encouraged in their centre. Some parents wanted pseudonyms for their children. While some selected the name for their child, others allowed the children to select their own pseudonym. The other children used their first names. The figure below only presents those children who elected to use a pseudonym [see Table 4.5 The pseudonyms chosen by the centres and the children, p.113].

Centre pseudonyms	Creative Kindergarten	Cosmic Kindergarten
Child pseudonyms	Amy Ding Ding The Joker	Dolphin Georgia (boy) Giraffe Kavithmi Dinosaur

Table 4.5 The pseudonyms chosen by the centres and the children

4.10.4 Familiarisation period

I conducted a familiarisation period at both centres, which is when I spent time in the centres getting to know the children, families, educators and the culture of the centres. The "stranger-researcher" must allow time to build rapport with child participants before seeking their assent to participant in the research (Sargeant & Harcourt, 2012, p. 32). Time is required for the researcher to be accepted as an insider within a kindergarten setting. For this study, I visited each kindergarten for every five-hour session for two weeks to get to know the participants, the routines of the settings, and to complete the consent/assent paperwork. I attended for the whole session and remained until all parents had departed to allow the parents to become familiar with me and to answer any questions they had. This familiarisation period for rapport building, similar to the preliminary home visits that Harwood (2010) conducted, allowed the children to become familiar with my presence. This also allowed the children and educators to acclimatise to the presence of the video camera. The children were also encouraged "to ask questions before the formal observations commenced" and these were answered simply and honestly (p. 7). Any researcher entering the field needs to acknowledge that their presence "alters the research site to an unknown degree" (Grieshaber, 2010b, p. 180). This imposition can be minimised if the researcher spends time in the setting, getting to know the participants, and provides opportunities for the children to learn about the research process and the role of the researcher.

After the two-week familiarisation period, I commenced my 12-week data collection phase. It is an advantage of a 12-week ethnographic study that relationships between the participants and the researcher have time to flourish. This meant that the children were comfortable with my presence by the end of the 12-week period. This relationship was apparent when the children both kindergartens questioned when I was absent. The 12-week data collection phase was spread across nearly six months, due to school holidays and a period of my annual leave. Consequently, it felt to me that I was in the two centres for a longer period of time. This protracted contact time, added to the strength of the relationship I had with all the participants, and made saying goodbye at the end of the data collection phase an emotional time. The timeline of data collection is presented below [see Figure 4:2 The timeline of my data collection visits to the two research sites]. In the tables, the 'W' stands for weeks and the numbers indicate the number of weeks of the familiarisation period and the data collection phase.

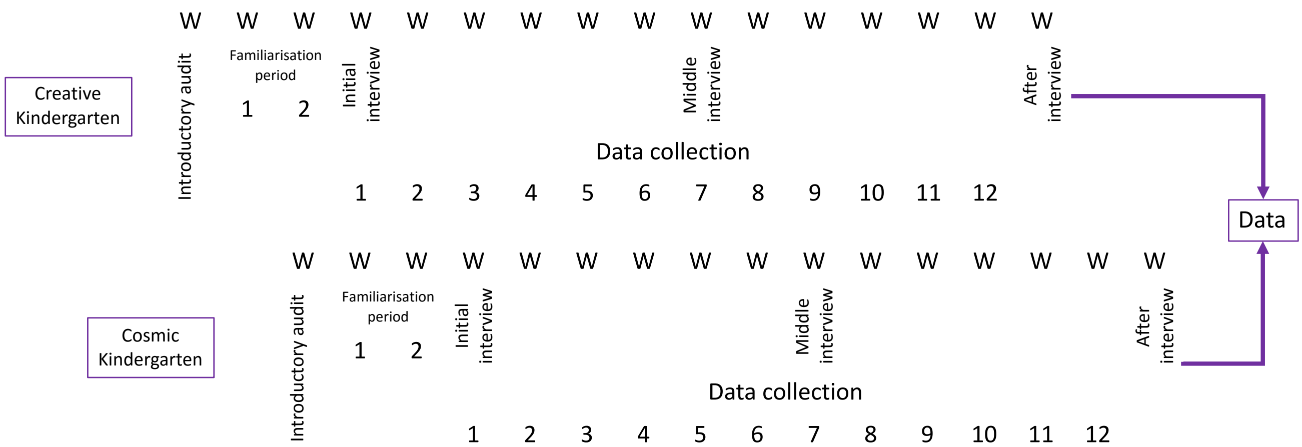

Figure 4:2 The timeline of my data collection visits to the two research sites

4.11 Data collection methods

A researcher's ontology, epistemology and the design of the research study will determine the data collection methods employed. Research methods are considered the "nuts and bolts of research practice" (Carter & Little, 2007, p. 1325). They are how the evidence of the phenomenon under study will be observed and collected ready for analysis. The research questions guide the data collection methods that will be used. I needed to collect data around children's imaginative play with working and non-working technologies, and the influences on educators' provision of these devices. The data collection methods were chosen to ensure that I could view the participants and the phenomenon under study in the everyday context in which it occurs (Larsson, 2006). Also, collecting data about the influences on educators' provision required alternative methods that were different to those used for collecting data about the children. The use of several data collection methods is recommended to ensure a complete picture of the activity under study is captured. Ethnographic studies require "presence in the field is a necessary condition for valid claims" (MacNaughton, 2005, p. 178). Therefore, the research methods employed during this study included: video recordings; written observations; photographs; interviews with educators; conversations with children and researcher field notes.

4.11.1 Video recordings

The use of video recordings is often an attractive data collection method when researching from a cultural-historical perspective. Video recordings capture the interactions between people and between people and objects, including subtle facial expressions that can be missed when using written observations. Direct quotations from participants can be captured accurately when the footage is replayed (Plowman & Stephen, 2008). I chose video footage for this study because video can capture both the interactions between children and the interactions between the children and the technologies. The educators' provision of technologies, the rules and restrictions they impose and the support for children's imaginative play were also captured in the video footage.

Children from developed countries are often the subjects of still and video recordings by the adults in their lives (Merchant, 2015). Moreover, the use of cameras is an acceptable documentation tool that is used to capture the children's play, learning and experiences in early childhood educational settings (Boardman, 2007; Lindgren, 2012; Rintakorpi, Lipponen, & Reunamo, 2014). While this exposure to recording technology may have helped the children feel comfortable with my use of the video recorder, they could have felt frustrated with the amount of recording in their lives. Thus, I closely monitored children's verbal and non-verbal cues and discontinued recording if children appeared uncomfortable. My responsiveness to children's non-verbal cues was part of my ethical research approach and this will be discussed further in the ethical considerations section [see Verbal and non-verbal cues, p.137].

The video camera chosen for this research was a Sony Bloggie™; a small, hand-held digital video camera [see Figure 4:3 The Sony Bloggie™ used in data collection. Image sourced from www.which.co.uk]. The portable device was chosen to enable me to follow the children as they engaged with the technologies around the room and outside. The Bloggie™ was also capable of taking still images, which meant I could take still photographs during data collection, without the need for a separate device.

Figure 4:3 The Sony Bloggie™ used in data collection. Image sourced from www.which.co.uk

The video camera was introduced to the children during the familiarisation period. I discussed the use of the video recorder with the children and they often watched the screen as I was recording other children. Robson (2011) states part of the familiarisation and informed consent process "should include opportunities for children to see themselves on video, and reflect on how that feels for them" (p. 183). I provided the opportunity for the children to observe my recorded data many times across the two centres during the research period. For example, at Cosmic Kindergarten, short videos were recorded of children acting out songs during a group time session. I downloaded these to the children's computers for them to watch at their will.

When selecting the recording device, I considered how imposing the device was going to be. For instance, Davidsen and Vanderlinde (2014) found children were often preoccupied with the camera even though they had selected "small web cameras" that were less obtrusive (p. 553). The Hawthorne effect is a research concept where there can be a change in a participant's response because they know they are part of a research study (Clement, 1981; Nicholson, 2014). This effect can be intensified with the use of video recording. While it is acknowledged that the children's behaviour may have been influenced by my presence or my use of the video recorder, contemporary children are familiar with having their photograph taken and being recorded in the daily lives, so it is not the novelty experience of previous times (Plowman & Stevenson, 2012). Often a child's image will feature in the documentation of the kindergarten programme, and not always with an educator asking for their consent (Lindgren, 2012), whereas, when I collected data on the children I asked permission via the assent process.

Despite children's familiarity with recording technology, the need to reflect on how "participants' interactions are affected by their 'camera-consciousness'" is an essential part of the research design (Pink, 2013, p. 107). In this study, the camera became part of my identity. The children noticed and commented if I did not have it with me. At other times, it was in my pocket and the children asked where it was. The video camera did influence the children's reactions, behaviour and assent to participate, and this was a limitation of the data collection method. For example, Shavani sat at the top of the slide and she smiled when she realised I was videoing her. She then proceeded to take my photo with the non-working camera that was hanging around her neck [see Video Cosmic24 and Video Cosmic25]. During data collection, I made every effort to hold the video camera close to me or I would steady it on my knee. This was in an attempt to keep eye contact with the children to avoid the camera being between us. While this was not always possible, there were times when the children focused on their play and forgot the video camera was there.

4.11.2 Observations

Written observations were undertaken when a non-assenting child was participating in the play scenario. This allowed me to record the scenario without compromising the child's assent choice. Several parents from both settings, had concerns about their child's image being captured and used for research purposes. In most cases, they consented to written observations of their children to be captured and used in this study. The aim of the written observations was to view the children as they played in their natural, early childhood setting and to capture their play scenarios as they happened (LeCompte & Schensul, 1999). Running records were taken when non-assenting children were engaged in play with the technologies. Anecdotal records were used when I was videoing a play scenario and something else was happening nearby that I also wanted to capture. I used the same criteria as I used with the video recording – I began writing the observation when the children were engaged with technologies in their imaginative play. I stopped writing the observation when the technologies were no longer being used.

A limitation of written observations can be the accuracy in recording participant's quotations and where possible I used the video recorder to ensure that quotations were accurate. Being an experienced early childhood educator, I am skilled at taking observational notes of children's play. As a "practitioner researcher," I have insights into the field of study – children's imaginative play, but to be reflexive I also had to separate myself from what I was observing in order to provide a fresh examination of what was occurring (Harrison, 2010, p. 162). Another limitation of observations can be the lens that the researcher uses to interpret what she/he has seen. Again, as a trained early childhood educator, my skill in writing anecdotal and running records is quite practiced. I wrote what I saw and waited until after the session when I was downloading the videos to interpret my observations.

4.11.3 Photographs

Photographs or digital still images were used within this research to supplement the researcher's observations and to capture a snapshot of what occurred (a strategy recommended by Siraj-Blatchford, 2010). As Pink (2013) posits, a camera has almost become a "mandatory element of the 'tool kit' for research" in the current era (p. 73). One benefit of a photograph is that it captures an image of a situation, before elements change or non-consenting children come into view.

In this study photos were taken to capture:

- a play set up before non-assenting children joined the play;
- where the technologies were positioned in the room;
- the non-working technologies provided;
- educators engaged with technologies; and
- children engaged in imaginative play with technologies.

I used these images to support my written observations and to quickly capture a scene before it disappeared or before unconsenting children entered. For example, I took a photograph at Cosmic Kindergarten, when the room was rearranged and the computers were moved to the other side of the room [see Figure 4:4]; and at Creative Kindergarten, I took a photograph of the play space the children set up before a non-consenting child joined the play [see Figure 4:5]. I also took photographs of the educators engaged with technologies or to capture what an educator described to me [see for example, Figure 5:1 Vanessa holding the mobiles made out of blocks by the children in the pasting area, p.142]. Consent was given by the educators and parents, with assent from the children, to publish photographs of them.

Figure 4:4 The computers were moved to the other side of the room when Cosmic Kindergarten was rearranged

Figure 4:5 The children's set up of a play space before a non-consenting child joined the play.

One limitation of photographs is they do not record the interaction between the children or the children and the technologies, which were important elements of this study. The photographs were used as supporting evidence for the observations, rather than standalone examples of the children's play scenarios.

4.11.4 Interviews

I conducted a technology audit telephone interview with Kim and Vanessa, prior to the commencement of the study [see Appendix 9 Kim's Technology Audit Answers, p.241 and Appendix 10 Vanessa's Technology Audit Answers, p.242]. During the subsequent familiarisation period, I observed that the educators' provision of technologies and the rules and restrictions surrounding their provision were different to what was discussed in the technology audit. I amended my ethics application to include face-to-face semi-structured interviews with the educators [see Appendix 11 Educators Amended Consent Form, p.243]. Interviews not only facilitate the collection of important data, but they can be used to clarify the differences observed between practice and what a person may say (Denzin & Lincoln, 2008). Understanding the power dynamic that occurs between the researcher and the interviewee is important. Through recognising and acknowledging power relations, a researcher can remain reflexive, therefore during the interviews I validated and encouraged my participant's point of view on their provision of the two different types of technologies. In cultural-historical research, interviews are seen as conversations, where the researcher asks questions and listens carefully to the interviewee's response. Semi-structured interviews encourage the interviewee to share stories and narratives about their own experience that relate to what is being investigated by the researcher (Schensul, Schensul, & LeCompte, 1999). Being able to interview the educators meant that I was able to question what I saw occurring and allowed for them to explain the beliefs that underpinned why they provided the technologies in the ways that they did. My updated ethics approval allowed me to conduct three semi-structured interviews in addition to the technology audit interview. These took place at the beginning [see Appendix 12 Educator Interview questions – , p.244], the middle [see Appendix 13 Educator Interview Questions – middle, p.245], and after the data collection was completed [see Appendix 14 Educator Interview Questions - after data collection, p.246]. In all three interviews, I encouraged Kim and Vanessa to share stories and examples from their practice to illustrate the points they were making. In the third interview, I repeated the statements that each educator made at the beginning of the project around their technology beliefs and asked if these had changed at all. This encouraged the educators to reflect on the project and identify how it influenced their beliefs in any way. Each of these interviews was audio recorded to ensure that the educator's responses were accurately captured.

Member checking is a technique to ensure validity where participants are provided with copies of the transcripts from each of their interviews. To ensure reflexivity and accuracy of the interview data, I conducted 'member checks' with Kim and Vanessa (Creswell & Miller, 2000). This allowed them to edit any comments that they did not want published and provided an opportunity to clarify that what was written was what they meant.

Interviewing has been a popular data collection method for decades (Denzin & Lincoln, 2008). While the process appears straightforward, acknowledging one's own position, focusing on what the participant answers rather than on one's own interests, avoiding leading questions and influencing participants is not so easy. One limitation of interviewing participants is the ambiguity of their responses and their misinterpretation of the interview questions. I believe this was overcome by the semi-structured nature of my interviews, where I could probe them to clarify their answers or I could rephrase the questions if they needed. My planned interview questions were open-ended, and my aim was to encourage the educators to elaborate on their answers and contemplate their provision of technologies within their settings. I also considered the location of the interviews. Conducting the interviews at the educators' kindergarten was problematic as distractions and interruptions occurred. The educators were also conscious of discussing the practice that occurs in their setting while other staff members were still present. The second and third interviews were conducted at cafes to reduce the impact of the location on the educators' willingness to share their stories. While at times the café wait staff interrupted the interviews, the educators appeared more relaxed and willing to share their experiences.

4.11.5 Conversations

Prior to the commencement of data collection, I believed that I could answer one of my research questions through observing and video recording children's imaginative play with the technologies. As data collection progressed, I realised that I needed to ask the children questions to clarify what I saw occurring and to further understand why they engaged with the technologies in the ways they did. There were several occasions where children told me about their play or the technologies that they were using, but I had not sought permission to use this data in my research. I submitted an updated ethics application to enable me to include conversations with the children in the data set. An amended information letter and consent form was provided to the parents [see Appendix 15 Amended Parents Information for Participants' and Consent Form, p.248] and children were invited to complete an amended assent form [see Appendix 16 Children's Amended Assent Form, p.252]. I collected conversational data from the second last week at Cosmic Kindergarten and the third last week at Creative Kindergarten.

Engaging in conversations with children around their technology use not only recognised them as "competent and interpretive social participants" (Dockett & Perry, 2003, p. 12) but also provided further insight into what was occurring in the research setting. The children were asked questions like "What are you playing with?", "How does that work?" and "What would happen if you had a working device to play with at kindergarten?" [see Appendix 17 Children's Conversation Questions, p.253]. Using a conversational approach "during the natural course of events as they unfolded, increased the salience and relevance" of the questions asked (Harwood, 2010, p. 9). Unfortunately, due to the timing of the ethics approval and the completion of the amended consent forms, I only undertook a limited number of conversations with children. This was a limitation of this study and will be discussed further shortly [see Limitations, p.124]. Another limitation associated with these conversations with the children was the possible belief that they needed to provide the answers that they thought I was looking for as a researcher (Fine & Sandstrom, 1988). However, this was partly mitigated by the time I had begun using conversations as I had already built a relaxed rapport with the children.

4.11.6 Researcher field notes

Personal journal writing is a documentary tool where researchers can reflect on the research process, what occurs in the settings and record any further questions that come to them during the data collection phase (Janesick, 2000). Field notes on the other hand, are documented observations of what is occurring in the research setting from the perspective of the researcher (Emerson et al., 1995). These notes need to be detailed and complete, describing events or the environment as they are without the researcher's interpretations. These can then be analysed later as another data set (Schensul et al., 1999). There are a plethora of publications that explain how to write researcher journals (for example see Denzin & Lincoln, 2011; Emerson et al., 1995; LeCompte & Schensul, 1999), and these aim to provide an account of how the researcher and setting influence one another, as a method for ensuring reflexivity. This occurs through the researcher's critical reflection on how the research was done and the impact of decisions that they made during each research session (Kohler Riessman, 2008). While the various publications often assume the researcher's identity is stable from the beginning to the end of a project, journaling can be incorporated to record a researcher's liquid identity to account for how the researcher's identity changes within a research project (Bauman, 2004).

I completed both field notes and a reflective journal. My journaling occurred at the same time as I took field notes. I wrote comments and/or the beginning of an analysis alongside the field notes as I wrote the journal entry. This allowed me to contemplate what was occurring as it happened and before my thoughts escaped my memory (Bryman, 2012). In ethnographic research, this is considered the beginning of the data analysis process (Hammersley & Atkinson, 1995).

A limitation of researcher field notes is the accuracy in the description of the event (Schensul et al., 1999). I recorded my field notes both while in the research settings and after leaving each setting as I contemplated the events of the day. I wrote field notes during or straight after events in the research settings as my interpretation of what occurred. From my cultural-historical lens, the interactions I had with the children and educators in each research setting changed me and my field notes aimed to capture what had occurred and my thoughts and reflections of these interactions. If I was unsure of the exact wording of the child's comment, then I would make a note of this on my field note. This allowed the recording of the event, feelings and thoughts to be captured, even though I had not recorded the exact words being spoken.

4.12 Limitations

Within any research study there are limitations. Due to the length of time the researcher spends in the field in ethnographic studies, some limitations can be identified early and addressed which reduces their impact on the overall study. This was the case, when I amended my ethics approval to include conversations with the children. Through the data collection phase, I realised that asking the children about their thoughts and experiences with technologies would increase my understanding of what was occurring and add even more knowledge to the research study. I did amend my approval but by the time the process of gaining the university approval, parental approval and then the children's assent, my 12 weeks within the research centres was concluding. Looking back at this process, I now realise I limited my data collection focus, believing that I could capture all I needed through focusing on one area of technology use and provision. Perhaps it was my highly expanded opinion of my ability as an early childhood educator causing me to think I could observe and capture what I needed. This is something I will be conscious of in future research projects; that being an observer researcher may not capture all that is needed to gain the full picture of what is occurring. Interview data can inform studies of this kind and add to the depth of data collected.

Questioning the educator participants also proved useful. Similarly, as with the conversations with children, I amended my ethics approval to include interviewing them before, during and after the data collection phase. I became aware of this limitation during the familiarisation period at Cosmic Kindergarten, which resulted in approval being sought and gained prior to beginning at Creative Kindergarten. It was a potential limitation of this research that was overcome due to the design of the study (for example, the two-week familiarisation period, then the 12-week data collection phase). Due to starting the research at Cosmic Kindergarten two weeks before beginning at Cosmic Kindergarten, I could make the changes before starting at Creative Kindergarten.

To fully embrace the cultural-historical perspective, exploration into the participants' cultures and histories was needed. I focused on the culture of a particular time and place. I did question the educators about their histories with technologies and in terms of the qualifications, experience and professional learning over their career. I neglected to investigation the children's histories. This oversight, while unfortunate, did limit my understanding of the children's histories, but I believe my observations and collected data still provide the rich explanation of the children's technology use in their imaginative play. Investigation into the children's history and previous technology exposure and use would have provided some information about prior experiences and current technology use of the children. The information would have contextualised their kindergarten experiences and provided insights into the skills the children already possessed around various technologies. I explored children's imaginative play at a particular moment in time and within a particular context – their early childhood classroom.

History did come into the children's play and is their understanding of the history of technologies, or specifically a mobile phone, that allowed them to pretend to use the devices in their play. Without their knowledge of the history of the mobile phone, the children would not know to press buttons to dial a number, talk into the microphone, listen to the speaker or access the internet. Even though I did not collect data on the children's personal histories, they displayed their understanding of the histories of the technologies in the play that they enacted for my collection as data.

Another limitation was the amount of free play that the children were allowed with the working technologies. Prior to commencing the study, I envisioned selecting sites where children were allowed to access the working technologies during any free play times. This was not the case. Even though what occurred was children's limited access to free play on working technologies, I believe the experiences I had at both Cosmic and Creative Kindergartens allowed me to see how the children navigate what was provided to ensure they were afforded imaginary play. It also allowed me to see and interpret what was occurring for these educators, in terms of the influences on their provision. The nature of early childhood settings will always result in some level of rules and restrictions being applied to the provision of technologies. Therefore, I believe conducting the same research project in settings where educators permitted children's free access to working technologies, may not have necessarily produced totally different results. This forms an idea for future research and will be discussed further in the concluding chapter [see Future research directions, p.197].

A limitation that occurs when relying on a theory whose authors does not speak the same language. I relied on Vygotsky's concepts and therefore read translated copies of his original works. Some translations have been dismissed in recent literature (Daniels et al., 2007) and I made every effort to read different versions to ensure I had an accurate impression of Vygotsky's theory.

4.13 Data analysis

Data analysis "permits researchers to make sense of what they have learned," understand the data they have collected and to present the findings for others to read (LeCompte & Schensul, 1999, p. 147). The data collected required initial processing (Resnick, 2006) before a search for meaning could commence (Hatch, 2002). I made comments alongside my researcher field notes and cleaned the data by removing unconsenting children and renaming files. This prepared it for input into data processing software (discussed below) where the formal analysis occurred. Each of these examples of data entered into the software were then a unit of analysis. Each of the steps in the process will now be discussed in detail.

4.13.1 The data analysis process

From the outset of my data analysis, I was conscious of my position within the research process and the lens I would apply while exploring the data; the whole time remembering "the fact that research data and analysis is always affected by the researcher" (Purcell-Gates, 2011, p. 148). I was also aware of reflexivity during the data analysis process, understanding that analysis was my interpretation of the data from my perspective. I checked my analytical assumptions with other colleagues, including my supervisors, to ensure the codes I had assigned were appropriate, well-chosen and coherent.

Data analysis commenced as soon as data was collected. I began by making comments and summaries of my researcher field notes [see Researcher field notes, p.123] that were taken every research session (Hammersley & Atkinson, 1995). This analysis also fed back into the research design and the data collection phase. This flexibility is one of the advantages of undertaking an ethnographic study; where I was in each setting for 12 weeks. As a result of my ongoing analysis, I determined to make changes to both the research design and the collection methods to ensure appropriate data is collected. The benefit of analysing the data as I collected it was that I could reflect on the process and make changes to benefit the study (as recommended by Lichtman, 2013). This resulted in the change, mentioned above, to gather data from speaking to educators and children [see Interviews, p.120 and Conversations, p.122]. Through my initial data analysis, I realised that conducting interviews with educators and holding conversations with children would increase the knowledge around technology provision and use in the two kindergartens.

After each data collection session, I began the process of cleaning video recordings so that they were ready for analysis. This involved watching each video and removing any material that contained unconsenting children (Schensul et al., 1999). In a spread sheet, I created a log with the information about each recording including: the date; location; original file name; new file name; a summary of the video; and a list of the children and educators captured (Walsh, 2007). I also included a column for my initial thoughts as I was processing the recordings and this became my informal, first phase of analysis (Hammersley & Atkinson, 1995). The photographs were included in a similar spreadsheet and I recorded: the date; location; original file name; new file name; a description of the photograph; and a list of the children and educators captured (Walsh, 2007). Again, I made notes alongside each one as an informal analysis phase. The educator interviews and conversations with children were transcribed and analysed using *NVivo* software, a computer-based program that assists with data analysis (QSR International, 2012). The software has the useful function of slowing down the voice recordings to make transcription easier. The conversations with children were also transcribed using *NVivo*. The observations and researcher field notes were typed from handwritten notes. Once this processing was complete, all the data was entered into *NVivo* to begin the more formal phase of analysis (as recommended by Lichtman, 2013).

Respecting that the most important tool in the analysis process is the researcher (Denzin & Lincoln, 2011), I utilised *NVivo* to make the analysis process easier. I constructed my understanding of the data through the process of watching videos and reading observations and transcripts in *NVivo*. My analysis was revised as I reviewed the constructed understanding. *NVivo* doesn't not conduct the analysis (Leech & Onwuegbuzie, 2011), but rather, assists with making the process easier for the researcher. *NVivo* allows similar themes and codes to be found, sorted and linked so finding examples of data coded to the same theme a quick process. One benefit for using *NVivo* is that all types of data (for example, observations, interviews, photograph and videos) can be analysed in the same way and the same list of codes can be applied.

4.13.2 Coding to the Imaginative Affordance Framework

Once the data was cleaned, I analysed each play scenario using the Imaginative Affordance Framework. As discussed in the theoretical chapter [see Bringing the concepts together, p.81], I combined Vygotsky's (1978, 2004) concepts of mediation and imagination with Gibson's (1979) concept of affordance to create the Imaginative Affordance Framework. At the beginning of the research, I began thinking about children's play with technologies from the concepts of imagination and mediation, and the educators' provision of the devices from the concept of affordance. I soon realised that all three concepts were involved in both the children's use and the educators' provision of technologies and therefore needed to be considered together. I designed the Imaginative Affordance Framework and tested it in the data analysis process. As one of my methodological contributions to knowledge, the framework assists educators and researchers to investigate the complexity of cultural-historical dimensions in early childhood centres. By combining the concepts into one framework, it allows for exploring an early childhood scenario and the interactions of mediation, imagination and affordances.

I began working with each scenario, placing the elements into the framework. I completed frameworks for both working technology examples [for example, see Figure 4:6 Jack's Imaginative Affordance Framework for his iPad use, p.129] and non-working technology examples [for example, see Figure 4:7 Mia's Imaginative Affordance Framework for a non-working microphone, p.129]. These are examples from the data, presented here for illustration purposes and were randomly selected. A full list of the framework information is included in the appendices [See Appendix 18, p.253]. The letters 'A' and 'C' represent the affordances and constraints of the situation. I drew dotted lines to indicate the relationship between the stimulus information and the affordance and constraints [these are indicated with the blue dotted lines].

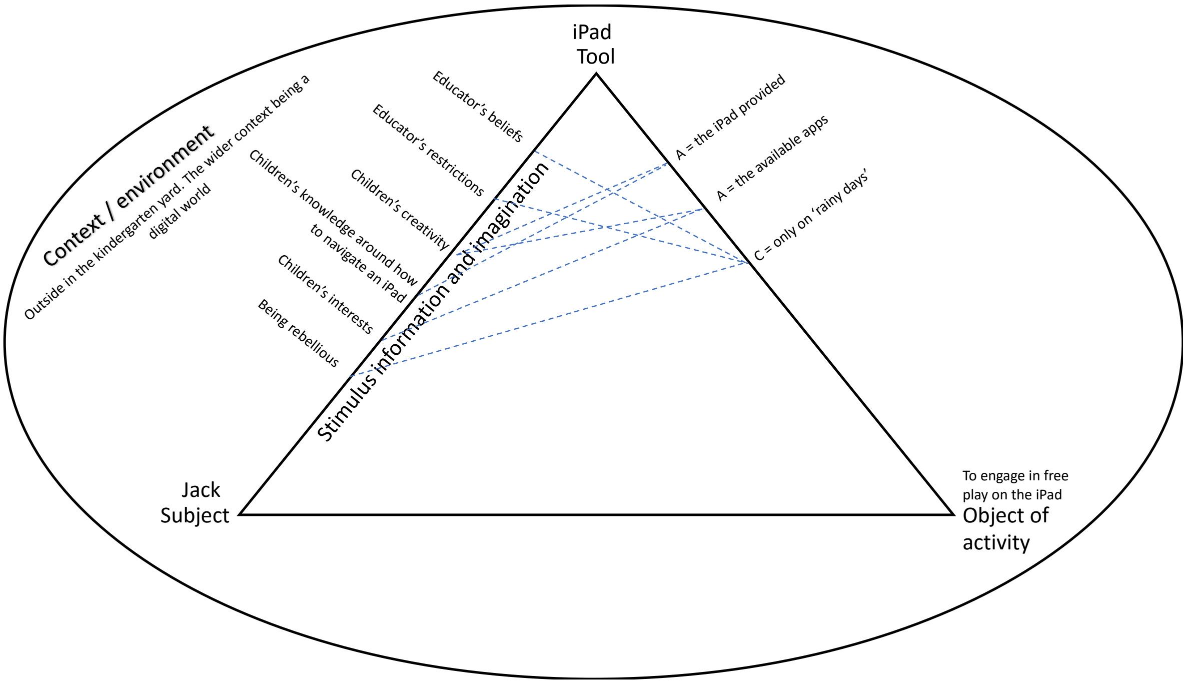

Figure 4:6 Jack's Imaginative Affordance Framework for his iPad use

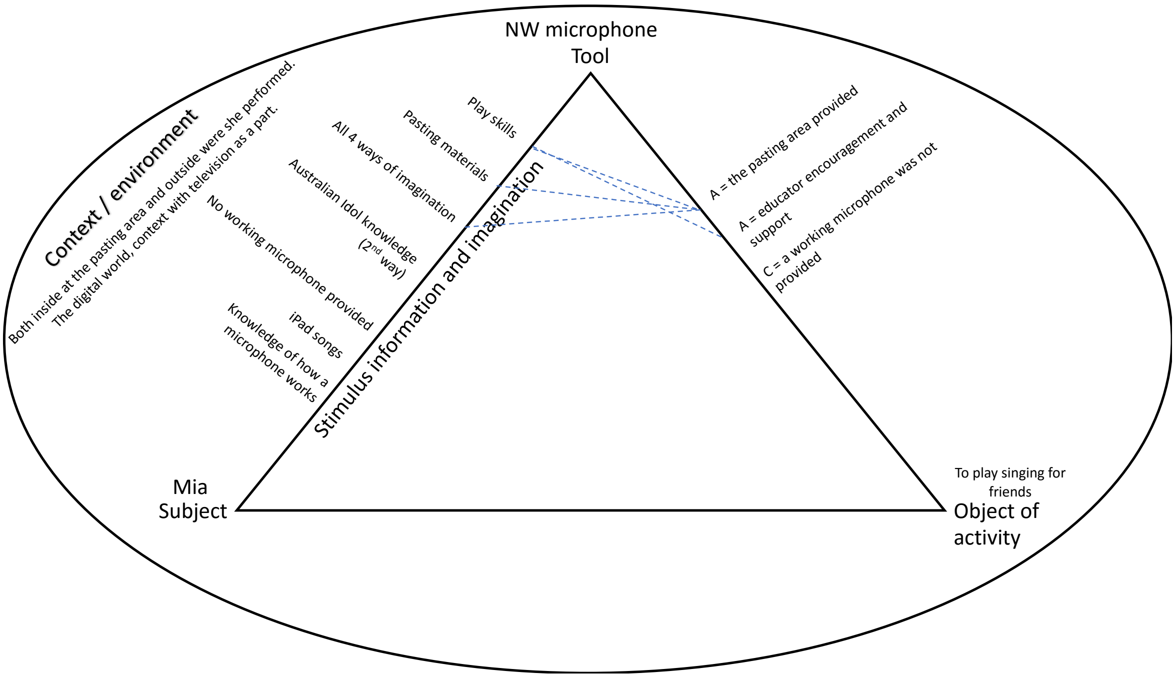

Figure 4:7 Mia's Imaginative Affordance Framework for a non-working microphone

The data of the children's experiences with technologies were analysed used the Imaginative Affordance Framework as illustrated above [Figure 4:6 and Figure 4:7]. The children's mediation of the cultural tools to achieve their object of activity were listed. The frameworks also show the stimulus information that is relevant to the scenario and the affordance and constraints that may impact their ability to mediate the cultural tool. By exploring the data in this way, it highlights for both myself as a researcher, and potentially for the educators the stimulus information, affordance and constraints that influence the children's ability to mediate the cultural tool. If potential stimulus information is missing, or if a constraint exists, then the child may struggle to mediate the tool and achieve their object of activity. Early childhood educators aim to support children's imaginative play and in order to achieve imaginative play with technologies, then the children need to learn how to use the devices. Educators can identify stimulus information and affordances that are necessary to support the children's ability to mediate the tool to achieve their object of activity.

I also analysed the educators' behaviours and provision of technologies and placed this data into the Imaginative Affordance Framework [for example, see Figure 4:8 Vanessa's Imaginative Affordance Framework for providing technologies, p.130].

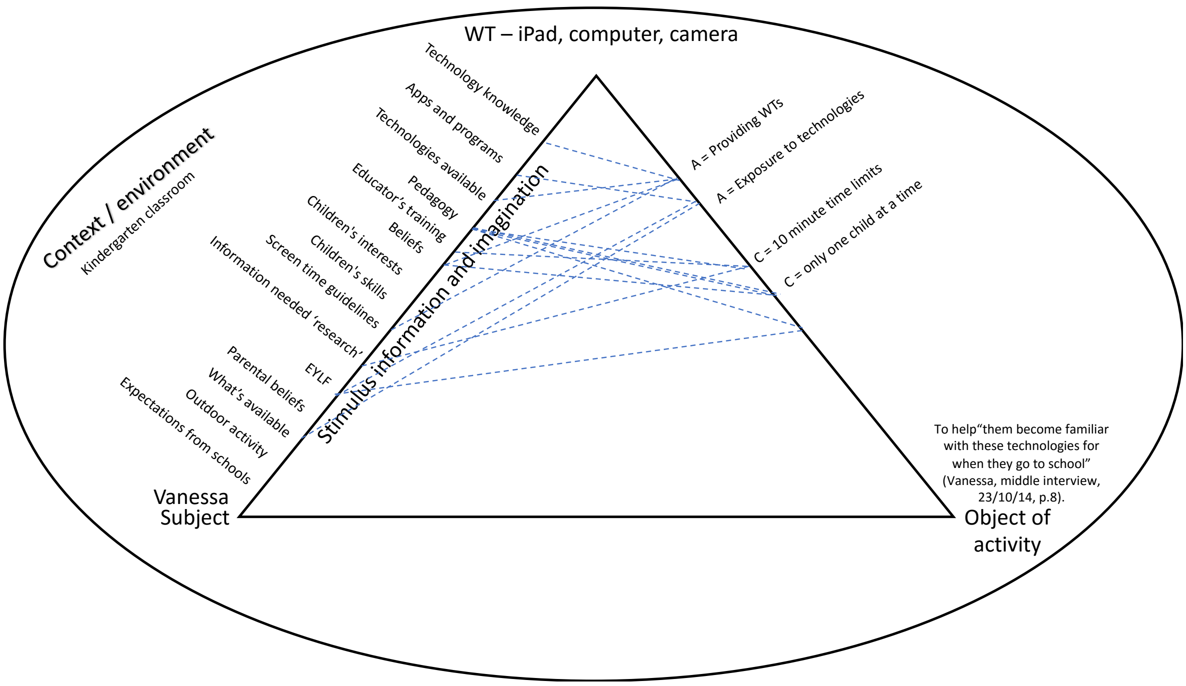

Figure 4:8 Vanessa's Imaginative Affordance Framework for providing technologies

The educators' frameworks illustrated the stimulus information that influences the affordances and constraints related to the technologies as cultural tools. For some of the educators' scenarios, I considered what may have happened if added stimulus information was considered [for example, see Figure 4:9 Vanessa's Imaginative Affordance Framework for providing stories and songs on the iPad including potential elements, p.131]. The red lines are the potential stimulus information that would lead to other affordances. Considering these elements of stimulus information and affordances may illustrate to educators the potential for technology provision and will be discussed further in the discussion chapter [see Discussion, p.167].

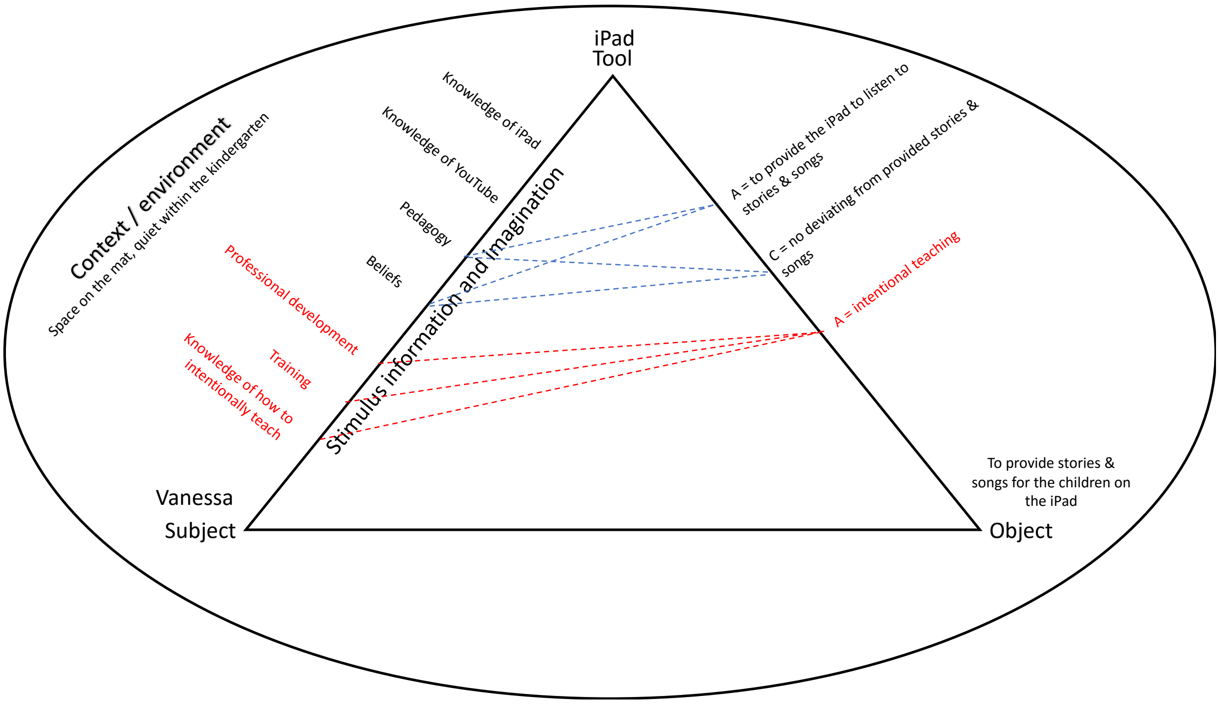

Figure 4:9 Vanessa's Imaginative Affordance Framework for providing stories and songs on the iPad including potential elements

I divided the data into categories of Cosmic Kindergarten Videos, Cosmic Kindergarten Observations, Creative Kindergarten Videos, Creative Kindergarten Observations and Educators. Rather than including each element for every scenario in an illustration of the Imaginative Affordance Framework, I then listed them all in a table, under the headings of *Context*, *Stimulus Information and Imagination*, *Tool*, *Affordance and Constraints*, and *Object of Activity* [see Appendix 18 Table of Imaginative Affordance Framework Data, p.254]. I also added a column for my initial *Notes and Thoughts*. This is where I began to interpret the scenarios in terms of the Imaginative Affordance Framework and what it could mean. The Imaginative Affordance Frameworks will be discussed further in the results chapter [see Results Chapter, p.139].

4.14 Ethics

The importance of researching "ethically" is acknowledged within all disciplines (B. Macfarlane, 2009, p. 1). To conduct ethical research means not only meeting the ethical guidelines set by institutions and regulatory bodies, but also conducting sensitive research that respects the rights of all those involved (Etherington, 2007). This includes remaining aware of the power dynamics that may be present in research settings and between the researcher and the participants. Within the literature surrounding ethical practice is a plethora of what researchers should not do, rather than clear explanations of how to deal with ethical issues as they arise (B. Macfarlane, 2009). Guillemin and Gillam (2004) categorise ethical considerations into two dimensions - "procedural ethics and 'ethics in practice'" (p. 261). They acknowledge that the procedural ethics do not provide a researcher with all the answers to every possible ethical dilemma, instead, they encourage researchers to practice reflexivity to research ethically.

As part of the ethics process, I followed the university's ethics approval process and also aimed to conduct my research in ways that were responsive to children's needs and valued them as capable of providing their assent. The research study was approved by the university's Ethics Board [see Appendix 1 Australian Catholic University Ethics Approval, p.228] and the Department of Education and Early Childhood Development [see Appendix 2 DEECD Ethics Approval, p.229]. Permission was also sought from the managing body with which the research kindergartens were affiliated [see Appendix 3 Kindergarten Managing Body's Approval, p.230]. I then received consent from the educators of each service, the parents and assent from the children.

4.14.1 Children involved in research

Researching with children brings its own set of ethical dilemmas. Children are often seen as victims within research, caused largely by the view researchers hold of children and childhood (Coady, 2001; Sargeant & Harcourt, 2012). The view of children and childhood has shifted in recent years to recognise children as able to participate in and assist with conducting research that involves them. A balance between how the research benefits the children and the potential benefits from knowledge gained by the study, was an ethical consideration of this study (Coady, 2001). The cultural shift of ethical research with children, now focuses on projects and methods "where children are seen as social actors and competent contributors of valid opinions, ideas and theories" (Harcourt et al., 2011, p. 39). The United Nations (1989) *Convention on the Rights of the Child* and the theoretical perspective of the *sociology of childhood* (Corsaro, 1997) have put the spotlight on children as "experts in their own lives" (Langsted, 1994, p. 12). This has led to the empowering of children as co-researchers, who provide insight into their worldview. Gallacher and

Gallagher (2008) question this view, arguing that some researchers only include children's tokenistic participation and points out the power imbalance that occurs between children and adults. They advocate for an approach where both the children and researchers come from positions of unknowing, and this perspective fits with my epistemological stance where knowledge is socially constructed by the individuals within the cultural context. In my research study, I took control of the data collection, videoing the participants and deciding what to capture. As outlined above, I collected the data in a way that I hoped would not change the children's use of technologies in their imaginative play or the educators' provision of the devices. Therefore, children were not invited as co-researchers in this study as this was not the focus of the research. However, one-way children can be empowered during the research process is through informed assent. This is where the children have "the right to determine what is in their own best interests" and opt in or out of the proposed research (Coady, 2001, p. 74). I used a process to obtain children's informed assent and this is discussed further below.

4.14.2 Informed consent

In Australia, all research is bound by the *National Statement on Ethical Conduct in Human Research* (The Australian National Health and Medical Research Council (ANHMRC), 2007) and this study also met the requirements of the university's *Code of Conduct for Research* (Australian Catholic University [ACU], 2007). These strict guidelines inform researchers on ethical considerations and the standards that must be adhered to. Within the guidelines, children are one group of participants that are viewed as vulnerable and "whose consent is not required" (p. 50). Instead, parents provide their consent on their child's behalf because it is believed that children do not have the capacity to understand and consequently, be able to provide informed consent to participate. A child's refusal, according to the ANHMRC, can be overridden by the parent if they believe participating in the research is in the child's best interests. In legal terms, children are not able to give consent, parents or guardians must do so, on their behalf. This contradicts the United Nations (1989) *Convention on the Rights* of the Child which states children have "the right to freedom of expression" and to "impart information and ideas of all kinds" (p. 4). Ethically, a child's parents or guardians must provide consent for their child to participate but rather than seeing this as sufficient, "many researchers have invoked the concept of children's assent" (Dockett, Einarsdóttir, & Perry, 2012, p. 245), providing the child the right to have the final say in their participation. Helseth and Slettebø (2004) state it is imperative that children realised their assent provided the final say in their participation in the research, even if their parents provided their consent (p. 303). The process of assent will be discussed further [see Children's assent, p.134].

4.14.3 Children's assent

Understanding the terms 'consent' and 'assent' is dependent on the context and the beliefs surrounding the children's role when participating in research (Dockett et al., 2012). The ANHMRC (2007) defines consent as a person's "agreement, based on adequate knowledge and understanding of relevant material, to participate in research" (p. 88). Assent is described as "the term used to convey a sense of agreement obtained from those who are not able to enter into a legal contract" (Ford, Sankey, & Crisp, 2007, p. 20). As identified above children's assent was obtained before the children could participate in the research project.

Introducing children to research requires the researcher to explain the aims and what is required of the participants in child friendly terms (Coady, 2001; Sargeant & Harcourt, 2012). The ANHMRC (2007) believes "even young children with very limited cognitive capacity should be engaged at their level in discussion about the research and its likely outcomes" (p. 50) but they stress children cannot provide consent for their own participation. Many researchers gain children's assent and require them to make the final decision about their participation (Coady, 2001; Ford et al., 2007; Harcourt et al., 2011). Before this occurs, children should be provided an "explanation of the why, what, when, where and who of the research process" in a way they understand, then they can make an informed decision about being involved (Sargeant & Harcourt, 2012, p. 50). Children can be invited to give their 'assent' in both verbal and written forms (Coady, 2001), through the use of assent documents in child friendly terms (Ford et al., 2007). When children are invited to participate and can fully understand all that is involved in the research, "they are empowered in their decision-making processes" (p. 27) and they have the feeling that their opinion, both in assent and participation, counts (Helseth & Slettebø, 2004).

For this study, once parental assent was obtained, the children were invited to provide their assent to participate in the research. A child friendly assent form (Ford et al., 2007) was designed that contained both written statements that were read to the children and an image that related to each statement [see Appendix 6 Children's Assent Form, p.238]. The children's assent form was attached to the parental information letter and consent form [see Appendix 5 Parent Information for Participants and Consent Form, p.234]. This was an issue because some parents completed the form for their child. The researcher presented the children with the assent form and asked if they had completed the form with their parents. If the children said they did not complete it, I invited them to complete another form. I read each of the statements and asked the children to circle the happy or sad face depending on their response to each statement (Coady, 2001; Harcourt & Conroy, 2005). For example, for the statement 'I would like to watch you play at kindergarten' the children were asked to circle the happy face if they were happy for the researcher to watch them play or the sad face if they did not want the researcher to watch them. Children were then asked to write their name at the bottom of the form to show that they had completed the form. Children who were unable to sign their name were offered to copy their name or draw a picture of themselves.

As already discussed [see Conversations, p.122], I amended my ethics approval to include conversations with the children. During the assent process for the conversations with the children, conducted during the data collection phase, Connor showed he fully understood the research process. The following conversation was held as he completed the assent form [see Appendix 19 Connor's Assent Form, p.281]:

> Filling out his assent form, Connor circled both the happy and the sad faces.
> Connor "Sometimes I don't want to talk to you, sometimes I do. So I circled both. Today I'm happy but the next day I might be sad."
> Jo "OK, that's fine. You just need to tell me if you are happy or sad each day ok?"
> Connor "Ok. Today I'm happy. What do you want to talk about?"
> Jo "I'll ask you questions when you are playing with the digital technologies, about what you are playing with. Ok?"
> Connor "OK. I'm not playing now, maybe later. Now I'm going outside with Shaun." (Researcher Journal, 20151006)

This example clearly illustrates that Connor was fully aware of the research consent process. He demonstrated that he understood and would make his feelings clear, if and when he wanted to engage in conversations with me.

Harcourt and Conroy (2011) recommend that children should be invited to provide their assent at the beginning of each research session. A daily assent form (Coady, 2001) was designed and used for every session that I was present during the data collection phase [see Appendix 7 Children's Daily Assent Form, p.239]. At the beginning of every session, children were asked to draw a face on the daily assent form to indicate if I could observe and video record them that day. Encouraging the children to draw a happy or sad face provided a medium, other than verbal language, for children to communicate their assent to participate (Gray & Winter, 2011). Some children displayed agency by refusing to the sign the form or asking to sign it later. These decisions were respected and indicated their ability to take control in matters that concerned them. Revisiting a child's choice to participate at each stage of the research process is critical and does not stop once a child has indicated their decision on an assent form (Etherington, 2007; Phelan & Kinsella, 2013; Warin, 2011). Instead, the need for recognising children's ongoing assent through recognising their often subtle cues was required. Researchers need to ensure that children are indeed providing their informed assent and those who have experience working with young children can often notice by watching their body language their nonverbal cues (Phelan & Kinsella, 2013). Identifying and responding to children's visual cues is an important part of researching with children as described later [see Verbal and non-verbal cues, p.137]. For me, this included having conversations to ensure their assent, interpreting the pictures drawn on the daily assent form and asking if they wanted to be video recorded.

At the beginning of the research study all the children drew faces or people on the daily assent form. As the data collection phase progressed, children became creative in the way they signed the daily assent form. Some children wrote their name [see Appendix 20 Children's writing of their names on the Daily Assent Form, p.282], drew flowers or ice-cream [see Appendix 21 Children drawing flowers and ice-cream on the Daily Assent Form, p.283], and on one particular day at Creative Kindergarten, The Joker (pseudonym) drew "a happy sea", Kai drew "a rainbow person", and Amy (pseudonym) drew "squiggerly, wiggerly lines" [see Appendix 22 Children's drawings on the Daily Assent Form, p.284]. On one day, Connor drew his face with a zip over his mouth. He explained "My mouth is zipped up. But you can watch me" [see Appendix 22 Children's drawings on the Daily Assent Form, p.284]. Connor was removing his assent to participate in conversations with me but was providing his assent for me to observe him. Each time these creative expressions occurred, I asked the children if they were happy to be watched and video recorded that day. I noted the children's words on the daily assent form that described the child's drawing and then verbally clarified their assent wishes.

I acted ethically by seeking their permission and regularly clarifying the children's wishes with them. While aiming to be reflexive, the boundaries of our own beliefs and subjectivities also shift (Pillow, 2003). I was aware that asking them for assent may have also pressured them to provide the response that they believed I wanted. This is where I followed their non-verbal, subtle cues. If I was in doubt as to their assent, I did not observe or record them.

4.14.4 Verbal and non-verbal cues

In some cases, children are overt in their assent to participate. Being invited into children's play is one clear way children demonstrated their ongoing assent (Cocks, 2006). Being handed a non-working mobile phone and told "I'm calling you," was Toby's way of providing consent for me to be part of his play [Video Creative109]. Children are also capable of showing "their disinterest in the research" (Sargeant & Harcourt, 2012, p. 77), which is often communicated through subtle cues. These covert signs can be recognised by researchers who are bound ethically to respect and respond to the participants' wishes.

While negotiating children's assent can be difficult to plan for, researchers who commit to being responsive to children's negative cues around their participation, can predetermine their response to these dilemmas (Flewitt, 2005, p. 556). The need for checking with participants that they still want to continue in the research is what Ellis (2007) termed "process consent" (p. 23). Throughout the whole process of data collection there is a need to regularly request children's acknowledgement that they want to continue to be observed and recorded. Renold, Holland, Ross, and Hillman (2008) posit children spend data collection "becoming participant," as researchers continually negotiate their ongoing assent to participate in various moments of the research journey (Renold et al., p. 427). In practice, this occurs when recognising the children's subtle cues and while responding to these may result in missing out on capturing perceived important data, this disappointment is not conveyed by the researcher to the participants. In practice, this occurred when I made comments like 'Looks like you don't want me to watch you anymore. I will go and see what is happening outside', or 'Ok, I can stop recording you if you like?'. The children often brought technologies over to where I was observing other children's play, indicating their assent to also be observed. In other examples, children left the area I was observing, indicating they removed their assent to be observed at that time. All of these indications were respected and I responded to the removal of their assent.

4.15 Conclusion

This chapter provides an explanation and justification for the methodological choices in this study. I took an interpretivist approach (ontology) to this research, acknowledging I form my sense of the world through my social experiences and that I construct knowledge (epistemology) through my interactions in my social context. Therefore, the methods I selected for data collection and analysis acknowledge these beliefs. The methods used in this study were outlined, along with my role as the researcher in relation to the children, the parents and the educators. I described and illustrated the data analysis process that leveraged the Imaginative Affordance Framework and detailed how this heuristic makes a contribution to my data analysis process and a potential contribution to exploring episodes of play within early childhood settings. My ethical choices were justified and described how reflexivity was considered and would be ensured through the research process. The next chapter, *Chapter Five* will present and discuss the results from the data collected for this study.

Five: Results Chapter

5.1 Introduction

The framework presented in the Theory Chapter [see Theoretical frame, p.38], combines Vygotsky's (1978) concepts of mediation and imagination, with J. J. Gibson's (1979) concept of affordance. These theoretical concepts have never been combined before and therefore, present a new way to explore children's play with working and non-working technologies. In this chapter I use the Imaginative Affordance Framework to analyse the data collected and to make sense of what was occurring for both the children and the educators. While exploring the Imaginative Affordance Frameworks for the data collected, I realised that often two distinct narratives were present in children's technological engagement. Further exploration of these revealed that these could be presented as paradoxes.

The findings show how the educators' provision and the children's play with technologies created a series of paradoxes. A paradox is the juxtaposition of two ideas where one is what actually occurs and the other is an opinion of what happens or "it involves two or more facts or qualities which seem to contradict each other" ("Paradox", 2018). The paradoxes arising from the data are discussed below. They include the collocation of: working technologies versus non-working technologies; solitary individuals working with devices versus groups of children on devices; play-based, child centred programmes versus adult controlled; nature discourse versus technologies as not natural; traditional kindergarten activities versus newer technological activities; and, children learning to navigate the rules pertaining to working technologies versus their desire to play according to their own volition. The identification of these paradoxes highlights the position the educators I researched are currently in. Both are beginning to reflect on their practice and they are exploring technologies in children's lives, but also the role technologies may have in the kindergartens in which they teach. I conclude the chapter with a discussion of the term 'non-working technologies'.

5.2 Working technologies – non-working technologies

The non-working technologies were provided without rules or restrictions, whereas the working technologies were constrained by the rules and restrictions that were attached to their provision. These differences included the way that they were provided for the children's play; the rules and restrictions included the time limits set around their use; and the way that educators interacted with the children while they were engaged with the devices. These differences gave the children covert messages about the value educators placed on each type of device and the value placed on the children's play with each type of device. These differences became stimulus information that enabled the children to perceive the affordances and constraints related to the provision of the technologies.

A key difference between the use of working and the non-working technologies was in the way that they were presented to the children. For instance, the non-working technologies were provided in the imaginative play areas (for example home corner, hospital or restaurant), that were set up in each kindergarten. Drawing from the Reggio Emilia philosophy, where the environment is the "third teacher" (Malaguzzi, 1998), the educators in both kindergartens supported the children's play with non-working technologies through planning and sourcing materials for the imaginative play spaces. At times during the data collection phase, both centres contained doctor's surgeries, offices, hospitals, restaurants and the usual home corner set up. In each of these themed areas, non-working technologies were provided to support the children's re-enactment of the cultural behaviours which children are a part of in the real-life versions of these spaces. At Cosmic Kindergarten, a large basket of non-working technologies was provided in the outside shed. The children were not allowed to access the shed, and therefore, had to ask for items from the shed to be brought out. However, they knew they were there and could request them whenever they wanted. In contrast, at Creative Kindergarten, non-working devices were also in containers in the outdoor shed. The children were freely allowed to access the shed and take out the items they wanted for their play.

Conversely, in both kindergartens, the working technologies were provided in a set place or only brought out as a tool (Vygotsky, 1978) when they were being used in the programme. The computers were set up on a table and on the occasions that iPads were used they were brought out for particular activities. Prior to one session at Cosmic Kindergarten, the computers were moved to a corner of the room and the children had trouble finding them [see Figure 4:4 The computers were moved to the other side of the room when Cosmic Kindergarten was rearranged, p.119]. At Creative Kindergarten, the computers were located in a central part of the room. They remained covered with a sheet, unless it was raining, and only then was the computer was available for children's free play [Vanessa, After interview, 31/10/2014, p.3].

There were differences in the rules and restrictions the educators applied to each type of device. Across both kindergartens, no rules or restrictions were applied to the non-working technologies and the children could move them to any area of the kindergarten and use them in any way they desired. No time limits were attached to the use of non-working technologies; hence, children were free to use them for as long as they fancied. If peers wanted to use a device, children were encouraged by the educators to share them and negotiate turn taking. They were not forced to relinquish the device after a particular time. Conversely, the working technologies were time limited, with a timer used to indicate when it was the end of a child's turn. The use of the timer to identify the end of a child's turn can be seen as an example of a lost opportunity for children to engage in social interaction where they learn how to manage their turn taking. In contrast, there were many non-working technologies available and the children did not have to wait or wait long for a turn. The children did not learn to negotiate sharing and turn-taking with this equipment during the research and this was a missed learning opportunity.

Children were encouraged to think and act creatively if the non-working technology they wanted was not available. At other times, when a non-working technology was not available, the educators encouraged the children to create the device they needed for their play. Both kindergartens had pasting areas set up with a range of open-ended materials that the children could use to create what they needed. The educators also supported the children's creativity in these pasting areas through questioning and providing guidance. For example, at Creative Kindergarten, Vanessa reported that when the updated touchscreen mobiles were introduced to the children, there was not enough for everyone who wanted to use one [Researcher Journal 20140627]. Some children went into the pasting area and made mobiles out of blocks, sticking cardboard pieces on as the buttons. Vanessa and Louise were then invited into the play and they modelled mobile phone behaviours [see Figure 5:1 Vanessa holding the mobiles made out of blocks by the children in the pasting area].

Other examples of the children creating the non-working technologies they needed for their play are displayed below [see Figure 5:2 Examples (photographs) of the non-working technologies the children created, p.145]. These created technologies were then used by the children in their play scenarios to achieve their object of activity (Vygotsky, 1978), which also displayed all four ways of imagination (Vygotsky, 2004).

Figure 5:1 Vanessa holding the mobiles made out of blocks by the children in the pasting area

When children created technologies for their play, they demonstrated the four ways of imagination, culminating in the creation of new, non-working technologies (Vygotsky, 1987a) [see Imagination, p.56]. These created technologies then became items of reality available for the children to use in the first way of imagination, allowing the four ways of imagination to come a full circle (Edwards, 2011) [illustrated in Figure 5:3 Examples of the Four Ways of Imagination, p.146]. In each example, the children created the technology they needed and then used it in their play scenario in order to then play in the way they intended. According to Bodrova and Leong (2007), this type of play displays mature play skills because the children were able to invent the technologies that they needed for their play and therefore sustained their play for longer periods.

<table>
<tr>
<td>
Diana went to the pasting area and said “I’m looking to make a TV.” She drew a picture and stuck it on a box. Returning to the tent, she watched her created TV with Eleni, Emily and Kavithmi [Observation 20140723 #2]</td>
<td>
Mia held the microphone she made and sang for Kim, Diana and Ann Mary [Video Cosmic17]</td>
</tr>
<tr>
<td>
Diana and Kavithmi made a television and snacks in the pasting area [Video Cosmic01]</td>
<td>
Jack created a video camera out of boxes, he said “Action” and videoed me [Video Creative84]</td>
</tr>
</table>

Jack and Oliver videoed Madeleine with their created cameras [Video Creative 86]

Jack made an iPad and charger [Video Creative01]

Daniel made a mobile phone [Video Creative82]

Kai held the microphone he made out of paper rolls while singing [Observation 20140627 #2]

DATE	SUBJECT	CONTEXT		STIMULUS INFORMATION & IMAGINATION	TOOL	AFFORDANCE / CONSTRAINTS	OBJECT OF ACTIVITY
23/7/14	Diana	Pasting area, outside and in the tent at Cosmic Kindergarten	Children's interest All 4 ways of imagination Understanding of televisions	NW Television		A = Pasting area provided A = Educator support A = Children's play skills C = Working TV not provided	To make a television to pretend to watch in the tent

			Play skills Cultural re-enactment			
5/6/14	Mia	Set up stage outside at Cosmic Kindergarten	Children's creativity Children's skills All ways of imagination Knowledge of singing and performing Separating meaning from object Pasting area and materials	Non-working microphones	A = Stage area provided A = Pasting area and materials provided A = iPad to provide songs C = Working microphones not provided	To create and use her made microphone to sing for her friends
27/5/14	Diana Kavithmi	Pasting area of Cosmic Kindergarten	Children's creativity Children's skills All ways of imagination Pasting area materials Support from educators	Created TV	A = Pasting area provided A = Educator support A = Children's play skills C = Working TV not provided	To play watching TV with cakes to eat
1/8/14	Jack	Pasting area of Creative Kindergarten	Children's interest Children's skills Social skills All ways of imagination Knowledge of video cameras	Non-working video camera	A = Creation of a non-working video camera A = Pasting area and materials provided C = Working camera not provided C = No educator involvement	To create a video camera to use in his play
1/8/14	Jack	Pasting area of Creative Kindergarten	Children's interest Children's skills Social skills All ways of imagination Knowledge of video cameras	Non-working video camera	A = Creation of a non-working video camera A = Pasting area and materials provided C = Working camera not provided C = No educator involvement	To create a video camera to use in his play
13/6/14	Jack	Creative Kindergarten classroom	Knowledge of iPads Play skills 4 ways of imagination Pasting materials provided iPad not provided for free play	Non-working technology - iPad	A = pasting area and materials provided A = educator encouragement and support C = iPads not available for children's free play	To play with an iPad he had created himself
28/7/14	Daniel	Pasting area of Creative Kindergarten	Children's interest Children's skills All ways of imagination Knowledge of mobiles	Non-working mobile	A = Non-working mobiles provided A = Pasting area and materials C = Working mobiles not provided C = No educator involvement	To create a mobile to use in his play
20/6/14	Kai	Inside Creative Kindergarten on the mat area	Children's interests Children's skills 1st and 2nd ways of imagination Knowledge of the movie Frozen Understanding of iPads	Working iPad and Bluetooth speaker	A = iPad is used to play music A = YouTube being provided C = iPad not available for free play	To sing and dance along to Frozen songs as they do in the movie

Figure 5:2 Examples (photographs) of the non-working technologies the children created and the Imaginative affordance Frameworks for each.

1st Way of Imagination Based on experiences of reality	2nd Way of Imagination Based on another description of reality	3rd Way of Imagination Emotional connection	4th Way of Imagination Creating a new item that feeds into reality
Pretending to watch a television, a group of children were sitting in the tent discussing what they watch on television [Observation 20140723 #2].	Kavithmi pretended to watch television programs she was unfamiliar with, by combining the knowledge shared by others, with her own understandings.	Kavithmi was happy and excited to be pretending to watch television and programs she was unfamiliar with.	Kavithmi creating a television in the pasting area by drawing a picture on paper and then attaching it to a box. She returned to the tent and watched it with her friends.
Connor sang along to the *Lego Movie* song that was playing on the iPad [Observation 20141020 #2].	He combined his knowledge of the *Lego Movie* and of singers performing songs on stage.	Connor was frustrated because he needed a microphone to be able to pretend to be a singer on stage.	Connor made a microphone out of a long cardboard tube and used it to sing *Everything is Awesome*.
Ding Ding and Amy were pretending to be two friends going shopping [Video Creative115].	Ding Ding and Amy combined their knowledge of shopping and friends contacting each other.	Ding Ding and Amy enthusiastically went shopping together.	Ding Ding made a phone out of 'Struts,' held it to her ear then showed Amy [Video Creative11]; Ding Ding talked into the phone she made and Amy held a 'Strut' to her ear to talk to Ding Ding.
Jack pretended to be a movie director [Video Creative84].	He combined his knowledge of movies, directors and video cameras.	Jack happily pretended to record using his video camera.	Jack created a video camera out of boxes, he said "Action" and videoed me.
Mia pretended to be a singer, singing songs that were being played on the iPad [Video Cosmic17].	Mia combined her knowledge of *Australian Idol*™, song lyrics and performing to act out the television show.	Mia proudly performed for her friends, pretending to sing the different songs.	Mia had made a microphone in the pasting are and now standing on the stage, she held the microphone she made and sang for Diana and Ann Mary.
Kai and Ryan sang 'Let It Go' from the movie Frozen that was playing on the iPad [Observation 20140627 #2].	They combined their knowledge of *Frozen* and of singers performing songs on stage.	Kai and Ryan were happily pretending to sing the *Frozen* song.	In the pasting area, Kai and Ryan made microphones out of paper rolls. They pretended to sing *Let It Go*.

Figure 5:3 Examples of the Four Ways of Imagination

The educators' interactions with children were different, depending on whether the children were engaged in play with the working or the non-working technologies. When the children were engaged in imaginary play with the non-working technologies, the educators interacted and scaffolded their play and learning. For example, Kim pretended to be the audience for a concert [Video Cosmic 2], Kim posed for a pretend photo [Video Cosmic 107], Toula took a selfie with William [Observation 20140617 #5], and Vanessa danced for Madeleine who was holding the video recorder and the video was uploaded to pretend Facebook™ [Observation 20140627 #2]. In these examples, the educators became involved in the children's play as co-players through supporting the play theme and praising the children's play ideas (Wohlwend, 2016). In play with non-working technologies, educators knew how to support this kind of play. I argue that these pedagogical moves fit with their current understandings of play and the way in which they understand traditional toys (for example blocks) can be used to support play. As discussed in the literature review, non-working technologies are used in a similar manner as any other prop in imaginative play spaces (Alper, 2011) and therefore the educators did not require any new pedagogies or ways to support children's engagement with them. This was evidenced in the Imaginative Affordance Framework for the non-working technology examples [see Figure 4:7 Mia's Imaginative Affordance Framework for a non-working microphone, p.129].

It is paradoxical that working technologies, when provided as tools, can be perceived by the children and educators to afford or constrain possible behaviours. When children took turns on the computer or iPad, there were limited interactions with the educators. It was noticeable in the data that educators only interacted with the children on the computer to move them on when the timer went off [Observation 20141014], to fix technical issues, or to remind children of appropriate computer behaviour [Observation 20140625 #3]. This finding suggests that the educators did not see the affordances of the computer or iPad as they did not engage with the children, around these devices. These findings are similar to those of a study by Howard, Miles, and Rees-Davies (2012) who found that educators were unprepared to use working technologies and integrate them with play. Aubrey and Dahl (2008) and Beastall (2006) posit that educators need more support to extend children's learning with information, and communicative technologies. This finding that the educators did not perceive the affordances of the technologies suggests that potential learning opportunities may be missed by practitioners. Howard and colleagues (2012) found that children learn more when adults interact with them around technologies, which differs from the understanding that educator involvement signifies the behaviour is no longer play (Burghardt, 2010). The educators in my study seemed reluctant to engage with children on a deeper level or in ways that might scaffold their learning when they were using working technologies; supportive and constructive interactions were absent from the data. The educators did not perceive the same level of affordance in the working technologies offered as the children did. This then resulted in rules and restrictions being implemented that further constrained the children's ability to play imaginatively with the working technologies.

Educator involvement in children's technology engagement supports their concept building. Children do not build concepts like "finding out, problem solving and reflecting on thinking and learning" through the use of computer games without the involvement of an educator (Plowman, 2013, p. 7). My findings support this idea that educator involvement is needed to enhance children's learning with technologies, especially around particular concepts (Stephen & Plowman, 2008) such as "sustained shared thinking" (Siraj-Blatchford, 2009, p. 1) and "guided interaction" (Plowman & Stephen, 2007, p. 14). These pedagogical constructs develop through educator involvement in children's digital activity and provide technological affordances for intentional teaching. To reiterate the literature review, the concepts of sustained shared thinking and guided interaction have not been widely taken up in early childhood education despite the focus in the EYLF on intentional teaching (Lindahl & Folkesson, 2012). I believe educator involvement is necessary to extend children's learning around working technologies and this thesis adds to the knowledge around children's technology use and how it can be supported.

There was only one piece of data generated through this research that captured an educator actively involved with children who were using a working technology. This example was when Kim had a turn on the computer and played *Reader Rabbit* (The Learning Company, 1986). Through modelling and questioning, Kim was able to assist the children in developing the needed skills, and she was able to see how much the children understood of the program content [Video Cosmic 81]. An interesting point in the Howard and colleagues (2012) study was that educators were involved in "structured learning activities" away from the computers, and that when the children were involved in activities on the computers, the educators were surprisingly scarce (p. 187). Interestingly, they concluded that children "learned to associate play [with technologies] with no teacher presence" (p. 187). In a similar manner, children seemed to recognise that there were limited educator interactions around the working technologies at both of my research kindergartens and in the example where Kim interacted with the children while they were engaged with the computer, the children laughed [Video Cosmic 81]. Similarly, Couse and Chen (2010) found as the children gained familiarity with the computer program, they asked "for less instruction and assistance from the adults" (p. 93), but the initial educator involvement was there. Educator involvement is an ongoing area for research (Howard et al., 2012; Plowman & Stephen, 2013) and will be further discussed in future possibilities for investigation [see Future research directions, p.197].

In summary, the comparison of data around the working and the non-working technologies suggests that educators' interactions were vastly different. The educators did not become co-players in the children's play with working technologies, nor did they verbally encourage their achievements. In fact, as discussed above, the educators only interacted with the children using the working technologies to enforce the rules and appropriate behaviour. These limited interactions also reinforced the notion to the children that play or even engagement with working technologies was not a valued activity in the early childhood settings.

5.3 Solitary individuals working with devices – groups of children on collaborative devices

There was a paradox between the children's and the educators' conception of whether the devices were for solitary or collaborative use. When digital technologies were first introduced into early childhood educational settings, they were presented as solitary or isolating devices (See for example, Cordes & Miller, 2000). The belief that working technologies are solitary devices is often still held within the early childhood field. This conception may be fuelled by the way in which these technologies are provided, the value placed on their use and the interactions between educators and children as they engage with these devices.

This paradox was demonstrated in how the educators provided the working technologies and how the children used them. In both kindergartens, the educators' perceived and positioned the working technologies as solitary devices, when in practice, the children engaged more often with them in pairs or small groups. The children were required to place their name on the 'turn sheet' and then wait their turn, often being asked by educators to find something else to do until it was their turn.

Other times, children would stand behind the child whose turn it was. This was discouraged by the educators because they viewed standing and watching another child having their turn as passivity. The discontinuation of the practice constrained the children's ability to engage with the technologies in the way that they wanted and limited opportunities for learning social interaction skills and skills in using the computer and its software. The children worked around this rule which promulgated individualism and attempts to remain watching even after being asked to "find something else to do" [Observation 20141014]. At Cosmic Kindergarten, the computers were available throughout sessions for children's free play. In one session, Eleni was playing *Reader Rabbit* (The Learning Company, 1986) and three of her friends suggested musical instruments for her to select. When the music played, they all danced and laughed [Video Cosmic116]. If the children were moved on from standing behind and watching Eleni at the computer, they would not have shared their knowledge of the names of the instruments and the children would not have had the pleasure of dancing to the music. Nor would they have learned that fun comes from sharing an activity vicariously, even when they are not the child actively manipulating the technology. Another example from Cosmic Kindergarten of children negotiating the educator imposed constraints around the computer provision occurred when five children stood behind the two children on the computers who were playing *Reader Rabbit* (The Learning Company, 1986) [Figure 5:4 Children watching the computers being used [Photo Cosmic P02]]. The children watching gave hints and suggestions to those on the computers in ways that scaffolded all of their learning. Again, if they were moved on to play somewhere else and this behaviour was constrained, the learning would not have occurred.

Figure 5:4 Children watching the computers being used [Photo Cosmic P02]

There were further examples of peer scaffolding within the ZPD of the child actually using the computer from Cosmic Kindergarten. These types of interactions occurred more than once. Children stood behind the computer and gave instructions to the child playing *Miner Max* (EurekaMultimedia, 2004) [Observation 20141015]. Although this helping behaviour assisted the child whose turn it was, the educators still moved them on. This finding links with educator perception of working and non-working technologies associated with the previous paradox of working and non-working technologies. The educators did not observe or engage with the children to ascertain what was actually occurring, instead they redirected them to another activity. For the educators, enforcing the rule around solitary engagement with the technology was more important than the interactional learning affordances offered in this situation. The affordances for children's social interaction when engaged with working technologies were considerable. Even when two children were using separate devices, they would seek collaboration and often discuss what was happening or provide each other with hints on how to achieve in the game [Observation Cosmic 20141015]. In my Masters research, I found that 'social interaction' was the main activity in which children engaged in around the technologies, and this included assisting others having their turn on a device (Bird, 2012). One of the implications from that study was for educators to teach children to be mentors for their friends on the devices. Findings here, that working technologies afford social interactions and learning, also support this notion. When children share their knowledge, they build their skills and scaffold the learning for the child they are assisting to develop new skills.

The examples described above of children engaging with the working technologies in groups illustrate the relational positions that children can embody while using technologies. The roles of "*the owner*" and "*the participant*", as suggested by Ljung-Djärf (2008), imply a negotiated relationship with the owner retaining the control of the device due to their positional power (pp. 65-67, italics in the original). Part of the role of the participant is to provide support and encouragement to the owner, with the owner retaining the power to receive or deny those suggestions. Being a participant can extend their time on the device beyond that allocated to them when they are the owner and in control of the device. The findings presented here extend Ljung-Djärf's (2008) concept of the role of the participant. Ljung-Djärf did not acknowledge how participants can increase their knowledge of a game in order to be successful when their turn comes around again. Ljung-Djärf's "*spectator*" role is one where the child watches what is occurring on the device without suggesting, interfering or engaging with the owner (Ljung-Djärf, p. 69). This position allows the spectator time to watch and learn skills without being blamed for any failures, different from the participant role where the child interacts with the device. Through the observation as the spectator, the child learns skills and actions that have proven to be successful, before they become the owner, having to control the device and commence their allocated time. From the observations undertaken during my research study, I determined that opportunities to watch peers and learn how to play the games as participants and spectators can afford learning, a notion that Ljung-Djärf did not explore in her research.

In their interviews, Kim and Vanessa both referred to the practice of moving children on from watching peers using working technologies [Kim After Interview, 30/10/2014, p.1; Vanessa, After Interview, 31/10/2014, p.1]. They both acknowledged the benefits of children watching their friends on working technologies and admitted to reflecting on and questioning their current practice. Kim commented that children were "obviously learning new skills", however she was still unsure whether it was "appropriate just to stand and watch" [Figure 5:5 Kim, After Interview, 30/10/2014, p.1]. Vanessa's comments were similar, "I realise that they like helping each other and so I have sort of adapted that a little bit, but I still don't want them to hang around the whole time" [Figure 5:6 Vanessa, After Interview, 31/10/2014, p.1]. While both Kim and Vanessa said in their interviews that they were reconsidering their restrictions around letting children watch the child having their turn, they still moved children on in the period after the interview without first determining if learning was occurring. They took action if the noise level rose or they viewed that the behaviour was disruptive, ignoring the social learning possible around the working technologies. Rather than Vygotsky's (1978) approach or one where learning through direct observation is valued (Bandura, 1977), the educators' pedagogy fits with Piaget's notion of constructivism, where children learn individually through their own activity. In this approach, the focus is on "self-initiated and self-directed activity" where children gain from being the one having the direct contact with the working technology (Wood & Bennett, 2006, p. 19).

> I did have to limit some of the children's interactions at the computer because, left to their own devices they could be standing there watching the computer for two hours. So, is that appropriate just to stand and watch? And there were times when they were laughing and cheering on their friends and obviously learning new skills while they were there but I guess perhaps I let a little bit of that screen time come into my own teaching. So, I eventually redirected them and gave them time limits, how much [time] they could spend at the computer and also watching at the computer.
>
> Figure 5:5 Kim, After Interview, 30/10/2014, p.1

> I question the time limit that the children use it when it's a rainy day and also watching other children, using that technology. On the rainy days, and do I let them stand around and watch and for how long? And I realise that they like helping each other and so I have sort of adapted that a little bit, but I still don't want them to hang around the whole time.
>
> Figure 5:6 Vanessa, After Interview, 31/10/2014, p.1

The action of moving children on from the devices was a constraint the educators applied and the children then negotiated. This was evident when relieving educator Susan moved the children on, saying "they had watched the computers long enough" [Observation 20141014]. The children negotiated this constraint and when Susan went outside, they returned to the computer and supported their friends through their turn. When questioned if she moved children on from other activities, Kim replied, "Perhaps not always so consistently … probably not as diligently as what I have done with the computer" [seeFigure 5:5 Kim, After Interview, 30/10/2014, p.1]. This comment is supported by my observations that indicated that there were times when children remained at non-technology related activities for over three hours without educators moving them on. This illustrates how educator's actions can communicate a covert message to children that other activities were more valued than technological engagement in the research settings.

This practice conveyed the message to the children that the working technologies were not as valued as other activities in the kindergarten programme. Children's involvement in other areas of the programme are valued and supported because they align with what is seen as 'appropriate' kindergarten activity. Until technologies are seen in the same way, children's engagement with them will not be as valued and this theme is addressed in the following section.

5.4 Play-based, child-centred programmes – adult controlled

The following paradox addresses the issue where educators espouse that they provide a play-based, child-centred programme and then do not provide working technologies – a known interest of many children. A key educator narrative is that the programme they provide is play-based, child centred and grounded on the children's interests. This position is reinforced by the EYLF which states, "educators identify children's strengths and interests, choose appropriate teaching strategies and design the learning environment" (DEEWR, 2009, p. 9). A play-based, child-centred learning environment design requires the facilitation of experiences that build on the children's interests, including the provision of play props in ways that encourage, support and extend children's learning. Where technologies are concerned, this is not always the case. As the research findings demonstrate [see Figure 5:4 Children watching the computers being used [Photo Cosmic P02], p.151], the reality is that working technologies, which are an interest of the children may not be provided for children's unrestricted free play. Thus, when working technologies are juxtaposed with play-based, child centred planning that is grounded in children's interests, the paradoxical treatment is apparent.

In early childhood education, the themes for imaginative play spaces are expected to be taken from the children's interests and situations happening in their social community. More and more often these community situations and experiences involve technologies. Technologies are needed to make the representations of these situations realistic. Examples of these day to day technology rich spaces include: a supermarket with a digital scanner and credit card machine; a doctor's surgery with a computer for writing patient notes; and a restaurant with an iPad to take down customers' orders. These imaginative play spaces need technologies in order to be culturally accurate. The learning environment scaffolds children's meaning-making and assists them to make sense of their experiences in the wider context in which they live (Yelland, 2011). With careful engagement educators can ensure children's technological experiences are child-centred and culturally meaningful (Marsh, 2010). However, in order for this to occur, children's technological experiences need to be perceived as valid, essential and supported appropriately.

Basing activities on children's interests requires that working technologies are provided for free play. Neither of the kindergartens provided iPads for children's free play and in Cosmic Kindergarten the computer was limited to 20-minute turns. Creative Kindergarten only provided the computers and iPad as a "special treat" on rainy days [Vanessa, After Interview, 31/10/2014, p.3]. During the 12-weeks of Melbourne winter when data collection was occurring, there was only one day which rained and when the working technologies were available for children's free play in this kindergarten. This intermittent provision is not meeting the children's interests. A further way that the children's interest in working technologies was constrained was through the rules and restrictions placed on their use. For example, at Creative Kindergarten, when Ding Ding tried to watch the iPad screen, Vanessa constrained her ability to do so by turning over the iPad [Observation 20140627 #4]. At Cosmic Kindergarten, Kim asked Shivani to move away when she tried to watch the iPad [Video Cosmic 21]. This resulted in Ding Ding and Shivani abandoning both the iPad and their play plans. Instead of working to constrain the children's working technology use, Vanessa and Kim could have used Ding Ding and Shivani's interest in the iPad to extend their play, thus making their programmes child-centred and based on children's interests.

Once the working technologies were provided, the apps and programs provided on them impacted how the children could engage and the nature of the play afforded. For instance, Kim constrained the potential affordance of the computer for children's imaginative play through her selection of particular programs to install. These programs were mainly "concept and skill building" and they did not allow for deviations from the set script, so they did not extend children's thinking nor encourage imaginative play (Yelland & Gilbert, 2013, p. 1). The programs and apps installed on Vanessa's iPad and computer were no different. Her understanding of the affordances of the programs and apps was limited. This was evidenced in her interview response when she attempted to explain the difference between the "adult" games and the children's games [Vanessa, After Interview, 31/10/2014, p.2], by describing the adult games as fun and the children's ones as educational.

The programs and apps installed influenced the children's ability to engage in imaginative play, using the devices. One example of an app installed on Vanessa's iPad was, *The Pirate Match* app (Peep Software, 2012). The children abandoned this app after one or two games because of its limited flexibility. Similar experiences are reported in current literature. For example, Marsh and colleagues (2015) explored play and creativity in children's apps with the aim of identifying the "affordances of apps that are particularly successful in promoting young children's play and creativity" (p. 1). They found that some successful apps contradict the list of features they found to support children's play and creativity but were still popular with children. The reason for this was to do with some apps being appealing in the colours, characters and sounds, but despite this, they did not hold the children's interest for long. Goodwin and Highfield (2012) examined the available educational apps and concluded that the current labels used in the *App Store*™ do not assist parents or educators in selecting appropriate apps for their learning potential [for more information on this topic see Educators' provision of technologies, p.27].

The apps and programs provided also have their own affordances. Apps and programs are similar to the "*executing a plan*" affordance (Pols, 2012, p. 115, italics in the original), as described in the Theory Chapter [see Theoretical frame, p.38]. One affordance leads to another and if there is a break in the chain, then the chain of affordance stops. Pols (2012) emphasises the importance of understanding the sequence of affordance necessary to achieve the desired outcome. In this research, it appears that the educators believed that simply providing the iPad to children afforded their imaginative play. In reality between the provision and outcome of imaginative play there is another, if not several, layers. Firstly, the apps the educators select and also provide on the iPad need to afford imaginative play. Not all apps do so, so the choice of apps is important. Following on from this are the actual skills necessary to manipulate the iPad: knowing how to swipe to activate the iPad, knowing how to select an icon, recognising different icons and knowing which app is which, are all further affordances needed before the child can play imaginatively with the iPad. These affordances all need adult (or more skilled peer) support to develop, thus educators have an important role here in supporting children's engagement for imaginative play to be achieved. The educators' perception that imaginative play is not a relevant outcome of children's engagement with working technologies thus prevents them from taking advantage of the possible affordances available.

5.5 Nature discourse – technologies as not natural

There is a salient nature discourse in current early childhood literature that leverages the notion that contemporary children are disadvantaged due to their lack of experience and time in natural settings (Elliott & Chancellor, 2014; Greenleaf, Bryant, & Pollock, 2014). Play in nature has been reported to improve children's health (Munoz, 2009), lower stress and anxiety (Townsend & Weerasuriya, 2010), and improve cognitive functioning (Greenleaf et al., 2014). An Australian research project around the effect of "Bush Kinders" has "affirmed the vision of creative, independent and resilient children" (Elliott & Chancellor, 2014, p. 51). Time spent playing outdoors, getting dirty and experiencing the learning that nature has to offer has been viewed by Greenleaf et al. (2014) as reducing over recent times. The increased presence of working technologies in the lives of young children is often held as the cause of this reduced time for active outdoor play. The effect of increased technology use is believed to negatively influence children's physical, social, and emotional health (Cordes & Miller, 2000), reduce their play abilities (Smirnova, 2011) and decrease their physical activity which leads to a rise in obesity (Cox et al., 2013).

Research that proclaims the benefits of children's technology use contrasts the reported negative effects. These benefits include increased multimodal learning (Yelland & Kilderry, 2010), improved digital literacy (Kim, 2016; Slavin & Chambers, 2016), increased language learning (McPake & Stephen, 2016; Price et al., 2015), support of meaning making (Goncu & Gaskins, 2012) and increased ability to play out the experiences they witness in their social lives (Yelland, 2011). As with other experiences, balance is the key.

The notion that children need more outside activity rather time on technologies was emphasised when Susan told children to move outside as they had been on the computer for long enough [Observation 20141014]. In their research into children's technology use in the home, Plowman and colleagues (2010) theorise a “disjunction” between the media presented toxic effects of technology and parents’ understandings and beliefs about their use (p. 71). Included in the list of toxic effects they offer are the reduction of outdoor play and time in nature, but the parents interviewed in their study had, to the contrary, a belief they were getting the balance right. One way to overcome the lack of outdoor time in children’s lives is “nature-based counselling”, the idea that time in nature will restore people and have positive effects on their mental and cognitive health (Greenleaf et al., 2014, p. 162). Technologies do have a place in outdoor play: for example, activities like taking photos of nature, animals and outdoor experiences and undertaking research around what children find outdoors on an internet enabled iPad (See for example, Harwood & Collier, 2017; Kacoroski, Liddicoat, & Kerlin, 2016). The balance can be struck which supports both ideals [see Future research directions, p.197].

At Creative Kindergarten, Vanessa provided a camera for the children’s use. Everyone was outside and Jack, Ding Ding, James, and Rehan had a turn [see Video Creative 1-16, 32]. There was only two days that the camera was provided for the children’s use [being 13/10/2014 and 16/10/2014]. On the second day, the camera battery was exhausted and when Vanessa attempted to charge it, the camera turned on but quickly turned itself off again. On the first day the children used the camera, James took photographs of living creatures in the vegetable patch [see Video Creative 22-24]. Working technologies can be useful in supporting the notion to respect all living creatures as important and valued. In the past, children were encouraged to capture bugs, lizards and other small creatures in ‘bug catchers’ (clear plastic containers with breathing holes and a removable lid), so they were easily observed and learnt about. These creatures slowly died, removed from their natural habitat, not to mention the shock of being captured and constantly observed up close. Now with technologies, these creatures can be videoed in their natural habitat, removing the need to capture them and place them in a plastic container to be observed. The videos can be watched over and over as the learning happens and is then built upon and extended in other areas of the programme.

The educators in this study were not able to identify how technologies could be used to support learning in the outdoors. The educators perceived that the parents did not want their children to be “watching TV at kinder” [Kim, middle interview, 22/07/14, p.3], believing the parents viewed the provision of technologies as watching television. Instead, the educators perceived the parents “wanted the children out climbing and, doing that sort of thing” [Vanessa, middle interview, 8/08/14, p.3]. Both educators provided technologies for children’s use, albeit limited use, but prioritised outdoor play and other forms of learning which in their minds excluded technologies. This leads into the next paradox – traditional kindergarten activities versus technological activities.

5.6 Traditional kindergarten activities – technological activities

Both educators provided technologies for children’s use, but applied rules and restrictions to the technological activities that were not applied to other activities. The provision of technologies is often compared to other activities in the kindergarten classroom and their learning potential is not seen or valued. Subtly, educators provide the message to the children that their technological engagement is not as valued as other activities in the kindergarten classroom. For instance, in this study these messages were evident through behaviour such as educators enforcing time restraints, not interacting with the children as they engage with the technologies, and not actively supporting or encouraging their technological play, as they did with the non-working technologies and other activities. Zevenbergen and Logan (2008) argued that, “educators see the use of technology as the antithesis of good practice” in early childhood settings (p. 8), but this was not totally supported in my study. Although the educators’ in their verbal interviews acknowledged the potential of the working technologies to afford children imaginative play, they continued to prioritise “traditional” activities and experiences in kindergarten as the approach that best affords children’s learning [Kim, Middle Interview, 22/07/2014, p.1]. For example, Kim stated her “old fashioned” thinking constrained her technology provision [Kim, Middle Interview, 22/07/2014, p.1], and Vanessa valued “physical learning” over any possible digital learning [Vanessa, After Interview, 31/10/2014, p.3]. These views highlight that the educators did not perceive the affordances of the working technologies for imaginative play and therefore, learning.

I believe there is potential for change with Kim and Vanessa. They both admitted to the potential affordance for imaginative play, yet their practice did not reflect these statements. Targeted professional learning where Kim and Vanessa, and potentially other educators, could see how technologies could be used by the children for imaginative play and therefore learning, could encourage the educators to provide the technologies in ways that meet the children's play interests. This finding that the two educators appeared not to value children's digital imaginative play for potential learning also raises a concern for me. It raises a question whether the two participant educators are missing the link between children's imaginative play and their learning? Even though it is a widely espoused early childhood tenet that children learn through play (Brooker, 2011; Lillemyr et al., 2013; Wood, 2013; Yelland, 2011), either these educators do not recognise the link between working technologies affording play and learning or they do not identify children's technological play as play and therefore miss the learning. This requires further investigation [see Future research directions, p.197].

Technologies are present in Western children's everyday lives and are becoming ubiquitous in early childhood education settings within developed countries. The notion that technologies are "an integral part of education provision for young children" is salient in current literature (Stephen & Plowman, 2014, p. 330). For example, Parette and colleagues (2010) posit that children are "often asked to leave their technologies at the door" (Parette et al., p. 336) and therefore early childhood educational settings are frequently devoid of technological experiences. The integral place of technologies in education was alluded to by Kim and Vanessa, who both agreed that technologies are an interest of the children's and that technologies can support children's learning. Vanessa stated, "Once schools started using them [technologies] more, the children needed to explore them more" [Vanessa, Middle Interview, 8/08/2014, p.3]. The educators' stance in the two research settings was not as extreme as banning technologies, however, there was limited provision of working technologies in both settings and restrictions applied that constrained possible affordances.

How the educators viewed the technological and other activities in the kindergartens was illustrated in the merging of real and digital play props and scenarios. Children integrate their digital play experiences with the "traditional" [Kim, Initial Interview, 28/05/2014, p.1] non-digital props they use in their play, and within a seamless blending of play narratives (Stephen & Plowman, 2014). Recent research studies have explored the integration of technologies and popular culture within early childhood settings, with conclusions drawn that a real – virtual continuum exists (Edwards et al., 2016; Hedges, 2011; Marsh, 2010; Mawson, 2011). When the educators used the iPad to play music in both contexts, they supported the children's play scenarios [see Video Cosmic21 and Observation 20140627

#4] and the educators encouraged the seamless merging which brought working technologies and traditional play together [see Figure 5:7 Kim playing songs on the iPad to support children's play and Figure 5:8 Vanessa playing songs on the iPad to support children's play].

Despite these small examples, the notion of merging both the real and digital experiences of children remains generally foreign to the wider early childhood field (Edwards et al., 2016). Despite the years of research, the role of technologies in improving children's learning is still somewhat of a mystery (Ching-Ting, Li, & Chin-Chung, 2014; Crescenzi, Jewitt, & Price, 2014; Price et al., 2015). It appears that "staff development and increased knowledge of technology is not enough" for educators to feel confident to provide technologies in their classrooms (Aubrey & Dahl, 2014, p. 106) in ways that supports and extends children's learning. I believe targeted professional learning with educators that builds their skills and confidence around technologies can support them in the provision of technologies and in ways that benefit the children they teach.

> Mia is singing on the stage with her made microphone. Kim comes out with the iPad and downloads the song Mia wants to sing and plays it for her. Diana returns and sits on the seat. Ann Mary and Kim also sit down to be the audience. Mia is as confident with the words while the actual song is playing. Diana gets on the stage with a made microphone and sings with Mia. Shivani comes onto the stage and looks at the iPad. Mia asks for more songs. Kim then puts on a CD for them to listen to.
>
> Figure 5:7 Kim playing songs on the iPad to support children's play

> Vanessa moved the iPad and speaker inside to the mat area. Let it go (Anderson-Lopez & Lopez, 2013) is playing on the iPad. Kai is singing along. Kieran is running in circles and Kai sometimes joins him. Kai stops and moves his arms to the actions from the movie.
>
> Figure 5:8 Vanessa playing songs on the iPad to support children's play

If early childhood educators are to engage with digital literacies in order to understand children's experiences with technologies they could ensure that experiences are child-centred and culturally meaningful for young children (Marsh, 2010). The findings from my study supports the notion that educators need professional learning around providing technologies for children in meaningful ways. Kim suggested that educators would benefit from being provided with information regarding "great web sites, [and] resources would be another good thing, there's your PD [professional development]" [Kim, Middle Interview, 8/08/2014, p.4]. Another suggested solution in the literature is to "further theorise the relationship between early childhood education and society's accelerating technological changes" (Roberts-Holmes, 2013, p. 2), through the provision of professional learning for educators that addresses these concerns (Nuttall et al., 2015). The notion that educators require additional opportunities to learn how to integrate technologies into their programmes reflects a paradox around traditional activities and technological activities where educators appear to be holding on to their traditional beliefs and pedagogies rather than exploring how they can integrate technology as another vehicle through which they can offer many different learning opportunities. The findings suggest that educators understand that the provision of technologies is only the first step in an 'executing a plan affordance' [see Understanding actions, understanding affordances, p.70]. As I have already stated, this could be because the educators did not recognise the potential affordances of technologies and how to provide the devices in ways that support children's learning.

5.7 Children learning to navigate the rules around working technologies – their desire to play according to their volition

In the two kindergartens, the working technologies were provided and appeared to afford children imaginative play, yet the rules and restrictions applied to this provision limited how the children could engage with them and the type of play that was actually afforded. The educators' rules and restrictions imposed alongside the provision of working technologies influenced the ways that the children used them. When engaging with technology children have a particular outcome in mind. This is something that they want to do that can be seen as their object of activity (Vygotsky, 1978). Their object of activity may be to create something new or simply enjoy their engagement with the device. There were times in this study when the rules, enforced by the educators, threatened to prevent children from achieving their objects of activity and in response the children negotiated these rules in order to play in the way that they wanted. For instance, when the iPad was being used to play a particular song, Connor negotiated the rules by selecting a different song to play [Observation 20141020 #3]. Connor then used his thumb to scroll through the other YouTube videos, selected one but it was slow to buffer. He then picked a different app to play [Video Creative130). In another example, Jack negotiated the rules around the iPad when he used it for free play on a sunny day. Louise soon enforced the rules around technology use, by removing the iPad stating, "It's too nice today" [Video Creative131].

Figure 5:9 Connor selected a different app on the iPad before being told it was too nice a day!

Another way that children negotiated the restrictions pertaining to the working technologies was to work around the rules and restrictions that surrounded their use. This was evident when Oliver remained at the computer after the timer went off [Creative Video140]. At Cosmic Kindergarten, the children who wanted to have a turn at the computer placed their names on a list, but Giraffe negotiated this rule by sitting down at the computer when his name was not next on the list for a turn [Video Cosmic189]. In another example, Jordan and Eleni were told by Susan to find something else to do, because “They had watched the computers long enough.” Then when Susan went outside, they returned to the computer [Observation 20141014]. In an asylum centre in Sweden, Karlsson (2018) found children learnt to “navigate institutional regulation” in order to play. Spaces available for the children to play were restricted and monitored through surveillance cameras. The children were aware of the cameras and worked around this restriction in order to engage in play. These examples demonstrate how the children were aware of the rules imposed by educators or security guards, but they still wanted to play and therefore manipulated them in order to play.

By enforcing rules and restrictions to the provision of technologies, educators are shaping a system within their classroom. Arnott (2016) described the rules around technology provision as part of the "Preschool System" that children attempted to negotiate in order to meet their own needs (p. 1). It is evident from the findings that the educators in this research were creating a 'Preschool System' that positioned technology play as an opportunity to create and enforce the rules. The children, on the other hand, whilst understanding the rules, often acted to oppose them in order to achieve their object of activity. It is a common rhetoric within the early childhood field that practices should be maintained because 'that's the way it has always been done' (Salamon, Sumsion, Press, & Harrison, 2015). This mantra suggests that the rules pertaining to how things have been done in the past are important and should not be questioned. This research demonstrates that this position is evident in relation to working technologies and children's play. Working technologies create a context where rule imposition and enforcement is prioritised. It is this type of thinking that restricts the integration of technologies in the early childhood field and I will explore this idea further next in the *Discussion* chapter.

5.8 Renaming non-working technologies

At the beginning of this thesis, I defined the terms working and non-working technologies [see Defining terms, p.5]. Through my process of analysing data, writing up findings and drawing final conclusions, I have come to realise that the term, *non-working technologies* does not adequately represent the potential of these devices. Yes, they are no longer 'working' in the way originally intended, yet they do 'work', in that they have enormous potential as affordances that support children's imaginative play. Therefore, a new term is needed that encompasses the potentials of these devices. In considering a new title and exploring the literature, albeit a limited corpus around *non-working technology* use in early childhood settings, I acknowledge that these devices are objects that have limited influence until children's input and imagination act upon them. Hence, I rename them *imaginative technologies*. When children use *imaginative technologies* in their play, they create purposes, roles and specific features for the devices to embody. Without children (or imaginative educators) to include them in play scenarios, the devices are non-working technologies. When children use them and transform them into something else, they cease being a toy or an object that no longer fulfils its original purpose as a non-working technology. Whilst this might appear to be a relatively unimportant point, it is the children's assigning a new purpose to the object that allows the object to separate from its non-working status. Even the term non-working technologies infers a negative connotation, in that these devices no longer have a purpose because they no longer work. From a sustainability perspective, it is desirable that we consider how non-working devices can be repurposed into objects that become a valued as part of the children's imaginative play (Bundy et al., 2017). It is a tenet of cultural-historical theory that objects contain a history and are shaped by the individuals in the cultural context. I argue that *imaginative technologies* in early childhood settings are shaped by the children who appropriate the history of the technologies and use them in their play. Repurposed by the children to re-enact cultural behaviours, the perceived affordances of *imaginative technologies* can be centred in as an important feature of play contexts that support the fourth way of imagination (Vygotsky, 2004).

In the concluding chapters of this thesis, I refer to the non-working technologies as *imaginative technologies.* This recognises my shift in thinking about the value of these devices and also highlights the important part they hold in children's technological, imaginative play.

5.9 Chapter summary

In this Results Chapter, I introduced several paradoxes that were illustrated in the findings from the collected data. These paradoxes include:

a) working technologies – non-working technologies;
b) solitary individuals working with devices – groups of children on devices;
c) play-based, child centred programmes – adult controlled;
d) nature discourse – technologies as not natural;
e) traditional kindergarten activities – technological activities; and,
f) children learning to navigate the rules around working technologies – their desire to play according to their own volition.

I have illustrated the friction that coincides with providing technologies for children's imaginative play due to educator beliefs and pedagogies and the outside forces that influence their teaching roles. I have alluded to a range of factors that impact educators' work and the quality of the children's learning. I concluded the chapter by introducing the term *imaginative technologies* to transcend the shortcomings of the term non-working technologies. This new term better represents the potential affordances these devices hold for children's play. Through analysing the paradoxes presented in this chapter, factors that impact educators' work and the quality of the children's learning came to the fore and potential changes to enhance teaching and learning were highlighted. These will be expanded on and explored in the following discussion chapter.

Six: Discussion

6.1 Introduction

Children’s imaginative play with digital technologies is influenced by the educators’ provision of the devices. I recognise the struggles educators face as they investigate changing their practice and acknowledge the educators I researched are on the beginning of their technology journey and are therefore just exploring what is possible. The notion of provision comprises not only the devices provided, but the rules and restrictions that surround their use. The educators’ interactions with the children as they engage with the devices is a further element that constrained the children’s ability to engage in imaginative play. My exploration of the findings related to children’s technological engagement surfaced several paradoxes that illustrate the juxtaposing nature of technology provision. These paradoxes demonstrate how educators are (often unconsciously) being forced to enact neoliberal ideals and ways of teaching, an idea I explore in more depth below. I contend in this discussion that the identification of neoliberal influences that operate at a deep and subtle level, can allow educators to critically reflect on their technology provision, their pedagogy and their teaching as a whole. This critical reflection could enable early childhood educators to push back against the influences that potentially separate them from their teaching goals.

In exploring the paradoxes identified in the previous chapter, I layout my recommendations to address inconsistencies between the two sides of each paradox. These include challenging educators’ beliefs, their identification of children’s four ways of imaginative play and their exploration of why certain behaviours, rules, and restrictions exist pertaining to working and imaginative technologies. In presenting these recommendations, I am providing one way to increase technology provision and ideas for supporting children’s technological engagement. In no way am I dismissing the work that educators’ do or judging their pedagogical choices. Instead, I am presenting these recommendations in response to the research I have conducted and the findings I present in this thesis. Having discussed the issues, I then explore what was missing from the data and the implications of these omissions for the children, educators, leaders, parents and policy makers. I argue that digital technology provision is rule bound and this influences how it is provided and how children engage with it. I then conclude the chapter with a discussion on the professional development required to increase the integration of technologies in early childhood settings and to facilitate educators supporting children's imaginative play and learning.

6.2 Technology provision and intervention points

The following figure provides a visual representation of the outcomes from this research around the provision of working technologies and their perceived affordances or constraints [see Figure 6:1 A flow chart of technology provision]. In the flow chart, I illustrate several points where educators could intervene and use their pedagogical and teaching skills to scaffold or extend children's engagement and learning. These critical points could change the affordances available and positively affect the children's play and learning. The four points of intervention, as illustrated in the flow chart are: a) the provision of working technologies; b) the rules and restrictions applied to the technologies; c) the child's and the educators' object of activity; and d) how the working technologies were used by the children. There are also three points at which the children, responding to how the technologies are provided, navigate their play with the working technologies. These were a) the children's capacity to change the rules and restrictions, b) children's skills and knowledge to negotiate provision, and c) children's capacity to challenge the rules.

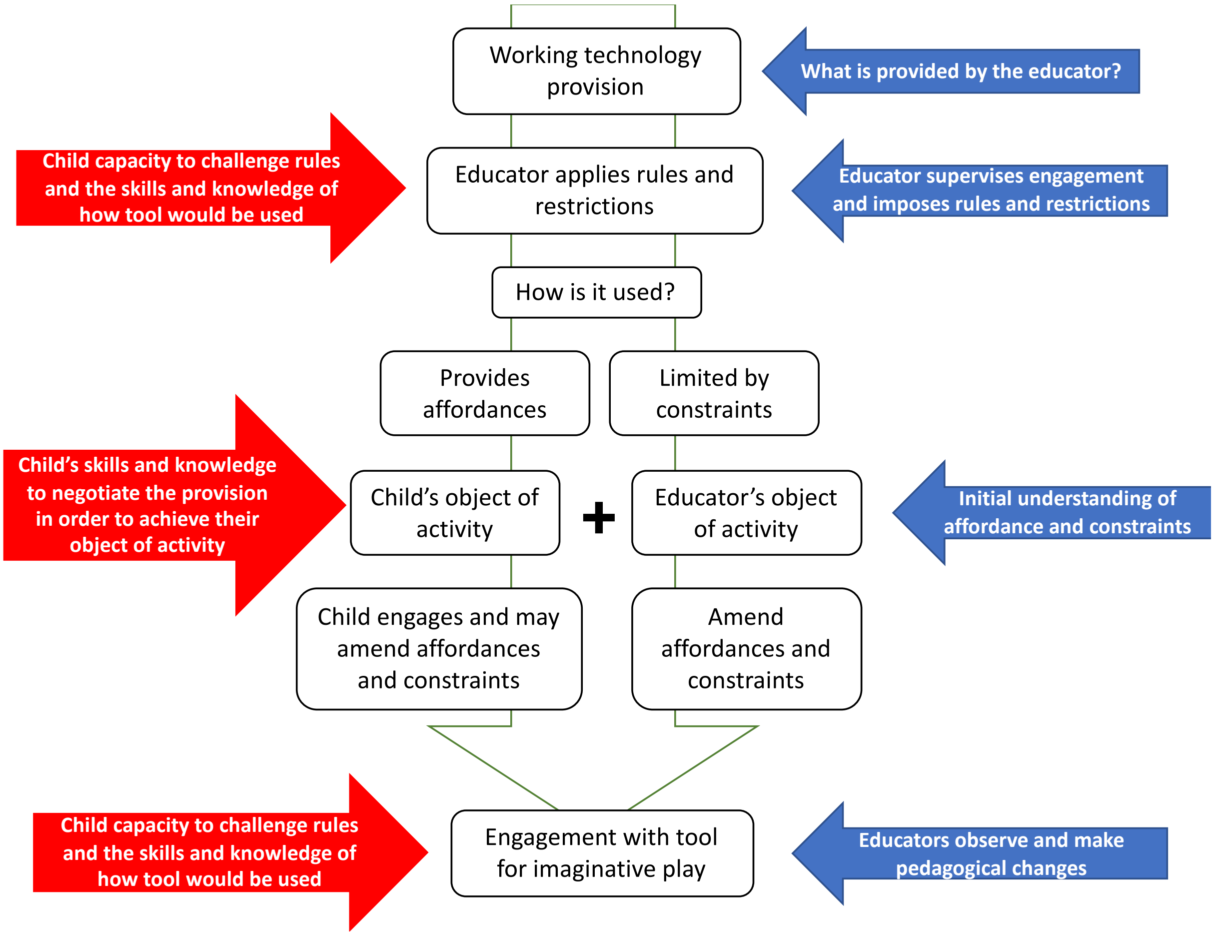

Figure 6:1 A flow chart of technology provision

The first point of intervention is around the provision of the various technologies. Both of the educators provided limited working technologies for children's free play. In this, their behaviour is consistent with that of other educators identified in current literature (for example, see Liu & Pange, 2015; Yelland, 2011). For Vanessa, provision involved only allowing the computer and iPad to be used by the children for free play on rainy days [see Vanessa, After Interview, 31/10/2014, p.1]. This is a point where Vanessa could have made changes to her provision resulting in more affordances around the technologies for children's play and learning. Similarly, Kim could provide the iPad for children's free play. Both educators considered providing the camera for children's use, but this ideal was constrained by the limited cameras available in the centre, and the educators' programme planning (which did not involve children using the camera) took priority. Changes here in educator beliefs and pedagogy, could result in more provision of the technologies for children's free play. This is the first point of intervention illustrated in the diagram. At this point, the children from the two research sites did not influence the provision of the technologies. As the data collection occurred towards the middle of the year, I suspect the educators' rules and restrictions were already being enforced and the children knew what technologies were provided, when and how. If data collection occurred at the beginning of the kindergarten year, then maybe the children would have been less familiar with the rules and more likely to follow their interests; and therefore, they would request that the educators allow them to use the working technologies for their free play. This I can only speculate as it did not occur during my data collection. It is important to note that the educators did not recognise the kinds of affordances technologies can offer children impacted their provision. In order for there to be changes in the provision of technologies in early childhood settings, educators' understandings have to be challenged and expanded which can be addressed through professional learning [see What professional learning is needed?, p.185].

The second point for educator intervention in the flow chart, is where the rules and restrictions around the provision of the technologies influence the children's ability to use the devices for their free play. This requires knowledge of not only the technologies, but also how the children engage with them and what they are capable of doing with them. For instance, understanding the impact short time limits have on children's ability to engage in imaginative play, educators may change them or amend this rule. As Bodrova and Leong (2007) assert as part of mature play, children's play needs to be sustained for longer periods of time. At this point of provision illustrated in the flow chart, the children need the capacity to challenge the rules and restrictions imposed by the educators. They also need the skills and knowledge to know what affordances are possible on a working technology in order to challenge how they are provided. For instance, if a child knows that imaginative play is possible on an iPad, yet the educator has provided the iPad to play songs, the child knows to challenge how the iPad is provided in order to be able to use it in the way they want and to achieve their object of activity. Challenging the rules that surround the provision of the iPad also displays agency, as the child asserts their outcomes on the situation. Thus, it is important to scaffold children's learning in several areas: firstly, their knowledge of the affordances offered by the technology; secondly, in the actual skills needed to enable them to engage with the technology to achieve those affordances; and thirdly, how to negotiate adjustments to rules effectively. All of these opportunities can be supported by the educators if the educators themselves have the understandings and skills to do so.

The next point of intervention, illustrated in the flow chart is the child's and educators' objects of activity. Educators have an object of activity when providing technologies, even if it is not a conscious decision or aim. Through mediating their object of activity, educators will apply rules and restriction that constrain or afford the provision of the device. For instance, if Kim observed Eleni and her friends' play, she could have modified the rules in ways that could have extended the children's learning [see Video Cosmic 116]. There are similar examples in Vanessa's data: for example, where she provided stories on the iPad with the object of children listening to them [see Video Creative 67,68 & 69]. The rules and restrictions she applied involved requiring children to stay only with the designated app and to keep their noise to an appropriate level. However, in participating, the children's object of activity was to play different apps and not to engage with the story app Vanessa provided. Likewise, if Jordan was encouraged to question the rules, he could have explained that he was about to get a high score and move to a level he had not attempted previously [see Observation, 20141014 #3]. Kim may have then relaxed the rules and allowed Jordan to continue his turn. She could have also scaffolded his learning and asked him what he did differently during this turn with the device to pass to a more difficult level. Recent research posits that children require educators to scaffold their learning with technologies (Sullivan & Bers, 2016). Through not recognising the learning that was occurring and enforcing the rules, valuable lessons and opportunities to extend children's understandings of mathematical concepts, sequencing and persistence were being lost. In both of these examples, the children's and the educators' objects of activity did not align.

If the children's and educators' object of activity did align, then the affordances of the device would be greater. This could have resulted in imaginative play and in-depth learning. In the above examples where the two objects of activity were not aligned, the educators' rules and restrictions constrained the child's ability to engage in imaginative play and limited the learning potential. Educators wield power to determine the provision of technologies: when and how they are provided. Educators also influence technology use through the rules and restrictions they apply, which in turn impacts how children engage with them and the extent of imaginative play and learning. In the above examples, the educators' objects of activity were deemed more important than the children's, thus rules were imposed to constrain the children's play. Educator understandings of children's objects of activity, the range of potential affordances offered, and the associated skills to engage with the technology, are all essential elements for appropriate intentional teaching.

Had these elements been present in the above examples the educators may have used intentional teaching to extend the children's learning and supported their engagement with technologies.

The children often attempted to negotiate the rules and restrictions imposed by the educators in order to engage with the technologies to achieve their object of activity, which was imaginative play. The children questioned the imposed rules and restrictions and attempted to engage with the devices in the ways that they wanted. On a superficial level, the children's behaviour could be seen as rebellious. Alternatively, this 'rebellious' behaviour could also be viewed as an opportunity for managing future moral dilemmas. If educators in early childhood contexts teach children the thinking skills required to question rules (Scott & Marsh, 2018) that they see as unfair or unjust, and to consider the implications of the rules and the need to question their appropriateness, children could develop the capacity to resist conformity rather than blindly comply with what is being asked of them. This is a key skill to develop given the influence of peer pressure and 'mob mentality' which demands that individuals follow the status quo and conform and the ultimate aim of moral development which is to make informed decisions about one's behaviour based on key principles.

The fourth and final point of intervention is the children's actual engagement with the working technologies. This is where the educators can observe the children's engagement with the technologies, increase their understanding around how the children use them in their imaginative play and then change their provision, interactions or teaching to extend children's learning. This change in educator practice is similar to the four ways of imagination (Vygotsky, 2004). When educators increase their knowledge of how the children use the technologies in their play, it is possible that they recognise their value and increase the provision of technologies. This is a recursive move illustrated in the flow chart where the educators' observations of children's technology use results in changes to their provision, and the flow chart begins again [see Figure 6:2 The recursive nature of the intervention points illustration, p.174]. Lawrence (2018) found the educators in her study were surprised by the social interactions children displayed around the iPad. Lawrence concluded that the type of app provided influenced the children's interactions and the type of play they displayed. Similar to my study, the educators in the Lawrence study appeared unaware of the affordances for social interactions when appropriate apps were provided.

The importance of these opportunities for social interactions is recognised by Furman et al. (2018) who argue it is not necessarily the use of technologies that improves children's learning outcomes, instead it is the interactions and teaching strategies of the educators that affects what and how much children learn.

Also, at this point of provision is where the children's capacity, their skills and knowledge on how the working technologies can be used will influence their use of the device. Without this capacity, children will just use the technologies in the way that they are provided; simply operating as consumers of technology (Waller, 2011). Instead, as this research demonstrates, technologies can be used in ways that provide opportunities for creativity, and for doing things in different ways. The flow chart illustrates the different points of intervention for both the educators and the children, and how changes at any point can result in modifications to the provision of technologies and in ways that support children's play and learning. Outlined in the next section are some suggested professional learning that can support educators to reconsider how they provide technologies for children's play.

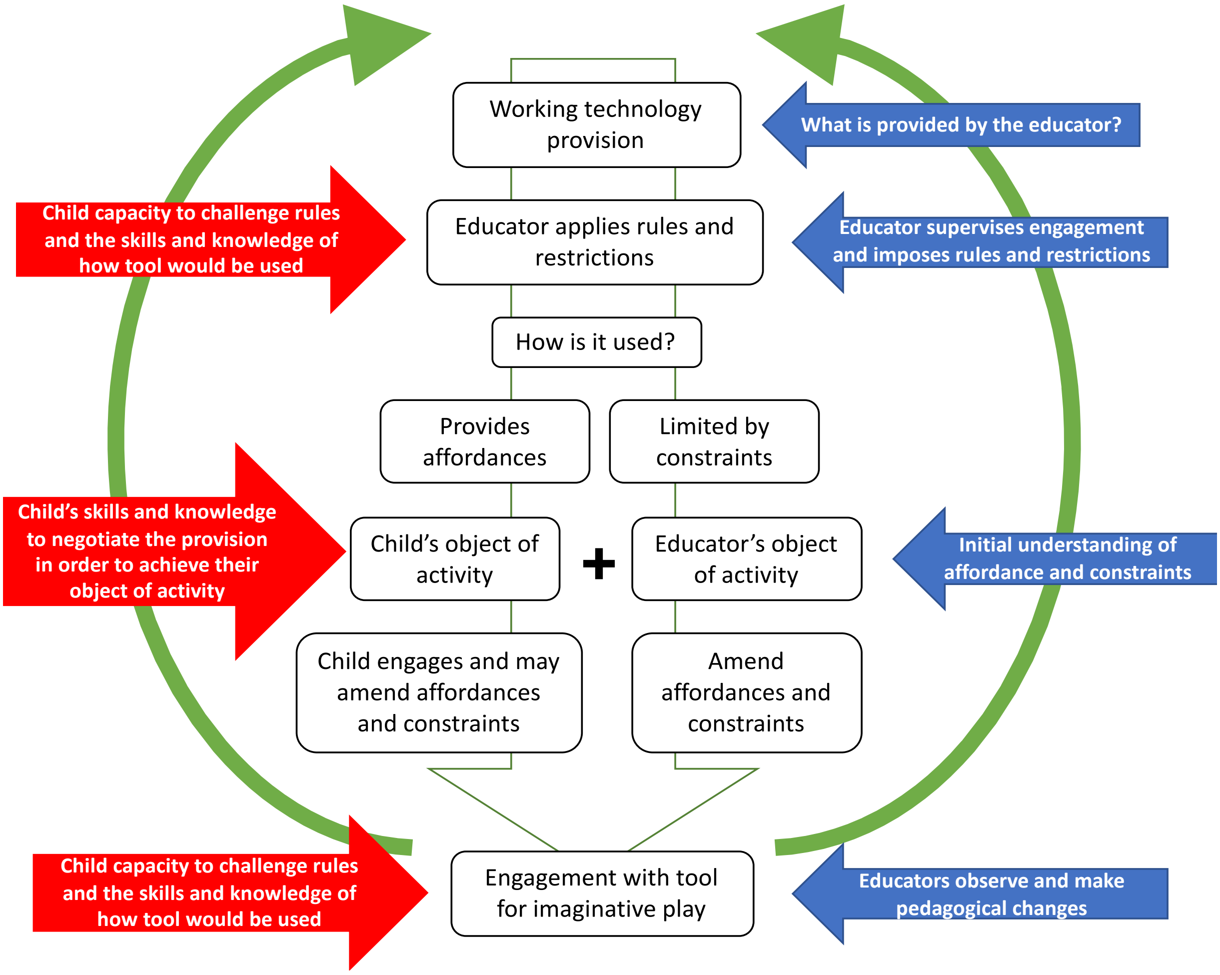

Figure 6:2 The recursive nature of the intervention points illustration

6.3 Does the EYLF support educators' practice?

During discussions with educators, both in their interviews and during data collection periods in their kindergartens, neither educator mentioned the EYLF (DEEWR, 2009). This surprised me. The EYLF was introduced over seven years ago and has become strongly embedded into many early childhood educators' practice (Fenech et al., 2012). I thought the educators would talk about their pedagogy and technology provision in relation to the EYLF. Instead, these links were not made.

This creates a tension between the role of the EYLF and educators' need for more guidance around how to integrate technologies into their programmes. In one way, the EYLF could be seen as a neoliberal governance tool that dictates how educators should plan and engage children in their kindergartens (Kilderry, 2015a). Certainly, the group who developed the

EYLF had no intention that it should become a prescriptive recipe identifying sanctioned knowledge, rather they argued that the framework should be used to stimulate discussion around how to best support children's learning (Sumsion & Grieshaber, 2012) and to "redress the sometimes unrelenting focus in government discourse on children as investments in the future" (Sumsion et al., 2009). In honouring this intention, the educators in this study could use the EYLF to stimulate discussion about their technology provision and how they provide technological experiences that support children "to make sense of their world" (DEEWR, 2009, p. 44). The EYLF could be used by educators to push back against neoliberal ideals and the perceived expectations of the parents, the local community and schools, serving as a lever, used to justify their innovative provision of the various technologies that they have in their centres.

As discussed above, an evaluation of the EYLF could highlight the ways in which the curriculum document could be improved to better support educators in their work with children. For instance, technologies could be more explicitly embedded within several learning outcomes, rather than being seen as separate to other areas of the programme. Technologies fit within the learning outcomes "Children are confident and involved learners" and "Children are effective communicators" but it could also be integrated within the other learning outcomes (DEEWR, 2009, p. 19). iPad apps could be provided that promote the learning of languages other than English and this is highlighted by the success of the ELLA program in preschools (see https://www.ella.edu.au/). The ELLA apps are language learning programs that encourage children to become familiar with other languages early in life, with the aim to continue children's interest in learning other languages later in school. The ELLA apps are available in seven community languages including: Arabic, Chinese (Mandarin), French, Indonesian, Italian, Japanese and Spanish. The use of the ELLA apps and other culturally inclusive programs assists with building children's sense of identity through valuing various cultures and cultural languages. This emphasis on building children's cultural competence and sense of identity, fits with learning outcome one in the EYLF – "Children are confident and involved learners" (p. 21).

Technologies can be included in the second learning outcome "Children are connected with and contribute to their world", through learning about the environment and their world (p. 26). Educators often use technologies to conduct research with the children, to build their knowledge and expand their understandings of topics of interest. Both of the educators participating in the research used their iPads to conduct their own research. For example, Vanessa used hers to research the evolution of an ape to a man [Video Creative110] and Kim used hers to research why a shell turned green [Kim, Introductory Interview, 28/05/2014, p.2]. These examples illustrate how the educators met the learning outcomes in practice, but they did not refer to the EYLF or rely on it to articulate the choices made in their provision. The educators' evaluations of the learning experiences did not specifically relate the use of the iPad for research purposes or in meeting EYLF outcomes. Both educators admitted that they make specific links with other areas of their programme, but the links between the EYLF and technologies seem to be omitted or overlooked.

The third learning outcome – "Children have a strong sense of wellbeing" can also be promoted through the use of technologies (p. 31). During my Masters research, a child, Rithik, became an expert among his peers in using the technologies. His confidence within the group was boosted by his knowledge and other children asked for his advice when they were using the various technologies (Bird, 2012). A recommendation from my Masters research was that educators should encourage children to become mentors to their peers, and in doing so, extend the zone of proximal development of both the mentors and their peers (Bird, 2012). An example of peer scaffolding from this study was when a child playing *Reader Rabbit* (The Learning Company, 1986) was provided hints on how to play the game by those standing behind, as described above [see Figure 5:4 Children watching the computers being used [Photo Cosmic P02], p.151]. This relationally embedded way of using technologies could be emphasised more in early childhood settings with links made with the EYLF and learning with technologies could be extended by educators.

So to summarise, even though the educators did not link the EYLF to their technology provision or practice, there is scope to do so. Again, with more knowledge and confidence, gained through experience and/or professional learning, educators could turn to the EYLF to justify their practice. When the EYLF is evaluated and the second edition formulated, the integration of technologies across learning outcomes and areas of early childhood programmes could be emphasised. The incorporation of technologies into various learning outcomes of the EYLF could potentially encourage and support the integration of technologies into early childhood play-based learning settings.

6.4 Digital technologies for digital citizens

Children's play with imaginative technologies could provide an avenue for discussing and teaching children about morally responsive, digital citizenship (Scott & Marsh, 2018). Educators already have the pedagogical skills to introduce and discuss somewhat difficult topics that surface in children's play and technological play is no different. For instance, when Madeleine was recording Vanessa's dancing and then uploaded it to Facebook™ [See Observation 20140627#2], Vanessa could have introduced a conversation with Madeleine about asking permission to share the footage of others via the internet, and what to do if someone doesn't want a recording of them to be shared. Madeleine had an in-depth knowledge of Facebook™, but was unaware of the necessary ethical considerations that accompany the use of social media. It is in this way that intentional teaching can be utilised to begin conversations about digital citizenship and challenge children's beliefs and understanding about the cultural practices they witness in their social context. The use of imaginative technologies in this way may help alert children to the consequences of their behaviour with technologies and encourage them to be empathetic to others' wishes and feelings. Conversations on difficult or challenging topics often occur in early childhood settings and responsive and caring educators can maximise the learning potential that these types of engagement can have. These types of conversations around technologies and the moral and ethical behaviours associated with them, are just another example of or an extension of this behaviour.

6.5 Working technologies are rule bound

Teaching about digital citizenship can also occur around the working technologies. As established in the findings, the provision and use of working technologies in the early childhood settings in which this research was conducted are rule bound. Every time a working technology was provided, rules or restrictions shadowed its use. The children also designed and enforced their own rules related to the roles they enacted in their imaginary play with technologies and as Vygotsky (1966) posited, all imaginary play contains rules [see Three requirements of play, p.53]. The educators' rules arose from a variety of influences: their own history and experiences, the pressures of screen time guidelines (American Academy of Pediatrics, 2001, 2013), their perception of the parents' wishes and beliefs, their pedagogical beliefs and their understandings around the provision of technologies to maximise learning potential. These elements combined to influence the rules and restrictions educators set to constrain the children's ability to participate in free play with working technologies and to engage in imaginative play using these devices. For instance, the time restriction imposed by educators [see Working technologies – non-working technologies, p.139] limited the children's ability to engage in imaginative play with the working technologies. What often happened when the timer went off, was that children were moved on, regardless of what was occurring in the game. Moving on often meant children were unable to complete the activity in which they were engaged, and this limited the learning they gained from this activity. Similar constraints occurred with other rules. For example, not being able to stand behind and watch the child having their turn meant that the benefits of social interaction and learning through observation of the more capable other were lost, as was the learning from taking on the mentoring role (Vygotsky, 1966). Rules and restrictions had negative effects on children's ability to engage in imaginative play and reflect lost opportunities for educators to engage in thoughtful intentional teaching to extend children's knowledge and imaginative play.

If educators observed children's engagement with the working technologies and could see that imaginative play was occurring, they could extend the time the child was allowed to remain at the device and they could scaffold their ongoing learning in the activity. The same could be said for the rule about not standing behind and watching another child have their turn. As an example, if Kim had observed the children learning about instrument names and dancing when Eleni was having her turn on *Reader Rabbit* (The Learning Company, 1986), then she may have handled the situation differently [see Video Cosmic116]. She may have scaffolded their learning of the instrument names they didn't know, and she may have extended their learning by providing the different physical instruments for the children to explore and play. Relatedly, Vanessa did not observe and then extend her children's knowledge when they were watching stories on the iPad [see Creative Video67, 68, 69]. Instead, she enforced the rule of remaining with the app that was provided. Had she listened to the children's conversation and observed their behaviour, Vanessa may have relaxed the rule and then used the children's interest to plan and build on their engagement.

Technologies do not need to be as tightly rule bound. Often it is the educators (or other adults) who impose the rules and restrictions without understanding how children are engaging with the devices and the potential learning that may be occurring. If technologies were provided without restrictions or without educators imposing rules, children may demonstrate their ability to negotiate the devices as they do with other props during imaginative play. In play, children negotiate the rules and roles with those involved in the play scenario. Negotiating rules around technologies would be an extension of this. Instead, children are not given the chance to demonstrate these skills because educators provide the technologies with attached rules and restrictions. Providing them without rules and restrictions requires further investigation to establish how to scaffold children to be capable of self-managing these devices in group settings.

6.6 Neoliberal thinking

Through the findings and the discussion of the rules and restrictions that were placed on the devices in both settings, I am drawn to the concept of neoliberalism and its effect on the educators' provision of technologies. I realise the educators' positions as they pedagogically make decisions for the children they teach, while also confirming to the rules and regulations that are placed on them from outside stakeholders. We are all neoliberal subjects and are being shaped by external forces that become our ways of thinking and acting as we go about our daily lives. It is from this neoliberal belief system that I now move the discussion, to extend the reach of the findings of this study and suggest a rationale to explain what was occurring in the research settings.

Neoliberalism unescapably effects how "many of us interpret, live in, and understand the world" (Harvey, 2005, p. 3). It "employs modes of governance, discipline, and regulation" in order to determine how professional and social life will look and be enacted (Giroux, 2013, p. 459). In attempting to categorise neoliberalism, Ganti (2014) asserts that there are four main labels that can be used: economic policies; defined political roles; an ideology that guides human action; and a type of governance. Whichever the stance, neoliberalism impacts political, social and economic contexts. Vintimilla (2014) views neoliberalism as a form of governance, that dictates "ways of behaving and [the] organisation of social and economic life" (p. 20). Sims and Waniganayake (2015) present similar ideas, stating "corporatisation, privatisation, quality assurance, efficiency, accountability and globalisation" are all words associated with neoliberal thinking (p. 334). These neoliberal ways of thinking are not just an external force, dictating ways of being, but also come from within or as Ball (2016) espouses, it is "in our souls" (p. 1050).

Education has been influenced by neoliberal thinking in particular ways. Exploring education, Sims (2017) states that the purpose of education has changed as a result of neoliberal shifts. Previously, the purpose was "to prepare citizens to live in, and participate in, a world where freedom, tolerance, debate and social justice were valued" (p. 3). Instead, the purpose of education now seems to be the promotion of neoliberal ideas where children are educated in preparation to be productive employees who do not question directives and who work towards achieving their managers' goals (Sims & Waniganayake, 2015). This creates generations of children who comply and respond to questions with the 'right' answers, rather than becoming critical and imaginative thinkers who interrogate practices and contemplate new and innovative ideas.

There is a clash between the aspiration that education should aim to educate children to be questioners where they critically think about technologies and what is presented to them via the internet, and the neoliberal emphasis on compliance to authority and the narrowed view of one's self as a neoliberal citizen. This gives rise to another paradox that is particularly salient for early childhood educators. Pedagogy is shaped by educators' understandings of how to comply with federal and state frameworks, and the policies and rules imposed upon them. They also draw from their own experiences of the world and are influenced by a traditional early childhood ideology that positions learning as child-centred and child directed (Plowman, Stevenson, et al., 2012; Samuelsson & Carlsson, 2008). Ball (2016) explains how educators are not only conforming with neoliberal ideals but are also the product of this way of thinking:

> They change what it means to be educated, what it means to teach and learn, what it means to be a teacher. They do not just change what we do; they also change who we are, how we think about what we do, how we relate to one another, how we decide what is important and what is acceptable, what is tolerable. As I have said already – these changes are both out there, in the system, the institution; and 'in here', in our heads and in our souls. (p. 1050)

Educators have their own histories and experiences and these marry with outside pressures like neoliberal thinking that shape their beliefs and ways of 'being a teacher'. Prior to undertaking this study, in my naive understanding of neoliberalism, I saw it as black and white – a binary where educators either conformed to neoliberal ways or they pushed back and rebelled. Now I see that we are shaped by neoliberalism and we enact practices that fit a neoliberal agenda, while not always consciously or deliberately, but by enacting these behaviours we too are a creation of a neoliberal ideals.

In this study, the educators perceived the parents of the children they taught had different beliefs about technology than the ones the same parents shared with me. The educators in this study enacted “self-audit and self-surveillance” behaviours (Davies & Bansel, 2010, p. 9). For instance, when Vanessa explained that the parents in her centre did not want many technologies in their children’s kindergarten, she was a conforming neoliberal subject who met the requirements of her parent committee [see Nature discourse – technologies as not natural, p.157]. However, these were perceived requirements. My discussions with parents showed that they supported and even encouraged their children’s technology use. Vanessa’s perceived that the parents did not want technologies in the kindergarten, and this view of the parents’ beliefs may have been formed through her interactions with them over the years before or may have been based on particular comments from a handful of parents. Wherever they came from, they influenced Vanessa’s technology provision and had her performing in a way that complied with the parents’ wishes. In her interview, Vanessa said she was considering changing her provision of working technologies. It appears that she had an internal struggle when the needs and interests of the children juxtaposed with her own educator identity, who could be judged and assessed according to outside forces [see Vanessa, middle interview, 8/08/14, p.3]. Ball (2003) summarises this struggle:

> We become ontologically insecure: unsure whether we are doing enough, doing the right thing, doing as much as others, or as well as others, constantly looking to improve, to be better, to be excellent. And yet it is not always very clear what is expected. (p. 220)

Vanessa questioned her practice but did not have any first-hand knowledge of what technology integration looks like. Had she known what children’s learning with technologies, imaginative play with technologies or children’s free play with unrestricted technologies looks like, then her questioning of her practice may have changed her provision. This notion of not understanding what technology provision looks like, also fits with the EYLF and the educators’ use [or non-use] of the curriculum document in their practice (DEEWR, 2009). The fact that the educators in this study did not look to the EYLF in order to justify or inform their practice, indicated they did not know what was possible in relation to their technology provision.

In considering making changes to her technology provision, Vanessa also looked to her peers and colleagues to understand what they do in their practice. This may have been to ensure that she was compliant and did not digress too far from ‘normal’ educator behaviour. This behaviour was part of her self-surveillance, her need to ensure that she was performing as a neoliberal subject. Her reflexivity was internalised (Ball, 2003) and she looked to others for their advice, comparing her centre to others in the area. Rather than meeting the needs of the children she was teaching, Vanessa sought to equate her teaching to a "form of competition" through self-comparison with other educators (p. 220). Kim was rebelling against neoliberal forces when she stated in her interview, "I don't believe I should be owned by Apple™" [Kim, initial interview, 28/05/2014, p.2]. Discussing the technologies her kindergarten had available, she explained that she owned an iPod but was not confident in using an iPad, she did not transfer her knowledge of iPods to the centre's iPad [Kim, initial interview, 28/05/2014, p.2]. She did use her iPod to play music for the children who made a stage outside [see Video Cosmic17]. This displays an acceptance of the Apple™ control in order to play up-to-date music. Her behaviour was a contradiction. On the one hand, she claimed that she did not want to be controlled by Apple and on the other, she used an Apple product in her teaching. This illustrates how some practices are embedded in our everyday cultural behaviours and unless they are reflected upon, then their influences are unclear.

Early childhood settings in Australia are governed by the *National Quality Standard* (ACECQA, 2018), which is underpinned by state and national regulations and laws. The EYLF, with the aim to increase the quality of early childhood programmes (DEEWR, 2009). While not designed as a prescriptive curriculum (Sumsion et al., 2009), educators use the included elements in planning, assessing and communicating children's experiences and learning. Technologies do not feature strongly in the framework, but neither do other tools that are provided for children's play and learning. There is a difference with technologies as opposed to other more familiar tools, like blocks, in that educators do not have the understanding around how these items can benefit children's play and learning. As an example, block play is taught in pre-service education courses, with students learning the benefits of blocks and the concepts that can be taught and learned through block play. Technologies on the other hand are briefly touched on in university courses (X. Hu & Yelland, 2017), with pre-service teachers emerging from university with limited knowledge about how to provide technologies for children's learning. Technologies are an emerging area of study in pre-service education courses, with recognition of the challenges associated with integrating technologies into early childhood education and therefore, the need to teach pre-service teachers about technologies and how to "support educational change

(Donohue & Schomburg, 2014; X. Hu & Yelland, 2017, p. 260; Tondeur et al., 2012). Teaching about technologies in pre-service education courses only half addresses the problem, as many pre-service teachers learn about technologies during their university course, only to find when they undergo practical experience, the services do not use technologies and the pre-service teachers are unable to practice the skills they've learned (X. Hu & Yelland, 2017). In addition, technology advances are so rapid that learning must be ongoing to keep up. Maybe in years to come when today's kindergarten children are educators themselves, technologies will be a regular feature in early childhood services and discussions like this one will be pointless. But for now, this is not the case and this thesis is needed to assist the early childhood field to understand children's use of technologies and to offer ideas on ways to help integrate them into early childhood programmes.

The neoliberal concept of preparing children for their future role as productive members of society was evident in this study. In her interview, Vanessa proclaimed that her provision of technologies was to prepare the children for school [Vanessa, Middle interview, 8/08/14, p.8]. Unknowingly, Vanessa is contributing to neoliberal thinking in her provision of technologies in her kindergarten through teaching in a way that meets external measures. For Vanessa, neoliberal discourses, or preparing children for future schooling is "naturalised and taken-for-granted in what counts as being a good…" teacher, student or child (Keddie, 2016, p. 118). As I read and re-read the data, findings and discussion of this thesis, I am reminded of the early childhood discourse that values process over product. In neoliberal thinking, the product of children as future earning citizens is more valued than the processes of playing and learning in early childhood. This notion needs more reflection and consideration, especially around the integration and teaching of technologies.

The current nature of technology provision advances the neoliberal agenda. Skill and drill apps, where children are exposed to basic familiarisation of letters, numbers and colours, *does* prepare them for later learning in school, and pushes a neoliberal plan. As the findings from this study showed, children soon lost interest in these types of apps, and instead turned to apps that required creativity, where they could progress through software levels and there was challenge involved. The children pushed back against the aim to educate them to be productive, educated employees of the future, and selected apps that met their objects of activity rather than just ones that prepared them for later school learning.

Both educators discussed the perceived expectations of parents, the community and local schools and how these expectations influenced their technology provision.

> I think that comes from people, other people's perspectives on what I am allowing children to do. Like fear about judgement that I am letting them have a lot of screen time. Definitely, definitely. And I don’t think I've quite worked that one out yet, how to balance that." [Kim, after interview, 30/10/14, p.2]

This again fits with neoliberal thinking, where outside people dictate what occurs in the early childhood classroom. In a neoliberal framework children’s learning is shaped to enable them to ‘fit’ into their communities and their roles as future neoliberal, employable citizens (Keddie, 2016). Early beliefs of how children engaged with screens included the notion that they provided entertainment only (Yelland & Gilbert, 2013), thus they took time away from more valued learning opportunities. When parents ask that their children do not engage in screen-time at kindergarten [Vanessa, Middle interview, 8/08/14, p.8], they are indicating their expectations that the early childhood environment should provide appropriate education, not what they view as less valuable entertainment. These attitudes arise from the neoliberal positioning of citizens as needing to be employable, to be productive and valued. Parents want their children to be adequately prepared to participate in this digital world (Hatzigianni & Margetts, 2014; Plowman, 2013) but Vanessa contradicted this idea when she explained how her parent committee didn’t want too many technologies in their children’s kindergarten. She accepted this positioning of ‘screen-time’ as entertainment, rather than as a valuable learning tool, and accordingly appeared to accept her role in preparing children to be future employable citizens. Despite this, by reducing the children’s exposure to technologies, she was not preparing them for their place in the digital society in which they are part. She allowed the parents to make pedagogical decisions, rather than use what could potentially be her own professional judgement to explore the learning opportunities possible.

Questioning taken for granted early childhood practices and engaging in critical reflection is often an everyday part of any educators’ work. The questioning of taken for granted, hegemonic practices is not about second-guessing supervisors or educational leaders, but rather part of rich and responsive teaching and “a genuine search for knowledge and understanding” (Sims, 2017, p. 7). Vanessa and Kim have begun this process in their technology provision; they are beginning to question the rules and restrictions they impose on the working technologies. For instance, Vanessa is contemplating providing the working technologies more often for children’s free play, rather than just on rainy days and Kim is questioning how much the children should be permitted to stand behind and watch others have their turn. It is in questioning hegemonic practices where the beginnings of educational change occur (X. Hu & Yelland, 2017). Through recognising other ways of doing things, other ways of teaching and other ways of providing technologies, the educators in this study are beginning to critically evaluate “what is important and acceptable” in their daily work (Ball, 2016, p. 1050). As the educators in this research question their technology provision and the way things have always been done, they can move beyond thinking and bring about changes that work towards the education of children as critical and imaginative thinkers, who go on to question education and the knowledge they are presented as truths. This may then lead to the shaping of children who question the behaviours surrounding working technologies and who may think more critically and ethically about their technology practices in the future.

In this thesis, I have advocated for educators to promote the use of technologies in not only building on children’s interests but also as a way to prepare children for the digital world of which they are part. Along with providing technologies for children’s interests, the need to protect and keep children safe is an ongoing concern for parents and educators (American Academy of Pediatrics, 2013; Buckingham, 2007; Vittrup, Snider, Rose, & Rippy, 2014). Organisations are now in the process of developing digital media policies and statements around appropriate technology practice (See for example, Early Childhood Australia (ECA), 2018; Erikson Institute, 2016). National organisations and individual early childhood settings are beginning to explore digital policies and are creating guidelines for how technologies can be provided, used and promoted within their services. Neither of the two research kindergartens had as yet formulated a policy around technologies but did admit that technologies do come under other policies already in practice. As these policies and statements are developed, the learning that comes from them and the conversations generated in the process of producing them, can be used as a basis from which to teach children how to navigate appropriate and constructive technology use.

6.7 What professional learning is needed?

Professional learning previously focused on the provision of technologies and the skills and knowledge around what devices and apps to provide (Nuttall et al., 2015). Educators attending such training were given a list of apps or computer programs and told what specific learning the children could gain from them. They were often told of lists that rated apps for educational purposes, promoted as a necessary tool to help keep up to date as new apps surfaced on the market. However, professional learning that focused on the functionality of devices has not proved useful in supporting full integration of technologies into early childhood settings (Nuttall et al., 2015). Having conducted this doctoral research, I propose that what needs to occur is pedagogical learning for educators at two points of intervention illustrated in the flow chart. This is important if technologies are going to be fully integrated into early childhood services and in ways that support children's play and learning [see Figure 6:1 A flow chart of technology provision, p.169]. At the second point of intervention, targeted professional learning could enable educators to question their beliefs and behaviours around their technology provision (Ertmer et al., 2012; Fisher & Wood, 2012). This re-evaluation could influence the rules and restrictions that they enforce around the children's use of the technologies.

To reiterate a key point from the literature review, our knowledge of how children engage with working technologies in their imaginative play is a significant gap in the field [see Identifying the gap, p.36]. This research extends recent understandings around technology provision that creates a picture of how children can engage with working technologies, especially in their imaginative play (See for example, Fleer, 2017; Marsh et al., 2016; Rogowsky et al., 2017). Once educators have a fuller understanding of how children engage with technologies in their imaginative play, they will be in a better position to provide these devices in ways that support children's play and learning. I have established in this thesis that children's use of working technologies in early childhood setting is an area for further educator professional learning.

For educators to begin to make changes to their teaching, they need to be challenged in their practice, so that they can consider how their espoused beliefs match their practice (Ertmer et al., 2012; Fisher & Wood, 2012). The use of video footage for practice analysis can enable educators to engage in professional reflection that is aimed at changing practice (Traum & Moran, 2016). Ertmer and colleagues (2012) and Fisher and Wood (2012) argue that the formation of a "professional learning community" (Borko, 2004, p. 6) allows educators to both evaluate their own practice and observe the practice of others and discuss what occurs. They can critically reflect on both the behaviours that they value and those that they want to change. Practice analysis conversations to discuss practice are important if educators are going to, "collectively explore ways of improving their teaching and support one another as they work to transform their practice" (Borko, 2004, p. 7). A focus group or professional learning community can provide conditions for educators to come together, where researchers can share examples of technological provision research and literature that show how technologies have successfully been integrated into early childhood education (Thoma et al., 2017). This could also allow educators to share their personal success stories and consider new ideas that may work in their own contexts. These learning networks may provide positive examples of the integration of both working and imaginative technologies in children's imaginative play and highlight what is possible.

The third point of intervention is where the children and educators' object of activities could align and where the second suggestion for professional learning fits. If educators are able to recognise and support children's technological objects of activity, they can scaffold the children's engagement and therefore, their learning. The educators in this research did not fully provide a programme based on children's interests. This idea was discussed in the results chapter in the paradox between providing a programme that is child-centred and based on children's interests versus providing one that is adult controlled [see Play-based, child-centred programmes – adult controlled, p.154]. The professional learning suggestion outlined here builds on the children's interests one step further through educator recognition of the child's object of activity and its use as a basis from which to plan for and extend activities that scaffold further learning. However, during the data collection phase I determined that educators allowed their rules and restrictions to de-privilege the children's interests and their object of activity. This de-privileging resulted in the children's ability to engage in imaginative play with technologies being constrained. The suggestion of this intervention addresses this constraint.

Educators can observe children's play with technologies and increase their understanding of how they engage with these devices and how to recognise the potential learning afforded [see Figure 6:1 A flow chart of technology provision, p.169]. While I don't believe that this point of intervention needs a specific professional learning target, educators' knowledge will be increased through the professional learning outlined for the other points of intervention. By observing children once technologies have been provided and throughout all parts illustrated in the flow chart, I think any potential professional learning would already be achieved.

The final suggestion for potential professional learning would be around the concept of interacting with children as they engage with technologies. As stated earlier, educator interactions with imaginative technologies already occurs, because educators have expertise in engaging with children during episodes of imaginative play. Here it is important to note the caution proposed by Grieshaber (2010a) that educator over-involvement in children's imaginative play can become problematic when they focus on teaching the children content knowledge through play, and thus end up taking control, removing the play element from the children's activity. Bearing this in mind, there is a focus in pre-service teacher education courses on how to engage with children during imaginative play and how to interact to ensure that the play is authentic and child driven. This study demonstrated that imaginative technologies are treated as any other props provided for imaginative play and educators felt comfortable to scaffold this type of play. Such was not the case with working technologies. In addition to their potential in supporting imaginative play, I argue that this type of play with both working and imaginative technologies could explore ideas around being ethical, digital citizens who consider the wider implications of their behaviour on others. This thesis answers the call from Scott and Marsh (2018) who propose more studies to investigate the development of children's critical digital literacy skills. They argue:

> with regard to the development of digital literacies in early years' settings, there appears to be a limited number of studies that examine young children's development of critical digital literacy skills. This clearly needs addressing if we are to enable children to become critical and engaged digital citizens who are able to navigate the complex online terrain. (p. 21)

Educator professional learning could also be designed to support children's thinking and learning in this area. Professional learning could also be designed to support educators to understand how to recognise affordances when they interact with children who are engaging with working technologies. As my findings showed, there were limited examples where an educator interacted with children while they were engaged with the working technologies. Educators' knowledge and skills need to be systematically addressed if children are to both maximise the learning potential of technologies and develop their thinking skills and dispositions to question the rules and restrictions around their use.

6.8 Conclusion

In this discussion chapter, I outlined how the provision of technologies appears to be following neoliberal thinking. I discussed how educators can push back against these agendas and consider their role in the teaching of technologies. Using a flow chart of technology provision, I illustrated how technologies are provided and the intervention points at which educators can influence children's engagement with technologies. These intervention points list opportunities that highlight to the educators when changes to their practice can result in more affordances around their technology provision for the children's imaginative play and learning. Technologies provide a unique context for teaching children to question the rules and think about the consequences of their actions on themselves and those around them. I advocate that educators take opportunities to promote learning that develop children's skills and dispositions for criticality. I concluded the chapter with some directions for professional learning which link with the four intervention points in the flow chart. Next, in the final and concluding chapter of this thesis, I begin with the research questions, how they were answered and reiterate the contribution to knowledge this thesis postulates.

Seven: Conclusion

7.1 Introduction

In the previous *Discussion* chapter [see p.167], I introduced the idea that neoliberalism influenced the way in which educators provided technologies. This idea stems from the notion that the aim of providing technologies for play and learning is to prepare young children for their future work as employable citizens; which creates paradoxical relationships between what is espoused and what is enacted in practice. I also posited that educators are victims of neoliberal pressures but show glimpses of resisting these forms of being. Focusing on the provision of technologies in the two research kindergartens, I presented an illustration of the intervention points at which professional learning could address and therefore increase the provision of devices and reduce the rules and restrictions enforced on their use. Moving on to this concluding chapter, I discuss the research aim and questions and how they were addressed within the thesis. I then state the contributions to knowledge that this thesis makes. Future research directions are then outlined and discussed.

7.2 The research questions and the answers

The early childhood field has struggled to integrate digital technologies smoothly into play-based educational settings (Aubrey & Dahl, 2014; Hedges, 2011; Mawson, 2011). Part of the reason for this has been the lack of understanding around how children use these devices in their imaginative play. My own history as an early childhood teacher led me to undertake a Masters research into how children use technologies. I had noted how a child in my class used a computer to create a story with rabbits and grass [see Personal orientation to this research, p.1]. In the conclusion of my Masters work, I proposed further research into children's use of technologies in imaginative play. Taking up this focus, I explored both children's use of working and imaginative technologies in their imaginative play and the educators' provision of these devices in play-based educational settings. In the preceding chapters I answered the two research questions:

1) What characterises children's imaginative play with working and non-working technologies?
2) What influences early childhood educators' provision of working and non-working technologies in play-based learning settings?

In the results chapter, my findings pointed to six different paradoxes at work within early childhood settings. Some of the paradoxes answered the first, the second or both of the research questions.

In answer to my first question, I illustrated how the children responded to and used the provided technologies in their imaginative play. My exploration of the affordances of the provided technologies allowed me to understand how the children navigated their early childhood environment in order to play imaginatively with technologies. The children's play was influenced by the provision of technologies. They displayed agency and adapted their own play skills to achieve their object of activity when the devices they wanted were not available. Their ability to enact the cultural behaviours that they witnessed in their everyday lives around technologies was not abandoned if the technologies were not provided. Instead, children negotiated the rules and restrictions applied to the technologies and continued their play scenarios.

The second question was answered through an exploration of the educators' provision of technologies which involved asking them why they provided them in the ways that they did. During the course of the study, the educators reflected on their technology provision. They considered making changes to how they both provided technologies in their kindergartens and the rules and restrictions they applied alongside this provision. Through reflecting on how the children engage with technologies in their play, the educators involved in this research may make changes that then, in turn, impact how the children can engage with the devices, although it is beyond the scope of this study to judge whether it is the case. The educators' provision of technologies was influenced by external forces, which included: their perceptions of parents' wishes; the perceived expectations of schools and society that they put on themselves around appropriate educator behaviour; and their perceived need to balance technology provision with play-based pedagogies.

7.3 Contribution to knowledge

The thesis makes theoretical, conceptual, methodological and practice related contributions to the early childhood field. The first contribution to knowledge this thesis makes is in relation to my conceptual framework. I combined Vygotsky's (1978) concepts of mediation and imagination with J. J. Gibson's (1979) concept of affordance to create the Imaginative Affordance Framework. This is the first time that these concepts have been brought together as a means to explore human behaviour. This new framework allowed me to investigate both the children and the educators. The framework provided nuanced descriptions of stimulus information, objects of activity, affordances and constraints in both the children's imaginative play with the working and imaginative technologies and the educators' provision of these devices. As the children or educators were mediating the various technologies, I explored the stimulus information which resulted in affordances or constraints being perceived. The identification of these features enabled me to illustrate the various elements that influence children's use of the technologies for their play and the elements that influence the educators' provision of the devices. Through the framework, I could also identify elements that were missing from the scenario or elements that, if included, may have changed either the children's ability to play imaginatively with the technologies or may have changed the educators' provision or the rules and restrictions that they applied to the devices.

The second contribution to knowledge is around the paradoxes that occurred surrounding the provision of technologies in early childhood, play-based settings. It was apparent that the promoted or espoused rhetoric is often different to the realities of the participants' lived experiences. For instance, working technologies may be viewed as solitary devices (Lentz, Seo, & Gruner, 2014; Marsh et al., 2005) that negatively impact on children's social skills (Sigman, 2011). In contrast, my research illustrated that the children mostly used them in groups, with one child controlling the device and others standing behind to provide advice, encouragement and support, enhancing their own learning. A similar issue occurred with the discourse around the educators' provision of a play-based, child-centred programme. I found that the educators limited children's free play on technologies, even though technologies are of interest to the children and imaginative play is possible on these devices. This paradox implies that children's engagement with technologies is set up in a dichotomous relationship to traditional kindergarten activities. When these binaries are brought together, technologies can provide an additional experience within a comprehensive kindergarten programme. I propose that the discourse that sets up this binary needs to be challenged in the field of early childhood. It is time to change the rhetoric about digital technology use and appropriate for educators to acknowledge that technologies are inherent in most societies and an important part of many children's day to day lives. It is within the scope of educators to promote the affordances of technological devices to benefit children's learning.

A third contribution to knowledge made by this thesis is the finding that children demonstrate creative potential using all four ways of imagination when imaginative technologies are not provided. When the imaginative technologies were not provided by the educators the children represented or created what they needed. Their play skills determined their ability to represent or create the technologies that they needed. For instance, in order to have the ability to use another object to represent the technology a child needed for their play, the child needed to have the skill to be able to separate meaning from object (Vygotsky, 1966) [see Separating meaning from object, p.55]. This ability to create a needed technology was determined by the child's imaginative skills and their ability to engage in all four ways of imagination, especially the ability to create a new object that can feed back into reality to then be used in their play (Vygotsky, 2004) [see The fourth way of imagination, p.60].

A fourth contribution to knowledge is the creative capacity of children to engage in acts of resistance when technological provision does not meet their expectations. When the children engaged with the working technologies, they attempted to negotiate the rules and restrictions that were place on the devices by the educators. The children's behaviour with the working technologies illustrated their ability to resist the rules and restrictions surrounding the provision of the devices in order to achieve their object of activity. They perceived the affordance of the working technologies within their imaginative play and consequently negotiated the technology provision to achieve this object of activity. The rules and restrictions were enforced by the educators who, as neoliberal subjects, are influenced by their own history, society's rules of being an early childhood educator and the layer of governance, for both teaching quality and quality assurance, that is applied to their work via the curriculum and quality frameworks.

7.4 Contribution to practice and policy

As I think about my findings and contemplate what they mean for future practice and for the early childhood field, I am compelled to make recommendations that will contribute to improving practice and policy, that may result in improved technological engagement for young children. I make three broad recommendations – one related to children, one to educators and one to the wider community and policy makers.

The first relates to the children. Children will always play and they draw their inspiration from their experiences within their cultural contexts (Marsh, 2014a; Rogoff, 1990). This is not new, what is new are the cultural tools they use in their play scenarios and which they attempt to mediate through their play. The thesis provides more understanding around how children use both working and imaginative technologies in their play and this addresses a gap established earlier in the thesis. From this new knowledge comes a need to challenge children's play skills in order to development the kind of play using these new tools (technology) that Vygotsky (1966) asserted builds children's cognitive learning. I recommend children build their play skills and not just focus on the fun and enjoyment of technologies, but instead increase their learning as they have fun and enjoyment.

The other part of the recommendation related to the children involves the learning of 21st century skills. While Yelland and Gilbert (2016a) encourage educators to "be critical thinkers, creators, collaborators and effective communicators" (p. 35), I recommend children do the same. The old cliché of the 'children are our future' comes to mind here. They are our future and need to develop the skills to be successful adults who will work to sustain our planet for the generations to come. This includes encouraging children to think for themselves and to question the rules in order to learn both the reasons underpinning rules and how to make judgements about ways in which they can achieve their, and others', objects of activity in ways that they judge are moral and socially just. The adults of the future will need the skills and capacities to understand and question where appropriate the rules of the workplace and the rules that identify and shape acceptable social behaviour, again with a focus on morality and social justice.

From answering the research questions, I have come to a point where I need to draw implications from the results from my thesis. Through exploring the children's imaginative play with technologies, I have added to the pool of knowledge around how children engage with these devices and the implications technology provision has for children's play affordance. This should assist educators when they are planning their programme for children's play and learning. The recommendation is for educators to model and scaffold appropriate technology use in relation to the provision of both working and imaginative technologies and to support the children's imaginative play with these devices. This will not be successful if educators unconsciously promote neoliberal ideals and just focus on "giving them [the children] some exposure [to technologies] before they go to school"

[Vanessa, Middle interview, 8/08/14, p.8]. Instead, there is a need to question practices and put "forward new ideas, new ways of looking at things and asking difficult questions" (Sims, 2017, p. 7). In engaging in pedagogy that resists performativity demands, educators will "maintain agency and negotiate and challenge the status quo" (Kilderry, 2015a, p. 634) and this may result in technologies being provided in engaging ways that encourage and support children's their play and learning. My findings suggest that at the moment technologies and play are not fully or seamlessly integrated in play-based, early childhood settings (Yelland, 2011), and moreover the provision of technologies promotes neoliberal ideals that aim to create conforming, educated, and rule following children who are ready for their productive future employment. [Note: the idea of shaping children as rule followers is reinforced by the way in which educators governed access to the working technologies, which I discussed in 6.5, p. 177].

What I am recommending here is that educators increase their interactions with children around technologies; not only to model and scaffold appropriate technology use but to teach children concepts and further their understanding of what is possible with technologies. In the literature review, I discussed intentional teaching and the call for balancing intentional teaching and play in early childhood settings (McArdle & McWilliam, 2005). This thesis adds to the literature that calls for more educator involvement in children's technology use in order to maximise the learning potential (Plowman, 2013; Siraj-Blatchford, 2009; Stephen & Plowman, 2008). Professional learning to address this recommendation was discussed in the previous section [see What professional learning is needed?, p.185].

The final recommendation from the findings of this thesis is aimed at the wider community and policy makers. It has several parts that address the issues which impact children's technology engagement. The first relates to the "toxic effects of technology" presented in the media (Plowman, McPake, et al., 2010, p. 71) and the sensationalising of the negative impacts of technologies on young children. What the media does not include is the positives around technology engagement or that children are responding to their cultural context and the value adults place on the devices. The findings around the children's use of technologies in their imaginative play can also dispel some of the claims made that technologies are detrimental for children's social development. In doing so, this thesis can support the creation of technology related policies that promote children's social skills through the inclusion of technological play and learning. More stories are required that support parents and educators to balance children's technology use and provide technologies in ways that support play and learning.

As stated earlier, the EYLF needs to be evaluated and a second edition released that supports educators in their work with children. The educators involved in this research did not rely on the EYLF to guide or support their practice. Evaluating why that is could inform the next version and address this concern. Until technologies are seamlessly integrated into early childhood settings and in ways that support children's play and learning, more guidance is needed for educators to ensure this occurs. When the early childhood field moved to rely on social-cultural observations of children's experiences, educators had the developmental understandings required as a foundation (Edwards & Bird, 2015). The same is true for technologies. Once educators have the foundations for support children's technological play and learning, specific and detailed curriculum guidelines will not be needed, but until then, more support is required.

In the literature review, I questioned the notion that technologies are not fully integrated in early childhood settings [see Technology integration: what stops educators?, p.29]. The use of the term integration, conjures thoughts of combining two separate and perhaps oppositional ideas, where they are still somewhat separate. Instead, I believe technologies need to be *synthesised* into early childhood practice, where their combining creates a unified whole. By synthesising technologies, they would not be seen as an additional activity, rather they could be viewed as another item in the early childhood setting and a potential learning tool for children. Outlined in the discussion chapter [see What professional learning is needed?, p.185], was the suggested professional learning that targets technology provision. One of the suggestions included where educators could share stories of successful technology synthesising to raise their consciousness and make sustained changes to their practice (MacNaughton, 2005). By reflecting on their own practice, change may occur. Fisher and Wood (2012) explain how the process of change can occur when all influence elements are taken into account:

> sustained change is more likely to occur where practitioners are encouraged to make explicit their implicitly held beliefs, and to open these to critical reflection in ways that enable them to co-construct new knowledge that will underpin changes in beliefs and practices. (p. 127)

Early childhood education is not a static process, curricula and practices need to change in response to changes in society and from discoveries made through research. MacNaughton (2007) contends that educators need to continually change their everyday teaching practices through personal reflection and in response to changes in their wider community. This has not been occurring in response to technologies. Instead, the slippage between children's and educators' understandings of technologies has resulted in the two ends of dialectical continuum remaining poles apart.

7.5 Future research directions

Throughout the discussion chapter I outlined several suggestions for further research that could support the seamless embedding of technologies in early childhood settings. These included: further exploration of children's use of working and imaginative technologies; research into how technologies can be provided to support children's play in natural environments; and investigation into educators' understandings of play and learning with technologies. While the focus of this research has been to work directly with children, I realise that researching with and about the educators' practice is a valuable exercise that could have a ripple effect on children and early childhood programming that addresses their needs. In this next section, I present suggestions for further research directions that focus on both children's learning and educators' practice.

The first future research projects could focus on children's imaginative play with both working and imaginative technologies. Firstly, a study similar to this one, could be conducted where working technologies are provided without restrictions imposed. I envision provision would be a manner similar to the ways in which other experiences within early childhood programmes are offered, where educators set up the activity and then observe how the children interact with it during free play time. This would further validate the findings of this study and provide additional knowledge to support educators to provide working technologies for children's imaginative play. An exploration of the characteristics of different types of apps that promote imaginative play could assist researchers to develop a guide for educators to assist them in their selection of suitable types of apps. As part of the research or a separate project, I recommend an exploration of children's play skills to determine the ones that are needed for imaginative play with working technologies. This research could support the conceptualisation of strategies that educators could use to support the children's play.

In relation to the imaginative technologies, there could be further research into how the children represent or create the technologies they need when the appropriate one is not provided. Again, I would investigate ways for educators to support the development of the necessary play skills and ways to scaffold and provide encouragement to do so.

The next suggested area of research would be around the ways technologies can support or enhance nature play. As discussed in the results chapter, the paradox around technological play and nature play has been fuelled by a concern that technologies are taking children away from natural environments [see Nature discourse – technologies as not natural, p.157]. I suggest that researchers could explore the ways in which technologies can be used in natural environments and the ways that children's engagement with these devices can support their play and learning in natural environments. Rather than being seen as an either-or scenario, I argue that technologies and nature can complement each other and used in ways that support children's play and learning.

Another suggested research direction is into educators' view of play with technologies and more precisely how they recognise children's behaviour with technologies as play. The notion that educators do not recognise children's technological play as fitting with their current understandings of what constitutes 'real' play is demonstrated in the findings of this thesis and supported by authors questioning what is digital play in current literature (Edwards & Bird, 2015; Marsh et al., 2016). With children's interest in technologies, this is a concern and warrants further research. If technologies are to be fully synthesised into early childhood settings, educators need to be supported to recognise the learning potential that these tools have. They may then be more willing to provide technologies and in ways that meet the children's needs. This thesis could be used by educators as an illustration of how children can engage with technologies in ways that enable the potential imaginative play to be unleashed. The findings could support educators to make decisions about intentional teaching and inform their interactions with children as they engage with technologies. I propose a further research project that aims to explore educators' understandings of the links between children's play with technologies and their own learning with these devices. The outcomes of the study could address ways to support educators in their planning and practice for technological play and learning.

As the Imaginative Affordance Framework is pioneering work in the field and there is no research into its use as a heuristic, I propose further investigations where it could inform theoretical, conceptual, and methodological frameworks. There is potential for it to be used across the early childhood and schooling sectors to observe and understand both children's and educators' behaviour in a variety of disciplines. An intervention project could start with an educator workshop which provided professional learning on the theories behind the framework. Then educators could be given copies of the framework to take back to the centres to use in their programming and planning. The framework could be used as a way to explore activities from both the children and the educators' points of view. The framework could be used to establish if there are elements missing, if the children's and educators' objects of activities align and if the objects or tools provided are actually affording or constraining the children's ability to engage with them for play and learning. A research study into the framework could also establish to a degree to which the framework is useful to affect pedagogical change and if any adaptations are required for it to be more effective.

I propose that the results of this thesis could be used to design and develop a unit of study for pre-service teachers. This would aim to increase educator knowledge of play-based learning with technologies through an intervention when students are learning to teach and become educators, would mean as pre-service teachers venture out into the field, they would have an increased knowledge of how children use technologies in their play and ways to scaffold and support their play. The Imaginative Affordance Framework could also be presented as a way to explore what is occurring for both the children and the educators and for pre-service teachers to recognise what is missing in programmes they observe as part of their education.

7.6 Concluding comments

When I began this PhD research journey, I wanted to focus on the children, their play and experiences with technologies. I soon discovered the influence that educators had on children's play experiences through the provision of working and imaginative technologies. I also recognised with surprise the children's responses to what was provided or in most cases, not provided. Children worked around the imposed rules and restrictions to represent, create or negotiate them, in order to play agentically. I find this quite inspiring. The children perceived imaginative affordances and used their creativity and imagination skills to play and create what they needed to play, which contradicts rhetoric in the literature that technologies are damaging children's imaginative play skills and instead leaves me with faith in the future of play, and children.

The title I chose for this thesis reflects the ability of children to perceive affordance with both the working and imaginative technologies – "*This is pretend. We are just playing*." It is an adult interpretation of the place technologies have in early childhood settings which limits children's ability to play imaginatively. While many educators conceive that technologies have a negative effect on children's play skills, I see positive possibilities for sophisticated learning. I maintain that children exhibit mature play skills and use their imaginations to create the props that they need for play scenarios. I remember as a child making cars out of slippers and beds out of pillows for my dolls. Today's children make video cameras out of boxes and mobiles phones out of blocks. Children's imaginative play is a reflection of the cultural experiences of the context and the point in time in which it is occurring. If educators are encouraged to develop the skills to support this kind of play, it will benefit the children they teach. The thesis findings detail a plethora of ways that children can be encouraged to engage with the affordances offered by technologies. These new understandings could result in technologies being provided in ways that open up new possibilities for children's imaginative play and learning.

References

Agbenyega, J. S. (2014). Beyond Alienation: Unpacking the methodological issues in visual research with children. In M. Fleer & A. Ridgeway (Eds.), *Visual Methodologies and Digital Tools for Researching with Young Children. Transforming Visuality* (pp. 153-168). Cham, Switzerland: Springer.

Akcaoglu, M. (2014). Learning problem-solving through making games at the game design and learning summer program. *Educational Technology Research and Development, 62*(5), 583-600. doi:10.1007/s11423-014-9347-4

Aladé, F., Lauricella, A. R., Beaudoin-Ryan, L., & Wartella, E. (2016). Measuring with Murray: Touchscreen technology and preschoolers' STEM learning. *Computers in Human Behavior, 62*(September 2016), 433-441. doi:10.1016/j.chb.2016.03.080

Alder, P. A., & Alder, P. (1987). *Membership Roles in Field Research*. Thousand Oaks, CA: SAGE Publications.

Aldhafeeri, F., Palaiologou, I., & Folorunsho, A. (2016). Integration of digital technologies into play-based pedagogy in Kuwaiti early childhood education: teachers' views, attitudes and aptitudes. *International Journal of Early Years Education, 24*(3), 342-360. doi:10.1080/09669760.2016.1172477

Alper, M. (2011). Developmentally appropriate New Media Literacies: Supporting cultural competencies and social skills in early childhood education. *Journal of Early Childhood Literacy*. doi:10.1177/1468798411430101

American Academy of Pediatrics. (2001). Children, adolescents, and television. *Paediatrics, 107*(2), 423-426. doi:10.1542/peds.107.2.423

American Academy of Pediatrics. (2013). Children, adolescents, and the media. *Pediatrics, 132*(5), 958-961. doi:10.1542/peds.2013-2656

American Academy of Pediatrics. (2016). Children and Adolescents and Digital Media. *Pediatrics, 138*(5), e2-e18. doi:10.1542/peds.2013-2656

Anderson-Lopez, K., & Lopez, R. (2013). Let It Go (Performed by Demi Lovato). On *Frozen* [CD]. Burbank, CA: Wonderland Music Company, The Disney Music Group.

Anning, A., Cullen, J., & Fleer, M. (Eds.). (2009). *Early Childhood Education: Society and Culture* (2nd ed.). London, England: SAGE Publications.

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), 97-115. doi:10.1080/09669760.2013.772049

Arnott, L. (2016). An ecological exploration of young children's digital play: framing children's social experiences with technologies in early childhood. *Early Years*, 1-18. doi:10.1080/09575146.2016.1181049

Arnott, L. (2017). Introduction. In L. Arnott (Ed.), *Digital Technologies and Learning in the Early Years* (pp. 1-4). London, England: Sage Publishing.

Arnott, L. (2018). Children's negotiation tactics and socio-emotional self-regulation in child-led play experiences: the influence of the preschool pedagogic culture. *Early Child Development and Care*, 1-15. doi:10.1080/03004430.2018.1443919

Arthur, L., Beecher, B., Death, E., Dockett, S., & Farmer, S. (2017). *Programming and Planning in Early Childhood Settings* (7th ed.). South Melbourne, Australia: Cengage Learning.

Atkinson, P., Coffey, A., Delamont, S., Lofland, J., & Lofland, L. (Eds.). (2001). *Handbook of Ethnography*. London, England: SAGE Publications.

Atkinson-Lopez, S. (2010). Interviewing adults in an Indigenous community. In G. MacNaughton, S. A. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood*

Research. International Perspectives on Theory & Practice (pp. 261-270). Maidenhead, England: Open University press.
Aubrey, C., & Dahl, S. (2008). *A review of the evidence of the use of ICT in the Early Years Foundation Stage* Retrieved from http://dera.ioe.ac.uk/id/eprint/1631
Aubrey, C., & Dahl, S. (2014). The confidence and competence in information and communication technologies of practitioners, parents and young children in the Early Years Foundation Stage. *Early Years, 34*(1), 94-108. doi:10.1080/09575146.2013.792789
Australian Catholic University [ACU]. (2007). *Code of Conduct for Research*. Brisbane, Australia: Australian Catholic University Retrieved from http://www.acu.edu.au/__data/assets/pdf_file/0004/175207/ACU_National_Code_of_Conduct_for_Research_2005.pdf.
Australian Children's Education and Care Quality Authority [ACECQA]. (2018). *Guide to the National Quality Standard*. Australian Children's Education and Care Quality Authority (ACECQA) Retrieved from https://www.acecqa.gov.au/nqf/about/guide.
Baerentsen, K. B., & Trettvik, J. (2002). *An activity theory approach to affordance*. Paper presented at the Proceedings of the second Nordic conference on Human-computer interaction, Aarhus, Denmark.
Bailey, D., Hufford, M. M. C., Emmerson, M. S., & Eckert, S. A. (2017). Identifying and Living Leadership in the Lives of Prekindergarten Through 4th-Grade Girls: The Story of One Intentional Leadership Identity Development Program. *Journal of Research in Childhood Education*, 1-21. doi:10.1080/02568543.2017.1344751
Ball, S. J. (2003). The teacher's soul and the terrors of performativity. *Journal of Education Policy, 18*(2), 215-228. doi:10.1080/0268093022000043065
Ball, S. J. (2016). Neoliberal education? Confronting the slouching beast. *Policy Futures in Education, 14*(8), 1046-1059. doi:10.1177/1478210316664259
Bandura, A. (1977). *Social learning theory*. Oxford, England: Prentice-Hall.
Baptiste, I. (2001). Qualitative Data Analysis: Common Phases, Strategic Differences. *Forum : Qualitative Social Research, 2*(3). Retrieved from http://search.proquest.com.ezproxy.une.edu.au/docview/867758767?accountid=17227
Barron, B., Cayton-Hodges, G., Bofferding, L., Copple, C., Darling-Hammond, L., & Levine, M. H. (2011). *Take a giant step: A blueprint for teaching children in a digital age*. Stanford, CA: The Joan Ganz Cooney Centre at the Sesame Street Workshop.
Barron, I. (2013). The potential and challenges of critical realist ethnography. *International Journal of Research & Method in Education, 36*(2), 117-130. doi:10.1080/1743727X.2012.683634
Bauman, Z. (2000). *Liquid Modernity*. Cambridge, England: Polity Press.
Bauman, Z. (2004). *Identity*. Cambridge, England: Polity Press.
Beastall, L. (2006). Enchanting a disenchanted child: revolutionising the means of education using Information and Communication Technology and e-learning. *British Journal of Sociology of Education, 27*(1), 97-110.
Berman, J., & Smyth, R. (2015). Conceptual frameworks in the doctoral research process: a pedagogical model. *Innovations in Education and Teaching International, 52*(2), 125-136. doi:10.1080/14703297.2013.809011
Bers Umaschi, M., & Horn, M. S. (2010). Tangible programming in early childhood. Revisiting developmental assumptions through new technologies. In I. R. Berson & M. J. Berson (Eds.), *High-Tech Tots: Childhood in a Digital World* (pp. 49-70). Charlotte, NC: New Age Publishing.
Bird, J. (2011). The rabbit is eating the grass. *TLN Journal, 18*(1), 38-39.

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. (2013). A world of digital possibilities. *Every Child, 19*(4), 14-15.
Bird, J., Colliver, Y., & Edwards, S. (2014). The camera is not a methodology: towards a framework for understanding young children's use of video cameras. *Early Child Development and Care, 184*(11-12), 1741-1756. doi:10.1080/03004430.2013.878711
Bird, J., & Edwards, S. (2015). Children learning to use technologies through play: A Digital Play Framework. *British Journal of Educational Technology, 46*(6), 1149-1160. doi:10.1111/bjet.12191
Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2014). Factors influencing digital technology use in early childhood education. *Computers & Education, 77*(2014), 82-90. doi:10.1016/j.compedu.2014.04.013
Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2016). The influence of TPACK contextual factors on early childhood educators' tablet computer use. *Computers & Education, 98*(July 2016), 57-69. doi:10.1016/j.compedu.2016.02.010
Blackwell, C. K., Lauricella, A. R., Wartella, E., Robb, M., & Schomburg, R. (2013). Adoption and use of technology in early education. The interplay of extrinsic barriers and teacher attitudes. *Computers & Education, 69*(2013), 310-319. doi:10.1016/j.compedu.2013.07.024
Bloome, D. (2012). Classroom ethnography. In M. Grenfell, D. Bloome, C. Hardy, K. Pahl, J. Rowsell, & B. Street (Eds.), *Language, ethnography, and education. Bridging new literacy studies and Bourdieu* (pp. 7-26). New York, NY: Routledge.
Bloomfield, B. P., Latham, Y., & Vurdubakis, T. (2010). Bodies, technologies and action possibilities: When is an affordance? *Sociology, 44*(3), 415-433. doi:10.1177/0038038510362469
Boardman, M. (2007). 'I know how much this child has learned. I have proof!' Employing digital technologies for documentation processes in kindergarten. *Australian Journal of Early Childhood, 32*(3), 59-66. Retrieved from http://search.informit.com.au/fullText
Bodrova, E., & Leong, D. (1998). Development of dramatic play in young children and its effects on self-regulation: The Vygotskian approach. *Journal of Early Childhood Teacher Education, 19*(2), 115-124.
Bodrova, E., & Leong, D. (2007). *Tools of the Mind: the Vygotskian Approach to Early Childhood Education* (2nd ed.). Upper Saddle River, NJ: Pearson Education.
Bodrova, E., & Leong, D. (2011). Revisiting Vygotskian perspectives on play and pedagogy. In S. Rogers (Ed.), *Rethinking play and pedagogy in early childhood education: concepts, contexts and cultures* (pp. 60-72). New York, NY: Routledge.
Bolstad, R. (2004). *The role and potential of ICT in early childhood education*. Wellington, New Zealand: New Zealand Council of Educational Research.
Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher, 33*(8), 3-15. doi:10.2307/3699979
Bourbour, M., & Masoumi, D. (2016). Practise what you preach: the interactive whiteboard in preschool mathematics education. *Early Child Development and Care*, 1-14. doi:10.1080/03004430.2016.1192617
Britzman, D. P. (2009). *Very Thought of Education : Psychoanalysis and the Impossible Professions*. Albany, NY: State University of New York Press.
Brooker, L. (2011). Taking children seriously: An alternative agenda for research? *Journal of Early Childhood Research, 9*(2), 137-149.

Brown, B. (2013). Ethnographic Approaches to Digital Research. In S. Price, C. Jewitt, & B. Brown (Eds.), *The SAGE Handbook of Digital Technology Research* (pp. 189-202). London, England: SAGE Publications.
Brown, J. S. (2000). Growing up digital. How the web changes work, education, and the ways people learn. *Change, March/April*, 10-20.
Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford, England: Oxford University Press.
Buckingham, D. (2007). *Beyond technology: children's learning in the age of digital culture*. Cambridge, England: Polity.
Buckingham, D. (2013). Making sense of the 'Digital Generation': Growing up with digital media. *Self & Society, 40*(3), 7-15. doi:10.1080/03060497.2013.11084274
Bundy, A., Engelen, L., Wyver, S., Tranter, P., Ragen, J., Bauman, A., . . . Naughton, G. (2017). Sydney Playground Project: A cluster-randomized trial to increase physical activity, play, and social skills. *Journal of School Health, 87*(10), 751-759. doi:10.1111/josh.12550
Burghardt, G. M. (2010). Defining and Recognizing Play. In P. Nathan & A. D. Pellegrini (Eds.), The Oxford Handbook of the Development of Play. New York, NY: Oxford University Press.
Carr, M. (2000). Technological affordance, social practice and learning narratives in an early childhood setting. *International Journal of Technology and Design Education, 10*(1), 61-80. doi:10.1023/A:1008986002620
Carr, M., Podmore, V., May, H., Cubey, P., Hatherly, A., & Macartney, B. (1999). *Learning and Teaching Stories: New Approaches to Assessment and Evaluation*. Paper presented at the AARE - NZARE Conference on Research in Education.
Carter, S. M., & Little, M. (2007). Justifying knowledge, justifying method, taking action: Epistemologies, methodologies, and methods in qualitative research. *Qualitative Health Research, 17*(10), 1316-1328. doi:10.1177/1049732307306927
Chaiklin, S., & Hedegaard, M. (Eds.). (2005). *Radical-Local Teaching and Learning for Education and Human Development*. Aarhus, Denmark: Aarhus University Press.
Chaudron, S. (2015). *Young Children (0-8) and Digital technology. A qualitative exploratory study across seven countries*. Retrieved from http://publications.jrc.ec.europa.eu/repository/handle/JRC93239
Cherner, T., Dix, J., & Lee, C. (2014). Cleaning up that mess: A framework for classifying educational apps. *Contemporary Issues in Technology and Teacher Education, 14*(2), 158-193.
Ching-Ting, H., Li, M.-C., & Chin-Chung, T. (2014). The Influence of Young Children's Use of Technology on Their Learning: A Review. *Journal of Educational Technology & Society, 17*(4), 85-99. doi:10.1046/j.0266-4909.2003.00016.x
Cicconi, M. (2014). Vygotsky meets technology: A reinvention of collaboration in the early childhood mathematics classroom. *Early Childhood Education Journal, 42*(1), 57-65.
Clement, F. J. (1981). Affective considerations in computer-based education. *Educational Technology, 21*(4), 28-32.
Clements, D., & Sarama, J. (2002). The role of technology in early childhood learning. *Teaching Children Mathematics, 8*(6), 340-345.
Coady, M. (2001). Ethics in Early Childhood Research. In G. MacNaughton, S. A. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood Research. International Perspectives on theory & practice* (pp. 73-84). Maidenhead, England: Open University Press.

Cocks, A. J. (2006). The Ethical Maze: Finding an inclusive path towards gaining children's agreement to research participation. *Childhood, 13*(2), 247-266. doi:10.1177/0907568206062942
Cole, M. (1995). Socio-cultural-histroical psychology: some general remarks and a proposal for a new kind of cultural-genetic methodology. In J. V. Wertsch, P. Del Rio, & A. Alvaez (Eds.), *Sociocultural studies of mind* (pp. 187-214). Cambridge, England: Cambridge University Press.
Cole, M. (2009). The Perils of Translation: A First Step in Reconsidering Vygotsky's Theory of Development in Relation to Formal Education. *Mind, Culture, and Activity, 16*(4), 291-295. doi:10.1080/10749030902795568
Connell, J. (2007, 9 January 2007). We are on the verge of profound change. *The Guardian*. Retrieved from http://www.johnconnell.co.uk/files/profoundchange.pdf
Corbin Dwyer, S., & Buckle, J. L. (2009). The Space Between: On Being an Insider-Outsider in Qualitative Research. *International Journal of Qualitative Methods, 8*(1), 54-63.
Cordes, C., & Miller, E. (Eds.). (2000). *Fool's Gold: a critical look at computers in childhood*. College Park, MA: Alliance for Childhood.
Correa-Chávez, M., & Rogoff, B. (2005). Cultural research has transformed our ideas of cognitive development. *International Journal of Behavioral Development, 29*(3), 7-9.
Corsaro, W. A. (1997). *The sociology of childhood* (Third ed.). Thousand Oaks, CA: Pine Forge Press.
Couse, L. J., & 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), 75-96. doi:10.1080/15391523.2010.10782562
Cox, R., Skouteris, H., Dell'Aquila, D., Hardy, L. L., & Rutherford, L. (2013). Television viewing behaviour among pre-schoolers: Implications for public health recommendations. *Journal of Paediatrics and Child Health, 49*(2), E108-E111. doi:10.1111/jpc.12041
Crescenzi, L., Jewitt, C., & Price, S. (2014). The role of touch in preschool children's learning using iPad versus paper interaction. *Australian Jounral of Language & Literacy, 37*(2), 68-95.
Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches* (3rd ed.). Los Angeles, CA: SAGE Publications.
Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory Into Practice, 39*(3), 124-130. doi:10.1207/s15430421tip3903_2
Creswell, J. W., & Planco Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
Dahlberg, G., & Moss, P. (2005). *Ethics and politics in early childhood education*. London, England: Routledge Falmer Publishers.
Daniels, H. (2001). *Vygotsky and pedagogy*. London, England: Routledge Falmer.
Daniels, H. (2005). Introduction. In H. Daniels (Ed.), *An Introduction to Vygotsky* (2nd ed., pp. 1-32). New York, NY: Routledge.
Daniels, H. (2008). *Vygotsky and Research*. Milton Park, England: Routledge.
Daniels, H., Coles, M., & Wertsch, J. V. (2007). *The Cambridge Companion to Vygotsky*. New York, NY: Cambridge University Press.
Davidsen, J., & Vanderlinde, R. (2014). Researchers and teachers learning together and from each other using video-based multimodal analysis. *British Journal of Educational Technology, 45*(3), 451-460. doi:10.1111/bjet.12141
Davies, B., & Bansel, P. (2010). Governmentality and Academic Work. Shaping the Hearts and Minds of Academic Workers. *Journal of Curriculum Theorizing, 26*(3), 5-20.

Day, S. (2012). A reflexive lens: Exploring dilemmas of qualitative methodology through the concept of reflexivity. *Qualitative Sociology Review, 8*(1), 60-85. Retrieved from http://search.proquest.com/docview/1040729617?accountid=8194

Denzin, N. K., & Lincoln, Y. (2008). *Collecting and Interpreting Qualitative Materials* (3rd ed.). Los Angeles, CA: SAGE Publications.

Denzin, N. K., & Lincoln, Y. (Eds.). (2011). *The SAGE Handbook of Qualitative Research* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Department for Education. (2012). *Statutory Framework for the Early Years Foundation Stage. Setting the Standards for Learning, Development and Care for Children from Birth to Five*. London, England: Crown.

Department of Education and Training Victoria (DETV). (2016). *The Early Years Learning and Development Framework* Retrieved from http://www.education.vic.gov.au/childhood/professionals/learning/Pages/veyldf.aspx

Department of Education Employment and Workplace Relations (DEEWR). (2009). *Belonging, Being and Becoming. The Early Years Learning Framework for Australia.* Canberra, Australia: Department of Education Employment and Workplace Relations.

Department of Health. (2017). *Australian 24-Hour Movement Guidelines for the Early Years (Birth to 5 years)*. Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#npa05

Department of Health and Ageing. (2010). Move and Play Every Day. Canberra, Australia: Commonwealth of Australia.

Dewey, J. (1938). *Experience and Education*. New York, NY: The Macmillan Company.

Dockett, S., Einarsdóttir, J., & Perry, B. (2012). Young children's decisions about research participation: opting out. *International Journal of Early Years Education, 20*(3), 244-256. doi:10.1080/09669760.2012.715405

Dockett, S., & Perry, B. (2003). Children's views and children's voices in starting school. *Australian Journal of Early Childhood, 28*(1), 12-17. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA101172893&v=2.1&u=acuni&it=r&p=AONE&sw=w&asid=1837d38536e70c4dde0dc4f26eddcd39

Donohue, C., & Schomburg, R. (2014). Teaching With Technology: Preparing Early Childhood Educators for the Digital Age. In C. Donohue (Ed.), Technology and Digital Media in the Early Years: Tools for Teaching and Learning : Tools for Teaching and Learning (pp. 36-53). New York, NY: Routledge.

Duncan, R., & Tarulli, D. (2003). Play as the leading activity of the preschool period: Insights from Vygotsky, Leont'ev and Bakhtin. *Early Education and Development, 14*(3), 271-292.

Dunn, J., Gray, C., Moffett, P., & 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*, 1-13. doi:10.1080/03004430.2016.1238824

Early Childhood Australia (ECA). (2018). Statement on young children and digital technology use. Retrieved from http://www.earlychildhoodaustralia.org.au/our-work/submissions-statements/eca-statement-young-children-digital-technology-use/

Eckhoff, A., & Urbach, J. (2008). Understanding imaginative thinking during childhood: Sociocultural conceptions of creativity and imaginative thought. *Early Childhood Education Journal, 36*, 179-185.

Eco, U. (1979). *A theory of semiotics*. Bloomington, IN: Indiana University Press.

Edwards, S. (2011). Lessons from 'a really useful engine'™: using Thomas the Tank Engine™ to examine the relationship between play as a leading activity,

imagination and reality in children's contemporary play worlds. *Cambridge Journal of Education, 41*(2), 195-210. doi:10.1080/0305764x.2011.572867
Edwards, S. (2013). Digital play in the early years: a contextual response to the problem of integrating technologies and play-based pedagogies in the early childhood curriculum. *European Early Childhood Education Research Journal, 21*(2), 199-212.
Edwards, S., & 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, 15*(2), 158-173.
Edwards, S., Henderson, M., Gronn, D., Scott, A., & Mirkhil, M. (2016). Digital disconnect or digital difference? A socio-ecological perspective on young children's technology use in the home and the early childhood centre. *Technology, Pedagogy and Education*, 1-17. doi:10.1080/1475939X.2016.1152291
Edwards, S., Nuttall, J., Mantilla, A., Wood, E., & Grieshaber, S. (2015). Digital Play: What do early childhood teachers see? In S. Bulfin, N. Johnson, & C. Bigum (Eds.), *Critical Perspectives on Technology and Education* (pp. 69-84). New York, NY: Palgrave Macmillan.
Edwards, S., Skouteris, H., Rutherford, L., & Cutter-Mackenzie, A. (2013). 'It's all about Ben10™': children's play, health and sustainability decisions in the early years. *Early Child Development and Care, 183*(2), 280-293. doi:10.1080/03004430.2012.671816
Elkonin, D. B. (2005a). Chapter 3 Theories of Play. *Journal of Russian & East European Psychology, 43*(2), 3-89. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=pbh&AN=16504717&site=ehost-live
Elkonin, D. B. (2005b). The psychology of play. Preface: the biography of this research. *Journal of Russian and East European Psychology, 43*(1), 11-21.
Elliott, S., & Chancellor, B. (2014). From forest preschool to Bush Kinder : An inspirational approach to preschool provision in Australia. *Australasian Journal of Early Childhood, 39*(4), 45-53.
Ellis, C. (2007). Telling secrets, revealing lives: Relational ethics in research with intimate others. *Qualitative Inquiry, 13*(1), 3-29. doi:10.1177/1077800406294947
Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). *Writing Ethnographic Fieldnotes*. Chicago, IL: The University of Chicago Press.
Engestrom, Y. (1987). *Learning by Expanding: An activity-theoretical approach to developmental research*. Helsinki, Finland: Orienta-Konsultit.
Engestrom, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133-156. doi:10.1080/13639080020028747
Engestrom, Y. (2015). *Learning by expanding : an activity-theoretical approach to developmental research* (Second edition. ed.). New York, NY: Cambridge University Press.
Erickson, F. (1984). What Makes School Ethnography 'Ethnographic'? *Anthropology & Education Quarterly, 15*(1), 51-66. doi:10.2307/3216442
Erikson Institute. (2016). Statement from Erikson Institute on new recommendations for technology and young children issued by the American Academy of Pediatrics [Press release]
Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61. doi:10.1007/BF02299597

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39. doi:10.1007/BF02504683

Ertmer, P. A., Gopalakrishnan, S., & Ross, E. M. (2001). Technology-using teachers: Comparing perceptions of exemplary technology use to best practice. *Journal of Research on Computing in Education, 33*(5), 1-26.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435. doi:10.1016/j.compedu.2012.02.001

Espinosa, L. M., Laffey, J. M., Whittaker, T., & Sheng, Y. (2006). Technology in the home and the achievement of young children: Findings from the early childhood longitudinal study. *Early Education and Development, 17*(3), 421-441. doi:10.1207/s15566935eed1703_5

Etherington, K. (2007). Ethical research in reflexive relationships. *Qualitative Inquiry, 13*(5), 599-616. doi:10.1177/1077800407301175

EurekaMultimedia. (2004). 101 Kid's Brainy Games [Computer Program]. Australia: Nodtronics.

Evangelou, M., Coxon, K., Sylva, K., Smith, S., & Chan, L. L. S. (2013). Seeking to engage ‘Hard-to-Reach’ families: Towards a transferable model of intervention. *Children & Society, 27*(2), 127-138. doi:10.1111/j.1099-0860.2011.00387.x

Falloon, G. (2013). Young students using iPads: App design and content influences on their learning pathways. *Computers & Education, 68*(0), 505-521. doi:10.1016/j.compedu.2013.06.006

Fenech, M., Giugni, M., & Bown, K. (2012). A critical analysis of the National Quality Framework: Mobilising for a vision for children beyond minimum standards. *Australasian Journal of Early Childhood, 37*(4), 5-14.

Fenech, M., & Lotz, M. (2016). Systems advocacy in the professional practice of early childhood teachers: from the antithetical to the ethical. *Early Years*, 1-16. doi:10.1080/09575146.2016.1209739

Fenty, N. S., & Anderson, E. M. (2014). Examining educators’ knowledge, beliefs, and practices about using technology with young children. *Journal of Early Childhood Teacher Education, 35*(2), 114-134. doi:10.1080/10901027.2014.905808

Fetterman, D. M. (1998). *Ethnography. Step by Step* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Fine, G. A., & Sandstrom, K. L. (1988). Researchers and Kids. In G. A. Fine & K. L. Sandstrom (Eds.), Knowing Children. Newbury Park, England: SAGE Publications.

Fisher, J., & Wood, E. (2012). Changing educational practice in the early years through practitioner-led action research: an Adult-Child Interaction Project. *International Journal of Early Years Education, 20*(2), 114-129. doi:10.1080/09669760.2012.715400

Flannery, L. P., & Bers, M. U. (2013). Let's dance the "robot hokey-pokey!": children's programming approaches and achievement throughout early cognitive development. *Journal of Research on Technology in Education, 46*(1), 81-101. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA349903222&v=2.1&u=acuni&it=r&p=AONE&sw=w&asid=416678fa5490565c5b45b58196c86eef

Fleer, M. (2010). *Early Learning and Development. Cultural-historical concepts in play.* Port Melbourne, Australia: Cambridge University Press.

Fleer, M. (2011). Kindergartens in cognitive times: Imagination as a dialectical relation between play and learning. *International Journal of Early Childhood, 43*(3), 245-259. doi:10.1007/s13158-011-0044-8

Fleer, M. (2017). Digital Role-Play: The Changing Conditions of Children's Play in Preschool Settings. *Mind, Culture, and Activity, 24*(1), 3-17. doi:10.1080/10749039.2016.1247456

Flewitt, R. (2005). Conducting research with young children: some ethical considerations. *Early Child Development & Care, 175*(6), 553-565.

Ford, K., Sankey, J., & Crisp, J. (2007). Development of children's assent documents using a child-centred approach. *Journal of Child Health Care, 11*(1), 19-28. doi:10.1177/1367493507073058

Furman, M., De Angelis, S., Dominguez Prost, E., & Taylor, I. (2018). Tablets as an educational tool for enhancing preschool science. *International Journal of Early Years Education*, 1-14. doi:10.1080/09669760.2018.1439368

Gall, M. D., Gall, J. P., & Borg, W. R. (Eds.). (2007). *Educational Research. An Introduction* (Eighth ed.). Boston, MA: Pearson.

Gallacher, L.-A., & Gallagher, M. (2008). Methodological immaturity in childhood research? Thinking through 'participatory methods'. *Childhood, 15*(4), 499-516.

Ganti, T. (2014). Neoliberalism. *Annual Review of Anthropology, 43*(1), 89-104. doi:10.1146/annurev-anthro-092412-155528

Gialamas, V., & Nikolopoulou, K. (2010). In-service and pre-service early childhood teachers' views and intentions about ICT use in early childhood settings: A comparative study. *Computers & Education, 55*(1), 333-341. doi:10.1016/j.compedu.2010.01.019

Gibson, E. J., & Pick, A. D. (2003). *An ecological approach to perceptual learning and development*. Oxford, England: Oxford University Press.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Boston, MA: Houghton Mifflin Company.

Giroux, H. A. (2013). Neoliberalism's War Against Teachers in Dark Times. *Cultural Studies ↔ Critical Methodologies, 13*(6), 458-468. doi:10.1177/1532708613503769

Glick, J. (2004). The History of the Development of Higher Mental Functions: Exegesis of Vygotsky's Text. In R. W. Rieber & D. K. Robinson (Eds.), *The Essential Vygotsky* (pp. 345-374). New York, NY: Kluwer Academic / Plenum Publishers.

Goncu, A., & Gaskins, S. (2012). Comparing and extending Piaget and Vygotsky's understandings of play: Symbolic play as individual, sociocultural, and educational interpretation. In A. Pellegrini (Ed.), Oxford handbook of the development of play (pp. 48-58). New York, NY: Oxford University Press.

Goodwin, K., & Highfield, K. (2012). *iTouch and iLearn: An examination of "educational" apps.* Paper presented at the Early Education and Technology for Children Conference, March 14-16, 2012., Salt Lake City, UT.

Graue, M. E., & Walsh, D. J. (1988). *Researcher Role as Context. Studying Children in Context: Theories, Methods, and Ethics*. Thousand Oaks, CA: SAGE Publications.

Gray, C., & Winter, E. (2011). The ethics of participatory research involving young children with special needs. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Children's Perspectives: debating ethics and dilemmas of educational research with young children* (pp. 26-37). Milton Park, England: Routledge.

Greenleaf, A. T., Bryant, R. M., & Pollock, J. B. (2014). Nature-Based counseling: Integrating the healing benefits of nature into practice. *International Journal for the Advancement of Counselling, 36*(2), 162-174. doi:10.1007/s10447-013-9198-4

Greeno, J. G. (1998). The situativity of knowing, learning, and research. *American Psychologist, 53*(1), 5-26.

Grieshaber, S. (2008). Interrupting stereotypes: Teaching and the education of young children. *Early Education & Development, 19*(3), 505 - 518. Retrieved from http://www.informaworld.com/10.1080/10409280802068670

Grieshaber, S. (2010a). Departures from tradition: The Early Years Learning Framework for Australia. *International Journal of Child Care and Education Policy, 4*(2), 33-44. doi:10.1080/13502930802689053

Grieshaber, S. (2010b). Equity and research design. In G. MacNaughton, S. A. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood Research. International Perspectives on Theory & Practice* (Second ed., pp. 177-192). Maidenhead, England: Open University Press.

Grix, J. (2002). Introducing students to the generic terminology of social research. *Politics, 22*(3), 175-186. doi:10.1111/1467-9256.00173

Guba, E., & Lincoln, Y. (2004). Competing Paradigms in Qualitative Research: Theories and Issues. In S. N. Hesse-Biber & P. Leavy (Eds.), *Approaches to Qualitative Research. A Reader on Theory and Practice* (pp. 17-38). New York, NY: Oxford University Press.

Guernsey, L., Levine, M., Chiong, C., & Severns, M. (2012). *Pioneering literacy in the digital wild west: Empowering parents and educators*. Retrieved from http://www.joanganzcooneycenter.org/publication/pioneering-literacy/

Guillemin, M., & Gillam, L. (2004). Ethics, reflexivity, and "ethically important moments" in research. *Qualitative Inquiry, 10*(2), 261-280. doi:10.1177/1077800403262360

Gusso, Y. (2009). Play in Different Cultures. In P. K. Smith (Ed.), Children and Play (pp. 80-98): Wiley-Blackwell.

Gutiérrez, K. D., Baquedano López, P., & Tejeda, C. (1999). Rethinking diversity: Hybridity and hybrid language practices in the third space. *Mind, Culture, and Activity, 6*(4), 286-303. doi:10.1080/10749039909524733

Hammersley, M., & Atkinson, P. (1995). *Ethnography: Principles in Practice* (3rd ed.). London, England: Routledge.

Hammond, S., Powell, S., & Smith, K. (2015). Towards mentoring as feminist praxis in early childhood education and care in England. *Early Years, 35*(2), 139-153. doi:10.1080/09575146.2015.1025370

Harcourt, D., & Conroy, H. (2005). Informed assent: ethics and processes when researching with young children. *Early Child Development & Care, 175*(6), 567-577. doi:10.1080/03004430500131353

Harcourt, D., & Conroy, H. (2011). Informed Consent. Process and Procedures in Seeking Research Partnerships With Young Children. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young children's Perspectives. Debating the ethics and dilemmas of educational research with children.* New York, NY: Taylor & Francis Routledge.

Harcourt, D., Perry, B., & Waller, T. (2011). *Researching young children's perspectives : debating the ethics and dilemmas of educational research with children*. Milton Park, England: Routledge.

Harrison, L. J. (2010). Quantitive designs and statistical analysis. In G. MacNaughton, S. A. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood Research. International Perspectives on Theory and Practice* (Second ed., pp. 127-154). Maidenhead, England: Open University Press.

Harvey, D. (2005). *Brief History of Neoliberalism*. Oxford: Oxford Oxford University Press, UK.

Harwood, D. (2010). Finding a voice for child participants within doctoral research: experiences from the field. *Australasian Journal of Early Childhood, 35*(4), 4-13. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA246534980&v=2.1&u=acuni&it=r&p=AONE&sw=w

Harwood, D., & Collier, D. R. (2017). The matter of the stick: Storying/(re)storying children's literacies in the forest. *Journal of Early Childhood Literacy, 17*(3), 336-352. doi:10.1177/1468798417712340

Hatch, J. A. (2002). *Doing qualitative research in educational settings*. Albany, NY: State University Of New York Press.

Hatzigianni, M., & Margetts, K. (2014). Parents' beliefs and evaluations of young children's computer use. *Australasian Journal of Early Childhood, 39*(4), 114-122.

Hays, D. G. (2012). *Qualitative inquiry in clinical and educational settings*. New York, NY: Guilford Press.

Healy, J. (1998). *Failure to connect: How computers affect our children's minds - for better or worse.* New York, NY: Simon & Schuster.

Hedegaard, M. (2008). The role of the researcher. In M. Hedegaard & M. Fleer (Eds.), *Studying Children. A Cultural-Historical Approach* (pp. 202-207). Maidenhead, England: Open University Press.

Hedges, H. (2011). Rethinking Sponge Bob and Ninja Turtles: Popular culture as funds of knowledge for curriculum co-construction. *Australasian Journal of Early Childhood, 36*(1), 25-29. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=61835666&site=ehost-live

Helseth, S., & Slettebø, Å. (2004). Research Involving Children: some ethical issues. *Nursing Ethics, 11*(3), 298-299. doi:10.1191/0969733004ne697oa

Henricks, T. S. (2008). Play and the rhetorics of time: Progress, regression, and the meanings of the present. In D. Kuschner (Ed.), *From Children to Red Hatters : Diverse Images and Issues of Play. Play and Culture Studies* (Vol. 8, pp. 14-38). Lanham, MD: University Press of America.

Hesse-Biber, S. N., Guba, E., & Lincoln, Y. (2004). Distinguishing Qualitative Research. In S. N. Hesse-Biber & P. Leavy (Eds.), *Approaches to Qualitative Research* (pp. 1-38). New York, NY: Oxford University Press.

Highfield, K. (2010a). Possibilities and Pitfalls of Techno-toys and Digital Play in Mathematics Learning. In M. Ebbeck & M. Waniganayake (Eds.), *Play in Early Childhood Education. Learning in Diverse Contexts* (pp. 177-196). South Melbourne, Austrlai: Oxford University Press.

Highfield, K. (2010b). Robotic Toys as a Catalyst for Mathematical Problem Solving. *Australian Primary Mathematics Classroom, 15*(2), 22-27.

Hirsh-Pasek, K., Golinkoff, R. M., Berk, L. E., & Singer, D. G. (Eds.). (2009). *A mandate for playful learning in preschool: Presenting the evidence*. New York, NY: Oxford University Press.

Holliday, A. (2007). *Doing and Writing Qualitative Research* (2nd ed.). London, England: SAGE Publications.

Holzman, L. (2006). What Kind of Theory is Activity Theory?: Introduction. *Theory & Psychology, 16*(1), 5-11. doi:10.1177/0959354306060105

Holzman, L. (2009). *Vygotsky at work and play*. New York, NY: Routledge.

House, R. (2012). The inappropriateness of ICT in early childhood. Arguments from philosophy, pedagogy, and developmental research. In S. Suggate & E. Reese (Eds.), *Contemporary Debates in Childhood Education and Development* (pp. 105-120). New York, NY: Routledge.

Howard, J., Miles, G. E., & Rees-Davies, L. (2012). Computer use within a play-based early years curriculum. *International Journal of Early Years Education, 20*(2), 175-189. doi:10.1080/09669760.2012.715241

Hu, J. (2012). *Qualified affordance-based design.* (Unpublished Thesis), Clemson University, Ann Arbor, MI. Retrieved from http://search.proquest.com/docview/1023799933?accountid=8194

Hu, X., & Yelland, N. (2017). An investigation of preservice early childhood teachers' adoption of ICT in a teaching practicum context in Hong Kong. *Journal of Early Childhood Teacher Education, 38*(3), 259-274. doi:10.1080/10901027.2017.1335664

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education, 13*(2), 277-302. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA132711919&v=2.1&u=acuni&it=r&p=AONE&sw=w&asid=a51c9b333c035e544c26e027950850fe

Hughes, P. (2001). Paradigms, methods and knowledge. In G. MacNaughton, S. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood Research. International Perspectives on Theory and Practice*. Crows Nest: Allen and Urwin.

Hutt, C. (1966). *Exploration and Play in Children.* Paper presented at the Symposia of the Zoological Society of London, London, England.

Ingleby, E. (2016). 'We don't just do what we're told to do!' Exploring pedagogical technology development needs. *International Journal of Early Years Education, 24*(1), 36-48. doi:10.1080/09669760.2015.1099038

Janesick, V. J. (2000). The Choreography of Qualitative Research Design. Minuets, Improvisions, and Crystallization. In N. K. Denzin & Y. Lincoln (Eds.), *Handbook of Qualitative Research* (2nd ed., pp. 379-400). Thousand Oaks, CA: SAGE Publications.

Japiassu, R. O. V. (2008). Pretend Play and Preschoolers. In B. Van Oers, W. Wardecker, E. Elbers, & R. Van Der Veer (Eds.), The Transformation of Learning Advances in Cultural-Historical Activity Theory. Cambridge, England: Cambridge University Press.

Jeannine St. Pierre, H. (1996). Coming to Terms: Social Constructivism. *The English Journal, 85*(1), 91-92. doi:10.2307/821136

Johnson, B., & Christensen, L. B. (2008). *Educational Research: quantitative, qualitative, and mixed approaches* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Kacoroski, J., Liddicoat, K. R., & Kerlin, S. (2016). Children's use of iPads in outdoor environmental education programs. *Applied Environmental Education & Communication, 15*(4), 301-311. doi:10.1080/1533015x.2016.1237903

Kalliala, M., & Pramling Samuelsson, I. (2014). Pedagogical documentation. *Early Years, 34*(2), 116-118. doi:10.1080/09575146.2014.906135

Karlsson, S. (2018). 'Do you know what we do when we want to play?' Children's hidden politics of resistance and struggle for play in a Swedish asylum centre. *Childhood.* doi:10.1177/0907568218769353

Kazakoff, E., Sullivan, A., & Bers, M. (2013). The effect of a classroom-based intensive robotics and programming workshop on sequencing ability in early childhood. *Early Childhood Education Journal, 41*(4), 245-255. doi:10.1007/s10643-012-0554-5

Keddie, A. (2016). Children of the market: performativity, neoliberal responsibilisation and the construction of student identities. *Oxford Review of Education, 42*(1), 108-122. doi:10.1080/03054985.2016.1142865

Kennewell, S. (2001). Using affordances and constraints to evaluate the use of information and communications technology in teaching and learning. *Journal of Information Technology for Teacher Education, 10*(1-2), 101-116. doi:10.1080/14759390100200105

Kervin, L. (2016). Powerful and playful literacy learning with digital technologies. *Australian Journal of Language & Literacy, 39*(1), 64-73.
Kilderry, A. (2015a). The intensification of performativity in early childhood education. *Journal of Curriculum Studies, 47*(5), 633-652. doi:10.1080/00220272.2015.1052850
Kilderry, A. (2015b). Intentional pedagogies: Insights from the past. *Australasian Journal of Early Childhood, 40*(3), 20-28
Kim, M. S. (2016). Uncovering one trilingual child's multi-literacies development across informal and formal learning contexts. *European Early Childhood Education Research Journal, 24*(3), 414-438. doi:10.1080/1350293X.2016.1164407
Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60-70. Retrieved from http://www.citejournal.org/volume-9/issue-1-09/general/what-is-technological-pedagogicalcontent-knowledge
Kohler Riessman, C. (2008). *Narrative Methods for the Human Sciences*. Los Angeles, CA: SAGE Publications.
Kozulin, A. (1990). *Vygotsky's psychology: a biography of ideas*. New York, NY: Harvester Wheatsheaf.
Kozulin, A. (2003). Psychological Tools and Mediated Learning. In A. Kozulin, B. Gindis, V. S. Ageyev, & S. M. Miller (Eds.), *Vygotsky's Educational Theory in Cultural Context*. New York, NY: Cambridge University Press.
Kozulin, A., Gindis, B., Ageyev, V. S., & Millier, S. M. (2003). Introduction. Sociocultural Theory and Education: Students, Teachers and Knowledge. In A. Kozulin, B. Gindis, V. S. Ageyev, & S. M. Millier (Eds.), *Vygotsky's Educational Theory in Cultural Context* (pp. 1-14). New York, NY: Cambridge University Press.
Kravstov, G. (2008). *Periodisation of Development.* Paper presented at the Vygotsky Symposium, Monash Univeristy, Melbourne.
Kravtsova, E. (2006). The concept of age-specific new psychological formations in contemporary developmental psychology. *Journal of Russian and East European Psychology, 44*(6), 6-18.
Kucirkova, N., Messer, D., Sheehy, K., & Fernández Panadero, C. (2014). Children's engagement with educational iPad apps: Insights from a Spanish classroom. *Computers & Education, 71*(0), 175-184. doi:10.1016/j.compedu.2013.10.003
Lafton, T. (2015). Digital literacy practices and pedagogical moments: Human and non-human intertwining in early childhood education. *Contemporary Issues in Early Childhood, 16*(2), 142-152. doi:10.1177/1463949115585657
Langsted, O. (1994). Looking at Quality From the Child's Perspective. In P. Moss & A. Pence (Eds.), Valuing Quality in Early Childhood Services: New Approaches to Defining Quality. London, England: SAGE Publications.
Larsson, S. (2006). Ethnography in action. How ethnography was established in Swedish educational research. *Ethnography and Education, 1*(2), 177-195.
Lauricella, A. R., Wartella, E., & Rideout, V. J. (2015). Young children's screen time: The complex role of parent and child factors. *Journal of Applied Developmental Psychology, 36*(2015), 11-17. doi:10.1016/j.appdev.2014.12.001
Laurillard, D. (2008). *Digital technologies and their role in achieving our ambitions for education*. London, England: Institute of Education.
Lawrence, S. M. (2018). Preschool children and iPads: Observations of social interactions during digital play. *Early Education and Development, 29*(2), 207-228. doi:10.1080/10409289.2017.1379303

LeCompte, M. D., & Schensul, J. J. (Eds.). (1999). *Designing and Conducting Ethnographic Research. Ethnographer's Toolkit* (Vol. One). Plymouth, England: Altamira Press.

Leech, N. L., & Onwuegbuzie, A. J. (2011). Beyond constant comparison qualitative data analysis: Using NVivo. *School Psychology Quarterly, 26*(1), 70. Retrieved from http://search.proquest.com.ezproxy.une.edu.au/docview/862146509?accountid=17227

http://primo-direct-apac.hosted.exlibrisgroup.com/openurl/61UNE/61UNE_SP??url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&sid=ProQ:ProQ%3Apsychology&atitle=Beyond+constant+comparison+qualitative+data+analysis%3A+Using+NVivo&title=School+Psychology+Quarterly&issn=10453830&date=2011-03-01&volume=26&issue=1&spage=70&au=Leech%2C+Nancy+L%3BOnwuegbuzie%2C+Anthony+J&isbn=&jtitle=School+Psychology+Quarterly&btitle=&rft_id=info:eric/&rft_id=info:doi/

Leggett, N., & Ford, M. (2013). A fine balance: understanding the roles educators and children play as intentional teachers and intentional learners within the Early Years Learning Framework. *Australasian Journal of Early Childhood, 38*(4), 42-50. Retrieved from http://www.earlychildhoodaustralia.org.au/australian_journal_of_early_childhood/ajec_index_abstracts/a-fine-balance-understanding-the-roles-educators-and-children-play-as-intentional-teachers-and-intentional-learners-within-the-early-years-learning-framework-full-free-text-available.html

Lei, J., & Zhao, Y. (2007). Technology uses and student achievement: A longitudinal study. *Computers & Education, 49*(2), 284-296. doi:10.1016/j.compedu.2005.06.013

Lentz, C. L., Seo, K. K.-J., & Gruner, B. (2014). Revisiting the early use of technology: A critical shift from "How young is too young?" to "How much is 'just right'?". *Dimensions of early childhood, 42*(1), 15-23. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=95402302&site=ehost-live

Leong, D., & Bodrova, E. (2012). Assessing and scaffolding make-believe play. *Young Children, 67*(1), 28-34.

Leont'ev, A. N. (1977). *Activity and Consciousness* Retrieved from http://www.marxists.org/archive/leontev/works/activity-consciousness.pdf

Leont'ev, A. N. (1981). *Problems of the Development of the Mind* Retrieved from www.marxists.org

Lévi-Strauss, C. (1966). *The savage mind*. Chicago, IL: University of Chicago Press.

Lichtman, M. (2013). *Qualitative Research in Education. A User's Guide*. Thousand Oaks, CA: SAGE Publications.

Lillemyr, O. F., Dockett, S., & Perry, B. (2013). Varied Perspectives on Play and Learning. Theory and Research on Early Years Education. In O. F. Lillemyr, S. Dockett, & B. Perry (Eds.), *Play and Learning in Early Years Education: International Perspectives* (pp. 1-8). Charlotte, NC: Information Age Publishing.

Lindahl, M. G., & Folkesson, A.-M. (2012). ICT in preschool: friend or foe? The significance of norms in a changing practice. *International Journal of Early Years Education, 20*(4), 422-436. doi:10.1080/09669760.2012.743876

Lindgren, A.-l. (2012). Ethical issues in pedagogical documentation: Representations of children through digital technology. *International Journal of Early Childhood, 44*(3), 327-340. Retrieved from http://search.proquest.com/docview/1197181826?accountid=8194

Liu, X., & Pange, J. (2015). Early childhood teachers' perceived barriers to ICT integration in teaching: a survey study in Mainland China. *Journal of Computers in Education, 2*(1), 61-75. doi:10.1007/s40692-014-0025-7

Livingstone, S., Marsh, J., Plowman, L., Ottovordemgentschenfelde, S., & Fletcher-Watson, B. (2015). *Young Children (0-8) and Digital Technology. A qualitative exploratory study - National report - UK*. Retrieved from

Ljung-Djärf, A. (2008). The owner, the participant and the spectator: positions and positioning in peer activity around the computer in pre-school. *Early Years, 28*(1), 61-72. doi:10.1080/09575140701846487

Llopart, M., & Esteban-Guitart, M. (2018). Funds of knowledge in 21st century societies: inclusive educational practices for under-represented students. A literature review. *Journal of Curriculum Studies, 50*(2), 145-161. doi:10.1080/00220272.2016.1247913

Lund, A. (2008). Assessment made visible: Individual and collective practices. *Mind, Culture, and Activity, 15*(1), 32-51. doi:10.1080/10749030701798623

Luria, A. R. (1979). Vygotsky *The Making of Mind* (pp. 38-57). Cambridge, England: Harvard University Press.

Macfarlane, B. (2009). *Researching with integrity: the ethics of academic inquiry*. New York, NY: Routledge.

Macfarlane, K., & Cartmel, J. (2012). Circles of change revisited: building leadership, scholarship and professional identity in the children's services sector. *Professional Development in Education, 38*(5), 845-861. doi:10.1080/19415257.2012.680603

MacNaughton, G. (2005). *Doing Foucault in early childhood studies: applying poststructural ideas*. New York, NY: Routledge.

MacNaughton, G. (2007). *Shaping Early Childhood: Learners, Curriculum and Contexts*. Maidenhead, England: McGraw-Hill Education.

Malaguzzi, L. (1998). History, ideas, and basic principles: An interview with Loris Malaguzzi. In C. Edwards, L. Gandini, & G. Forman (Eds.), *The hundred languages of children: The Reggio Emilia approach- advanced reflections* (pp. 49-97). Greenwich, CT: Ablex.

Mama, M., & Hennessy, S. (2013). Developing a typology of teacher beliefs and practices concerning classroom use of ICT. *Computers & Education, 68*(2013), 380-387. doi:10.1016/j.compedu.2013.05.022

Manches, A., Duncan, P., Plowman, L., & Sabeti, S. (2015). Three questions about the Internet of things and children. *Linking Research and Practice to Improve Learning A publication of the Association for Educational Communications & Technology, 59*(1), 76-83. doi:10.1007/s11528-014-0824-8

Mandell, N. (1988). The least-adult role in studying children. *Journal of Contemporary Ethnography, 16*(4), 433-467. doi:10.1177/0891241688164002

Marsh, J. (2010). Young children's play in online virtual worlds. *Journal of Early Childhood Research, 8*(1), 23-39.

Marsh, J. (2014a). From the wild frontier of Davy Crockett to the wintery fiords of Frozen: changes in media consumption, play and literacy from the 1950s to the 2010s. *International Journal of Play, 3*(3), 267-279. doi:10.1080/21594937.2014.975975

Marsh, J. (2014b). Media, Poplular Culture and Play. In L. Brooker, M. Blaise, & S. Edwards (Eds.), *The SAGE Handbook of Play and Learning in Early Childhood* (pp. 403-414). Los Angleles, CA: SAGE reference.

Marsh, J. (2016). The digital literacy skills and competences of children of pre-school age. *Media Education - Studies & Research, 7*(2), 17-214. doi:10.14605/MED721603

Marsh, J., Brooks, G., Hughes, J., Ritchie, L., Roberts, S., & Wright, K. (2005). *Digital Beginnings: young children's use of media, technologies and popular culture*. Retrieved from http://www.digitalbeginnings.shef.ac.uk/final-report.htm

Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., & Scott, F. (2016). Digital play: a new classification. *Early Years*, 1-12. doi:10.1080/09575146.2016.1167675

Marsh, J., Plowman, L., Yamagata-Rice, D., Bishop, J., Davenport, A., Davis, S., . . . Piras, M. (2015). *Exploring Play and Creativity in Pre-Schoolers' Use of Apps*. Sheffield, England: University of Sheffield.

Maton, K. (2003). Reflexivity, relationism, & research: Pierre Bourdieu and the epistemic conditions of social scientific knowledge. *Space and Culture, 6*(1), 52-65. doi:10.1177/1206331202238962

Mawson, B. (2011). Technological funds of knowledge in children's play: implications for early childhood educators. *Australasian Journal of Early Childhood, 36*(1), 30-35. Retrieved from http://go.galegroup.com/ps/i.do?id=GALE%7CA254244483&v=2.1&u=acuni&it=r&p=AONE&sw=w

Mayall, B. (2008). Conversations with children: Working with generational order. In P. Christensen & A. James (Eds.), *Research with children: Perspectives and practices* (pp. 109-124). New York, NY: Routledge Publishers.

McArdle, F., & McWilliam, E. (2005). From balance to blasphemy: shifting metaphors for researching early childhood education. *International Journal of Qualitative Studies in Education, 18*(3), 323-336. doi:10.1080/09518390500082376

McKendrick, J. (2009). Localities: A Holistic Frame of Reference for Appraising Social Justice in Children's Lives. In J. Qvortrup, W. Corsaro, & M.-S. Honig (Eds.), The Palgrave Handbook of Childhood Studies (pp. 238-255). New York, NY: Palgrave Macmillan.

McLachlan, C., Fleer, M., & Edwards, S. (2010). *Early childhood Curriculum. Planning, assessment and implementation*. Port Melbourne, Australia: Cambridge University Press.

McLaughlin, T., Aspden, K., & Snyder, P. (2016). Intentional teaching as a pathway to equity in early childhood education: Participation, quality, and equity. *New Zealand Journal of Educational Studies, 51*(2), 175-195.

McPake, J., Plowman, L., & Stephen, C. (2013). Pre-school children creating and communicating with digital technologies in the home. *British Journal of Educational Technology, 44*(3), 421-431. doi:10.1111/j.1467-8535.2012.01323.x

McPake, J., & Stephen, C. (2016). New technologies, old dilemmas: theoretical and practical challenges in preschool immersion playrooms. *Language and Education, 30*(2), 106-125. doi:10.1080/09500782.2015.1103257

Merchant, G. (2014). Apps, adults and young children: researching digital literacy practices in context. In R. Jones, A. Chik, & C. Hafner (Eds.), Discourse and Digital Practices: Doing discourse analysis in the digital age (pp. 144-157). Oxford, England: Taylor & Francis.

Merchant, G. (2015). Keep taking the tablets: iPads, story apps and early literacy. (Report). *Australasian Journal of Language and Literacy, 38*(1), 3-11.

Merewether, J. (2018). Listening to young children outdoors with pedagogical documentation. *International Journal of Early Years Education*, 1-19. doi:10.1080/09669760.2017.1421525

Merriam, S. B. (2009). *Qualitative Research. A Guide to Design and Implementation*. San Francisco, CA: Jossey-Bass.

Miller, J. L., Paciga, K. A., Danby, S., Beaudoin-Ryan, L., & Kaldor, T. (2017). Looking beyond swiping and tapping: Review of design and methodologies for researching

young children's use of digital technologies. *Cyberpsychology, 11*(3). doi:10.5817/CP2017-3-6
Ministry of Education New Zealand. (1996). *Te Whāriki. He whāriki matauranga mo nga mokop-una o*. Wellington, New Zealand: Learning Media.
Ministry of Education Singapore. (2012). *Nurturing Early Learners: A Framework for a Kindergarten Curriculum in Singapore*. Singapore: Preschool Education Unit.
Ministry of Social Affairs and Health. (2004). *National Curriculum Guidelines on Early Chidlhood Education and Care*. Helsinki, Finland: Ministry of Social Affairs and Health.
Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.
Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice, 31*(2), 132. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=5200140&site=ehost-live
Monahan, T., & Fisher, J. A. (2010). Benefits of 'observer effects': lessons from the field. *Qualitative Research, 10*(3), 357-376. doi:10.1177/1468794110362874
Montessori, M. (1965). *The Child* (5th ed.). Madras, India: The Theosophical Publishing House.
Moore, H. C., & Adair, J. K. (2015). "I'm just playing iPad": Comparing prekindergarteners' and preservice teachers' social interactions while using tablets for learning. *Journal of Early Childhood Teacher Education, 36*(4), 362-378. doi:10.1080/10901027.2015.1104763
Moss, P., & Petrie, P. (2002). *From children's services to children's spaces: public policy, children and childhood*. New York, NY: Routledge.
Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers & Education, 51*(4), 1523-1537. doi:10.1016/j.compedu.2008.02.003
Muir, T., Callingham, R., & Beswick, K. (2016). Using the IWB in an early years mathematics classroom: An application of the TPACK framework. *Journal of Digital Learning in Teacher Education, 32*(2), 63-72. doi:10.1080/21532974.2016.1138913
Munoz, S.-A. (2009). *Children in the outdoors: a literature review*. Retrieved from Forres, England: www.countrysiderecreation.org.uk/Children%20Outdoors.pdf.
Murray, O., & Olcese, N. (2011). Teaching and learning with iPads, ready or not? *TechTrends, 55*(6), 42-48. doi:10.1007/s11528-011-0540-6
National Heath and Medical Research Council, & Australian Research Council. (2007). *Australian Code for the Responsible Conduct of Research*. Canberra, Australia: Commonwealth of Australia Retrieved from http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/r39.pdf.
Neuman, W. L. (2011). *Social Research Methods. Qualitative and Quantitative Approaches* (Seventh ed.). Boston, MA: Pearson Education.
Neumann, M. M. (2014). An examination of touch screen tablets and emergent literacy in Australian pre-school children. *Australian Journal of Education, 58*(2), 109-122. Retrieved from http://aed.sagepub.com/content/58/2/109.abstract
Neumann, M. M. (2017a). Maternal scaffolding of preschoolers' writing using tablet and paper-pencil tasks: Relations with emergent literacy skills. *Journal of Research in Childhood Education*, 1-14. doi:10.1080/02568543.2017.1386740

Neumann, M. M. (2017b). Parent scaffolding of young children’s use of touch screen tablets. *Early Child Development and Care*, 1-11. doi:10.1080/03004430.2016.1278215
Neumann, M. M., & Neumann, D. L. (2014). Touch screen tablets and emergent literacy. *Early Childhood Education Journal, 42*(4), 231-239.
New Breed Software. (2002). Tux Paint. [Computer Program] Retrieved from www.tuxpaint.org
Newhouse, C. P. (2015). When does technology improve learning? In M. Henderson & G. Romeo (Eds.), *Teaching and Digital Technologies. Big Issues and Critical Questions* (pp. 197-213). Port melbourne, Australia: Cambridge University Press.
Nicholson, J. (2014). Hawthorne effect. In C. Clapham & J. Nicholson (Eds.), *The Concise Oxford Dictionary of Mathematics*. Oxford, England: Oxford University Press.
Nicolopoulou, A., Barbosa de Sá, A., Ilgaz, H., & Brockmeyer, C. (2009). Using the transformative power of play to educate hearts and minds: From Vygotsky to Vivian Paley and beyond. *Mind, Culture, and Activity, 17*(1), 42-58. doi:10.1080/10749030903312512
Nikolopoulou, K., & Gialamas, V. (2009). Investigating pre-service early childhood teachers’ views and intentions about integrating and using computers in early childhood settings: compilation of an instrument. *Technology, Pedagogy and Education, 18*(2), 201-219. doi:10.1080/14759390903003837
Nikolopoulou, K., & Gialamas, V. (2015). ICT and play in preschool: early childhood teachers’ beliefs and confidence. *International Journal of Early Years Education, 23*(4), 409-425. doi:10.1080/09669760.2015.1078727
Noble, W. G. (1981). Gibsonian theory and the pragmatist perspective. *Journal for the Theory of Social Behaviour, 11*(1), 65-85. doi:10.1111/j.1468-5914.1981.tb00023.x
Norman, D. A. (2002). *The Design of Everyday Things*. New York, NY: Basic Books.
Nuttall, J., & Edwards, S. (2013). Diverse theories for diverse learners? The Australian early years learning framework. In J. Georgeson & J. Payler (Eds.), *International Perspectives on Early Childhood Education and Care* (pp. 204-215). Maidenhead, England: Open University Press.
Nuttall, J., Edwards, S., Mantilla, A., Grieshaber, S., & 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), 222-235.
O'Mara, J., & Laidlaw, L. (2011). Living in the iworld: Two literacy researchers reflect on the changing texts and literacy practices of childhood. *English Teaching: Practice & Critique, 10*(4), 149-159.
Orlando, J. (2014). Veteran teachers and technology: change fatigue and knowledge insecurity influence practice. *Teachers and Teaching, 20*(4), 427-439. doi:10.1080/13540602.2014.881644
Oshlyansky, L., Thimbleby, H., & Cairns, P. (2004). *Breaking affordance: culture as context*. Paper presented at the Proceedings of the third Nordic conference on Human-computer interaction, Tampere, Finland.
Packer, M. J., & Jessie, G. (2000). Sociocultural and constructivist theories of learning: Ontology, not just epistemology. *Educational Psychologist, 35*(4), 227-241. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=pbh&AN=3933276&site=ehost-live
Palaiologou, I. (2016). Teachers’ dispositions towards the role of digital devices in play-based pedagogy in early childhood education. *Early Years*, 1-17. doi:10.1080/09575146.2016.1174816

Paradise, R., & Rogoff, B. (2009). Side by side: Learning by observing and pitching in. *Ethos, 37*(1), 102-138. doi:10.1111/j.1548-1352.2009.01033.x
Paradox. (2018)Collins Online English Dictionary. Retrieved from https://www.collinsdictionary.com.
Parette, H. P., Hourcade, J. J., Blum, C., Watts, E. H., Stoner, J. B., Wojcik, B. W., & Chrismore, S. B. (2013). Technology user groups and early childhood education: A preliminary study. *Early Childhood Education Journal, 41*(3), 171-179. doi:10.1007/s10643-012-0548-3
Parette, H. P., Quesenberry, A. C., & Blum, C. (2010). Missing the boat with technology usage in early childhood settings: A 21st century of developmentally appropriate practice. *Early Childhood Education Journal, 37*(5), 335-343.
Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3 ed.). Thousand Oaks, CA: SAGE Publications.
Pavlov, I. P. (1902). *The work of digestive glands*. London, England: Griffin.
Peep Software. (2012). Pirate Match V1.5. [Mobile Applictaion Software] Retrieved from http://itunes.apple.com
Pellegrini, A. (2009). *The Role of Play in Human Development*. New York, NY: Oxford University Press.
Pettigrew, A. M. (1990). Longitudinal field research on change: Theory and practice. *Organization Science, 1*(3), 267-292. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=heh&AN=4433675&site=ehost-live
Phelan, S. K., & Kinsella, E. A. (2013). Picture this . . . safety, dignity, and voice—ethical research with children: Practical considerations for the reflexive researcher. *Qualitative Inquiry, 19*(2), 81-90. doi:10.1177/1077800412462987
Phillips, M. (2015). Digital technology intergration. In M. Henderson & G. Romeo (Eds.), *Teaching and Digital Technologies. Big Issues and Critical Questions* (pp. 318-331). Port Melbourne, Australia: Cambridge University Press.
Piaget, J. (1964). Part I: Cognitive development in children: Piaget development and learning. *Journal of Research in Science Teaching, 2*(3), 176-186.
Pillow, W. (2003). Confession, catharsis, or cure? Rethinking the uses of reflexivity as methodological power in qualitative research. *International Journal of Qualitative Studies in Education, 16*(2), 175-196.
Pink, S. *The future of visual anthropology : engaging the senses* Retrieved from http://chishr09lsap.hosted.exlibrisgroup.com:9003/monash2?ctx_ver=Z39.88-2004
Pink, S. (2013). *Doing visual ethnography* (3rd ed.). London, England: SAGE Publications.
Plowman, L. (2003). A ‘benign addiction'? Research on ICT and pre-school children. *Journal of Computer Assisted Learning, 19*(2), 149-164.
Plowman, L. (2013). Digital media and the everyday lives of young children. In L. Whitaker (Ed.), *The Children's Media Yearbook* (pp. 135-140). London, England: Children's Media Foundation.
Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young children and technology in the home. *Children & Society, 24*(1), 63-74. doi:10.1111/j.1099-0860.2008.00180.x
Plowman, L., McPake, J., & Stephen, C. (2012). Extending opportunities for learning. The role of digital media in early education. In S. Suggate & E. Reese (Eds.), *Contemporary Debates in Childhood Education and Development* (pp. 95-104). New York, NY: Routledge.
Plowman, L., & Stephen, C. (2005). Children, play, and computers in pre-school education. *British Journal of Educational Technology, 36*(2), 145-157.

Plowman, L., & Stephen, C. (2006). *Technologies and Learning in pre-school education*. Paper presented at the American Educational Research Association, San Francisco, CA. Retrieved from: www.ioe.stir.ac.uk/staff/docs/plowmanstephen-technologies.pdf

Plowman, L., & Stephen, C. (2007). Guided interaction in pre-school settings. *Journal of Computer Assisted Learning, 23*(1), 14-26.

Plowman, L., & Stephen, C. (2008). The big picture? Video and the representation of interaction. *British Educational Research Journal, 34*(4), 541-565. doi:10.1080/01411920701609422

Plowman, L., & Stephen, C. (2013). Guided interaction: exploring how adults can support children's learning with technology in preschool settings. *Hong Kong Journal of Early Childhood, 12*(1), 15-22.

Plowman, L., Stephen, C., & McPake, J. (2010a). *Growing Up with Technology. Young children learning in a digital world.* London, England: Routledge.

Plowman, L., Stephen, C., & McPake, J. (2010b). Supporting young children's learning with technology at home and in preschool. *Research Papers in Education, 25*(1), 93-113.

Plowman, L., & Stevenson, O. (2012). Using mobile phone diaries to explore children’s everyday lives. *Childhood, 19*(4), 539-553. doi:10.1177/0907568212440014

Plowman, L., Stevenson, O., Stephen, C., & McPake, J. (2012). Preschool children’s learning with technology at home. *Computers & Education, 59*(1), 30-37.

Pols, A. J. K. (2012). Characterising affordances: The descriptions-of-affordances-model. *Design Studies, 33*(2), 113-125. doi:10.1016/j.destud.2011.07.007

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6.

Price, S., Jewitt, C., & Crescenzi, L. (2015). The role of iPads in pre-school children's mark making development. *Computers & Education, 87*(0), 131-141. doi:10.1016/j.compedu.2015.04.003

Puentedura, R. (2006). Transformation, technology, and education [Blog Post]. Retrieved from http://hippasus.com/resources/tte/.

Purcell-Gates, V. (2011). Ethnographic Research. In M. H. Mallette & N. K. Duke (Eds.), Literacy Research Methodologies (2nd ed., pp. 135-154). New York, NY: Guilford Publications. Retrieved from http://primo.unilinc.edu.au/ACU:alma7160335620002351.

QSR International. (2012). NVivo. Retrieved from http://qsrinternational.com/

Quinn, S. M. F., & Manning, J. P. (2013). Recognising the ethical implications of the use of photography in early childhood educational settings. *Contemporary Issues in Early Childhood, 14*(3), 270-278. doi:10.2304/ciec.2013.14.3.270

Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015). Mobile and interactive media use by young children: The good, the bad, and the unknown. *Pediatrics, 135*(1), 1-3. doi:10.1542/peds.2014-2251

Ratner, C. (2004). Child Psychology. Vygotsky's Conception of Psychological Development. In R. W. Rieber & D. K. Robinson (Eds.), *The essential Vygotsky* (pp. 401-414). New York, NY: Plenum Publishers.

Renold, E., Holland, S., Ross, N. J., & Hillman, A. (2008). `Becoming participant': Problematizing `informed consent' in participatory research with young people in care. *Qualitative Social Work, 7*(4), 427-447. doi:10.1177/1473325008097139

Resnick, M. (2006). Computer as paintbrush: Technology, play, and the creative society. In D. G. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play = learning: How play motivates and enhances echildren's cognitive and social-emotional growth.* New York, NY: Oxford University Press.

Reynolds, N. J. (2008). Seeking Affordances: searching for new definitions and new understandings of children's relationships with technologies in musical compositions. *Australian Educational Computing, 23*(1), 15-18. Retrieved from http://unilinc-alma-new.hosted.exlibrisgroup.com/ACU:TN_ericEJ849004
Reynolds, N. J. (2010). *Musical composition and ICT: children, computers and new musical ideas [unpublished doctoral thesis].* Retrieved from http://hdl.handle.net/11343/37021
Rich, M. (2014). Moving from child advocacy to evidence-based care for digital natives. *JAMA Pediatrics, 168*(5), 404-406. doi:10.1001/jamapediatrics.2014.55
Rideout, V. J., & Hamel, E. (2006). *The media family: Electronic media in the lives of infants, toddlers, preschoolers and their parents* Retrieved from http://kff.org
Ridgeway, A., & Quinones, G. (2012). How do early childhood students conceptualize play-based curriculum? *Australian Journal of Teacher Education (Online), 37*(12), 29-47.
Rintakorpi, K., Lipponen, L., & Reunamo, J. (2014). Documenting with parents and toddlers: a Finnish case study. *Early Years*, 1-10. doi:10.1080/09575146.2014.903233
Roberts-Holmes, G. (2013). Playful and creative ICT pedagogical framing: a nursery school case study. *Early Child Development and Care, 184*(1), 1-14. doi:10.1080/03004430.2013.772991
Robson, S. (2011). Producing and using video data with young children. A case study of ethical questions and practical consequences. In D. Harcourt, B. Perry, & T. Waller (Eds.), *Researching Young Children's Perspectives. Debating the ethics and dilemmas of educational research with children* (pp. 178-192). London, England: Routledge.
Rogers, E. M. (1965). *Diffusion of innovations*. New York, NY: Free Press.
Rogoff, B. (1990). *Apprenticeship in Thinking*. New York, NY: Oxford University Press.
Rogoff, B. (2003). *The Cultural Nature of Human Development*. New York, NY: Oxford University Press.
Rogoff, B. (2014). Learning by observing and pitching in to family and community endeavors: An orientation. *Human Development, 57*(2-3), 69-81. doi:10.1159/000356757
Rogowsky, B. A., Terwilliger, C. C., Young, C. A., & Kribbs, E. E. (2017). Playful learning with technology: the effect of computer-assisted instruction on literacy and numeracy skills of preschoolers. *International Journal of Play*, 1-21. doi:10.1080/21594937.2017.1348324
Romeo, G. (2015). Learning, teaching, technology: confusing, complicated and contested! In M. Henderson & G. Romeo (Eds.), *Teaching and Digital Technologies. Big Issues and Critical Questions* (pp. 22-34). Port Melbourne, Australia: Cambridge University Press.
Salamon, A., Sumsion, J., Press, F., & Harrison, L. (2015). Implicit theories and naïve beliefs: Using the theory of practice architectures to deconstruct the practices of early childhood educators. *Journal of Early Childhood Research, 14*(4), 431-443. doi:10.1177/1476718X14563857
Samuelsson, I. P., & Carlsson, M. A. (2008). The Playing Learning Child: Towards a pedagogy of early childhood. *Scandinavian Journal of Educational Research, 52*(6), 623-641. doi:10.1080/00313830802497265
Sanders, J. T. (1997). An ontology of affordances. *Ecological Psychology, 9*(1), 97-112.
Sandvik, M., Smordal, O., & Osterud, S. (2012). Exploring iPads in practitioners' repertoires for language learning and literacy practices in kindergarten. *Nordic Journal of Digital Literacy, 7*(3), 204-220.

Sargeant, J., & Harcourt, D. (2012). *Doing Ethical Research with Children*. Maidenhead, England: Open University Press.
Scarantino, A. (2003). Affordances explained. *Philosophy of Science, 70*(5), 949-961. doi:10.1086/377380
Schensul, S. L., Schensul, J. J., & LeCompte, M. D. (1999). *Essential ethnographic methods: Observations, interviews and questionnaires*. Plymouth, England: Altamira Press.
Scott, F., & Marsh, J. (2018). Digital literacies in early childhood. *Oxford Research Encyclopedia of Education*.
Selwyn, N. (2008). From state-of-the-art to state-of-the-actual? Introduction to a special issue. *Technology, Pedagogy and Education, 17*(2), 83-87. doi:10.1080/14759390802098573
Selwyn, N., & Facer, K. (2010). Beyond digital divide: towards an agenda for change *Handbook of research on overcoming digital divides* (pp. 1-20). Hershey, PA: Information Science Reference.
Sharp, J. L., Mobley, C., Hammond, C., Withington, C., Drew, S., Stringfield, S., & Stipanovic, N. (2012). A mixed methods sampling methodology for a multisite case study. *Journal of Mixed Methods Research, 6*(1), 34-54. doi:10.1177/1558689811417133
Sherwood, S. A. S., & Reifel, S. (2010). The Multiple Meanings of Play: Exploring Preservice Teachers' Beliefs About a Central Element of Early Childhood Education. *Journal of Early Childhood Teacher Education, 31*(4), 322-343. doi:10.1080/10901027.2010.524065
Shoukry, L., Sturm, C., & Galal-Edeen, G. H. (2015). Pre-MEGa: A Proposed Framework for the Design and Evaluation of Preschoolers' Mobile Educational Games. In T. Sobh & K. Elleithy (Eds.), Innovations and Advances in Computing, Informatics, Systems Sciences, Networking and Engineering (pp. 385-390). Basel, Switzerland: Springer International Publishing.
Sigman, A. (2011). Does not compute, revisited: screen technology in early years education. In R. House (Ed.), *Too much too soon? Essays on Early Learning and the Erosion of Childhood*. Stroud, England: Hawthorn Press.
Sims, M. (2017). Neoliberalism and early childhood. *Cogent Education, 4*. doi:10.1080/2331186X.2017.1365411
Sims, M., & Waniganayake, M. (2015). The performance of compliance in early childhood: Neoliberalism and nice ladies. *Global Studies of Childhood, 5*(3), 333-345. doi:10.1177/2043610615597154
Singer, E. (2013). Play and playfulness, basic features of early childhood education. *European Early Childhood Education Research Journal, 21*(2), 172-184. doi:10.1080/1350293X.2013.789198
Siraj-Blatchford, I. (2009). Conceptualising progression in the pedagogy of play and sustained shared thinking in early childhood education: A Vygotskian perspective. *Educational & Child Psychology, 26*(2), 77-89.
Siraj-Blatchford, I. (2010). An ethnographic approach to researching young children's learning. In G. MacNaughton, S. A. Rolfe, & I. Siraj-Blatchford (Eds.), *Doing Early Childhood Research. An International perspective on Theory & Practice* (2nd ed., pp. 271-290). Maidenhead, England: Open University Press.
Skolverket: Swedish National Agency for Education. (2010). *Curriculum for the Preschool Lpfö 98 Revised 2010*. Stockholm, Sweeden: Fritzes kundservice.
Skouteris, H., Edwards, S., Rutherford, L., Cutter-MacKenzie, A., Huang, T., & O'Connor, A. (2014). Promoting healthy eating, active play and sustainability consciousness in

early childhood curricula, addressing the Ben10? Problem: a randomised control trial. (Study protocol) (Report). *BMC Public Health, 14*, 548-554.
Slavin, R. E., & Chambers, B. (2016). Evidence-based reform: enhancing language and literacy in early childhood education. *Early Child Development and Care*, 1-7. doi:10.1080/03004430.2016.1211121
Slutsky, R., & DeShetler, L. M. (2016). How technology is transforming the ways in which children play. *Early Child Development and Care*, 1-9. doi:10.1080/03004430.2016.1157790
Smirnova, E. (2011). Character toys as psychological tools. *International Journal of Early Years Education, 19*(1), 35-43.
Somekh, B. (2006). Action Reserach and Innovation Pedagogies with ICTAction Reserach: A Methodology for Change and Development (pp. 175-195). Maidenhead, England: McGraw-Hill Education. Retrieved from www.openup.co.uk.
Spencer, R., Pryce, J. M., & Walsh, J. (2014). Philosophical Approaches to Qualitative Research. In P. Leavy (Ed.), The Oxford Handbook of Qualitative Research.
Stagg Peterson, S., Rajendram, S., & Eisazadeh, N. (2017). Multimodal meaning-making during play in two Northern Canadian Indigenous kindergarten classrooms. *Early Years*, 1-16. doi:10.1080/09575146.2017.1384994
Stephen, C., & Plowman, L. (2008). Enhancing learning with information and communication technologies in pre-school. *Early Child Development and Care, 178*(6), 637-654. doi:10.1080/03004430600869571
Stephen, C., & Plowman, L. (2014). Digital Play. In L. Brooker, M. Blaise, & S. Edwards (Eds.), *The SAGE Handbook of Play and Learning in Early Childhood* (pp. 330-341). Los Angeles, CA: SAGE reference.
Stetsenko, A. (1999). Social Interaction, Cultural tools and the Zone of Proximal Development: In Search of a Synthesis. In S. Chaiklin, M. Hedegaard, & B. Jensen (Eds.), *Activity theory and social practice* (pp. 235-253). Aarhus, Denmark: Aarhus University Press.
Stone, L. (1995). Narrative in Philosophy of Education: A Feminist Tale of "Uncertain" Knowledge. In W. Kohli (Ed.), *Critical Conversations in Philosophy Education* (pp. 173-188): Routledge.
Stonehouse, A., & Woodrow, C. (1992). Professional issues: A perspective on their place in pre-service education for early childhood. *Early Childhood Development and Care, 78*(1), 207-223.
Sullivan, A., & Bers, M. (2016). Robotics in the early childhood classroom: learning outcomes from an 8-week robotics curriculum in pre-kindergarten through second grade. *International Journal of Technology & Design Education, 26*(1), 3-20. doi:10.1007/s10798-015-9304-5
Sullivan, A., Kazakoff, E., & Bers, M. (2013). The wheels on the bot go round and round: Robotics curriculum in pre-kindergarten. *Journal of Information Technology for Teacher Education, 12*, 203-219. Retrieved from http://www.jite.org/documents/Vol12/JITEv12IIPp203-219Sullivan1257.pdf
Sumsion, J., Barnes, S., Cheeseman, S., Harrison, L., Kennedy, A., & Stonehouse, A. (2009). Insider perspectives on developing Belonging, Being & Becoming: The Early Years Learning Framework for Australia. *Australasian Journal of Early Childhood, 34*(4), 4-13. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=48298707&site=ehost-live
Sumsion, J., & Grieshaber, S. (2012). Pursuing better childhoods and futures through curriculum: Utopian visions in the development of Australia's Early Years Learning

Framework. *Global Studies of Childhood, 2*(3), 230-244. doi:10.2304/gsch.2012.2.3.230
Sumsion, J., Grieshaber, S., McArdle, F., & Shield, P. (2014). The 'state of play' in Australia: Early childhood educators and play-based learning. *Australasian Journal of Early Childhood, 39*(3), 4-13.
Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education, 57*(4), 2432-2440. doi:10.1016/j.compedu.2011.06.008
The Australian National Health and Medical Research Council (ANHMRC). (2007). *National Statement on Ethical Conduct in Human Research*. Canberra, Australia: Commonwealth of Australia Retrieved from http://www.nhmrc.gov.au/guidelines/publications/e72.
The Learning Company. (1986). Reader Rabbit Kindergarten [Computer Program]: Edutainment Software.
The New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 60-93.
Thoma, J., Hutchison, A., Johnson, D., Johnson, K., & Stromer, E. (2017). Planning for Technology Integration in a Professional Learning Community. *The Reading Teacher, 71*(2), 167-175. doi:doi:10.1002/trtr.1604
Thomas, L., Warren, E., & deVries, E. (2011). Play-based learning and intentional teaching in early childhood contexts. *Australasian Journal of Early Childhood, 36*(4), 69-75. Retrieved from http://search.informit.com.au/fullText;res=AEIPT;dn=190175
Thomson, P., & Gunter, H. (2011). Inside, outside, upside down: the fluidity of academic researcher 'identity' in working with/in school. *International Journal of Research & Method in Education, 34*(1), 17-30. doi:10.1080/1743727X.2011.552309
Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education, 59*(1), 134-144. doi:10.1016/j.compedu.2011.10.009
Townsend, M., & Weerasuriya, R. (2010). *Beyond blue to green: The benefits of contact with nature for mental health and well-being*. Melbourne, Australia: Beyond Blue Limited.
Traum, L. C., & Moran, M. J. (2016). Parents' and teachers' reflections on the process of daily transitions in an infant and toddler laboratory school. *Journal of Early Childhood Teacher Education, 37*(4), 331-350. doi:10.1080/10901027.2016.1241967
Trinh, M.-H. (1991). *When the moon waxes red: Representation, gender and cultural politics*. New York, NY: Routledge.
Underwood, M., Satterthwait, L. D., & Bartlett, H. P. (2010). Reflexivity and Minimization of the Impact of Age-Cohort Differences Between Researcher and Research Participants. *Qualitative Health Research, 20*(11), 1585-1595.
United Nations. (1989). *The United Nations Convention on the Rights of the Child*. New York, NY: UNICEF.
Van Der Veer, R. (2001). The Idea of Units of Analysis: Vygotsky's Contribution. In S. Chaiklin (Ed.), *The Theory and Practice of Cultural-Historical Psychology*. Langelandsgade: AARHUS University Press.
Van Der Veer, R. (2007). Vygotsky in Context: 1900-1935. In H. Daniels, M. Cole, & J. V. Wertsch (Eds.), *The Cambridge Companion to Vygotsky*. New York, NY: Cambridge University Press.

Van Der Veer, R. (2009). Exploring Vygotsky's Legacy: The Meaning of Mediation. In B. van Oers, E. Elbers, R. Van Der Veer, & W. Wardekker (Eds.), The Transformation of Learning (pp. 15-19): Cambridge University Press.

Van Der Veer, R., & Yasnitsky, A. (2011). Vygotsky in English: What Still Needs to Be Done. *Intergrated Psychological Behaviour, 45*, 475-493.

van Oers, B. (2003). Learning resources in the context of play. Promoting effective learning in early childhood. *European Early Childhood Education Research Journal, 11*(1), 7-26. doi:10.1080/13502930385209031

van Oers, B. (2010). Children's enculturation through play. In L. Brooker & S. Edwards (Eds.), *Engaging Play*. Maidenhead, England: Open University Press.

van Oers, B. (2012). Culture in play. In J. Valsiner (Ed.), *The Oxford Handbook of Culture and Psychology* (pp. 936-956). New York, NY: Oxford University Press.

van Oers, B. (2013). Is it play? Towards a reconceptualisation of role play from an activity theory perspective. *European Early Childhood Education Research Journal, 21*(2), 185-198. doi:10.1080/1350293X.2013.789199

Verenikina, I., & Kervin, L. (2011). iPads, digital play and preschoolers. *He Kupu, 2*(5), 4-19.

Vianna, E., & Stetsenko, A. (2006). Embracing history through transforming it. *Theory & Psychology, 16*(1), 81-108. doi:10.1177/0959354306060108

Vintimilla, C. D. (2014). Neoliberal fun and happiness in early childhood education. *Canadian Children, 39*(1), 79-87. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=95259019&site=ehost-live

Vittrup, B., Snider, S., Rose, K. K., & Rippy, J. (2014). Parental perceptions of the role of media and technology in their young children's lives. *Journal of Early Childhood Research*. doi:10.1177/1476718x14523749

Vygotsky, L. S. (1966). Play and its role in the mental development of the child. *Voprosy psikhologii, 12*(6), 62-76.

Vygotsky, L. S. (1976). Play and its role in mental development of the child (C. Mulholland, Trans.). In J. Bruner, A. Jolly, & K. Sylva (Eds.), *Play - Its Role in Development and Evolution* (pp. 537-554). New York, NY: Basic Books.

Vygotsky, L. S. (1978). *Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1979). Consciousness as a problem in the psychology of behavior. *Soviet Psychology, 17*(4), 3-35. doi:10.2753/RPO1061-040517043

Vygotsky, L. S. (1987a). Imagination and Its Development in Childhood (N. Minick, Trans.). In R. W. Rieber & A. S. Carton (Eds.), *The Collected Works of L.S. Vygotsky* (Vol. 1, pp. 339-349). New York, NY: Plenum Press.

Vygotsky, L. S. (1987b). Thinking and Speech. In R. W. Rieber & A. S. Carton (Eds.), *The Collected Works of L.S. Vygotsky. Problems of General Psychology* (Vol. 1, pp. 39-285). New York, NY: Plenum Press.

Vygotsky, L. S. (1994). The problem of the environment. In R. Van Der Veer & J. Valsiner (Eds.), *The Vygotsky Reader* (pp. 338-354). Oxford, England: Basil Blackwell Ltd.

Vygotsky, L. S. (1997a). Analysis of Higher Mental Functions. In R. W. Rieber (Ed.), *The Collected Works of L.S.Vygotsky* (Vol. 4, pp. 65-82). New York, NY: Plenum Press.

Vygotsky, L. S. (1997b). Research Method. In R. W. Rieber (Ed.), *The Collected Works of L.S.Vygotsky* (Vol. 4, pp. 27-65). New York, NY: Plenum Press.

Vygotsky, L. S. (2004). Imagination and creativity in childhood. *Journal of Russian & East European Psychology, 42*(1), 7-97.

Vygotsky, L. S., & Luria, A. R. (1993). *Studies on the history of behavior: ape, primitive, and child*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Waller, T. (2011). Digital play in the classroom. A twenty-first century pedagogy? In S. Rogers (Ed.), *Rethinkinging play and pedagogy in early childhood education: concepts, contexts and cultures* (pp. 139-151). New York, NY: Routledge.
Walsh, D. J. (2007). Using Digital Video in Field-Based Research with Children. A Primer. In J. A. Hatch (Ed.), *Early Childhood Qualitative Research* (pp. 43-62). New York, NY: Routledge.
Walter, M. (2013). The Nature of Social Science Research. In M. Walter (Ed.), *Social Research Methods* (3rd ed., pp. 1-24). South Melbourne, Australia: Oxford University Press.
Warin, J. (2011). Ethical mindfulness and reflexivity: Managing a research relationship with children and young people in a 14-year qualitative longitudinal research (QLR) study. *Qualitative Inquiry, 17*(9), 805-814. doi:10.1177/1077800411423196
Way, J., & Webb, C. (2007). A framework for analysing ICT adoption in Australian primary schools. *Australasian Journal of Educational Technology, 23*(4), 559-582. Retrieved from http://www.ascilite.org.au/ajet/ajet23/way.html
Wegner, E. (1998). *Communities of practice: learning, meaning and identity*. Cambridge, England: Cambridge University Press.
Wertsch, J. V. (2008). From social interaction to higher psychological processes. *Human Development, 51*(1), 66-79. doi:10.1159/000112532
Wertsch, J. V., Del Rio, P., & Alvaez, A. (1995). Sociocultural studies: history, action, and mediation. In J. V. Wertsch, P. Del Rio, & A. Alvaez (Eds.), *Sociocultural studies of mind* (pp. 1-36). Cambridge, England: Cambridge University Press.
Weston, M. E., & Bain, A. (2010). The end of techno-critique: the naked truth about 1:1 laptop initiatives and educational change. *Journal of Technology, Learning, and Assessment, 9*(6), 1-25.
Willett, R. (2015). Everyday game design on a school playground: children as bricoleurs. *International Journal of Play, 4*(1), 32-44. doi:10.1080/21594937.2015.1017305
Windsor, W. L. (2004). An ecological approach to semiotics. *Journal for the Theory of Social Behaviour, 34*(2), 179-198. doi:10.1111/j.0021-8308.2004.00242.x
Windsor, W. L., & de Bézenac, C. (2012). Music and affordances. *Musicae Scientiae, 16*(1), 102-120. doi:10.1177/1029864911435734
Wohlwend, K. E. (2009). Early adopters: Playing new literacies and pretending new technologies in print-centric classrooms. *Journal of Early Childhood Literacy, 9*(2), 117-140. Retrieved from http://ecl.sagepub.com/content/9/2/117.abstract
Wohlwend, K. E. (2015). One screen, many fingers: Young children's collaborative literacy play with digital puppetry apps and touchscreen technologies. *Theory Into Practice, 54*(2), 154-162. doi:10.1080/00405841.2015.1010837
Wohlwend, K. E. (2016). Who gets to play? Access, popular media and participatory literacies. *Early Years*, 1-15. doi:10.1080/09575146.2016.1219699
Wolcott, H. F. (1995). Making a study "more ethnographic". In J. Van Maanen (Ed.), *Representation in Ethnography* (pp. 79-111). Thousand Oaks, CA: SAGE Publications.
Wood, E. (2013). *Play, Learning and the Early Childhood Curriculum* (3rd ed.). Los Angeles, CA: SAGE Publications.
Wood, E., & Bennett, N. (2006). Teachers' theories of play: Constructivist or social constructivist? *Early Child Development & Care, 140*(1), 17-30.
World Economic Forum. (2018). *Readiness for the Future of Production Report 2018*. Retrieved from Geneva, Switzerland: https://www.weforum.org/reports/readiness-for-the-future-of-production-report-2018

Wragg, M. (2013). Towards an inversion of the deficit model of intervention in children's play. *European Early Childhood Education Research Journal, 21*(2), 283-291. doi:10.1080/1350293X.2013.789197

Yasnitsky, A., & Ferrari, M. (2008). From Vygotsky to Vygotskian psychology: Introduction to the history of the Kharkov School. *Journal of the History of the Behavioral Sciences, 44*(2), 119-145. doi:10.1002/jhbs.20303

Yelland, N. (1999a). Reconceptualising schooling with technology for the 21st century: images and reflections. *Information Technology in Childhood Education Annual, Annual 1999*, 39-59.

Yelland, N. (1999b). Technology as play. *Early Childhood Education Journal, 26*(4), 217-220. doi:10.1023/A:1022907505087

Yelland, N. (2011). Reconceptualising play and learning in the lives of young children. *Australasian Journal of Early Childhood, 36*(2), 4-12. Retrieved from http://www.earlychildhoodaustralia.org.au/our-publications/australasian-journal-early-childhood/ajec-archive/

Yelland, N., & Gilbert, C. (2013). *iPlay, iLearn, iGrow. Commissioned Research Report for IBM*. Retrieved from Melbourne, Australia: http://www.ipadsforeducation.vic.edu.au/userfiles/files/IBM%20Report%20iPlay,%20iLearn%20&%20iGrow.pdf

Yelland, N., & Gilbert, C. (2016a). Exploring with twenty-first century skills. *Every Child, 22*(4), 34-35.

Yelland, N., & Gilbert, C. (2016b). Learning and living in the twenty-first century. *Every Child, 22*(3), 36-37.

Yelland, N., & Kilderry, A. (2010). Becoming numerate with information and communications technologies in the twenty-first century. *International Journal of Early Years Education, 18*(2), 91-106. doi:10.1080/09669760.2010.494426

Yelland, N., & Masters, J. (2007). Rethinking scaffolding in the information age. *Computers & Education, 48*(3), 362-382. doi:10.1016/j.compedu.2005.01.010

Yin, R. K. (2011). *Qualitative Research from Start to Finish*. New York, NY: The Guildford Press.

Zevenbergen, R. (2007). Digital natives come to preschool: implications for early childhood practice. *Contemporary Issues in Early Childhood, 8*(1), 19-29. Retrieved from http://www.wwwords.co.uk/pdf/validate.asp?j=ciec&vol=8&issue=1&year=2007&article=3_Zevenbergen_CIEC_8_1_web

Zevenbergen, R., & Logan, H. (2008). Computer use by preschool children: rethinking practice as digital natives come to preschool. *Australian Journal of Early Childhood, 33*(1), 37-44. Retrieved from http://search.informit.com.au/fullTextres=AEIPTdn=167703

Zinchenko, V. P. (1995). Cultural-historical psychology and the psychological theory of activity: retrospect and prospect. In J. V. Wertsch, P. Del Rio, & A. Alvaez (Eds.), *Sociocultural studies of mind* (pp. 37-55). Cambridge, England: Cambridge University Press.

Appendices

Appendix 1 Australian Catholic University Ethics Approval

Dear Applicant,

Principal Investigator: A/Prof Susan Edwards Student Researcher: Ms Joanne Bird Ethics Register Number: 2014 03V
Project Title: Exploring how children use working and non-working digital technologies as tools in their play as a leading activity.
Risk Level: Low Risk 3
Date Approved: 18/03/2014
Ethics Clearance End Date: 31/12/2014

This email is to advise that your application has been reviewed by the Australian Catholic University's Human Research Ethics Committee and confirmed as meeting the requirements of the National Statement on Ethical Conduct in Human Research subject to the following conditions:

Written permission required from Kindergarten management.

This project has been awarded ethical clearance until 31/12/2014. In order to comply with the National Statement on Ethical Conduct in Human Research, progress reports are to be submitted on an annual basis. If an extension of time is required researchers must submit a progress report.

Whilst the data collection of your project has received ethical clearance, the decision and authority to commence may be dependent on factors beyond the remit of the ethics review process. The Chief Investigator is responsible for ensuring that appropriate permission letters are obtained, if relevant, and a copy forwarded to ACU HREC before any data collection can occur at the specified organisation. Failure to provide permission letters to ACU HREC before data collection commences is in breach of the National Statement on Ethical Conduct in Human Research and the Australian Code for the Responsible Conduct of Research.

If you require a formal approval certificate, please respond via reply email and one will be issued.

Decisions related to low risk ethical review are subject to ratification at the next available Committee meeting. You will only be contacted again in relation to this matter if the Committee raises any additional questions or concerns.

Researchers who fail to submit an appropriate progress report may have their ethical clearance revoked and/or the ethical clearances of other projects suspended. When your project has been completed please complete and submit a progress/final report form and advise us by email at your earliest convenience. The information researchers provide on the security of records, compliance with approval consent procedures and documentation and responses to special conditions is reported to the NHMRC on an annual basis. In accordance with NHMRC the ACU HREC may undertake annual audits of any projects considered to be of more than low risk.

It is the Principal Investigators / Supervisors responsibility to ensure that:
1. All serious and unexpected adverse events should be reported to the HREC with 72 hours.
2. Any changes to the protocol must be approved by the HREC by submitting a Modification Form prior to the research commencing or continuing.
3. All research participants are to be provided with a Participant Information Letter and consent form, unless otherwise agreed by the Committee.

For progress and/or final reports, please complete and submit a Progress / Final Report form:
http://www.acu.edu.au/research/support_for_researchers/human_ethics/forms

For modifications to your project, please complete and submit a Modification form:
http://www.acu.edu.au/research/support_for_researchers/human_ethics/forms

Researchers must immediately report to HREC any matter that might affect the ethical acceptability of the protocol eg : changes to protocols or unforeseen circumstances or adverse effects on participants.

Please do not hesitate to contact the office if you have any queries.

Kind regards,
Kylie
on behalf of ACU HREC Chair,

Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research) Australian Catholic University

Appendix 2 DEECD Ethics Approval

Department of Education and Early Childhood Development

Strategy and Review Group

2 Treasury Place
East Melbourne, Victoria 3002
Telephone: +61 3 9637 2000
DX 210083
GPO Box 4367
Melbourne, Victoria 3001

2013_002242

Associate Professor Suzy Edwards
Faculty of Education
Australian Catholic University
Locked Bag 4115
Fitzroy MDC
FITZROY 3065

Dear Associate Professor Edwards

Thank you for your application of 17 December 2013 in which you request permission to conduct research in Victorian government schools and/or early childhood settings titled *Exploring how children use working and non-working digital technologies as tools in their play as a leading activity.*

I am pleased to advise that on the basis of the information you have provided your research proposal is approved in principle subject to the conditions detailed below.

1. The research is conducted in accordance with the final documentation you provided to the Department of Education and Early Childhood Development.

2. Separate approval for the research needs to be sought from school principals and/or centre directors. This is to be supported by the DEECD approved documentation and, if applicable, the letter of approval from a relevant and formally constituted Human Research Ethics Committee.

3. The project is commenced within 12 months of this approval letter and any extensions or variations to your study, including those requested by an ethics committee must be submitted to the Department of Education and Early Childhood Development for its consideration before you proceed.

4. As a matter of courtesy, you advise the relevant Regional Director of the schools or governing body of the early childhood settings that you intend to approach. An outline of your research and a copy of this letter should be provided to the Regional Director or governing body.

5. You acknowledge the support of the Department of Education and Early Childhood Development in any publications arising from the research.

6. The Research Agreement conditions, which include the reporting requirements at the conclusion of your study, are upheld. A reminder will be sent for reports not submitted by the study's indicative completion date.

State Government Victoria

Appendix 3 Kindergarten Managing Body's Approval

Patrons
Hon. Alastair Nicholson, AO RFD QC
Former Chief Justice of the Family Court of Australia
Dame Beryl Beaurepaire, AC DBE
Mr Kevin Bartlett, AM

11 April 2014

Jo Bird
Faculty of Education & Arts
Australian Catholic University
Locked Bag 4115
Fitzroy MDC
Fitzroy VIC 3065

Dear Jo

Thank you for your request to engage participants from bestchance Kindergartens for your Doctor of Philosophy research "Children's play with digital technologies".

I have read and understood the Information Letter for Participants regarding the research and hereby give permission for this research to be conducted.

If you would like to discuss this further please do not hesitate to contact me on .

Yours sincerely

[redacted]

Chris
General Manager - Programs

Appendix 4 Educator Participant Information Letter and Consent Form

AUSTRALIAN CATHOLIC UNIVERSITY

EDUCATOR INFORMATION LETTER

PROJECT TITLE: Children's play with digital technologies.
PRINCIPAL INVESTIGATOR: Susan Edwards
ASSOCIATE SUPERVISIOR: Karen McLean
STUDENT RESEARCHER: Jo Bird
STUDENT'S DEGREE: Doctor of Philosophy

Dear Educator,

You are invited to participate in this research project described below because you are employed at the kindergarten in which the study will take place.

What is the project about?
The research project will explore children's use of digital technologies in the kindergarten classroom. The aim of the project is to increase the understanding of how children use both working and non-working digital technologies as tools in their imaginative play. The aim is to publish the research findings in my PhD thesis, and possible books, and/or journal articles and through conference presentations that influence technology curriculum provision. The research will give insight to the early childhood field as to how children use digital technologies in their imaginative play.

Who is undertaking the project?
This project is being conducted by Jo Bird and will form the basis for the degree of Doctor of Philosophy at Australian Catholic University under the supervision of Associate Professor Susan Edwards and Doctor Karen McLean.

Are there any risks associated with participating in this project?
There are no foreseeable risks involved with this research. Your participation will not be any different to what you do in your regular role as an educator within the regular kindergarten program.

What will I be asked to do?
The research will be conducted within the kindergarten program and children and educators will not be required to do any more than their regular participation in the program being offered. The children will be observed and video recorded as they engage with digital technologies within the kindergarten program and this is where you may be observed or video recorded by the researcher as you engage with children in their play. The researcher will spend approximately 10 hours with the group observing the children's play over a 12 week period.

What are the benefits of the research project?
While there are no benefits to the individual participants other than what they would receive in the regular kindergarten program, the general potential benefit of this research is to increase the understanding of how children use both working and non-working digital technologies in their imaginative play. These findings have the potential to inform parents, educators and policy makers leading to better technology curriculum provision.

Can I withdraw from the study?
Participation in this study is completely voluntary. You are not under any obligation to participate. Participants are free to withdraw from the research at any stage and without giving a reason. If participants withdraw from the research project it will not affect their employment or participation in the kindergarten program in any way. If you do not give consent the researcher will not video record or take written observations of you. If you do not give consent or if you decide to withdraw from the project once it has commenced any data pertaining to you will be disguised or destroyed.

Will anyone else know the results of the project?

The aim is to publish the research findings in my PhD thesis, and possible books, and/or journal articles and through conference presentations that influence technology curriculum provision. As data being collected is through video recordings, the researchers cannot guarantee participants' anonymity. Each participant can chose to use their first name or a pseudonym and these will be used when reporting data and in any publications. Recordings and images of participants will only be used in publications with the participant's consent. All data will be stored on a password protected computer and in a locked cabinet both within a locked office at the Australian Catholic University campus.

Will I be able to find out the results of the project?

A copy of the results chapter of the PhD thesis is available to all participants. Please indicate you would like to receive a copy on the consent form and provide your email or postal address to the Student Researcher on jo.bird@acu.edu.au

Who do I contact if I have questions about the project?

Any questions regarding this project should be directed to the Principal Supervisor, Associate Supervisor and the Student Researcher:

Principal Supervisor	Associate Supervisor	Student Researcher
Associate Professor Susan Edwards	Doctor Karen McLean	Jo Bird
suzy.edwards@acu.edu.au	Karen.mclean@acu.edu.au	jo.bird@acu.edu.au

What if I have a complaint or any concerns?

The study has been reviewed by the Human Research Ethics Committee at Australian Catholic University (review number 2014 03V). If you have any complaints or concerns about the conduct of the project, you may write to the Manager of the Human Research Ethics Committee care of the Office of the Deputy Vice Chancellor (Research).

Manager, Ethics
c/o Office of the Deputy Vice Chancellor (Research)
Australian Catholic University
North Sydney Campus
PO Box 968
NORTH SYDNEY, NSW 2059
Ph.: 02 9739 2519
Fax: 02 9739 2870
Email: res.ethics@acu.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

I want to participate! How do I sign up?

If you agree to participate in this project, you should sign both copies of the Consent Form, retain one copy for your records and return the other copy to the Student Researcher.

[redacted] [redacted] [redacted]

Associate Professor Suzy Edwards Doctor Karen McLean Jo Bird

2

EDUCATOR CONSENT FORM

TITLE OF PROJECT: Children's play with digital technologies.
PRINCIPAL SUPERVISOR: Susan Edwards
ASSOCIATE SUPERVISOR: Karen Mclean
STUDENT RESEARCHER: Jo Bird
PROGRAMME ENROLLED: Doctor of Philosophy

I .... (the educator) have read (or, where appropriate, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction.

I agree to participate in this research through being observed and video recorded, throughout the 12-week data collection period and know that I can withdraw my consent at any time (without adverse consequences). I understand that I may be video recorded as I interact with the children as they play.

I understand that agreeing to take part means that I am willing to:

Be observed by the researcher

☐ Yes ☐ No

Be filmed by the researcher

☐ Yes ☐ No

Be part of documented observations that may be used in the thesis, resulting publications or conference presentations.

☐ Yes ☐ No

Images taken from the video recordings of me may be used in the thesis or any resulting publications or conference presentations.

☐ Yes ☐ No

I agree to my first name to be used when reporting data

☐ Yes ☐ No

or
I want a pseudonym assigned when reporting data

☐ Yes ☐ No

(Preferred pseudonym)____

I would like a copy of the PhD results chapter and I will provide the student researcher with my email or postal address

☐ Yes ☐ No

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way and that the data I am in can be withdrawn from the project at any time of my choosing.

I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify me in any way, unless I have agreed for my first name and image to be used.

NAME: ....

SIGNATURE: .... DATE: ....

Education Victoria
Locked Bag 4115
FITZROY MDC, VIC 3065
T: (03) 9953 3247 F: (03) 9953 3475

Australian Catholic University Limited
ABN 15 050 192 660
CRICOS registered provider:
00004G, 00112C, 00873F, 00885B

Appendix 5 Parent Information for Participants and Consent Form

ACU
AUSTRALIAN CATHOLIC UNIVERSITY

PARTICIPANT INFORMATION LETTER

PROJECT TITLE: Children's play with digital technologies.
PRINCIPAL INVESTIGATOR: Susan Edwards
ASSOCIATE SUPERVISIOR: Karen McLean
STUDENT RESEARCHER: Jo Bird
STUDENT'S DEGREE: Doctor of Philosophy

Dear Parent or Guardian,

You are invited to participate in this research project described below because your child attends the kindergarten in which the study will take place.

What is the project about?
The research project will explore children's use of digital technologies in the kindergarten classroom. The aim of the project is to increase the understanding of how children use both working and non-working digital technologies as tools in their imaginative play. The aim is to publish the research findings in my PhD thesis, and possible books, and/or journal articles and through conference presentations that influence technology curriculum provision. The research will give insight to the early childhood field as to how children use digital technologies in their imaginative play.

Who is undertaking the project?
This project is being conducted by Jo Bird and will form the basis for the degree of Doctor of Philosophy at Australian Catholic University under the supervision of Associate Professor Susan Edwards and Doctor Karen McLean.

Are there any risks associated with participating in this project?
There are no foreseeable risks involved with this research. Activities and experiences are the same as your child's regular kindergarten program.

What will I be asked to do?
The research will be conducted within the kindergarten program and children will not be required to do any more than participate in the regular program being offered. The children will be observed and video recorded as they engage with digital technologies during the regular session time over a 12 week period. The researcher will spend approximately 10 hours with the group observing the children's play.

What are the benefits of the research project?
While there are no benefits to the individual participants other than what they would receive in the regular kindergarten program, the general potential benefit of this research is to increase the understanding of how children use both working and non-working digital technologies in their imaginative play. These findings have the potential to inform parents, educators and policy makers leading to better technology curriculum provision.

Can I withdraw from the study?
Participation in this study is completely voluntary. You and your child are not under any obligation to participate. Participants are free to withdraw from the research at any stage and without giving a reason. If participants withdraw from the research project it will not affect their participation in the kindergarten program in any way. If you give your consent for your child to be involved they will also be asked to give their assent via a form before data collection commences. Children will also be asked to sign an assent form at the beginning of every session.

If you do not give consent and/or you or your child decide to withdraw from the project any data pertaining to your child will be destroyed.

1

Will anyone else know the results of the project?

The aim is to publish the research findings in my PhD thesis, and possible books, and/or journal articles and through conference presentations that influence technology curriculum provision. As data being collected is through video recordings, the researchers cannot guarantee participants' anonymity. Each participant can chose to use their first name or a pseudonym and these will be used when reporting data and in any publications. Recordings and images of participants will only be used in publications with the participant's consent. All data will be stored on a password protected computer and in a locked cabinet both within a locked office at the Australian Catholic University campus.

Will I be able to find out the results of the project?

A copy of the results chapter of the PhD thesis is available to all participants. Please indicate you would like to receive a copy on the consent form and provide your email or postal address to the Student Researcher on jo.bird@acu.edu.au

Who do I contact if I have questions about the project?

Any questions regarding this project should be directed to the Principal Supervisor, Associate Supervisor and the Student Researcher:

Principal Supervisor	Associate Supervisor	Student Researcher
Associate Professor Susan Edwards	Doctor Karen McLean	Jo Bird
suzy.edwards@acu.edu.au	Karen.mclean@acu.edu.au	jo.bird@acu.edu.au

What if I have a complaint or any concerns?

The study has been reviewed by the Human Research Ethics Committee at Australian Catholic University (review number 2014 03V). If you have any complaints or concerns about the conduct of the project, you may write to the Manager of the Human Research Ethics Committee care of the Office of the Deputy Vice Chancellor (Research).

Manager, Ethics
c/o Office of the Deputy Vice Chancellor (Research)
Australian Catholic University
North Sydney Campus
PO Box 968
NORTH SYDNEY, NSW 2059
Ph.: 02 9739 2519
Fax: 02 9739 2870
Email: res.ethics@acu.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

I want to participate! How do I sign up?

If you agree to participate in this project, you should sign both copies of the Consent Form, retain one copy for your records and return the other copy to the Student Researcher.

[redacted] [redacted] [redacted]

Associate Professor Suzy Edwards ***Doctor Karen McLean*** ***Jo Bird***

AUSTRALIAN CATHOLIC UNIVERSITY

PARENT CONSENT FORM

TITLE OF PROJECT: Children's play with digital technologies.
PRINCIPALSUPERVISOR: Susan Edwards
ASSOCIATE SUPERVISOR: Karen Mclean
STUDENT RESEARCHER: Jo Bird
PROGRAMME ENROLLED: Doctor of Philosophy

I .... (the parent/guardian) have read (or, where appropriate, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction.

I agree that my child, nominated below, may participate in this research through being observed and video recorded, throughout the 12-week data collection period and I know I can withdraw my consent at any time (without adverse consequences).

I understand that agreeing to take part means that I am willing to allow

.... (insert full name of participant) to:

Be observed by the researcher

☐ Yes ☐ No

Be filmed by the researcher

☐ Yes ☐ No

Documented observations of my child may be used in the thesis or any resulting publication or conference presentations.

☐ Yes ☐ No

I agree to my child's first name to be used when reporting data

☐ Yes ☐ No

or
I want a pseudonym assigned when reporting data

☐ Yes ☐ No

(Preferred pseudonym)____

Images taken from the video recordings of my child may be used in the thesis or any resulting publications or conference presentations.

☐ Yes ☐ No

I understand that my child's participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw my child at any stage of the project without being penalised or disadvantaged in any way. I understand that the data of my child can be withdrawn from the project at any time of my choosing.

I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify my child in any way, unless I have agreed for my child's first name and image to be used.

NAME OF PARENT/GUARDIAN: ....

NAME OF CHILD: .... CHILD'S DATE OF BIRTH: ....

SIGNATURE: .... DATE: ....

Education Victoria
Locked Bag 4115
FITZROY MDC, VIC 3065
T: (03) 9953 3247 F: (03) 9953 3475

Australian Catholic University Limited
ABN 15 050 192 660
CRICOS registered provider:
00004G, 00112C, 00873F, 00885B

ACU AUSTRALIAN CATHOLIC UNIVERSITY

ACU education
Transforming learning communities

PARENT CONSENT FOR FILMING FORM

TITLE OF PROJECT: Children's play with digital technologies.
PRINCIPALSUPERVISOR: Susan Edwards
ASSOCIATE SUPERVISOR: Karen Mclean
STUDENT RESEARCHER: Jo Bird
PROGRAMME ENROLLED: Doctor of Philosophy

I .... (the parent/guardian) have read (or, where appropriate, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction.

I agree that my child, nominated below, may participate in this research through being observed and video recorded, throughout the 12-week data collection period and that I can withdraw my consent at any time (without adverse consequences).

I understand that agreeing to take part means that I am willing to allow

.... (insert full name of participant) to:

Be filmed by the researcher

☐ Yes ☐ No

Images taken from the video recordings of my child may be used in the thesis or any resulting publication or conference presentations.

☐ Yes ☐ No

I understand that my child's participation is voluntary, that we can choose not to participate in part or all of the project, and that I can withdraw my child at any stage of the project without being penalized or disadvantaged in any way and that the data of my child can be withdrawn from the project at any time of my choosing.

I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify my child in any way, unless I have agreed for my child's first name and image to be used.

NAME OF PARENT/GUARDIAN: ....

NAME OF CHILD: ....

CHILD'S DATE OF BIRTH: ....

SIGNATURE: .... DATE: ....

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CRICOS registered provider:
00004G, 00112C, 00873F, 00885B

Appendix 6 Children's Assent Form

Children's Assent Form

I am Jo a kindergarten teacher.
While you are at kindergarten, I would like to watch you play with technologies, like the computer, iPad, digital camera, keyboards and phones.

I would like to watch you play at kindergarten.

 

I would like to write down about your play.

 

I would like to record your play using a Flip camera.

 

I would like to write a book. Can I use your name in my book?

 

If no, what name can I call you in my book? ______________________

Can I take photos from the video and use your photo in my book?

 

Name:_____________________________

Thank you

Appendix 7 Children's Daily Assent Form

Children's Daily Assent Form

Today while you are at kindergarten, I would like to watch you play with technologies, like the computer, iPad, digital camera, keyboards and phones.

If you say no, you can keep playing, I will not record you.

Date: ___________

Child ___________	Child ___________	Child ___________	Child ___________	Child ___________
Child ___________	Child ___________	Child ___________	Child ___________	Child ___________
Child ___________	Child ___________	Child ___________	Child ___________	Child ___________
Child ___________	Child ___________	Child ___________	Child ___________	Child ___________
Child ___________	Child ___________	Child ___________	Child ___________	Child ___________
Child ___________	Child ___________	Child ___________	Child ___________	Child ___________

Appendix 8 Technology Audit

Kindergarten Digital Technology Audit

Name: ______________________________

Educators: ______________________________

Address: ______________________________

Phone: ______________________________

Session times:

DAY	GROUP 1	GROUP 2
MONDAY		
TUESDAY		
WEDNESDAY		
THURSDAY		
FRIDAY		
Number of children		

Digital technologies available:

WORKING	NON-WORKING
☐ Yes ☐ No iPad / tablet	☐ Yes ☐ No iPad / tablet
☐ Yes ☐ No Digital still camera	☐ Yes ☐ No Digital still camera
☐ Yes ☐ No Digital video camera	☐ Yes ☐ No Digital video camera
☐ Yes ☐ No Computer	☐ Yes ☐ No Computer
☐ Yes ☐ No iPad / tablet	☐ Yes ☐ No Keyboards
	☐ Yes ☐ No Mobile phones

Other: ....

....

....

Appendix 9 Kim's Technology Audit Answers

Kindergarten Digital Technology Audit

Name: Cosmic Kindergarten [pseudonym]

Educators: Kim Toula

Address:

Phone:

Session times:

DAY	GROUP 1	GROUP 2
MONDAY	-	
TUESDAY	9:15 - 2:15	
WEDNESDAY	9:15 - 2:15	
THURSDAY	9:15 - 2:15	
FRIDAY	-	
Number of children	30 (max)	

Digital technologies available:

WORKING	NON-WORKING
☒ Yes ☐ No iPad / tablet	☐ Yes ☒ No iPad / tablet
☒ Yes ☒ No Digital still camera	☒ Yes ☐ No Digital still camera
☐ Yes ☐ No Digital video camera	☐ Yes ☒ No Digital video camera
☒ Yes ☐ No Computer	☒ Yes ☐ No Computer / laptop
	☒ Yes ☐ No Keyboards
	☐ Yes ☒ No Mobile phones

Other: They also have non-digital still and video cameras for the children to play with.

Appendix 10 Vanessa's Technology Audit Answers

Kindergarten Digital Technology Audit

Name: Creative Kindergarten [pseudonym]

Educators: Vanessa Louise

Address:

Phone:

Session times:

DAY	GROUP 1	GROUP 2
MONDAY	11:30 - 4:30	
TUESDAY	8:30 – 1:30	
WEDNESDAY	8:30 – 1:30	
THURSDAY	11:30 - 4:30	
FRIDAY	8:30 – 1:30	
Number of children	40 (rotational)	

Digital technologies available:

WORKING	NON-WORKING
☒ Yes ☐ No iPad / tablet	☐ Yes ☒ No iPad / tablet
☒ Yes ☐ No Digital still camera	☐ Yes ☐ No Digital still camera
☐ Yes ☒ No Digital video camera	☐ Yes ☒ No Digital video camera
☒ Yes ☐ No Computer	☒ Yes ☐ No Computer
	☒ Yes ☐ No Keyboards
	☒ Yes ☐ No Mobile phones

Other: The digital still camera not all the time.

This group is rotational. Children attend for three session out of the possible five.

Appendix 11 Educators Amended Consent Form

AUSTRALIAN CATHOLIC UNIVERSITY

EDUCATOR CONSENT FORM (AMENDED)

TITLE OF PROJECT: Children's play with digital technologies.
PRINCIPAL SUPERVISOR: Susan Edwards
ASSOCIATE SUPERVISOR: Karen Mclean
STUDENT RESEARCHER: Jo Bird
PROGRAMME ENROLLED: Doctor of Philosophy

I .... (the educator) have read (or, where appropriate, have had read to me) and understood the information provided in the *Amended* Letter to the Participants. Any questions I have asked have been answered to my satisfaction.

I agree to participate in this research through being observed and video recorded, throughout the 12-week data collection period. I understand that I may be video recorded as I interact with the children as they play.

I agree to participate in semi-structured interviews with the researcher during the mid and final phases of this research project. These interviews will be video recorded. I know that I can withdraw my consent at any time (without adverse consequences).

I understand that agreeing to take part means that I am willing to:

Be observed by the researcher .... ☐ Yes ☐ No

Be filmed by the researcher.. ☐ Yes ☐ No

Be interviewed by the researcher .... ☐ Yes ☐ No

Have these interviews filmed by the researcher.. ☐ Yes ☐ No

Be part of documented observations that may be used in the thesis, resulting publications or conference presentations. .... ☐ Yes ☐ No

Images taken from the video recordings of me may be used in the thesis or any resulting publications or conference presentations. .... ☐ Yes ☐ No

I agree to my first name to be used when reporting data.................................. ☐ Yes ☐ No
or
I want a pseudonym assigned when reporting data .... ☐ Yes ☐ No
(Preferred pseudonym)____

I would like a copy of the PhD results chapter and I will provide the student researcher with my email or postal address .... ☐ Yes ☐ No

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way and that the data I am in can be withdrawn from the project at any time of my choosing.

I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify me in any way, unless I have agreed for my first name and image to be used.

NAME: ....

SIGNATURE: .... DATE: ....

Education Victoria
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Appendix 12 Educator Interview questions – Initial

Educator Interview Questions

Initial Interview

Why did you agree to this research?

So what sort of technologies do you provide for the children?

Either working or non-working?

How do you use the iPad in your program with the children?

Do the children use digital cameras to record their play or their artworks, or what they are doing or what they've constructed, buildings?

Is that something you allow them to do?

Appendix 13 Educator Interview Questions – middle

Educator Interview Questions

Middle Interview

Have you ever had any training, PD with digital technologies? In terms of general technologies, using computers, iPads, anything like that? And then specifically using them with children?

What factors influence your provision of working technologies? So in terms of working technologies?

What about with the non-working technologies? What sort of things do you think about when you provide those?

How do you introduce and scaffold the children's learning to use the various technologies, working technologies? Have you done anything to?

How do you, how do you document and assess children's use of both working and non-working digital technologies? And do you actually think about and assess, document what they do?

When children show interest in technologies, how do you incorporate it into your program?

What processes or rules do you that may influence children to use the technologies, like you personally?

Do you feel you have adequate technology in your classroom and explain what you believe?

If you could have some training in using technology within your classroom and with children, do you think that would be worthwhile and what sort of things would you be interested in learning?

What are the benefits that you see in incorporating technology with children in a kindergarten?

Appendix 14 Educator Interview Questions - after data collection

Educator Interview Questions

After data collection

Kim

Your beliefs at the beginning of the project included that technologies, in particular the computer, is a new permanent learning area; that the benefits of technologies include social skills and to reflect children's connectedness to technologies in your program, and that your fear of children breaking them effects your provision of working technologies
Is there anything you would like to add to that?

Can you think of an incident during the project that made you reflect on your beliefs about using technology?

You stated one of the benefits of digital technologies was building children's social skills, both from your previous experience and your knowledge, how do you encourage children's social skills around the working technologies and the non-working technologies?

In a previous interview we talked about ways to extend the children's play with digital technologies, the example of the children using a block as an iPad to look up recipes, has there been any other examples like that one that you extended their play or learning?

In an ideal world, where there were no restrictions on money or resources, would you provide anything different in your centre than you currently do?

Since your involvement in this project, do you have any goals or plans around your provision of both working and non-working digital technologies within your program?

Educator Interview Questions

After data collection

Vanessa

Your beliefs at the beginning of the project included technologies, in particular: limiting screen time across home and kindergarten; the societal beliefs around the provision of digital technologies; encouraging children to make the technologies they want; setting time limits; and being careful and respecting the devices.

Is there anything you would like to add to that?

Can you think of an incident during the project that made you reflect on your beliefs about using technology?

There was a session a last week where the children built a stage and the iPad was being used for the Lego song, but the children used the iPad to play games before an educator took it off them because it was a sunny day. When I had a conversation with the boys about what they were doing and why, they said they wanted to play the adult games. In kindergartens we encourage children to recreate adult behaviour and situations, for example home corner, why do you think it is discouraged around working technologies?

Last week was the first time I saw the computer and iPad in use, due to the rainy weather. I noticed the children were very keen to have turns at the start of the session but towards the end they weren't being used, if you turned them on every session, what do you think would happen?

In an ideal world, where there were no restrictions on money or resources, would you provide anything different in your centre than you currently do?

Since your involvement in this project, do you have any goals or plans around your provision of both working and non-working digital technologies within your program?

What pseudonym do you want for your preschool?

Appendix 15 Amended Parents Information for Participants' and Consent Form

AUSTRALIAN CATHOLIC UNIVERSITY

ADDITIONAL PARTICIPANT INFORMATION LETTER

PROJECT TITLE: Children's play with digital technologies.
PRINCIPAL INVESTIGATOR: Susan Edwards
ASSOCIATE SUPERVISIOR: Karen McLean
STUDENT RESEARCHER: Jo Bird
STUDENT'S DEGREE: Doctor of Philosophy

Dear Parent or Guardian,

You are invited to participate in this research project described below because your child attends the kindergarten in which the study will take place. The project is half way through and valuable data has been collected. This Information Letter and attached Consent Form are in relation to this additional component in the research project. The researcher would like to ask the children questions to understand why they select various technologies and if the provided technologies meet their imaginative play needs. This letter is to invite your child to be part of conversations with the researcher around their use of digital technologies.

The participant letter and consent form are in addition to the previous consent form and does not replace the original consent form.

What will I be asked to do?
During the kindergarten program, the researcher may engage in conversations with children about their digital technology use. The researcher will ask the children questions and may show children footage of their digital play (if consent was given in the original consent form) to stimulate their recall during the conversations. Children will be invited to complete an assent form before the conversations will be undertaken. At the beginning of every session children will be invited to draw a face to indicate their ongoing consent to participate. These conversations will be video or voice recorded.

Who is undertaking the project?
This project is being conducted by Jo Bird and will form the basis for the degree of Doctor of Philosophy at Australian Catholic University under the supervision of Associate Professor Susan Edwards and Doctor Karen McLean.

Are there any risks associated with participating in this project?
The foreseeable risks involved with this research are minimal. Activities and experiences are the same as your child's regular kindergarten program. When the researcher asks the children questions she will observe children's behaviour and follow their lead. If children do not want to answer questions the researcher will immediately cease the conversation.

What are the benefits of the research project?
The conversations have the potential to add to the insight gained around children's use both working and non-working digital technologies in their imaginative play. These findings have the potential to inform parents, educators and policy makers leading to better technology curriculum provision.

Can I withdraw from the study?
Participation in this additional component of the research is completely voluntary. You and your child are not under any obligation to participate. Participants are free to withdraw from the research at any stage and without giving a reason. If participants withdraw from the research project it will not affect their participation in the kindergarten program in any way. If you give your consent for your child to be involved they will also be asked to give their assent via a form before data collection commences. Children will also be asked to sign an assent form at the beginning of every session.

If you do not give consent and/or you or your child decide to withdraw from the project any data pertaining to your child will be destroyed.

Will anyone else know the results of the project?
The aim is to publish the research findings in my PhD thesis, and possible books, and/or journal articles and through conference presentations that influence technology curriculum provision. As data being collected is through video recordings, the researchers cannot guarantee participants' anonymity. Each participant can chose to use their first name or a pseudonym and these will be used when reporting data and in any publications. Recordings and images of participants will only be used in publications with the participant's consent. All data will be stored on a password protected computer and in a locked cabinet both within a locked office at the Australian Catholic University campus.

Will I be able to find out the results of the project?
A copy of the results chapter of the PhD thesis is available to all participants. Please indicate you would like to receive a copy on the consent form and provide your email or postal address to the Student Researcher on jo.bird@acu.edu.au

Who do I contact if I have questions about the project?
Any questions regarding this project should be directed to the Principal Supervisor, Associate Supervisor and the Student Researcher:

Principal Supervisor	Associate Supervisor	Student Researcher
Associate Professor Susan Edwards	Doctor Karen McLean	Jo Bird
suzy.edwards@acu.edu.au	Karen.mclean@acu.edu.au	jo.bird@acu.edu.au

What if I have a complaint or any concerns?
The study has been reviewed by the Human Research Ethics Committee at Australian Catholic University (review number 2014 03V). If you have any complaints or concerns about the conduct of the project, you may write to the Manager of the Human Research Ethics Committee care of the Office of the Deputy Vice Chancellor (Research).

Manager, Ethics
c/o Office of the Deputy Vice Chancellor (Research)
Australian Catholic University
North Sydney Campus
PO Box 968
NORTH SYDNEY, NSW 2059
Ph.: 02 9739 2519
Fax: 02 9739 2870
Email: res.ethics@acu.edu.au
Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

I want to participate! How do I sign up?
If you agree to participate in this additional component of this project, you should sign both copies of the Consent Form, retain one copy for your records and return the other copy to the Student Researcher.

[redacted] [redacted] [redacted]

Associate Professor Suzy Edwards ***Doctor Karen McLean*** ***Jo Bird***

ADDITIONAL PARTICIPANT INFORMATION LETTER

PROJECT TITLE: Children's play with digital technologies.
PRINCIPAL INVESTIGATOR: Susan Edwards
ASSOCIATE SUPERVISIOR: Karen McLean
STUDENT RESEARCHER: Jo Bird
STUDENT'S DEGREE: Doctor of Philosophy

Dear Parent or Guardian,

You are invited to participate in this research project described below because your child attends the kindergarten in which the study will take place. The project is half way through and valuable data has been collected. This Information Letter and attached Consent Form are in relation to this additional component in the research project. The researcher would like to ask the children questions to understand why they select various technologies and if the provided technologies meet their imaginative play needs. This letter is to invite your child to be part of conversations with the researcher around their use of digital technologies.

The participant letter and consent form are in addition to the previous consent form and does not replace the original consent form.

What will I be asked to do?
During the kindergarten program, the researcher may engage in conversations with children about their digital technology use. The researcher will ask the children questions and may show children footage of their digital play (if consent was given in the original consent form) to stimulate their recall during the conversations. Children will be invited to complete an assent form before the conversations will be undertaken. At the beginning of every session children will be invited to draw a face to indicate their ongoing consent to participate. These conversations will be video or voice recorded.

Who is undertaking the project?
This project is being conducted by Jo Bird and will form the basis for the degree of Doctor of Philosophy at Australian Catholic University under the supervision of Associate Professor Susan Edwards and Doctor Karen McLean.

Are there any risks associated with participating in this project?
The foreseeable risks involved with this research are minimal. Activities and experiences are the same as your child's regular kindergarten program. When the researcher asks the children questions she will observe children's behaviour and follow their lead. If children do not want to answer questions the researcher will immediately cease the conversation.

What are the benefits of the research project?
The conversations have the potential to add to the insight gained around children's use both working and non-working digital technologies in their imaginative play. These findings have the potential to inform parents, educators and policy makers leading to better technology curriculum provision.

Can I withdraw from the study?
Participation in this additional component of the research is completely voluntary. You and your child are not under any obligation to participate. Participants are free to withdraw from the research at any stage and without giving a reason. If participants withdraw from the research project it will not affect their participation in the kindergarten program in any way. If you give your consent for your child to be involved they will also be asked to give their assent via a form before data collection commences. Children will also be asked to sign an assent form at the beginning of every session.

Sign and return this copy to the student researcher.

ACU
AUSTRALIAN CATHOLIC UNIVERSITY

ADDITIONAL PARENT CONSENT FORM

TITLE OF PROJECT: Children's play with digital technologies.
PRINCIPALSUPERVISOR: Susan Edwards
ASSOCIATE SUPERVISOR: Karen Mclean
STUDENT RESEARCHER: Jo Bird
PROGRAMME ENROLLED: Doctor of Philosophy

I .... (the parent/guardian) have read (or, where appropriate, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction.

I agree that my child, nominated below, may participate in conversations with the researcher through being asked questions and video or voice recorded, throughout the data collection period and I know I can withdraw my consent at any time (without adverse consequences).

I understand that agreeing to take part means that I am willing to allow

.... (insert full name of participant) to:
Participate in conversations with the researcher .... ☐ Yes ☐ No
Be asked questions by the researcher .... ☐ Yes ☐ No

That these conversations be:
Documented by the researcher.. ☐ Yes ☐ No
Documented observations of my child may be used in the thesis or any resulting publication or conference presentations.. ☐ Yes ☐ No

Be voice recorded by the researcher .... ☐ Yes ☐ No
That comments taken from the voice recordings of my child may be used in the thesis or any resulting publications or conference presentations. .... ☐ Yes ☐ No

Be filmed by the researcher .... ☐ Yes ☐ No
Images taken from the video recordings of my child may be used in the thesis or any resulting publications or conference presentations.. ☐ Yes ☐ No

I understand that my child's participation is voluntary, that I can choose not to participate in this additional component of the project, and that I can withdraw my child at any stage of the project without being penalised or disadvantaged in any way. I understand that the data of my child can be withdrawn from the project at any time of my choosing.

I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify my child in any way, unless I have agreed for my child's first name and image to be used.

NAME OF PARENT/GUARDIAN: ....

NAME OF CHILD: .... CHILD'S DATE OF BIRTH: ....

SIGNATURE: .... DATE: ....

5

Children's Assent Form

I am Jo a kindergarten teacher.
While you are playing at kindergarten, I would like to talk to you about how you play with technologies, like the computer, iPad, digital camera, keyboards and phones.

I would like to talk to you about about your play.

 

I would like to write down about what we talk about.

 

Can I record what we talk about?

 

I would like to record our talk using a Flip camera.

 

Can I use what we talk about in my book?

 

Thank you

Name:____________________________

Date: / /

Appendix 17 Children's Conversation Questions

Conversations with children

What were you using the _____________ (the device) for?

Why did you choose ______________ (the device) for your play?

While you were playing you did ___________ (description of their play) was the device what you needed or is there another one you would prefer?

If there was working _____________ (the device) available would you play with them?

Would you play with them differently than how you used _____________ (the device)?

What other devices would you like to use in your play?

Are there digital technologies you have at home that you wish you could have at kindergarten?

Appendix 18 Table of Imaginative Affordance Framework Data

DATE	SUBJECT	CONTEXT	STIMULUS INFORMATION & IMAGINATION	TOOL	AFFORDANCE / CONSTRAINTS	OBJECT OF ACTIVITY
27/5/14	Diana Kavithmi	Pasting area of Cosmic Kindergarten	Children's creativity Children's skills All ways of imagination Pasting area materials Support from educators	Created TV	A = Pasting area provided A = Educator support A = Children's play skills C = Working TV not provided	To play watching TV with cakes to eat
27/5/14	Jordan	The computer in Cosmic Kindergarten	Children's skills Computer program All four ways of imagination Knowledge of computers Ability to control the mouse	Working computer	A = Working computer provided C = No eductor support	To play Reader Rabbit on the computer
28/5/14	William	The computer in Cosmic Kindergarten	Children's skills Computer program All four ways of imagination Knowledge of computers Ability to control the mouse	Working computer	A = Working computer provided C = No eductor support	To create a picture and story on the computer
28/5/14	Eleni	Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of computers	Non-working computer	A = Allowed to bring toys from home to play with C = limited access to working computers	To play with her toy computer
28/5/14	Annabelle	Home corner at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of phone	Non-working phone	A = Non-working phones provided A = Home corner provided	To pretend to talk on the phone in her play
28/5/14	Kim	Educator interview	Technology knowledge Pedagogy Educator's training Beliefs Educator understanding of play Educator's programming Children's interests Children's skills	Non-working technologies - keyboards, computer screens	A = To provide non-working technologies C = Non-working technologies are not available all the time	To provide technologies when they link to the programme (Kim, initial interview, 28/05/14, p.2).
28/5/14	Kim	Educator interview	Knowledge of the iPad Apps provided Pedagogy Educator's training Beliefs Children's interests Children's skills Screen time guidelines	Working iPad	A = Using the iPad	To learn how to use the iPad and use it in her programme (Kim, initial interview, 28/05/14, p.2).
28/5/14	Kim	Educator interview	Fragile iPad Knowledge of the iPad Children's skills Cost of the iPad Pedagogy Beliefs Educator's training	Working iPad	A = Trust A = Provide the iPad for children's use C = Limit the children's use C =Lack of trust	To trust the children will not break the iPad (Kim, initial interview, 28/05/14, p.2).
29/5/14	Annabelle	Home corner at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of video cameras	Non-working video camera	A = Non-working video camera provided A = Home corner provided	To pretend to take video of her friend in her play
29/5/14	Mia	Home corner at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of cameras	Non-working camera	A = Non-working camera provided A = Home corner provided	To pretend to take photos of her friends in her play
29/5/14	Annabelle	Home corner at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of phone	Non-working phone	A = Non-working phones provided A = Home corner provided	To pretend to talk on the phone in her play
29/5/14	Diana	Outside at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of cash registers Understanding of money and shops	Non-working cash register	A = Non-working cash register provided A = Shop set up provided	To pretend to work in a shop
29/5/14	Lola Annabelle Mia Saarah	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Understanding of cameras Cultural re-enactment Knowledge of vets	Non-working camera and phone	A = Non-working camera provided C = Non-working phone provided C = Working camera not provided C = Working phone not provided	To pretend they are the dog and need to call the vet
3/6/14	Annabelle	Home corner at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of cameras	Non-working camera	A = Non-working cameras provided A = Home corner provided C = Working camera not provided	To pretend to video her environment

3/6/14	Mia Lola	Set up stage outside at Cosmic Kindergarten	Children's creativity Children's skills Separating meaning from object Communication skills All ways of imagination Knowledge of microphones Knowledge of performing	Non-working microphones	A = Stage area provided A = Availability of magnetic wands C = Working microphones not provided	To pretend to sing and perform on stage
5/6/14	Giraffe	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To pretend to talk on a mobile in his play
5/6/14	Anne Mary	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To pretend to talk on a mobile in his play
5/6/14	Shivani	Outside at Cosmic Kindergarten	Children's creativity Communication skills 1st way of imagination Knowledge of cash registers Understanding of money and shops	Non-working cash register	A = Non-working cash register provided A = Shop set up provided	To pretend to work in a shop
5/6/14	Mia	Set up stage outside at Cosmic Kindergarten	Children's creativity Children's skills All ways of imagination Knowledge of singing and performing Separating meaning from object Pasting area and materials	Non-working microphones	A = Stage area provided A = Pasting area and materials provided A = iPad to provide songs C = Working microphones not provided	To create and use her made microphone to sing for her friends
5/6/14	Diana Ann Mary	Set up stage outside at Cosmic Kindergarten	Children's creativity Children's skills All ways of imagination Knowledge of singing and performing Understanding of the role of the audience	Non-working microphones	A = Stage area provided A = Pasting area and materials provided A = iPad to provide songs C = Working microphones not provided	To be the audience for their friend who is performing
5/6/14	Kim	Set up stage outside at Cosmic Kindergarten	Pedagogy Beliefs Supporting children's play Children's creativity Children's skills All ways of imagination Knowledge of singing and performing	Working iPad	A = Stage area provided A = Pasting area and materials provided A = iPad to provide songs C = Working microphones not provided C = Not allowed to watch the iPad screen	To provide songs on the iPad for the children to sing and perform to on the stage
5/6/14	Shivani	Set up stage outside at Cosmic Kindergarten	Children's creativity Children's skills 1st and 2nd ways of imagination Knowledge of iPads	Working iPad	A = Stage area provided A = Pasting area and materials provided A = iPad to provide songs C = Working microphones not provided C = Not allowed to watch the iPad screen	To watch the song on the screen of the iPad
10/6/14	Shivani	Outside at Cosmic Kindergarten	Children's creativity Children's skills 1st and 2nd ways of imagination Understanding of cameras Social skills	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of me and her kindergarten environment
10/6/14	Diana Eleni	Home corner and block area in Cosmic Kindergarten	Children's creativity Children's skills Children's social skills Understanding of phones 1st way of imagination	Non-working phone	A = Non-working phones provided A = Home corner provided A = Block area provided C = Working phone not provided	To pretend to talk on the phone in their play
10/6/14	Ann Mary	Home corner in Cosmic Kindergarten	Children's creativity Children's skills Children's social skills Understanding of phones 1st way of imagination	Non-working phone	A = Non-working phones provided A = Home corner provided C = Working phone not provided	To pretend to talk on the phone in their play
10/6/14	Annabelle	Home corner in Cosmic Kindergarten	Children's creativity Children's skills Children's social skills Understanding of phones 1st way of imagination Home corner Dress ups	Non-working phone	A = Non-working phones provided A = Home corner provided A = Dress ups provided C = Working phone not provided	To pretend to talk on the phone in their play
11/6/14	Eleni Mia Lola	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of mobiles Knowledge of cameras	Non-working phone, camera	A = Non-working mobiles provided A = Non-working cameras provided A = Home corner provided C = Working mobiles not provided C = Working cameras not provided	To pretend to use the non-working phones and cameras in their play

11/6/14	Lola Mia	Cosmic Kindergarten	Understanding of cameras Cultural re-enactment Social skills Play skills 1st and 2nd way of imagination Knowledge of performing	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to sing and dance and be videoed
12/6/14	Will	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Social skills Story creation	Working computer	A = Working computer provided A = Game provided	To create an underwater scene
13/6/14	Jack	Creative Kindergarten classroom	Knowledge of iPads Play skills 4 ways of imagination Pasting materials provided iPad not provided for free play	Non-working technology - iPad	A = pasting area and materials provided A = educator encouragement and support C = iPads not available for children's free play	To play with an iPad he had created himself
13/6/14	Jack Hayden	Outside at Creative Kindergarten	Knowledge of cameras 1st way of imagination NW Cameras provided	Non-working camera	A = Non-working cameras provided C = Working cameras not provided	Taking photos with a non- working camera
13/6/14	James	Creative Kindergarten	Working camera provided Children's interests Children's skills Understanding of cameras 1st and 3rd ways of imagination Social skills Friends / peers	Working camera	A = Working camera provided A = Friends to take photos of	To take photos with a working camera
13/6/14	Emma	Outside at Creative Kindergarten	Non-working camera provided Wheel barrows provided Non-working microphone provided Non-working mobile provided Friends Children's interests 1st and 2nd ways of imagination	Non-working camera, mobile, microphone	A = Non-working camera provided A = Non-working mobile and phones provided A = Non-working microphone provided	To play with the non-working camera, phones and microphone
13/6/14	Jamie	Outside at Creative Kindergarten	Working camera provided Knowledge of cameras Friends Understanding of taking photos of friends Children's interests Children's skills	Working camera	A = Working camera provided A = Friends to take photos of	To take photos with a working camera of his friends and the kindergarten yard
13/6/14	William	Outside at Creative Kindergarten	Understanding of cameras 1st way of imagination Cultural re-enactment Social skills	Working camera	A = Working camera provided	To take photos of his friends and the kindergarten yard
13/6/14	The Joker Jack	Pasting area and outside at Creative Kindergarten	Pasting area and materials All ways of imagination Social skills Play skills Understanding of video cameras Cultural re-enactment	Created video camera	A = The pasting area and materials C = Working video camera not provided	To create a video camera to video his friends
13/6/14	Emma Indy Eli	The cubby house outside at Creative Kindergarten	1st way of imagination Social skills Play skills Cultural re-enactment Understanding of devices - cameras, phones, mobiles, computers, microphones and remotes Communication skills Understanding of rules around computer use	Non-working cameras, phones, mobiles, computers, microphones and remotes	A = Non-working devices provided C = Working devices not provided	To create a house and pretend they are working
13/6/14	Vanessa	Creative Kindergarten	Availability of a working camera Understanding of cameras Pedagogy Beliefs Children's interests Children's skills	Working camera	A = Working camera provided	To provide a working camera for the children to take photos
13/6/14	Vanessa	Creative Kindergarten	Availability of a working camera Understanding of cameras Pedagogy Beliefs Children's interests Children's skills	Working camera	A = Working camera provided	To provide a working camera for the children to take photos
13/6/14	Vanessa	Creative Kindergarten	Availability of a working camera Understanding of cameras Pedagogy	Working camera	A = Working camera provided	To provide a working camera for the children

			Beliefs Children's interests Children's skills			to take photos
16/6/14	Connor	Inside at the pasting table of Creative Kindergarten	Pasting area provided Knowledge of swords Understanding of iPads Encouragement and support from educator All four ways of imagination Children's interests Children's skills	Working iPad	A = Pasting area provided A = Working iPad provided A = Educator encouragement and support A = Intentional teaching	To create a sword in the pasting area
16/6/14	Theo	Outside at Creative Kindergarten	Non-working computer provided Non-working mobiles and telephones provided	Non-working computer and phones	A = Non-working computer provided A = Non-working telephones provided	To play with a computer and telephones
16/6/14	Rehan	Outside at Creative Kindergarten	Working camera provided Children's interests Children's skills Knowledge of cameras Support from educator	Working camera	A = Working camera A = Educator support and encouragement	To take photos with the working camera
16/6/14	Vanessa	Outside at Creative Kindergarten	Understanding of Bluetooth speakers Pedagogy Educator beliefs Knowledge of songs	Working iPad and Bluetooth speaker	A = iPad available A = Bluetooth speaker available A = Music provided	To provide music for the children from the iPad via the Bluetooth speaker
17/6/14	Kavithmi Ameya Ann Mary Diana	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of computers Literacy skills Letter recognition	Non-working laptop and phones	A = Non-working laptop provided A = Non-working phones provided C = Working laptop not provided C = Working phones not provided	To recognise the letters of their names on the keyboards. To pretend to talk on the phone
17/6/14	Ann Mary Kavithmi Diana	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of computers Literacy skills Letter recognition	Non-working laptop	A = Non-working laptop provided C = Working laptop not provided	To recognise the letters of their names on the keyboards.
17/6/14	Shivani Annabelle Lola Mia	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Social skills Understanding of mobiles Understanding of laptops Understanding of cameras Educator scaffolding Roles in play	NW Mobiles NW Camera NW Laptop	A = Non-working mobiles provided A = Non-working cameras provided A = Non-working laptop provided A = Home corner provided A = Educator scaffolding C = Working mobiles not provided C = Working cameras not provided C = Working laptop not provided	To play offices in home corner
17/6/14	Shivani Annabelle Lola Mia	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Social skills Understanding of mobiles Understanding of laptops Understanding of cameras Educator scaffolding Roles in play	NW Mobiles NW Camera NW Laptop	A = Non-working mobiles provided A = Non-working cameras provided A = Non-working laptop provided A = Home corner provided A = Educator scaffolding C = Working mobiles not provided C = Working cameras not provided C = Working laptop not provided	To pretend to take photos and talk to friends on the phone
17/6/14	Bailey Dinosaur	Wooden doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Doll's house Separating meaning from object Social skills Understanding of televisions Researcher scaffolding	NW Television	A = Doll's house provided A = Researcher scaffolding A = Play skills C = Non-working TV for the doll's house wasn't provided	To play with the doll's house
17/6/14	Annabelle Lola Ameya	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Social skills Understanding of mobiles Understanding of laptops Knowledge of Dad's mobile Roles in play	NW laptop NW mobile	A = Non-working laptop A = Non-working phones provided A = Home corner provided C = Working laptop not provided C = Working phone not provided	To pretend to type and talk on the phone
17/6/14	Lennox	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Understanding of laptops	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the computer
17/6/14	Annabelle Ameya Diana	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Social skills	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to use a camera
17/6/14	William	Cosmic	Children's interests	NW camera	A = Non-working camera provided	To pretend to

		Kindergarten	Understanding of cameras Realisation it doesn't work		C = Working camera not provided	use a camera
17/6/14	Giraffe William	Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Cultural practice of taking photos Social skills	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to use a camera
17/6/14	Mia Lola	Outside and in the tent at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Understanding of cameras Understanding of mobiles Social skills Understanding of pretend	NW laptop NW mobile NW camera	A = Non-working laptop A = Non-working mobiles provided A = Non-working cameras provided C = Working laptop not provided C = Working mobile not provided C = Working camera not provided	To pretend to make phone calls
17/6/14	Lola Annabelle Phoenix Ameya	Home corner Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Social skills Play skills Understanding of laptops Roles in play	NW laptops	A = Non-working laptops provided C = Working laptops not provided	To pretend to type on the laptop
17/6/14	Hyo Joo	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Understanding of phones Understanding of film cameras Understanding of digital cameras	NW phones and mobiles	A = Non-working phones provided A = Non-working mobiles provided C = Working phones not provided C = Working mobiles not provided	To pretend to use the non-working phones and cameras in their play
17/6/14	Phoenix	Home corner at Cosmic Kindergarten	Children's interests 1st and 2nd ways of imagination Home corner and props Understanding of film video cameras Social skills Play skills	NW film video camera	A = Non-working film video camera provided C = Working film video camera not provided	To pretend to use a camera
17/6/14	Annabelle Ameya Phoenix	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Understanding of mobiles Understanding of film video cameras Social skills Play skills	NW mobiles and film video cameras	A = Non-working mobiles provided A = Non-working film video camera C = Working mobiles provided C = Working film video camera	To pretend to talk on the phone in her play
17/6/14	Dolphin	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Understanding of laptops Play skills Cultural re-enactment	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
17/6/14	Phoenix	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st way of imagination Separating meaning from object Understanding of cameras Cultural re-enactment	Non-working film video camera	A = Non-working video camera provided C = Working video camera not provided	To play with her friends
17/6/14	Diana Annabelle Hyo Joo	Activity table at Cosmic Kindergarten	Knowledge of Frozen Understanding of non-working mobiles 1st way of imagination Social skills Play skills	Non-working phones	A = Non-working phones provided C = Working phone not provided	To pretend using the Frozen dolls and a non-working mobile
17/6/14	Hyo Joo	Home corner at Cosmic Kindergarten	Knowledge of laptops Knowledge of mobiles Play skills 1st way of imagination	Non-working laptop and phone	A = Non-working laptop provided A = Non-working phone provided A = Home corner provided C = Working phone not provided C = Working laptop not provided	To pretend to type and talk on a phone
17/6/14	Annabelle	Home corner at Cosmic Kindergarten	Knowledge of cameras Social skills Play skills 1st way of imagination Cultural re-enactment	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend with a camera
18/6/14	Ann Mary Ameya	Tent outside at Cosmic Kindergarten	Children's creativity Children's skills Children's social skills Understanding of phones 1st way of imagination Tent Understanding of computers	Non-working cameras, phones and laptop	A = Non-working phones provided A = Non-working cameras provided A = Non-working laptop provided C = Working phone not provided C = Working camera not provided C = Working laptop not provided	To pretend to use non-working phones, cameras and laptop in their play
18/6/14	Mia	Tent outside at	Children's creativity	Non-working	A = Non-working phones provided	To pretend to

	Kiana Ameya Diana	Cosmic Kindergarten	Children's skills Children's social skills Understanding of phones 1st way of imagination Tent Understanding of computers	cameras, phones and laptop	A = Non-working cameras provided A = Non-working laptop provided C = Working phone not provided C = Working camera not provided C = Working laptop not provided	use non-working phones, cameras and laptop in their play
19/6/14	Camila Emma Indy	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of keyboards Understanding of cameras	Non-working keyboards and cameras	A = Non-working keyboards provided A = Non-working cameras provided C = Working keyboards not provided C = Working cameras not provided	To type and take photos of their friends
19/6/14	Emma Eli Indy	Home corner in Create Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of mobiles Understanding of cameras	Non-working mobiles and cameras	A = Non-working mobile provided A = Non-working cameras provided C = Working mobile not provided C = Working cameras not provided	To pretend to talk on mobiles and take photos of their friends
19/6/14	Vanessa	Outside at Creative Kindergarten	Social skills Literacy skills Knowledge of iPads Educator beliefs Educator support Educator pedagogy Children's interests	Working iPad and speaker	A = iPad and speaker used to play song A = Educator support C = iPad not sued for children's free play	To use the iPad to play a song for the children to act out
20/6/14	Camila	Outside at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Understanding of cameras and computers Literacy skills (letter recognition)	Non-working camera and keyboard	A = Non-working camera provided A = Non-working keyboard provided C = Working devices not provided	To type of the keyboard
20/6/14	Emma	Home corner of Creative Kindergarten	Children's interests Children's skills 1st way of imagination Understanding of cameras	Non-working camera	A = Non-working camera provided A = Home corner area provided	To play in home corner with a non-working camera
20/6/14	Indy	Outside at Creative Kindergarten where the children have created a stage	Children's interests Children's skills 1st and 2nd ways of imagination Understanding of cameras Social skills	Non-working camera	A = Non-working camera provided A = iPad is used to play music C = Working camera not provided	To take photos of the children singing
20/6/14	Camila	Outside at Creative Kindergarten where the children have created a stage	Children's interests Children's skills All ways of imagination Separation of meaning from object Understanding of cameras Social skills	Non-working microphone	A = iPad is used to play music C = Working microphone not provided	To use a stick to represent a microphone and sing songs on the stage
20/6/14	Daniel	Outside Creative Kindergarten, sitting at a table	Children's interests Children's skills 1st way of imagination Understanding of computers Literacy skills (letter recognition)	Non-working keyboard	A = Non-working keyboard provided	To type on the keyboard
20/6/14	Indy Kieran	Outside at Creative Kindergarten	Children's interests Children's skills 1st and 2nd ways of imagination Understanding of iPads Understanding of YouTube Educator's restrictions	Working iPad and Bluetooth speaker	A = iPad is used to play music A = YouTube being provided C = iPad not available for free play	To with the YouTube clips and listen to the songs on the iPad
20/6/14	Kai	Inside Creative Kindergarten on the mat area	Children's interests Children's skills 1st and 2nd ways of imagination Knowledge of the movie *Frozen* Understanding of iPads	Working iPad and Bluetooth speaker	A = iPad is used to play music A = YouTube being provided C = iPad not available for free play	To sing and dance along to *Frozen* songs as they do in the movie
20/6/14	Vanessa	Outside at Creative Kindergarten where the children have created a stage	Children's interests Children's skills 1st and 2nd ways of imagination Pedagogy Beliefs Understanding of iPads	Working iPad and Bluetooth speaker	A = iPad is used to play music	To use the iPad and speaker to play music for the children to sing along to
20/6/14	Vanessa	Outside at Creative Kindergarten	Children's interests Children's skills 1st and 2nd ways of imagination Pedagogy Beliefs Understanding of iPads	Working iPad and Bluetooth speaker	A = iPad is used to play music A = YouTube being provided C = iPad not available for free play	To provide YouTube clips and songs on the iPad
24/6/14	Ameya Lola Phoenix	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of mobiles Understanding of rules and roles	NW mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To pretend to talk on the phone in her play

			in play Home corner and props Play skills Social skills			
24/6/14	Phoenix	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Social skills Play skills Understanding of laptops Roles in play	NW laptops	A = Non-working laptops provided C = Working laptops not provided	To pretend to type on the laptop
25/6/14	Diana	Pasting area of Cosmic Kindergarten	Children's interests 1st way of imagination Pasting area and materials	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to talk on phones
25/6/14	River	Pasting area of Cosmic Kindergarten	Pasting area materials Knowledge of phones Play skills All ways of imagination Communication skills	Non-working phones	A = Non-working phones provided C = Working phone not provided	To pretend to call someone on her made phone
25/6/14	Anushka Ameya	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of phones Communication skills Cultural re-enactment	Non-working phones	A = Non-working phones provided C = Working phone not provided	To pretend to have a conversation on the phones
26/6/14	Lola	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Cultural re-enactment (Mother's role) Understanding of mobiles Understanding of laptops Social skills	NW mobile and laptops	A = Non-working mobile provided A = Non-working laptop provided C = Working mobile not provided C = Working laptop not provided	To pretend to type on the laptop
26/6/14	Dinosaur	Computer set up at Cosmic Kindergarten	Children's interests 1st way of imagination Separating meaning from object Understanding of computers Story telling skills	Working computer	A = Working computer provided C = No eductor support	To create a story on the screen
26/6/14	Minuri	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Social skills Cultural re-enactment	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
26/6/14	Will Jordan	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops	Non-working laptops	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptops
26/6/14	The Joker	The stage outside at Creative Kindergarten	Pasting area and materials All ways of imagination Social skills Play skills Understanding of microphones Cultural re-enactment	Created microphone	A = Pasting are and materials provided C = Working microphone not provided	To create a microphone and sing on stage
27/6/14	Kavithmi	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
27/6/14	Phoenix Ameya	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Social skills	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
27/6/14	Emily	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Social skills	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
27/6/14	Kim	Computer set up at Cosmic Kindergarten	Children's interests Educator experience Child scaffolding 1st way of imagination	Working computer	A = Computer provided	To play on the computer
27/6/14	Annabelle Phoenix	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Home corner and props Understanding of laptops Play skills Cultural re-enactment	Non-working laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
27/6/14	Diana	Pasting area and outside at Cosmic	Children's interests 1st way of imagination Understanding of cameras	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of her friends

		Kindergarten	Social skills Play skills Communication skills Cultural re-enactment			
27/6/14	Madeleine	Block area at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment Educator support as a co-player	Non-working mobiles	A = Non-working mobile provided A = Educator support C = Working mobiles not provided	To video Vanessa with a mobile phone
27/6/14	Oliver	Outside in the sandpit at Creative Kindergarten	Children's interests Children's skills 1st and 2nd ways of imagination Knowledge of computers Knowledge of cameras Understanding of building (Dad is a builder)	Non-working keyboard	A = Non-working keyboard provided	To pretend he is a builder who types on a computer
27/6/14	Jack	Outside at Creative Kindergarten where the children have created a stage	Children's interests Children's skills 1st and 2nd ways of imagination Understanding of iPads Understanding of YouTube Educator's restrictions	Created microphone	A = iPad available A = Bluetooth speaker available A = Music provided A = Pasting are and materials provided C = Working microphones not provided	To sing along to music with a created microphone
27/6/14	Ding DIng Camila	Home corner at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To play in home corner with mobiles and recreate community practices
27/6/14	Camila	Home corner at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To play in home corner with mobiles and recreate community practices
27/6/14	Madeleine	Home corner in Create Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of mobiles Knowledge of games on mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To share her knowledge of mobile games with her friend
27/6/14	Kai Ryan Ding Ding	The stage set up in block corner at Creative Kindergarten	Pasting area and materials All ways of imagination Social skills Play skills Understanding of microphones Cultural re-enactment Educator support Educator understanding of iPads	Created microphone	A = Pasting are and materials provided A = Educator support with music C = Working microphone not provided	To create a microphone and sing on stage
27/6/14	Madeleine	Home corner in Create Kindergarten	Understanding of mobiles Play skills All ways of imagination? Literacy skills Cultural re-enactment	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to sing a song as if it is the mobile playing it
27/6/14	kai Ryan Madeleine Ariel	Block area at Creative Kindergarten	Social skills Play skills All four ways of imagination Understanding of microphones Understanding of mobiles Knowledge of Frozen Knowledge of Facebook	Created microphone Non-working mobile	A = Pasting are and materials provided A = Non-working mobiles provided A = Educator support with music C = Working microphone not provided C = Working microphone not provided	To sing to the Frozen song with their made microphones. To record Vanessa dancing and post it to Facebook
14/7/14	Madeleine Lara	Home corner at Creative Kindergarten	Children's interest Children's social skills 1st and 2nd ways of imagination Knowledge of mobiles Knowledge of games played on mobiles Knowledge of cultural behaviours Home corner props	Non-working mobile	A = Non-working mobiles provided A = Home corner props provided C = Working mobiles not provided	To pretend to play games on a non-working mobile and to use non-working mobiles in their play
14/7/14	Kai Connor Oliver Archie	Outside at Creative Kindergarten	Children's interest Children's skills Children's social skills Knowledge of mobiles 1st and 2nd ways of imagination	Non-working mobile	A = Non-working mobiles provided C = Working mobiles not provided	To use non-working mobiles in their pretend play
14/7/14	Madeleine Lara	Home corner in Creative Kindergarten	Social skills Play skills Knowledge of mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to cook and have a picnic

			Cultural re-enactment The requirements of play			
14/7/14	Madeleine	Home corner in Creative Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of mobiles Knowledge of recipes on mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To use a mobile to find the recipe she is pretended to cook
14/7/14	Daniel	Home corner in Creative Kindergarten	1st way of imagination Play skills Cultural re-enactment Knowledge of mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To re-enact cultural behaviours in his play
14/7/14	Kai Connor Oliver Emma Indy	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of mobiles Knowledge of space Knowledge about working on engines	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend they are in a spaceship
15/7/14	Lola	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Cultural re-enactment	Non-working mobiles	A = Non-working mobiles C = Working mobiles not provided	To pretend to talk on the phone in her play
15/7/14	Shivani	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Social skills	NW laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptop
15/7/14	Eleni	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided	To pretend to talk on the phone in the doll’s house
15/7/14	Diana Kavithmi	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Understanding of computers Separating meaning from object Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided C = Working computer is not provided	To pretend to talk on the phone in the doll’s house
15/7/14	Minuri	Indoors at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Play skills Pretend skills Cultural re-enactment	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to video her friends
15/7/14	Diana Kavithmi Ameya Ann Mary	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Understanding of mobiles Play skills Social skills Pretend skills Cultural re-enactment	Non-working laptop and phones	A = Non-working laptop not provided A = Non-working mobile provided C = Working laptops not provided C = Working mobiles not provided	To pretend they are in a kitchen
15/7/14	Lola	Outside at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of mobiles Understanding of cameras Play skills Pretend skills Cultural re-enactment	Non-working mobiles and cameras	A = Non-working mobiles A = Non-working camera provided C = Working mobiles not provided C = Working camera not provided	To walk around the yard with mobile phone and camera
15/7/14	William	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Understanding of laptops	Non-working laptop	A = Non-working laptop provided A = Home corner provided C = Working laptop not provided	To pretend to use the non-working laptop in his play
15/7/14	Phoenix Saarah	Doll's house set up at Cosmic Kindergarten	Doll's house set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of phones Communication skills Cultural re-enactment	Non-working phones	A = Non-working phones provided C = Working phone not provided	To pretend to have a conversation with Grandma on the phones
15/7/14	Georgia	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination	Non-working laptops	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptops

			Separating meaning from object Understanding of laptops Understanding of work Cultural re-enactment			
15/7/14	William	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Understanding of work Cultural re-enactment	Non-working laptops	A = Non-working laptop provided C = Working laptop not provided	To pretend to type on the laptops
16/7/14	Mia	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of mobiles Understanding of cameras Social skills Play skills Pretend skills Cultural re-enactment	Non-working mobiles and cameras	A = Non-working mobiles A = Non-working camera provided C = Working mobiles not provided C = Working camera not provided	To carry a mobile phone and camera in their play
16/7/14	Hyo Joo Diana	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided C = Working computer is not provided	To pretend they are talking on the phone in the doll’s house
16/7/14	Emily Kiana	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided C = Working computer is not provided	To pretend they are talking on the phone in the doll’s house
16/7/14	Ameya Diana	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided C = Working computer is not provided	To pretend they are talking on the phone in the doll’s house
16/7/14	Ameya Shivani Ann Mary	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills Pretend skills Cultural re-enactment	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided C = Working computer is not provided	To pretend they are talking on the phone in the doll’s house
16/7/14	Hyo Joo Diana	The swing outside at Cosmic Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of cameras	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take a photo of her friend on the swing
17/7/14	Mia	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Social skills Play skills Pretend skills Cultural re-enactment	Non-working camera	A = Non-working camera provided A = Home corner provided C = Working camera not provided	To pretend to take photos of her friends
17/7/14	Eleni Annabelle Mia Ameya	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of mobiles Understanding of cameras Social skills Play skills Pretend skills Cultural re-enactment	Non-working mobiles and cameras	A = Non-working camera provided A = Non-working mobiles A = Home corner provided C = Working mobiles not provided C = Working camera not provided	To hold mobile phones in their play
17/7/14	Minuri Ameya	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of mobiles Understanding of cameras Social skills Play skills Pretend skills Cultural re-enactment	Non-working mobiles and cameras	A = Non-working camera provided A = Non-working mobiles A = Home corner provided C = Working mobiles not provided C = Working camera not provided	To pretend to take photos of their friends
17/7/14	Hyo Joo	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided	To pretend to talk on the phone in the doll’s house

			Pretend skills Cultural re-enactment			
17/7/14	William	Cosmic Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of cameras Understanding of 'selfies'	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos
17/7/14	William	Cosmic Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of cameras Understanding of 'selfies'	Working video camera	A = Working camera provided C = Free play not provided on video camera	To explore the working video camera
17/7/14	Toula	Cosmic Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of cameras	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos
18/7/14	Mia River	The tent outside at Cosmic Kindergarten	Social skills Play skills 1st way of imagination Cultural re-enactment Understanding of cameras Understanding of 'selfies'	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos
18/7/14	Ann Mary Ameya	The tent outside at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Cultural re-enactment Understanding of laptops Understanding of phones	Non-working laptop and phone	A = Non-working laptop provided A = Non-working phone provided C = Working phone not provided C = Working laptop not provided	To pretend to type and talk on a phone
18/7/14	Emma	The couch at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles provided C = Working mobiles not provided	To play talking on a mobile
18/7/14	Emma	Home corner of Creative Kindergarten	Children's interests Children's skills 1st way of imagination Understanding of mobiles Communication skills Home corner props and dress ups	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To play talking to someone on a mobile
18/7/14	Ding Ding Amy Jamie	Home corner of Creative Kindergarten	Children's interests Children's skills 1st way of imagination Understanding of mobiles Communication skills Home corner props	Non-working mobiles	A = Non-working mobiles provided A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
18/7/14	Emma	Creative Kindergarten	Children's interests Children's skills 1st way of imagination			
18/7/14	Camila	A mat at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Educator involvement	Non-working mobiles	A = Non-working mobile provided A = educator involvement C = Working mobiles not provided	To carry and use a phone while playing other activities
18/7/14	Camila	A mat at Creative Kindergarten	Children's interests Children's skills 1st and 2nd ways of imagination Pedagogy Beliefs Understanding of iPads	Working iPad and Bluetooth speaker	A = iPad available A = Bluetooth speaker available A = Stories provided C = No educator interactions	To listen to stories on the iPad
18/7/14	Emma	A mat at Creative Kindergarten	Children's interests Children's skills 1st and 2nd ways of imagination Pedagogy Beliefs Understanding of iPads Knowledge of mobiles	Working iPad and Bluetooth speaker Non-working mobile	A = iPad available A = Bluetooth speaker available A = Stories provided C = No educator interactions	To play using a mobile while listening to stories on the iPad
18/7/14	Coirle Emma Indy	A hairdresser set up at Creative Kindergarten	Social skills Play skills 1st way of imagination Understanding of hairdressers Knowledge of mobiles Cultural re-enactment	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend there are going to the hairdressers and driving with their dog
18/7/14	Ariel Emma	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Understanding of schools Knowledge of mobiles Cultural re-enactment Dressing up	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend they are going to school

18/7/14	Ding Ding Amy Jamie	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to talk on the phone
18/7/14	Emma Camila	Activity areas at Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To help complete the puzzle with others and use the mobile to take photos
18/7/14	Ariel Emma	Home corner in Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To play in home corner
18/7/14	Vanessa	The mat inside at Creative Kindergarten	Pedagogy Beliefs Understanding of iPads Understanding of YouTube Children's interests 1st and 2nd ways of imagination Advice from other teachers	Working iPad and Bluetooth speaker	A = iPad available A = Bluetooth speaker available A = Stories provided C = No educator interactions	To provide stories on the iPad for children to listen to
21/7/14	Madeleine Lara	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
21/7/14	Jamie	Creative Kindergarten	Children's interests Children's play skills 1st way of imagination Knowledge of cameras	Non-working cameras	A = Non-working cameras provided C = Working cameras not provided	To pretend to take photos
21/7/14	Toby	Creative Kindergarten	Children's interests Children's play skills 1st way of imagination Knowledge of cameras Knowledge of mobiles	Non-working cameras and non-working mobiles	A = Non-working cameras provided A = Non-working mobiles provided C = Working cameras not provided C = Working mobiles not provided	To pretend to take photos and use a non-working mobile
21/7/14	Theo Connor	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
21/7/14	Toby	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
21/7/14	Madeleine Lara	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
21/7/14	Amy Ding Ding	Table outside at Creative Kindergarten	Children's interests Children's skills 1st way of imagination Understanding of computers Letter recognition Children's social skills	Non-working keyboards and type writer	A = Non-working keyboards provided A = Non-working type writer provided C = Working keyboards not provided C = Working type writer not provided	To recognise letters on the keyboards and type writer
21/7/14	Amy Ding Ding Marcus Daniel	Table outside at Creative Kindergarten	Children's interests Children's skills Understanding of computers Letter recognition 1st way of imagination Children's social skills Understanding that the keyboard and type writer do not work	Non-working keyboards and type writer	A = Non-working keyboards provided A = Non-working type writer provided C = Working keyboards not provided C = Working type writer not provided	To recognise letters on the keyboards and type writer
22/7/14	Shivani	Activity table inside at Cosmic Kindergarten	Understanding of phones Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To weigh items and have a phone with her
22/7/14	Hyo Joo	Doll's house set up at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of phones Social skills Play skills	Doll's house NW phone	A = Doll's house is provided C = Working phone is not provided	To pretend to talk on the phone in the doll's house

			Pretend skills Cultural re-enactment			
22/7/14	Ann Mary Minuri Diana	Outside at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Social skills Play skills Cultural re-enactment Educator scaffolding	NW camera	A = Non-working camera provided A = Educator scaffolding C = Working camera not provided	To pretend to take photos of their friends
22/7/14	Kim	Outside at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of cameras Educator scaffolding Social skills Play skills Educator beliefs Educator pedagogy Cultural re-enactment	NW camera	A = Non-working camera provided A = Educator scaffolding C = Working camera not provided	To pretend to take photos of their friends
22/7/14	Mia	Computer set up at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Understanding of computers Play skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To wait for her turn on the computer with a mobile
22/7/14	Lola Saarah Mia	Home corner and the computer set up at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Cultural re-enactment Understanding of laptops Understanding of phones Understanding of iPads Knowledge of apps and games Knowledge of Frozen Understanding of the computer rules Understanding of recipes on mobiles	Non-working phones Working computer	A = Non-working phones provided A = Working computer provided C = Working phones not provided	To pretend to bake Frozen cookies using the recipe off the mobile
23/7/14	Mia	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to talk on the phone in her play
23/7/14	Dolphin	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Separating meaning from object Play skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to talk on the phone in her play
23/7/14	Dolphin	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of their friends
23/7/14	Eleni Kavithmi Emily Kiana	Pasting are, outside and in the tent at Cosmic Kindergarten	Children's interest All 4 ways of imagination Understanding of televisions Play skills Cultural re-enactment	NW Television	A = Pasting area provided A = Educator support A = Children's play skills C = Working TV not provided	To pretend to watch television
23/7/14	Dolphin	Home corner at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Separating meaning from object Cultural re-enactment Understanding of phones	A created phone	A = Home corner provided	To pretend a banana is a phone to make a call
23/7/14	Diana	Pasting area, outside and in the tent at Cosmic Kindergarten	Children's interest All 4 ways of imagination Understanding of televisions Play skills Cultural re-enactment	NW Television	A = Pasting area provided A = Educator support A = Children's play skills C = Working TV not provided	To make a television to pretend to watch in the tent
24/7/14	Eleni	Computer set up at Cosmic Kindergarten	Children's interests 1st way of imagination Peer support Computer program	Working computer	A = Working computer provided A = Program provided A = Peer support C = No eductor support	Pretending they are dancing to music from the computer
24/7/14	Mia Shavani	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to talk on the phone in her play
24/7/14	Hyo Joo Kavithmi	Outside at Cosmic	Children's interest 1st way of imagination	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of

	Mia	Kindergarten	Understanding of cameras Play skills Social skills Cultural re-enactment			their friends pretending to be animals at the zoo
24/7/14	Hyo Joo	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Social skills Cultural re-enactment	NW camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of her friends
24/7/14	Mia Shivani Anushka	Home corner at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Separating meaning from object Cultural re-enactment Understanding of phones Understanding of touch screens	Non-working mobiles	A = Non-working mobiles provided C = Working mobiles not provided	To use touch screen mobiles in their play
24/7/14	Mia Anushka	The block area at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Separating meaning from object Cultural re-enactment Understanding of phones Understanding of school	Non-working mobiles	A = Non-working mobiles provided C = Working mobiles not provided	To pretend they are going to school
24/7/14	Ameya Saarah	Doll's house set up at Cosmic Kindergarten	Social Skills Play skills 1st way of imagination Cultural re-enactment Understanding of phones	Non-working mobiles	A = Non-working mobiles provided C = Working mobiles not provided	To pretend to be talking on the phone
28/7/14	Amy Ding Ding	Table set up with a tea set inside at Creative Kindergarten	Children's interests Children's skills 1st way of imagination	Non-working mobile and camera	A = Non-working mobiles provided A = Non-working camera provided C = Working mobiles not provided C = Working camera not provided	To carry and use a mobile and camera while playing other activities
28/7/14	Daniel	Pasting area of Creative Kindergarten	Children's interest Children's skills All ways of imagination Knowledge of mobiles	Non-working mobile	A = Non-working mobiles provided A = Pasting area and materials C = Working mobiles not provided C = No educator involvement	To create a mobile to use in his play
28/7/14	Ding Ding Amy	Tea set activity at Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of mobiles Knowledge of cameras Cultural re-enactment	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To play while having a mobile and camera next to them
29/7/14	Dolphin	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend he is talking to an overseas friend on a mobile
29/7/14	Emily	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend she is talking on a mobile
29/7/14	Annabelle Mia Lola	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to be characters from Frozen and use a mobile to call people
29/7/14	Mia Annabelle Ameya Lola	The mat area at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Understanding of the teacher's role Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to be characters from Frozen, to pretend to be a teacher and use a mobile to call people
29/7/14	Ameya Annabelle Ameya Kavithmi Ann Mary	Home corner and block area in Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend to be characters from Frozen and use a mobile to call people
29/7/14	Ann Mary Ameya Annabelle	Book area at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Understanding of cameras Play skills	NW mobiles and cameras	A = Non-working mobiles provided A = Non-working cameras provided C = Working mobiles not provided C = Working cameras not provided	

			Social skills Cultural re-enactment			
29/7/14	Dolphin River Emily Lola	Home corner at Cosmic Kindergarten	Understanding of cameras Understanding of mobiles Social skills Play skills 1st and 2nd ways of imagination Cultural re-enactment	Non-working camera and phone	A = Non-working camera provided A = Non-working phone provided C = Working camera not provided C = Working phone not provided	To pretend they are on the moon
29/7/14	Dolphin Emily	Home corner at Cosmic Kindergarten	Understanding of mobiles Social skills Play skills 1st and 2nd ways of imagination Cultural re-enactment	Non-working phones	A = Non-working phones provided C = Working phone not provided	To pretend to talk to his friend visit overseas
31/7/14	Ameya	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Play skills Social skills Cultural re-enactment	NW mobile	A = Non-working mobiles C = Working mobiles not provided	To pretend with her friends and use a mobile
31/7/14	Mia	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW cameras	A = Non-working cameras provided C = Working cameras not provided	To mix sand and water in a bowl
31/7/14	Dolphin	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW cameras	A = Non-working cameras provided C = Working cameras not provided	To pretend to take photos of his friends
31/7/14	Georgia	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW cameras	A = Non-working cameras provided C = Working cameras not provided	To pretend to take photos of his friends
31/7/14	Minuri	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW cameras	A = Non-working cameras provided C = Working cameras not provided	To pretend to take photos of her friends
31/7/14	Mia	Outside at Cosmic Kindergarten	Understanding of cameras Social skills Play skills First way of imagination Cultural re-enactment	Non-working camera	A = Non-working camera provided C = Working camera not provided	To take photos of her friends
1/8/14	Jack	Pasting area of Creative Kindergarten	Children's interest Children's skills Social skills All ways of imagination Knowledge of video cameras	Non-working video camera	A = Creation of a non-working video camera A = Pasting area and materials provided C = Working camera not provided C = No educator involvement	To create a video camera to use in his play
1/8/14	Jack Oliver	Pasting area of Creative Kindergarten	Children's interest Children's skills Social skills All ways of imagination Knowledge of video cameras	Non-working video camera	A = Creation of a non-working video camera A = Pasting area and materials provided C = Working camera not provided C = No educator involvement	To create a video camera to use in his play
1/8/14	Emma	Home corner at Creative Kindergarten	Children's interests Children's skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided A = Home corner provided C = Working mobiles not provided C = No educator involvement	To carry and use a mobile and camera while re-enacting cultural behaviours
1/8/14	Camila	Table outside at Creative Kindergarten	Children's interests Children's skills 1st way of imagination	Non-working computer	A = Non-working keyboards provided C = Working keyboards not provided	To play typing on a keyboard
1/8/14	Kieran Edward Kai	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To carry and use a mobile in their pretend play
1/8/14	Emma	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To carry and use a mobile in their pretend play
1/8/14	Edward Kai Kieran	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To carry and use a mobile in their pretend play
1/8/14	Kai	Home corner at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To pretend to play a game on a non-working mobile

1/8/14	Camila	Home corner at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To carry and use a mobile and camera while re-enacting cultural behaviours
1/8/14	Camila Kai Eli	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To play in home corner
1/8/14	Kai Ryan Eli	Home corner in Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of mobiles Understanding of games on mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To play and discuss the games they play on mobiles
1/8/14	Camila Coirle Eli Emma	Home corner in Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To play in home corner
1/8/14	Emma	Outside at Creative Kindergarten	Play skills 1st way of imagination Separating meaning from object Knowledge of touch screen mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend a mirror is a touch screen mobile for her play
4/8/14	Daniel Toby	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working mobile	A = Non-working mobile provided C = Working mobiles not provided	To carry and use a mobile and camera while re-enacting cultural behaviours
4/8/14	Toby	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination	Non-working camera	A = Non-working cameras provided C = Working cameras not provided	To use a non-working camera in his play
4/8/14	William Theo Eli Lara Silly Edward Kieran	Outside at Creative Kindergarten	Social skills Literacy skills Knowledge of iPads Educator beliefs Educator support Educator pedagogy Children's interests	Working iPad and speaker	A = iPad and speaker used to play song A = Educator support C = iPad not sued for children's free play	To use the iPad to play a song for the children to act out
4/8/14	Daniel Toby	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to talk on the phone
4/8/14	William Theo Eli Lara Silly Edward Kieran	Outside at Creative Kindergarten	Social skills Literacy skills Knowledge of iPads Educator beliefs Educator support Educator pedagogy Children's interests	Working iPad and speaker	A = iPad and speaker used to play song A = Educator support C = iPad not sued for children's free play	To use the iPad to play a song for the children to act out
5/8/14	Mia Kiana Phoenix	Book area at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of mobiles Understanding of cameras Play skills Social skills Cultural re-enactment	NW mobiles and cameras	A = Non-working mobiles provided A = Non-working cameras provided C = Working mobiles not provided C = Working cameras not provided	To pretend to talk to friends on a mobile
5/8/14	Dolphin	Home corner at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	NW cameras	A = Non-working cameras provided C = Working cameras not provided	To pretend to take photos of his friends
5/8/14	Dolphin River Emily	Home corner at Cosmic Kindergarten	Understanding of cameras Social skills Play skills First way of imagination Cultural re-enactment	Non-working camera	A = Non-working camera provided	To pretend to take his friends' photos
5/8/14	Mia	Home corner at Cosmic Kindergarten	Understanding of cameras Understanding of phones Social skills Play skills First way of imagination Cultural re-enactment Knowledge of ambulances	Non-working camera and phone	A = Non-working camera provided A = Non-working phone provided C = Working camera not provided C = Working phone not provided	To pretend she is on the phone and calling an ambulance for a sick baby

8/8/14	Coirle Camila	Home corner at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination Understanding of phones Understanding of mobiles	Non-working phones and mobiles	A = Non-working mobile provided A = Non-working phones provided C = Working mobiles not provided C = Working phones not provided	To use non-working phones and mobiles in their play
8/8/14	Vanessa	Educator interview	Technological knowledge Apps and programs Technologies available Pedagogy Educator training Beliefs Children's interests Children's skills Screen time guidelines Information needed 'research' Parental beliefs What's available Outdoor activity Expectations form schools	Working technologies - iPad, computer and camera	A = To provide working technologies A = Exposure to technologies C = Time limits applied C = Only one child at a time C = Only on "rainy days as a special treat"	To help children become familiar with technologies before they go to school
8/8/14	Vanessa	Educator interview	Children's interests Educator pedagogy Educator beliefs Educator rules Educator knowledge of technologies	Working technologies - iPad, computer and camera	A = To provide working technologies A = Exposure to technologies C = Time limits applied C = Only one child at a time C = Only on "rainy days as a special treat"	To consider what the children are learning around the technologies
8/8/14	Vanessa	Educator interview	Educator pedagogy Educator beliefs Educator knowledge of technologies Educator support Value of play Value of technologies Beliefs about children's skills	Working technologies - iPad, computer and camera	A = Pasting area and materials provided A = Educator support C = Working technologies not provided	To encourage children to make the technologies they need for their play
8/8/14	Vanessa	Educator interview	Educator training Educator pedagogy Networking Scaffolding each other's skills Knowledge of technologies	Working technologies - iPad, computer and camera	A = Ideas for training that is needed C = Skills not already there	To provide ideas for the training that is needed
8/8/14	Vanessa	Educator interview	Children's interest Technology knowledge Educator support Educator pedagogy Educator beliefs Educator rules	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To consider the time limits applied and what the children are learning around the technologies
8/8/14	Vanessa	Educator interview	Educator pedagogy Educator beliefs Educator knowledge of technologies Educator support Value of play Value of technologies Knowledge to support children's play	Non-working technologies	A = Non-working technologies provided A = Pasting area and materials provided C = Working technologies not provided	To enrage children to extend their play and learning around technologies
11/8/14	Jamie	Outside at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination Understanding of cameras	Non-working camera	A = Non-working cameras provided C = Working cameras not provided	To use a non-working camera in his play
11/8/14	Toby	Home corner at Creative Kindergarten	Play skills Social skills 1st and 2nd ways of imagination Understanding of phones Communication skills Conversation skills	Non-working mobile	A = Non-working mobile provided A = Social contact A = Adult contact	To play talking to me on the mobile
11/8/14	Vanessa	Creative Kindergarten	Pedagogy Beliefs Understanding of iPads Understanding of search for content Children's interests 1st and 2nd ways of imagination Advice from other teachers	Working iPad	A = Working iPad provided A = Educator scaffolding	To provide children with information found on the iPad
12/8/14	Giraffe	Computer set up at Cosmic Kindergarten	Children's interests Understanding of computers Maths skills One-to-one correspondence Program provided	Working computer	A = Working computer provided A = Program provided C = No eductor support	To complete maths equations and slime the ghosts
12/8/14	William	Home corner at	Children's interests	NW electric	A = Non-working electric	To pretend to

		Cosmic Kindergarten	1st way of imagination Understanding of electric typewriters	typewriter	typewriter provided C = Working electric typewriter not provided	type on the electric typewriter
12/8/14	Lola	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Knowledge of cooking Cultural re-enactment Knowledge of recipes found on the internet Educator as a co-player Communication skills	Non-working laptop and phone	A = Home corner provided A = Non-working laptop provided A = Non-working phone provided A = Educator involvement C = Working laptop not provided C = Working phone not provided	For Lola to find a recipe to cook online
12/8/14	River Dolphin Emily Mia	Home corner set up as a doctor's surgery At Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Understanding of phones Understanding of cameras Knowledge of doctors	Non-working laptop, phone and camera	A = Home corner provided A = Non-working laptop provided A = Non-working phone provided A = Non-working camera provided C = Working laptop not provided C = Working phone not provided	To pretend they are doctors looking after sick patients
12/8/14	Saarah	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Literacy skills - letter recognition	Non-working laptop	A = Non-working laptop provided	To re-enact the cultural behaviour of working through typing on a laptop
12/8/14	William	Home corner at Cosmic Kindergarten	Home corner props and set up Understanding of type writers 1st and 2nd ways of imagination	Non-working type writer	A = Non-working type writer provided	To pretend he is typing on the type writer
12/8/14	Lola	Home corner at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Knowledge of cooking Cultural re-enactment Knowledge of recipes found on the internet Educator as a co-player Communication skills	Non-working laptop and phone	A = Home corner provided A = Non-working laptop provided A = Non-working phone provided A = Educator involvement C = Working laptop not provided C = Working phone not provided	For Lola to find a recipe to cook online
13/8/14	William	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of video cameras Understanding of electric typewriters Play skills Cultural re-enactment	NW video camera and electric typewriter	A = Non-working video camera provided A =Non-working electric typewriter provided C = Working video camera not provided C = Working electric typewriter not provided	To pretend to video his friends
13/8/14	William	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of video cameras Observation skills Cultural re-enactment	NW video camera	A = Non-working video camera provided C = Working video camera not provided	To pretend to video his friends
27/8/14	Kim	Educator interview	Pedagogy Beliefs Current understandings Training Children's interests Children's skills Knowledge of technologies	Technologies	A = To provide technologies C = To support children's technology use (potential A)	To extend her repertoire to include technology provision and teach technologies
27/8/14	Kim	Educator interview	Pedagogy Beliefs Understanding of children's play Understanding of NWT Understanding of imagination	NWT	A = Provision of NWT A = Support of imaginative play	To provide non-working technologies to extend children's play (Kim, middle interview, 27/07/14, p.1).
27/8/14	Kim	Educator interview	Fragile iPad Knowledge of the iPad (charging) Children's skills Cost of the iPad Pedagogy Beliefs Educator's training	Working iPad	A = Trust A = Provide the iPad for children's use C = Limit the children's use C =Lack of trust	To provide the iPad more often and to teach the children to respect it

27/8/14	Kim	Educator interview	Educator training Pedagogy Beliefs Children's learning Understanding technologies	Technologies	A = Provide technologies A = Support children's learning C = Knowing what to document and assess	To build her repertoire, provide technologies, support children's learning, then document and assess their learning.
27/8/14	Kim	Educator interview	Fragile iPad Knowledge of the iPad (charging) Children's skills Cost of the iPad Pedagogy Beliefs Educator's training	Working iPad	A = Trust A = Provide the iPad for children's use C = Limit the children's use C =Lack of trust	Jo - What processes or rules do you have that may influence the children to use the technologies? Kim - "Yeah, definitely the respect, I think needs to come into it, it's a really tricky one when you think about it, like it needs to be respected because there's a price tag on it, coming, especially with the, even if you are in a rich kinder you don't want to be replacing, replacing iPads and all that sort of thing all the time. But they're pretty, they're pretty good with them, but they are actually really good, I am actually thinking about the way boys interact with the phones at home and use the technologies at home. For some reason the kids are quite good at the use of technologies, and they don't really drop them and break them" (Kim, middle interview, 27/07/14, p.3).
27/8/14	Kim	Educator interview	Pedagogy Beliefs Understanding of technologies Training Children's interests Children's skills Perceptions of parental wishes	Technologies	A = Provide technologies A = Meeting parents wishes C = Meeting parents' wishes C = Monitoring content	To provide technologies respecting the parents' wishes and monitor the content they are accessing (Kim, middle interview, 27/07/14, p.3).
27/8/14	Kim	Educator interview	Children's interests The value adults place on technologies Mobile Internet Technology addiction	Working technologies	A = Recognising children's interests A = Provide a programme based on children's interests C = Provide a programme based on children's interests	To recognise the value placed on technologies by adults and that is what the children are learning.
27/8/14	Kim	Educator interview	Understanding of working technologies	Working technologies	A = To provide technologies C = To support children's	To assess the content children

			Understanding of content Knowledge of possible learning Children's interests Knowledge to support children's learning Engaging children		technology use (potential A)	are accessing and what they are learning (Kim, middle interview, 27/07/14, p.4).
27/8/14	Kim	Educator interview	Understanding of working technologies Understanding of child development Understanding of children's learning Pedagogy Beliefs Children's interests Children's connectedness Time limits Technology addicted	Working technologies	A = To provide technologies A = To support children's development and learning C = To support children's technology use (potential A) C = To move children on	To support children's learning and development by providing technologies (Kim, middle interview, 27/07/14, p.5).
6/10/14	Jamie Theo	Home corner at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination Understanding of phones Understanding of mobiles	Non-working phones and mobiles	A = Non-working mobile provided A = Non-working phones provided C = Working mobiles not provided C = Working phones not provided	To use non-working phones and mobiles in their play
6/10/14	Jamie Theo	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to call the police on the phone
6/10/14	Vanessa	Inside at Creative Kindergarten	Educator support Educator knowledge of You Tube Children's interests Educator pedagogy	Working iPad	A = Working iPad to play songs C = iPad not provided for children's free play	To use the iPad to play Daniel's favourite songs
7/10/14	Dolphin Giraffe Dinosaur	Outside at Cosmic Kindergarten	Children's interest 1st way of imagination Understanding of iPod Dancing skills Cultural re-enactment	Working iPod	A = Working iPod provided A = Song provided	To dance to the music with friends
7/10/14	Kiana Emily Ameya Kavithmi	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of computers Literacy skills Cultural re-enactment	Non-working laptop	A = Non-working laptop provided A = Home corner provided C = Working laptop not provided	To pretend to be doctors
7/10/14	Lola Mia Ameya	Home corner set up as a doctor's surgery At Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of laptops Understanding of phones Knowledge of doctors	Non-working laptop and phone	A = Non-working laptop provided A = Non-working phone provided A = Home corner provided C = Working phone not provided C = Working laptop not provided	To pretend they are a doctor in play
7/10/14	Kim	Cosmic Kindergarten	Children's interests 1st and 2nd ways of imagination Educator pedagogy Educator beliefs Educator understanding of the iPad	Working iPad	A = iPad provided to listen to stories C = iPad not available for free play	To provide the stories on the iPad so the children can then act them out with puppets
7/10/14	Kim	Outside at Cosmic Kindergarten	Children's interests Educator pedagogy Educator beliefs Educator understanding of the iPad	Working iPad	A = iPad provided to play music C = iPad not available for free play C = iPad screen not to be watched	To provide to the music on the iPad to support children's play
8/10/14	Nayte William	Outside at Cosmic Kindergarten	Children's creativity 1st way of imagination Understanding of cameras Play skills Social skills Cultural re-enactment	Non-working cameras	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of their friends
8/10/14	William	Outside at Cosmic Kindergarten	Children's creativity 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	Non-working cameras	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of his kindergarten
8/10/14	Jordan Lennox	Outside at Cosmic Kindergarten	Children's creativity 1st way of imagination Understanding of cameras Understanding of mobiles	Non-working cameras and mobiles	A = Non-working camera provided A = Non-working mobiles provided C = Working camera not provided C = Working mobiles not provided	To pretend driving, taking on a mobile and taking photos

			Play skills Social skills Cultural re-enactment			
8/10/14	Mia Kiana Will	Outside at Cosmic Kindergarten	Children's creativity 1st way of imagination Understanding of cameras Understanding of mobiles Play skills Social skills Cultural re-enactment	Non-working cameras and mobiles	A = Non-working camera provided A = Non-working mobiles provided C = Working camera not provided C = Working mobiles not provided	To pretend to take photos and talk to friends on the phone
8/10/14	Jordan Lennox	Outside at Cosmic Kindergarten	Children's creativity 1st way of imagination Understanding of cameras Play skills Cultural re-enactment	Non-working cameras	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of his kindergarten
10/10/14	Madeleine	Home corner at Creative Kindergarten	Children's interests Children's skills Children's social skills 1st way of imagination Understanding of phones	Non-working phones	A = Non-working phones provided C = Working phones not provided	To use non-working phones in her play
10/10/14	Amy Ding Ding	Construction area inside of Creative Kindergarten	Children's interests Children's skills All ways of imagination Conversation skills Separation of meaning from object Understanding of phones Social skills	Non-working phones	A = Non-working phone created C = Working phones not provided	To use the phones they created in their play
10/10/14	Madeleine	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Understanding of the different models of phones Cultural re-enactment Communication skills	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to get organised for a party
13/10/14	Kai	Construction area inside of Creative Kindergarten	Children's interests Children's skills All ways of imagination Separation of meaning from object Understanding of phones Social skills	Non-working phones	A = Non-working phone created C = Working phones not provided	To use the phone he created in his play
13/10/14	Madeleine Lara	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
13/10/14	Toby	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of phone headsets Home corner props	Non-working phone headset	A = Non-working headset provided A = Home corner provided C = Working phone headset not provided	To play with a headset
13/10/14	The Joker	Painting area at Creative Kindergarten	Knowledge of iPads Drawing skills Educator support	Working iPad	A = iPad used to support drawing A = Educator support C = iPad not sued for children's free play	To copy a picture of a dragonfly from the iPad
14/10/14	Jordan	Computer set up at Cosmic Kindergarten	Children's interest Separating meaning from object Understanding of computers Understanding of computer program Educator beliefs	Working computer	A = Working computer provided C = Time limits applied	To proceed through the levels
14/10/14	William	Home corner at Cosmic Kindergarten	Children's creativity Children's skills 1st way of imagination Home corner and props Knowledge of computers Literacy skills Cultural re-enactment	Non-working laptop	A = Non-working laptop provided C = Working laptop not provided	To pretend he is a doctor and typing on a laptop
14/10/14	Eleni Hyo Joo	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Understanding of roles and rules in play Cultural re-enactment (Doctor's and Mother's roles) Understanding of mobiles Social skills	Non-working phone	A = Non-working phone provided A = Home corner provided C = Working phone not provided	To pretend they are the doctor and a mother in play

14/10/14	Eleni Hyo Joo William	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Understanding of roles and rules in play Cultural re-enactment (Doctor's and Mother's roles) Understanding of mobiles Social skills	Non-working phone	A = Non-working phone provided A = Home corner provided C = Working phone not provided	To pretend they are the doctor and a mother in play
14/10/14	Mia Lola Saarah	Home corner set up outside at Cosmic Kindergarten	Home corner props and set up Social skills Play skills 1st and 2nd ways of imagination Separating meaning from object Understanding of televisions	Non-working television	A = Home corner provided	To pretend they are watching the television
14/10/14	Jordan	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Social skills	Working computer	A = Working computer provided A = Game provided	To play Miner Max and progress through the levels
14/10/14	Jordan	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Social skills Educator rules Educator beliefs	Working computer	A = Working computer provided A = Game provided	To play Miner Max and progress through the levels
14/10/14	Susan	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Social skills Educator rules Educator beliefs	Working computer	A = Working computer provided A = Game provided	To play Miner Max and progress through the levels
15/10/14	Kiana Emily	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Understanding of roles and rules in play Cultural re-enactment (Doctor's and Mother's roles) Understanding of mobiles Social skills	Non-working phone	A = Non-working phone provided A = Home corner provided C = Working phone not provided	To pretend they are the doctor and a mother in play
15/10/14	Nayte Bailey Giraffe Dinosaur Georgia	Computer set up at Cosmic Kindergarten	Children's interest 1st way of imagination Separating meaning from object Peer scaffolding Understanding of computers Understanding of the game	Working computer	A = Working computer provided A = Program provided A = Peer support C = No eductor support	To proceed through the levels and to listen to their friends' support
15/10/14	Lola	Computer set up at Cosmic Kindergarten	Children's interest 1st way of imagination Separating meaning from object Understanding of computers Understanding of the game	Working computer	A = Working computer provided A = Program provided C = No eductor support	To play Reader Rabbit on the computer
15/10/14	Will Hyo Joo	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Social skills Scaffolding between peers Communication skills	Working computer	A = Working computer provided A = Game provided A = Peer support	For Will and Hyo Joo to play Miner Max and for Will to teach Hyo Joo how to play
15/10/14	Emily	Computer set up at Cosmic Kindergarten	Understanding of computers Understanding of game Separation of meaning from object 1st way of imagination Literacy skills - letter recognition Educator beliefs Educator rules	Working computer	A = Working computer provided A = Game provided C - Educator rules	For Emily to play *Reader Rabbit*
16/10/14	Lennox	Computer set up at Cosmic Kindergarten	Children's interest 1st way of imagination Separating meaning from object Understanding of computers Understanding of the game	Working computer	A = Working computer provided A = Program provided C = No eductor support	To play Miner Max on the computer
16/10/14	Diana Kavithmi	Cosmic Kindergarten	All 4 ways of imagination Pasting area and materials Play skills	Pasting materials	A = Pasting area provided A = Educator support A = Children's play skills	To create a Minecraft city to pretend they are

			Social skills Understanding of the computer game			playing the computer game
16/10/14	Bailey	Computer set up at Cosmic Kindergarten	Children's interest 1st way of imagination Separating meaning from object Understanding of computers Understanding of the game	Working computer	A = Working computer provided A = Program provided C = No eductor support	To play Miner Max on the computer
16/10/14	Kiana	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Understanding of laptops Understanding of mobiles Play skills Pretend skills Cultural re-enactment	NW laptop NW mobile	A = Non-working laptop A = Non-working mobiles provided C = Working laptop not provided C = Working mobile not provided	To pretend she is typing on a laptop and talk on a mobile
16/10/14	Mia	Home corner at Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Cultural re-enactment (Doctor's roles) Understanding of laptops Understanding of mobiles Social skills	Non-working laptop and phone	A = Non-working laptop provided A = Non-working phone provided A = Home corner provided C = Working phone not provided C = Working laptop not provided	To pretend they are a doctor in play
16/10/14	Mia Dolphin Ameya	Home corner set up as a doctor's surgery At Cosmic Kindergarten	Children's interests 1st way of imagination Play skills Cultural re-enactment (Doctor's roles) Understanding of laptops Understanding of mobiles Social skills	Non-working laptop and phone	A = Non-working laptop provided A = Non-working phone provided A = Home corner provided C = Working phone not provided C = Working laptop not provided	To pretend they are a doctor in play
16/10/14	Diana Kavithmi	Cosmic Kindergarten	All 4 ways of imagination Pasting area and materials Play skills Social skills Understanding of the computer game	Pasting materials	A = Pasting area provided A = Educator support A = Children's play skills	To create a Minecraft city to pretend they are playing the computer game
16/10/14	Kiana Emily Lola	Home corner at Cosmic Kindergarten	Understanding of cameras Social skills Play skills First way of imagination Understanding of writing	NW camera	A = Home corner provided A = Non-working camera provided C = Working camera not provided	To pretend to take their friend's photo
17/10/14	Emma	Outside at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of computers	Non-working keyboard	A = Non-working keyboards provided C = Working keyboards not provided	To play with the keyboard
17/10/14	Emma	Outside at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of cameras Knowledge of animals	Non-working camera	A = Non-working camera provided C = Working cameras not provided	To use the non-working camera to pretend to take photos of animals
17/10/14	Emma Ariel	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of keyboards Literacy skills	Non-working keyboards	A = Non-working keyboard provided C = Working keyboard not provided	To pretend to type on the keyboard
17/10/14	Emma	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of cameras Cultural re-enactment Educator rules	Non-working camera	A = Non-working camera provided C = Working camera not provided	To pretend to take photos of her kindergarten yard
17/10/14	Jack Oliver The Joker	Pasting area and outside at Creative Kindergarten	Pasting area and materials All ways of imagination Social skills Play skills Understanding of video cameras Cultural re-enactment Understanding of filming behaviour	Created camera	A = Pasting are and materials provided C = Working video camera not provided	To make a video camera and use it to record their friends
17/10/14	Emma	Outside at Creative Kindergarten	Social skills Play skills 1st way of imagination Knowledge of cameras Cultural re-enactment Educator engagement	Non-working keyboards	A = Non-working keyboards provided A = Educator involvement C = Working keyboards not provided	To do work on the keyboard
17/10/14	Educator	Outside at Creative Kindergarten	Educator rules Educator beliefs Children's interests	Non-working camera	A = Non-working camera provided C = Working cameras not provided	To remind children of what to do, remind

			Understanding of play			them of the rules
20/10/14	Connor	Outside in the kindergarten yard. The wider context being a digital world.	Educators' beliefs Educators' restrictions Children's creativity Children's knowledge around how to navigate an iPad Children's interests Being rebellious	Working iPad	A = iPad is provided A = The available apps C = Only available for free play on rainy days	To engage in free play on the iPad on a sunny day
20/10/14	Jack	Outside in the kindergarten yard. Also, the environment where Jack was using the iPad for his free play.	Children's creativity Knowledge of iPads Being rebellious Weather Children's interests Knowledge of rules Educator's beliefs Educator's restrictions Role of educators	Working iPad	A = The provision of the iPad for song paying A = the available apps C = Only available for free play on rainy days	To engage in free play on the iPad on a sunny day
20/10/14	Amy Ding Ding	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
20/10/14	Daniel Theo	Outside at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles	Non-working mobiles	A = Non-working mobiles C = Working mobiles not provided	To use a non-working camera in their play
20/10/14	Connor	Stage built outside of Creative Kindergarten	Social skills Play skills All four ways of imagination Understanding of microphones Knowledge of performing on stage Understanding of mobiles Knowledge of The Lego Movie	Created microphones	A = Pasting are and materials provided A = Educator support with music C = Working microphone not provided	To pretend to perform to the Lego Move songs
20/10/14	Connor	Outside at Creative Kindergarten	Social skills Understanding of iPads Understanding of games on the iPad Communication skills Knowledge of music Educator's rules Educator's restrictions Educator beliefs Educator pedagogy	Working iPad	A = iPad provided to play music C = Educator rules C = iPad not provided for children's free play	To use the iPad to play an app on a sunny day
20/10/14	Ding Ding Amy	Home corner in Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend in home corner
20/10/14	Louise	Outside in the kindergarten yard. Also, the environment where Jack was using the iPad for his free play.	Weather Children's interests Knowledge of rules Role of educators	Working iPad	A = The provision of the iPad for song paying C = Only available for free play on rainy days	To enforce the rules of free play on iPads only on rainy days
22/10/14	Kim	Educator interview	Devices Apps and programs Knowledge Pedagogy Beliefs Children's interests Children's skills Educator's training Screen time guidelines Adult support and scaffolding Understanding of technologies	Working technologies - iPads, computers and camera	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	"To provide technologies as a new permanent learning area" (Kim, middle interview, 22/10/14, p.1)
22/10/14	Kim	Educator interview	Technology knowledge Apps and programs Technologies available Pedagogy Educator's training Beliefs Children's interests Children's skills Screen time guidelines Media surrounding technology provision	Working technologies - iPads, computers and camera	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	"Balancing old and new pedagogies" (Kim, middle interview, 22/10/14, p.1)

23/10/14	Vanessa	Educator interview	Devices Apps and programs Knowledge Pedagogy Beliefs Children's interests Children's skills Educator's training Networking - information from others Expectations from schools Expectations from parents	Working technologies - iPad, computer and camera	A = To provide working technologies A = Learning numbers and letters C = Time limits applied C = Only one child at a time C = Only on "rainy days as a special treat"	To provide technologies for learning
23/10/14	Vanessa	Educator interview	Children's interest Technology knowledge Educator support Educator pedagogy Educator beliefs Educator rules	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To consider the time limits applied and what the children are learning around the technologies
23/10/14	Vanessa	Educator interview	Children's interest Technology knowledge Educator support Educator pedagogy Educator beliefs Educator rules	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To consider the time limits applied and what the children are learning around the technologies
24/10/14	Eli Indy Madeleine	Outside at Creative Kindergarten	Social skills Play skills 1st and 2nd way of imagination Knowledge of mobiles Cultural re-enactment	Non-working phones and mobiles	A = Non-working phones and mobiles provided C = Working phones and mobiles not provided	To pretend to talk on the phone
27/10/14	Oliver	The computer inside at Creative Kindergarten	Children's interest Children's skills Programs available Understanding of computers	Working computer	A = Computers provided A = Programs provided C = No educator involvement	To play the cake game on the computer
27/10/14	Toby	The iPad inside at Creative Kindergarten	Children's interest Children's skills Apps available Understanding of iPad	Working iPad	A = iPad provided A = Apps provided C = No educator involvement	To play the matching game on the iPad
27/10/14	Jack	The iPad inside at Creative Kindergarten	Children's interest Children's skills Apps available Understanding of iPad	Working iPad	A = iPad provided A = Apps provided C = No educator involvement	To play a game on the iPad
27/10/14	Silly Connor Toby	Outside and at the pasting table at Creative Kindergarten	Children's interest Children's skills All ways of imagination Apps available Researching information on the iPad Understanding of iPad	Working iPad	A = iPad provided A = Educators scaffolding	To research volcanos and fires on the iPad
27/10/14	Archie	The computer inside at Creative Kindergarten	Children's interest Children's skills Programs available Understanding of computers	Working computer	A = Computers provided A = Programs provided C = No educator involvement	To play the face matching game on the computer
27/10/14	Toby	The iPad inside at Creative Kindergarten	Children's interest Children's skills Apps available Understanding of iPad	Working iPad	A = iPad provided A = Apps provided C = No educator involvement	To play My Play Home on the iPad
27/10/14	Madeleine Lara Jack	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st and 2nd ways of imagination Knowledge of mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
27/10/14		The computer inside at Creative Kindergarten	Children's interest Children's skills Programs available Understanding of computers	Working computer	A = Computers provided A = Programs provided C = No educator involvement	To play the cake game on the computer
27/10/14	Madeleine	Home corner in Creative Kindergarten	Play skills 1st way of imagination Knowledge of mobiles Cultural re-enactment	Non-working mobiles	A = Non-working mobile provided C = Working mobile not provided	To pretend to use a mobile
27/10/14	Connor Silly Louise	Outside and at the pasting table at Creative Kindergarten	Children's interest Children's skills All ways of imagination Apps available Researching information on the iPad Understanding of iPad Educator support	Working iPad	A = iPad provided A = Educators scaffolding	To research volcanos and fires on the iPad
27/10/14	Ding Ding	Home corner in	Social skills	Non-working	A = Non-working mobile provided	To pretend to

	Amy Marcus	Creative Kindergarten	Play skills 1st way of imagination Cultural re-enactment Understanding of mobiles	mobiles	C = Working mobile not provided	talk on the phone
27/10/14	Louise	Outside and at the pasting table at Creative Kindergarten	Children's interest Children's skills All ways of imagination Researching information on the iPad Understanding of iPad Pedagogy Beliefs Educator rules (iPad can be used for research)	Working iPad	A = iPad provided A = Educators scaffolding	To research volcanos and fires on the iPad
30/10/14	Kim	Educator interview	Children's interests The value adults place on technologies Mobile Internet Technology addiction parental beliefs Co-educator beliefs Understanding of traditional forms of learning	Working technologies	A = Respecting parental and co-educator's wishes A = Recognising children's interests A = Provide a programme based on children's interests C = Respecting parental and co-educator's wishes C = Provide a programme based on children's interests C = Limited understanding of potential learning with technologies	To provide technologies respecting parent's and co-educator's wishes (Kim, after interview, 30/10/14, p.1).
30/10/14	Kim	Educator interview	Technology knowledge Pedagogy Educator's training Beliefs Educator understanding of play Educator's programming Children's interests Children's skills Children scaffolding each other Educator rules	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To reconsider the time limits Kim applies to the working technologies and the benefits for children
30/10/14	Kim	Educator interview	Children's interests The value adults place on technologies Mobile Internet Technology addiction parental beliefs Co-educator beliefs Understanding of traditional forms of learning Fear of judgement	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To reconsider the time limits Kim applies to the working technologies and the benefits for children
30/10/14	Kim	Educator interview	Children's interest Technology knowledge Educator support Educator pedagogy Educator beliefs	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To support children's interests and get them involved in the program
30/10/14	Kim	Educator interview	Children's interest Technology knowledge Educator support Educator pedagogy Educator beliefs	Working technologies	A = Providing working technologies A = Apps and programs provided C = Apps and programs provided C = Time limits applied C = Only one child at a time C = Lack of scaffolding	To reconsider the time limits Kim applies to the working technologies and the benefits for children
30/10/14	Kim	Educator interview	Children's interests Children scaffolding others Technological knowledge Knowledge of computers Knowledge of games	Working technologies	A = Computer provided A = Games provided A = Children scaffolding each other C = Educator support limited	For more knowledgeable children to scaffold their peers
30/10/14	Kim	Educator interview	Educator beliefs Educator pedagogies Educator knowledge Children's interests Knowledge around working technologies Knowledge of You Tube	Working technologies	A = Working technologies provided	Knowing how to support children's play
30/10/14	Kim	Educator interview	Educator training Pedagogy Beliefs Children's learning Understanding technologies	Working technologies	A = Working technologies provided C = Knowledge of how to extend	To learn how to provide and extend children's learning around working technologies
30/10/14	Kim	Educator interview	Educator training Pedagogy	Working iPad	A = Working technologies provided	To know how to provide the iPad

			Beliefs Children's learning Understanding technologies		C = Knowledge of how to provide the iPad	to support children's learning
30/10/14	Kim	Educator interview	Educator training Pedagogy Beliefs Children's learning Understanding technologies Traditional views Children's interests Extending children's learning	Working technologies	A = Working technologies provided C = Knowledge of how to extend	To consider how technologies are provided in her teaching
31/10/14	Emma	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Knowledge around how to play games on mobiles Home corner props	Non-working mobiles	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
31/10/14	Amy Ding Ding	Home corner at Creative Kindergarten	Children's interests Children's play skills Children's social skills 1st way of imagination Knowledge of mobiles Home corner props	Non-working mobile	A = Non-working mobiles A = Home corner provided C = Working mobiles not provided	To play and re-enact cultural behaviours in home corner
31/10/14	Coirle	Snack area inside at Creative Kindergarten	Children's interest 1st way of imagination Knowledge of mobiles Knowledge of cultural behaviours	Non-working mobile	A = Non-working mobiles provided C = Working mobiles not provided	To re-enact cultural behaviours
31/10/14	Daniel Coirle	Creative Kindergarten	Children's interest Children's social skills 1st way of imagination Knowledge of mobiles Knowledge of cultural behaviours Home corner props	Non-working mobile	A = Non-working mobiles provided A = Home corner props provided C = Working mobiles not provided	To re-enact cultural behaviours
31/10/14	Daniel Coirle	Creative Kindergarten	Children's interest 1st way of imagination Knowledge of mobiles Knowledge of cultural behaviours	Non-working mobile	A = Non-working mobiles provided C = Working mobiles not provided	To re-enact cultural behaviours
31/10/14	Amy Ding Ding Daniel Coirle	Creative Kindergarten	Children's interest Children's social skills 1st way of imagination Knowledge of mobiles Knowledge of cultural behaviours Home corner props	Non-working mobile	A = Non-working mobiles provided A = Home corner props provided C = Working mobiles not provided	To re-enact cultural behaviours
31/10/14	Daniel Madeleine Jack	Home corner at Creative Kindergarten	Children's interest Children's social skills 1st way of imagination Knowledge of mobiles Knowledge of cultural behaviours Home corner props	Non-working mobile	A = Non-working mobiles provided A = Home corner props provided C = Working mobiles not provided	To use non-working mobiles as they engage in other activities
31/10/14	Louise	Inside Creative Kindergarten	Children's interest Knowledge of iPads Using the iPad to research faces	iPad	A = iPad used for researching face paint	To use the iPad to research face paint ideas
	Vanessa	Inside on a mat at Creative Kindergarten	Educator pedagogy Educator beliefs Educator knowledge of technologies Children's interests Educator provision Educator rules	Working iPad	A = Working technologies provided A = Stories provided on the iPad C = iPad not provided for children's free play	To provide stories on the iPad for children to listen to
	Vanessa	Inside on supporters' day at Creative Kindergarten	Educator knowledge of iPads Understanding of the internet and what is available Children's interests	Working iPad	A = To provide team songs on the iPad C = The iPad not provided for children's free play	To provide team songs for the children to listen to

Appendix 19 Connor's Assent Form

Children's Assent Form

I am Jo a kindergarten teacher.
While you are playing at kindergarten, I would like to talk to you about how you play with technologies, like the computer, iPad, digital camera, keyboards and phones.

I would like to talk to you about about your play.

I would like to write down about what we talk about.

Can I record what we talk about?

I would like to record our talk using a Flip camera.

Can I use what we talk about in my book?

Name: CONNOR

Thank you

Date: 6/10/14

Appendix 20 Children's writing of their names on the Daily Assent Form

TWT

Children's Daily Assent Form

Today while you are at kindergarten, I would like to watch you play with technologies, like the computer, iPad, digital camera, keyboards and phones.

If you say no, you can keep playing, I will not record you.

Date: 13/8/14

Eleni	Oli Absent Georgia	Bailey	Vyom Giraffe	Lola
Mia	Oliver Dolphin	Kshom Dinosaur	Emily	Kiana
William	Jordan	Ameya	No filming	Will No filming
No filming	Annabelle Absent	Diana DIANA	Akarsha Kavithmi	Hyo Joo
No filming	Phoenix	Ann Mary	Shivani	Child ____________
Nayte	Lennox	Minuri		Child ____________

Appendix 21 Children drawing flowers and ice-cream on the Daily Assent Form

TWT

Children's Daily Assent Form

Today while you are at kindergarten, I would like to watch you play with technologies, like the computer, iPad, digital camera, keyboards and phones. I would also like to talk to you about what you are playing with. If you say no, you can keep playing, I will not record you.

Date: 8/10/2014

Eleni	Oli Georgia	Bailey	[illegible] Giraffe "My long hair"	Lola
Mia	Oliver Dolphin	Kshom Dinosaur	Emily	Kiana
William	Jordan	Ameya "Icecream means I'm happy. I have icecream when I'm happy"	No filming	Will "It's all my hair" No filming
No filming	Annabelle left third term.	Diana	Kavithmi	[redacted]
No filming	Phoenix	Ann Mary	Shivani	Child
Nayte	Lennox	Minuri Nayte		Child Minuri

Appendix 22 Children's drawings on the Daily Assent Form

M

Children's Daily Assent Form

Today while you are at kindergarten, I would like to watch you play with technologies, like the computer, iPad, digital camera, keyboards and phones. I would also like to talk to you about what you are playing with. If you say no, you can keep playing, I will not record you.

Date: 20/10/2014

"I'm the happy sea" No filming	William No filming	Annabelle	Archie	Eli No filming
Daniel	Jack P	James	Kai "I'm a rainbow person"	Kieran
Madeleine Absent	Marcus	Oliver	Ryan No filming	Lara
Amy "Squiggerley, wiggerley lines"	Connor "My mouth is zipped up" "But you can watch me"	Loki		Shaun
Theo	Toby Absent	Edward	Raziq	
Child ______	Child ______	Child ______	Child ______	Child ______

Appendix 23 Puentedura's permission

Thursday, October 13, 2016 at 11:56:11 AM Australian Eastern Daylight Time

Subject: Re: Diagram Permission
Date: Thursday, 13 October 2016 at 11:36:38 AM Australian Eastern Daylight Time
From: Ruben R. Puentedura
To: Jo Bird

Dear Jo,

You have my permission to use the SAMR model and diagram as described.

Please accept my best wishes for the completion of your thesis work.

All the best,
Ruben

Ruben R. Puentedura, Ph.D.

Founder and President
Hippasus
228 Main Street, #412
Williamstown, MA 01267
(413) 441-6467
rubenrp@hippasus.com

http://hippasus.com

> On Oct 12, 2016, at 6:17 PM, Jo Bird <jbird21@une.edu.au> wrote:
> Hello Ruben Puentedura,
>
> I am a PhD at the Australian Catholic University in Melbourne, Australia. I am just about to complete my PhD looking at children's use of technologies in their imaginative play and educators' provision of these devices. In my thesis I was hoping to use your SAMR model and I was writing to ask for your permission to do so. I have taken the diagram from the presentation on the Hippasus website (http://hippasus.com/resources/tte/)
>
> May I have your permission to use the diagram in my thesis?
>
> Thank you for your assistance,
>
> Jo
>
> Jo Bird
> Lecturer
> Early Childhood Education