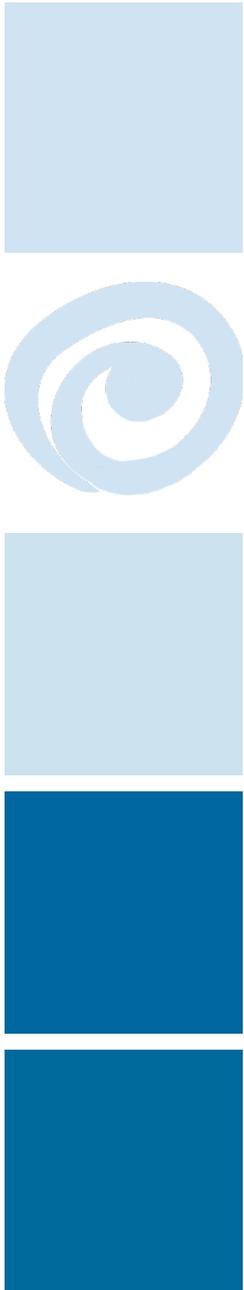


## iPads and opportunities for teaching and learning for young children



Elaine Khoo, Rosina Merry and  
Nhung Hong Nguyen

with Timothy Bennett and  
Nadine MacMillan





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*(iPads n Kids)*

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2015

Please cite as:

Khoo, E., Merry, R., & Nguyen, N. H., with Bennett, T., & MacMillan, N. (2015). *iPads and opportunities for teaching and learning for young children (iPads n kids)*. Hamilton, New Zealand: Wilf Malcolm Institute of Educational Research.

First published 2015

By Wilf Malcolm Institute of Educational Research (WMIER), Faculty of Education,  
The University of Waikato, Private Bag 3105, Hamilton, 3240, New Zealand

Further copies are available at <http://www.waikato.ac.nz/wmier/research/projects/young-children-using-ipads-ipads-n-kids>

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**Cover design:** Craig Gilliver, WMIER Summer Scholar 2014

**Printed by:** Waikato Print, Hamilton, New Zealand

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ISBN: 978-0-9922497-6-2 (Print)

ISBN: 978-0-9922497-7-9 (Online)

## ACKNOWLEDGEMENTS

The authors gratefully acknowledge funding support from the Wilf Malcolm Institute of Educational Research (WMIER), The University of Waikato, Hamilton, New Zealand. Acknowledgement and thanks are accorded to Professor Bronwen Cowie, Director of WMIER as the project mentor, and Professor Margaret Carr, Director of the Early Years Research Centre, The University of Waikato for valuable insights and helpful conversations in guiding the study.

This study would not be possible without the two key teachers at the Preschool Centre, Campus Creche, Timothy Bennett and Nadine MacMillan, who participated in the research and willingly shared their thinking, pedagogy, time and effort. Thank you both for initiating this inquiry into iPad use and for your willingness to take the risk to experiment, critically examine and extend your pedagogy. In doing so, you have contributed to enriching your children's learning journey at Creche and to current understandings of what iPad use for educational purposes might look like.

We express gratitude also to the management team at Campus Creche, especially Sue Bennett, Director of Campus Creche, and Melanie McFarlane, Supervisor of Preschool Centre, Campus Creche. Your leadership support, time and input in this joint endeavour are very much appreciated.

We thank all the parents/caregivers and children at the Preschool Centre, Campus Creche who had consented to participating in the research and given their time and thoughts to the research. This project would not have been possible without their contributions.

Thanks also to Margaret Drummond at WMIER for overseeing the layout and editing of this report and to Sarah McAnallen for publicising and publishing it on the website. We appreciate your assistance very much.



## EXECUTIVE SUMMARY

Tablet technologies such as the Apple iPad (iPad) have been garnering interest and increasingly adopted as a potential learning tool and resource to engage children's learning. Despite a growing literature on the ways educators have attempted to use iPads in their teaching across the compulsory schooling and tertiary sectors, there is a scarcity of studies in the early childhood education (ECE) context. This exploratory qualitative research project, the *iPads and opportunities for teaching and learning for young children (iPads n Kids)*, is intended to inform the current debate on young children's iPad use. It aimed to better understand the iPad use for educational purposes from the perspective of teachers, young children and their parents/caregivers. It recognises that young children are increasingly exposed to (and to an extent expected to make use of) digital and mobile technologies as members of a digital generation. Teachers and caregivers are further expected to take advantage of the educational affordances these technologies offer to facilitate young children's active pursuit and extension of their learning interests and exploration of the world.

This research involved a collaboration with two early childhood education (ECE) teachers at an education and care centre in Hamilton, New Zealand, to gain insight into the perspectives of the teachers, a number of the young children in their care, and the parents/ caregivers of four children concerning iPad adoption and use. Interviews with the two teachers, young children and their parents, observations of teacher interactions with children using iPads, and copies of children's work produced as part of the teaching and learning process using iPads provided evidence on the use of iPads. iPad use on its own was never the main focus rather it was integrated with and part of teachers' daily practice and context.

The findings highlight that the iPad is appealing and can support children's developing literacy, communicative and participatory learning skills and understandings. The iPad's key features including its portability/mobility, Internet connectivity, touchscreen, and educational apps allow for new and different ways of teacher-child/children interaction and the exploration of children's learning interests. Teachers' iPad supported practice fostered child-led interests, expanded children's learning opportunities and enabled closer home-centre links in a range of planned and emergent ways. The iPads served as a relational tool, a communicative tool, a documentation tool, an informational tool, and finally, an observational tool that could support child-led learning. The quality of teachers' talk and interaction with the children, when scaffolding children's learning with and through the iPad, was an important aspect of teacher practice. In the same way they helped children become aware of the iPad's affordances and its appropriate use. Quality teacher-child talk not only benefitted the individual child but also served as a model for children of how talk can be used and useful to group learning. Although young children can develop key skills for using the iPad through observing and trial and error, their interactions with the teacher and peers were most valuable to their exploration of iPad use. Just as importantly, iPad use afforded valuable interactions amongst children to allow for peer learning and collaborative exploration. iPad supported learning opportunities also helped to foster children's emerging literacies as well as social relationships and sense of belonging at the centre.

Finally, findings showed that supportive home-centre links can foster the development of children's agency and exploration of the iPad in pursuit of their learning interests and explorations. Parent and caregiver comments indicate their recognition of the increasingly important role iPads and subsequent digital technologies will play across all aspects of children's lives. They downloaded apps on their home mobile devices to allow children to continue playing and extending their learning interest thereby strengthening home-centre links and practices. Parents and caregivers (as with the teachers) cautioned the need for clear guidelines to guide, support and scope children's iPad use to help ensure they developed the awareness, dispositions and skills essential to the effective use of digital technologies. Some parents adopted rules similar to those used at the centre to help maintain continuity between home-centre practices.

Eight key implications are raised by the study. These are:

For young children's learning:

1. iPads are one of the wide repertoire of digital and mobile technologies available for today's young children to use to access resources to inform their, and their peers' learning. Young children are able to use iPads to express, share and communicate their ideas to others in multimodal ways that are appealing and meaningful to them. Young children are able to emulate teacher talk to help peers become aware of, and use, iPads productively within peer group learning.

For teaching practice:

2. Teachers valuing of children's interests and funds of knowledge is an important influence on how iPads come to be integrated into their teaching practice and enrich learning.
3. Teacher recognition and understanding of the opportunities iPads offer and their deliberate incorporation of these opportunities can support young children's learning and exploration.
4. The quality of teacher talk and interaction is central to children becoming aware of and developing the skills, confidence and dispositions for meaningful and productive engagement with iPads.
5. Teachers' modelling and negotiation of guidelines (including limits and social etiquette) for children's use and sharing of iPads, when they are a limited resource, is essential to ensure appropriate and productive use.

For teacher learning:

6. For teachers to recognise the affordances that iPads offer they need time to explore and experiment with the iPad's different functionalities and possibilities. As teachers grow in confidence and expertise they can share and reflect on the possibilities for iPad use with colleagues, to the mutual benefit of both groups.

For use across ECE centres and homes:

7. Complementary practices and consistent guidelines are important in helping children make sense of the role the iPad can have as a tool to support their learning interests and explorations, both at the early childhood centre and in children's homes.
8. iPad use in centre and home settings can provide a focus of communication between teachers and parents about children's learning, thereby strengthening home-centre links.

It is our hope that the ideas, examples and issues raised by this study will contribute new avenues for discussion and policy about the potential for digital technologies use by young children.

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# INTRODUCTION

With the increasing proliferation of mobile and tablet technologies there is considerable interest in the potential of iPad's to support learning in formal educational contexts (Couse & Chen, 2010; Ensor, 2012; Miletic, 2012; Wade, 2012). There are some who consider iPads to be a “game changer” (Brown-Martin, 2010) in teaching and learning to the extent of coining the term “iPadagogy” to refer to a range of teaching approaches attempting to incorporate iPads into educational context (Cochrane, Narayan, & Oldfield, 2013). On the other hand, Cuban (as cited in Hu, 2011) cautions educators not to be enamoured by the iPad's novelty effect, stating:

There is very little evidence that kids learn more, faster or better by using these machines ... iPads are marvellous tools to engage kids, but then the novelty wears off and you get into hard-core issues of teaching and learning.

The *iPads and opportunities for teaching and learning for young children (iPads n Kids)* research project was initiated by researchers at the Wilf Malcolm Institute of Educational Research (WMIER) and the Faculty of Education in partnership with staff, families/caregivers and children at Campus Creche, an early childhood education and care centre within Hamilton. The researchers collaborated with two early childhood teachers in a small exploratory study to better understand the educational possibilities of Apple iPad use. The study explored the perspectives of teachers, young children and their parents/caregivers.

This report firstly offers a brief background on digital technology use in early childhood education (ECE) followed by an overview of studies reporting on iPad use by young children. Details of the study and its findings follow. It concludes with a discussion of what the findings might mean for iPad supported teaching and learning practice in ECE contexts.

## Digital technologies and ECE

Concerns have been raised regarding the potential developmental harm in exposing young children to “screen media” based technologies at a tender age. Some researchers have raised as harmful the effects digital technologies can have on young children's learning and social development (Bayhan, Olgun, & Yelland, 2002; Cordes & Miller, 2000; House, 2012, Kaiser Family Foundation, 2005) with others arguing computers are “neither appropriate or important” (Downes, Arthur, & Beecher, 2001, p. 139) in early childhood settings. The German neuropsychiatrist, Dr Manfred Spitzer, goes as far as to suggest that young children can experience ‘digital dementia’, a form of permanent cognitive dysfunction when they spend too much time using a computer (Austin American-Statesman, 2014). These researchers however tend to level their criticisms at screen media based technology in general without considering the nuanced and different ways these have been used to support children's social interactions, collaboration and learning (Jenkins, Purushotma, Clinton, Weigel, & Robison, 2006). While such concerns have their place in reminding us that young children need to experience learning as a holistic process in a variety of real world spaces, it is important not to overlook the role technology can play in supporting learning, especially in the presence of adults/teachers/caregivers and other children who can provide scaffolds for their learning. As Jenkins et al. (2006) point out,

the focus on negative effects of media consumption offers an incomplete picture. These accounts do not appropriately value the skills and knowledge young people are gaining through their involvement with new media, and as a consequence, they may mislead us about the roles teachers and parents should play in helping children learn and grow. (p.11)

Numerous studies have documented the effects of incorporating digital technologies on young children's learning in educational settings. These studies emphasise the value of technology supported learning experiences when technology is used in the context of pedagogically sound

frames and integrated as part of children's naturalistic learning environment (e.g. Falloon, 2013; McCarrick & Li, 2007; McKenney & Voogt, 2009; Stephen & Plowman, 2003). In light of the increasingly important role digital technologies play in young children's lives (Zevenbergen, 2007), the challenge for early childhood educators therefore lies in identifying, either through professional development support or by way of experimentation and reflection on their experiences with colleagues, ways to ensure quality learning experiences for young children. This is important as access to and use of digital technologies alone does not ensure or translate into quality educational experiences for children (An, Wilder, & Lim, 2011; Ertmer, 2005).

## iPads and ECE

Popular media articles carrying headlines such as "Forget nap time; it's app time" (Evans, 2013), "Is my iPad in my backpack?" (Timmermann, 2010), and "iPads bridge kindy generation gap" (Wade, 2012) increasingly raise the profile of young children's prowess, capability and ease in picking up the skills to use and manage technologies such as iPads. These reports recognise the growing importance of iPads in young children's daily lives, serving as a prompt to teachers to integrate them into their practice as a way of enhancing children's learning. However, this poses a challenge for a majority of teachers who may not be accustomed to using digital technologies, and are likely to be pressed for time in their current professional roles and responsibilities.

While numerous studies are being conducted to evaluate the use and impact of the iPad or similar tablets in the classroom, these are mostly restricted to the compulsory and post-compulsory schooling or tertiary sectors. Nonetheless, evidence is emerging of iPad use in supporting and extending learning opportunities for young children in ECE contexts. For example, there is evidence that iPads can support children's engagement with drawing (Couse & Chen, 2010), (digital) play (Verenikina & Kervin, 2011), and literacy development in tandem with developing emotional competencies (Hatherly & Chapman, 2013) as well as more inclusive home practices for the visually impaired (Fleer, 2014) and expand teachers' pedagogical practices (Fagan & Coutts 2012; Khoo, Merry, Nguyen, Bennett, & MacMillan, 2014). Current studies also focus on the identification and impact of potential educational apps on preschooler's (collaborative) learning engagement (Kucirkova, Messer, Sheehy, & Fernández Panadero, 2014). Verenikina and Kervin (2011) found that iPad use could foster and sustain imaginative and collaborative play. Fagan and Coutts (2012) describe the educational use of iPads by young children as including opportunities for children to work collaboratively, produce their own stories, and engage in digital forms of literacy. They suggest that iPads can also play a role in fostering and developing relationships between the centre, home and the children's wider worlds. They indicate that teachers' interactions and pedagogical approaches are more important than the technology itself. They argue that to maximise children's learning opportunities iPad use needs to be combined with thoughtful teaching strategies

iPad use has been linked with the expansion of teachers' pedagogical practices (Fagan & Coutts 2012; Khoo, Merry, Nguyen, Bennett, & MacMillan, 2014). The importance of the teacher's role in iPad supported teaching practice was evidenced in Falloon and Khoo's (2014) study which found that iPads can be used as public learning devices to enhance young students' exploratory talk and collaboration. They found that teachers can facilitate high quality levels of constructive talk amongst young students when they set appropriate 'ground rules' regarding expectations and ways of working together, and through selecting and using iPad apps that are more open than closed in design. A key implication from these studies was for teachers to consider the interplay between the opportunities that iPads offered, their own pedagogical views and children's learning needs.

Despite the emerging evidence of iPad use in the ECE/early primary settings, much more still needs to be done to increase understanding in areas such as what might be the most effective strategies for supporting teacher and learner development for engaging with iPads, what pedagogical frames might help teachers understand their roles within iPad-mediated pedagogy, how can iPads be used to alter or shape power relationships in favour of more personalised learning contexts, and, how can we design effective iPad apps for young children (Falloon, 2013; Ostashevski & Reid, 2010; Woolf,

2010). If teachers are to be successful in facilitating the dispositions, skills and attitudes children need to become lifelong learners in a digitally mediated world they will need to consider and embrace digital technologies and to understand their educational affordances. Our study aimed to go some way towards addressing this need.

## THE STUDY CONTEXT

Campus Creche (Creche) is an ECE centre adjacent to the University of Waikato campus. It consists of five centres catering for children from ages of 3 months to 5 years. Congruent with *Te Whāriki*, the New Zealand Early Childhood Curriculum, the curriculum at Creche is emergent; it stems from the interests of individual/groups of children and staff and their engagement with the learning environment (Ministry of Education, 1996). Children enjoy positive interactions and are supported to develop the dispositions of lifelong learners. Effective communication and involvement of family/whānau are part the Creche's philosophy; they underpin the partnership the Creche aims to build with children and their families (Campus Creche, 2014). This research was based at one of the Creche's centres—the Preschool Centre (Centre) which caters for children aged three years and nine months to school age (ERO report, 2011). The typical enrolment at the Centre is 35–40 children. The staff to child ratio at the Centre is one staff member to nine children in attendance.

In early 2011, two preschool teachers, Tim and Nadine [real names used with permission], initiated bringing their personal iPads to the Centre for children to explore and use under supervision. Children took turns exploring the different apps and activities they were interested in with other children watching. Tim and Nadine observed that children engaged with the iPad with enthusiasm and great interest. They became interested in further exploring the potential of the iPad to expand their practice and support children's learning. When approached by Elaine, the lead researcher, the two teachers and Creche management, including the Preschool Supervisor, were keen for a research study to take place as Creche had plans to purchase iPads for each of its five centres. The timing of this study was seen as opportune in informing these plans and for implementing meaningful iPad supported practice.

## THE RESEARCH DESIGN

The research aim was to obtain a better understanding of iPad use for educational purposes from the perspectives of teachers, young children and their parents/ caregivers. The following question guided the study:

### **What are the educational affordances of iPads as applied in an early childhood educational context?**

Three subsidiary research questions expanding on this question were developed. They were:

- a. How are teachers using iPads to provide opportunities for young children's learning and exploration?
- b. How are young children responding to and taking up those opportunities for learning and exploration?
- c. How do parent/ caregiver views and children's home experiences shape children's responses, skills and abilities in using iPads?

A qualitative, interpretive methodology framed the research design, collection and analysis of the data (Maykut & Morehouse, 1994).

### **Data collection approaches**

Data was generated via interviews, observation and the collection of children's work.

Teacher interviews were conducted prior to and upon completion of the study to ascertain changes to teachers' perspectives on iPad use. Assistance was sought from the teacher participants to help identify and select four children to be case studied (noted as Child 1, Child 2, Child 3, and Child 4 in the Findings). These children were selected based on their interests and confidence in iPad use. Interviews with these selected children were conducted by Tim as the children already had an established and positive relationship with him. The four children's parents/caregivers were offered the opportunity to attend their child's interview which focused on the child's motivations for using the iPad. One parent opted to participate in this process. Interviews with the parents/caregivers of the four children were conducted focused on their views of their child's use of iPads and aspects of the home environment and practices that potentially shaped their child's response to and developing skills and dispositions in using iPads (noted as Parent of Child 1, Parent of Child 2, Parent of Child 3, and Parent of Child 4 in the Findings).

Eight observations (video, photos and audio recordings), lasting between one hour to one and a half hours each, were conducted at the Centre building and surrounding area. The observations focused on Tim and Nadine (their teachers) and aimed to understand their iPad supported practice and interactions with children (Children who were observed but not case studied are identified with an alphabet, for example, Child A, Child B etc.). Each observation concluded with a teacher and researcher debrief with negotiated planning for further exploration or refinement of iPad use for the next session.

The iPad produced work from the four case study children was collected as part of documenting their thinking and working on the device. These work samples included children's learning stories and drawings/colouring.

The project obtained formal approval from the Faculty of Education Human Research Ethics Committee, The University of Waikato. Formal permission and ethical consent was obtained from Creche management, Centre staff, and families of children enrolled at the Centre. All participants participated voluntarily in the study. Parental consent was obtained for all photos published in this report where children's faces could be identified. The project commenced on March 2012 and was completed in March 2013.

## Data analysis

Interview data was transcribed and the transcription verified by the participants. The transcriptions, videos and researcher field notes were imported into the qualitative software analysis package NVivo (version 10) for analysis. The data was analysed based on sociocultural theory which directs attention to the interactions between people, the tools they use to achieve particular purposes, and the settings in which interactions occur (Cole & Engestrom, 1993; Wertsch, 1995, 1998). Tools are viewed as mediators of learning (Nasir & Hand, 2006) and can be physical, technical, psychological or symbolic in nature. Sociocultural theory directs attention to a tool's affordances or the ways in which it can support particular types of action and interaction with the aim of understanding how the tool mediates the ways learners think, speak and act. This view of learning allowed for an examination of the possibilities for empowerment and for limitations/ constraints on learning of iPad use.

Themes emerging from the data were identified through a process of inductive reasoning (Braun & Clarke, 2006). Within case and cross case analyses of teacher and child use of the iPad were developed (Merriam, 2001). A process of teacher and researcher collaborative data analysis (Armstrong & Curran, 2006; Hennessy & Deaney, 2009) was established to develop and share the emerging findings with the teacher participants. This process included the teachers viewing and responding to a short video compilation of highlights reflective of the thematised initial findings to do with the different ways they had engaged and interacted with the children, and the children's interactions with peers, while using the iPad. This process added rigour and credibility to the analysis and allowed the teachers to take an active and central part in the meaning making process in the research (Lincoln & Guba, 1985).

## Limitations of the study

The participants in this study represent a convenient purposive sample of teachers and young children from one early childhood educational setting. Although the findings cannot be generalised we hope that by providing "rich descriptions" of the context and action (Lincoln & Guba, 1985) readers working in similar ECE teaching contexts will gain insights from them.

## FINDINGS

The findings are organised according to the research questions. They are elaborated through representative participant quotes and contextualised examples of participants' practice to illustrate the ways iPad mediated practice can support young children's developing interests and learning.

### Research Question 1: A Focus on The iPad's Educational Affordances

#### Research question 1: What are the educational affordances of iPads as applied in an early childhood educational context?

Participants in the study highlighted several features of the iPad which facilitated opportunities for teaching and learning with young children. Table 1 summarises these educational affordances together with relevant participant quotes. The educational affordances included those of: *mobility* because the iPad can be easily carried as a just-in-time teaching and learning resource; *connectivity* because teachers and children could access the Internet to follow up on their questions; *touchscreen sensitivity* that enables easy visual and tactile exploration and manipulation for children when compared to desktop technologies; *zooming in and out* capability that allows children to hone in and zoom out of a recorded phenomenon; *multimodal recording* that enables children to easily capture, create and communicate observations, ideas and phenomenon in a variety of formats; an attached *keyboard* for typing descriptions of events; a *robust surface* that is less prone to breaking and less complicated (fewer parts) than desktop technologies; and, capacity to download and execute a range of *educational applications (apps)* in support of learning and interaction. Taken together these features meant the iPad was very easy to use and a convenient tool for anytime, anywhere teaching and learning for the young children in this study who were just learning to read and write and who had limited capacity to manipulate heavy or big-sized learning resources.

Table 1: iPad features, educational affordances, and supporting participant quotes

Features of the iPad	Educational affordances	Illustrative quotes
Mobility/portability/ accessibility	<p>Teachers are able to carry the iPad around as a resource for just-in-time teaching and learning purposes.</p> <p>Children can easily lift and carry the iPad around to use it to explore their learning interests and the environment.</p>	<p><b>Nadine:</b> Just the fact that it's so accessible. You can have it there wherever you are. You don't need to move from wherever you are to go to a computer. You can just pull it out no matter where you are.... Because it's there and it's instant. You can do your photos on it. There is a possibility to sit with the child and do a learning story together rather than having to do it in your non-contact sitting in the office by yourself.</p>
Connectivity (Internet access)	<p>Teachers and children can easily access the Internet (e.g., Google, YouTube), different apps, communication tools (FaceTime, Skype), music/video (iTunes) for just-in-time exploration of children's interests.</p> <p>It enables reporting/communicating feedback about children's work/progress to their families with more immediacy.</p>	<p><b>Tim:</b> We can FaceTime other children around the Centre which we did on Friday last week and that's quite neat for them to see other children at another place at the same time.</p>
Touchscreen sensitivity	<p>Children find the touch, swipe and pinch facility intuitive and fun to use compared with point-and-click technologies (e.g., desktop computer).</p> <p>Children can take charge of iPad use and functionality through their finger movements.</p> <p>Children can transfer these skills across different touchscreen devices (iPods, iPhone).</p>	<p><b>Tim:</b> The touchscreen interface is more user friendly and adaptable to any situation... everything that you can do is on the screen, you don't need to move something to get to that, you can touch it with your hand, your motor skills don't need to be as refined as with the computer.</p> <p><b>Parent of Child 1:</b> Compared to the desktop, it's more interactive with the iPad with the touchscreen technology. The applications are designed specifically for the iPad and are bigger, faster, more eye catching. It takes less time to download ...the programmes. It's more intuitive for the kids, and it's a lot more fun.</p>
Zooming in and out on specific visuals/resources (images, videos)	<p>Children can easily focus in/out to observe specific aspects of a phenomenon of interest using the touchscreen. This engages and appeals to their visual and tactile senses.</p>	<p><b>Nadine:</b> It's a bigger screen [than the iPhone]. It's just easier in the sense it's bigger, easier to manipulate.</p> <p><b>Tim:</b> Purposefully pinching and squeezing to zoom in and out. They [children] are pretty good at figuring that out.</p>

Multimodal formats (photos/videos/audio) to capture events that can then be reviewed and/or edited	Teachers and children are able to easily capture an observed planned/impromptu learning phenomenon /action and review it for further observation, elaboration or comment. Children can draw from/express themselves through a variety of multimodal resources accessed through the iPad+Internet.	<b>Tim:</b> It's handy that it's got a camera on the back...it does mean that we can take photos and insert those photos straight into a learning story on the go. It is also possible to make audio recordings and they can have video and they can narrate the video which would be a type of digital learning story which would be entirely made by them.
Keyboard	Teachers and children can type to describe/ provide explanation for a phenomenon.	<b>Tim:</b> And everything's there, you've got the keyboard and the photos and everything's already there on the screen. You don't need to get things from the office to do it. You just need the iPad and you might see something happening so you can take some photos and then those children can be involved in their assessment for learning.
Robustness	Teachers, parents and children acknowledged the iPad's robustness—it has few parts that are liable to break/breakdown.	<b>Child 4:</b> The iPad can't break. <b>Parent of Child 1:</b> Its [iPad] less complicated for kids. Because there's the screen and you go ... whereas keyboard and mouse sometimes you have to do something on the keyboard before you get to use the mouse and you've got three points. Whereas the iPad, it's there and it's just touch slide, moves condense, enlarge whatever it is, it's essentially instant access. The time delay is minimal whereas on the desktop you have to know which F button do I have to push and then something happens and you might have to shut down and reboot.
Educational applications (apps) that support learning and interaction	Teachers, parents and children made use of different iPad apps to support a range of developmental learning and exploration including social skills (e.g., turn taking, negotiating, collaborating).	<b>Tim:</b> Each app is different. Some apps are good for one child and some are ok for as many children [like the Alice in Wonderland story app one] which is ok for many children who want to listen to it because it's simply listening to a story and pushing the next button. They can take turns. They can use their own social skills to figure out whose turn it is. They are pretty good at dictating the rules themselves. <b>Parent of Child 2:</b> There's a whole set of games [apps] that are on those iPads that are really good. So we've purchased some of them like word bingo where they are learning things. [Child 2] is only learning her name but she will see the pictures and she is learning things like the sounds of the words.

The following two examples illustrate how different aspects of the iPad's educational affordances were foregrounded and backgrounded in support of children's learning and development. In Example 1, a parent of one of the case study children (Child 1) commented on the benefits of the iPad's touchscreen sensitivity in extending her child's developmental flexibility to use his right arm as he has cerebral palsy (CP).

Because it's a touchscreen rather than a keyboard, it's easier just to use (a) flat screen. The problem with the mouse is because its set up for right handed people. [Child 1's] CP is on his right side so his hand is often like that, like a claw hand especially when he is tired. We are encouraging him to use that [hand] so that he is aware that he has a right side and a right hand to use ... We've seen how much they have used it [the iPad] at Preschool particularly with [Child 1] for his cerebral palsy. I'm hoping he will get a bit more flexibility with his hands and with his fine motor skills. It's worked out really well. (Child 1's parent)

In Example 2, Tim (a teacher) describes how the ability of the iPad to support a range of educational apps with visual and tactile formats helped to foster young children's emergent reading. He explained how a reading app linking written text and its oral expression allowed children to read independently.

Children generally don't have the ability to read themselves, and so the iPad [app] allows them to read a book and often books will 'read' to the children and will light up words as they go. They can also drag their finger along a word to have it [the iPad] read those words or tap a word for it to say what that word is. They [children] don't have that same social dynamic going on if a teacher was reading them a story but they are also empowered to do it by themselves. (Tim)

To sum up, children found the iPad features detailed above very appealing. They afforded new and different ways of exploration and learning such that children could, for example, access information instantaneously, capture and create learning resources in various multimodal formats and zoom in and out to examine resources and phenomena of interest.

## **Research Question 1a: A Focus on Teacher Exploratory Use of the iPad**

### **Research Question 1a: How are teachers using iPads to provide opportunities for young children's learning and exploration?**

The teachers identified and elaborated on three different ways that the iPad's features and educational affordances can support teaching and learning. These were:

1. Create new and different opportunities for teaching and child-led learning.
2. Scaffold children's learning interactions.
3. Support children's developing digital literacy awareness, dispositions and skill.

The teachers accorded these approaches different priority at different times, in different contexts and for different purposes.

### **1. Teachers created new and different opportunities for teaching and child-led learning**

Both Tim and Nadine, the teachers, adopted a range and combination of planned and emergent iPad supported teaching strategies. Their pedagogical practices included use of the iPad as (i) a relational tool, (ii) a communicative tool, (iii) a documentation tool, (iv) an informational tool, and finally, (v) an observational tool that could support child-led learning. While each of the teachers made use of

these practices they were evident to different degrees, which are reflected in the examples that are presented next.

### iPads as a relational tool

Nadine, whose teaching philosophy is underpinned by the *Te Whāriki* principle of relationships, elaborated on the necessity to form trusting relationships with children to encourage their learning, exploration and risk taking. She saw the potential of using the iPad to foster and support her relationship building with the children, as well as relationships amongst the children.

When the iPad was initially introduced to the children at the Centre, Nadine would, on some of the days she was not at work, share information about herself (her home environment, pets etc.) with the children from home. She did this through using the *FaceTime* synchronous communication app on the iPad. With Tim's help to set up the *FaceTime* session at the Centre, Nadine was able to show the children the surrounds of her house, parts of her house and so forth. The children at the Centre (in groups) were able to communicate with Nadine by asking questions to find out more about her. They got to know her better and she in turn learned more about them. Over time the children began to establish a trusting relationship with her. She explains:

It comes back to the relationships. For the children to be able to see us outside of work. When Tim faced time me, I was at home, I introduced them to my cat and things like that. It's the relationships we build with the children that are the most important aspect of my job. Relationship building is about the trust for the children to take risks and try new things and be brave. They need to trust the people that they are with. (Nadine)

When at work, Nadine would encourage the children to try out different apps or Internet search engines and/or to produce drawings, puppet characters and so on, guiding the children through any difficulties they faced (see Figure 1 where Nadine is working with a group of children). Nadine described the iPad as an enabler in the children's exploration and to the development of relationships as children were generally keen and interested to use iPads:

That's why relationships are important. The iPad offers more possibilities to build those relationships. (Nadine)



Figure 1. Nadine relating to children as they explored apps on the iPad within a safe and supportive group environment

Nadine valued creating a safe and supportive environment where children's ideas were valued and respected, thereby helping to develop children's risk taking capacities to engage with new learning experiences:

There is so much more than who they [children] are at the Centre. This builds up relationships with their peers and teachers, sharing with their peers and teachers what they know. (Nadine).

She cited an example of a child (Child A) who was usually reserved and shy but was able to rise up to an occasion to share his expert knowledge and understanding of dinosaurs with other children. Nadine knew of Child A's interest and vast knowledge of dinosaurs. As Child A was a shy and quiet child she would look for opportunities that would help him develop his confidence in sharing his interests with his peers. During a group sharing session, when the topic of dinosaurs came up, Nadine encouraged Child A to use the iPad to search and locate different images of dinosaurs and point out and explain their features, eating habits, habitat and so forth. Child A did this in an enthusiastic manner.

There's still a few children who are passionate about dinosaurs. For [Child A], he is quite a quiet, shy reserved boy. But for him to sit there and go through pictures of dinosaurs and because he knows who they are and what they eat and what they do, for him to share that knowledge with a group of friends, share what he knows was an amazing thing. He is not the type of child who has the courage to stand up and let the world know that stuff but in that small group, he was a bit puffed up and had them all completely intrigued. It was pretty amazing, it gave him the opportunity to share what he knows [through the images located on the Internet and shown on the iPad]. (Nadine)

In further elaborating on this incident Nadine noted that it was important that Child A knew he was sharing within the context of a safe and supportive environment where a trusting teacher-child relationship had been developed.

Using the iPad as a tool to develop and support relationship building between teacher and child and amongst children affirms children's interests and supports them to develop risk taking capacities to share/extend their interests further with their peers and even families.

### **iPad as a communicative tool**

Tim, emphasised and explored the communicative functions on the iPad using the FaceTime app. He explored using multiple iPads to allow children to experience communicating with one another in real time across different locations within the Centre. He arranged to set up one iPad in the corner of the Centre (stationary iPad), and made available another iPad for any of the children to carry around (mobile iPad). Both iPads were set to FaceTime one another.



Figure 2. A child carrying the mobile iPad around the outdoor area while on FaceTime with his friends to show them things of interests to him

Individual children would take turns carrying the mobile iPad and walking with it towards different areas of the Centre as demonstrated in Figure 2. Other children grouped around the stationary iPad would ask the child with the mobile iPad questions about his location, details of what he was seeing and so forth. Occasionally the group around the stationary iPad would ask the child with the mobile iPad to turn his iPad around so the camera would show them what he was seeing as well. A sample conversation illustrating how children showed interest in their surrounding and communicated this to the group include:

Tim (explaining what they were observing on the FaceTime screen to the children grouped at the stationary iPad): He's [Child B] taking us to see the tortoise.

Tim (speaking to Child B): You ('re) what? Hold on. Oh. Hey. There they are (Tim directs the children's attention towards the screen to observe what Child B was seeing). Look. He looks at the tortoise so we can see from here.

A child with Tim: I can't see.

Tim: Wait. Wait until he looks closer.

(Child B explains to the group he is going to go closer)

Tim: Yeah, Child B, we can see the tortoise. Have a look [Tim says to the group gathered around him at the stationary iPad location]. He's looking at the tortoise's home.

On another occasion, Tim extended the FaceTime experience by creating a makeshift helmet on which he mounted an iPod supporting FaceTime communication for the children to take turns to wear and talk/respond to their peers as they walked around the Centre (see Figure 3). The iPod was set up to communicate with a stationary iPad placed at a central location in the Centre where the children gathered around to watch and ask questions of their friend wearing the iPod helmet (see Figure 4).



Figure 3. A child with an iPod mounted helmet that supported real time communication through the FaceTime app



Figure 4. Tim explaining to the children how the FaceTime app worked on the iPad and how it communicated with the FaceTime app on the iPod mounted helmet worn by one of the children

The children were very interested in the space and place aspect of exploration offered through the FaceTime session on the iPads. They would watch the FaceTime screen, think about what it was they were seeing (through their friend's verbal explanation or visual showing of where he/she was located at the moment), create a possible hypothesis of their friend's spatial location and run off to check their theory.

Another example of using the iPad as a communicative device involved setting up cross-centre FaceTime sessions. Tim explained:

We can FaceTime other children around the Centre which we did on Friday last week and that's quite neat for them to see other children at another place at the same time. For example, Child E who had just come from another centre to Preschool, enjoyed seeing her old teachers and that was quite neat. (Tim)

This experience allowed children at the Preschool Centre to communicate with younger children/siblings/teachers from other centres within the Creche. Younger children at other centres will eventually transition to Preschool. Although they can physically visit the Preschool, opportunities are limited by the availability of teachers and the suitability of timing as both centres had different routines and activities in place. By providing this cross centre communication opportunity, younger children could become familiar with the available activities/routines and environment at the Preschool Centre to aid their transition and for the Preschool children to share their knowledge and communicate events of interests to their younger audience. Some of the children at the Preschool Centre had in fact transitioned from those centres, hence their sharing and communicating with the younger children was quite affirming for them.

Using the iPad as a communicative device allowed children to connect and share interests across spaces within the Preschool Centre and between the Preschool Centre and the other centres without leaving their own contexts. Children learned to discover the world through others' eyes and perspectives and developed spatial awareness of the environment around them within a setting that was safe and familiar to them.

### **iPad as a documentation tool**

Tim and Nadine also used the iPad as a documentation tool as part of their assessment practice. Tim, for example, used the camera function and an app called *Pages* on the iPad to capture and record children's on-site activities and interests in the form of learning stories (see Figure 5). Children could review and select the photos that they thought best illustrated their learning and interest. Tim also used photos taken of children as a provocation for their input. He would prompt, scaffold and record children's explanation of a photo as evidence of their learning. After a child was happy a learning story accurately reflected his/her learning experience Tim would save his work to incorporate it later in the child's learning portfolio. He could also email a copy of the story to a child's parents. In this way, the iPad afforded instantaneous capture and record of children's play and learning interests and was valuable in supporting Tim's assessment practice. Tim explained:

The children would be interested in seeing their photos and being able to move their photos where they wanted to in their learning story. And then they can tell me what they were thinking at that time of each photo so we can make captions under each photo. Or they can dictate a story to me and I can type it up. It won't be very common for a child to type up their own story but they can certainly dictate and we can type as they talk.... The whole point is to make assessment for learning exciting so that they can be empowered to be part of that process. (Tim)

Nadine affirmed this notion of using the iPad as a documentation tool to include children's voices in their learning stories:

For me it's about the children's input, I really want to look at doing the learning stories with them on the floor and just their voices being a lot louder and clearer in assessment and the learning story and in guiding their own learning. (Nadine)



Figure 5. A child co-constructing his Learning Story on the iPad with Tim's help

These examples show something of how teachers can make use of the iPad's affordance to co-constructively document children's interests during an event rather than later. Children's voice in the form of their ideas, explanations, questions and elaborations can be scaffolded and recorded for sharing with their parents/family at home. Importantly, children can be empowered throughout the entire process of selecting, documenting and editing a story of their learning. Children can therefore be given ownership in the documentation/ assessment process rather than have their story written solely from a teacher perspective and at a later time, as has been the norm in ECE practices.

### iPad as an informational tool

Both Tim and Nadine valued the iPad as an informational tool. They allowed children to use the Internet connection available on the iPad to foster and support child-led exploration. Children, with teacher support, typically used *Google* or *YouTube EDU* to search for information and resources on topics of interest to them. These topics ranged from dinosaurs to the solar system.

It's [the iPad] quite a versatile tool so it can be used in many different ways for research. The children can use it almost anywhere in the Centre. We can look on things on the Internet, photos or videos of things that they might be interested in like animals or buildings or things like that. (Tim)

Being able to access information instantaneously allowed for more fluid and spontaneous learning because children could be informed immediately rather than having their interest suspended until a later opportunity. Tim explained:

At morning tea, I was talking to them [children] about how I was getting a water dragon soon and they were interested in that. I was able to Google a photo of a water dragon and show them pictures of water dragons. It wasn't that I had to say "Wait until 10 o'clock when morning tea finishes then we can go and get the laptop then we can sit down and look at pictures of water dragons". It was like pretty much instantaneous; I was able to get it out. I can Safari, Google water dragons then show pictures of water dragons and so it was more instantaneous fulfilment of their interest. The learning happens more fluidly. There's not big patches of stagnant time in between when we are talking about something that they want to research and when we are able to research it. It's more instantaneous. (Tim)

Nadine gave another example of how instantaneous access to information on the Internet allowed children to share their interests with peers (dinosaurs in this case). She cited how Child C had told the group that he attended a special exhibit/performance about dinosaurs in the previous week. Nadine allowed Child C to Google and share a video of the performance with the children.

Like Child C, who'd come in for one day and had been to the "Walking with Dinosaurs" [a special performance]. So we Googled that and found the video clip of that so he could show his friends where he'd been and what he'd seen. It's about those connections with home and the outside world and them being able to share that with their peers. It turned out that there had been a few of them that had been [to the same performance] so we all got to talk about it. (Nadine)

Nadine took advantage of a child-led interest about dinosaurs as a prompt to use the iPad to source further information and resources about dinosaurs. This added to the group's understanding about the topic and allowed for different children's perspectives in the learning process.

Both Tim and Nadine's examples highlight the usefulness of the iPad as a tool to access information in the 'here and now'. Children could contribute their background knowledge to add and extend the discussions in these sessions. They considered that through this experience children came to realise how the funds of knowledge they brought from home could contribute to and enrich their peers' learning.

### iPad as an observational tool

The two teachers highlighted instances where the children would use the iPad as an observational tool to focus/hone in on areas of interest. They allowed children to take turns using the iPad to capture images and/or record videos of events/phenomena of interest such as moving insects, their building block constructions, or, other children in action (see Figure 6).



Figure 6. A child trying out the photo capture function on the iPad with Nadine

The children could review these through the recordings later as a group, a process that allowed for close observation (see Figure 7). Children could review the recordings as many times as they wished, using their finger movements to pinch, rotate or zoom in or zoom out of a particular image to view different angles and level of details. This combination of physical manipulation and close observation helped maintain children's interests. Tim cited an example from children using the *Google Earth* app to illustrate the value of involving children's visual and tactile senses as part of their learning:

They really like using *Google Earth* and that's partially because they can manipulate the 'world' with their fingers. They can zoom in, zoom out, and do all sorts of things. (Tim)

It was interesting to note that using the iPad as an observational tool not only allowed a child to focus and hone in on a phenomena of interest but also mediated other children's observational learning skills. In addition to children learning from their peers about the topic in focus they also inadvertently learn about iPad use in general through observing, manipulating and conversing about an observed video/image. Tim explains:

They [the children] are able to watch another child use the iPad and learn its use through that observation. (Tim)



Figure 7. Nadine reviewing photos captured of a child's learning creation with him

Using the iPad as an observational tool therefore supported children's finer and more detailed observation (including visual tactile manipulation) of a phenomena as well as the unanticipated benefit of promoting the whole group's observational learning skills about general iPad use.

## 2. Teachers scaffolded children's learning interactions with the iPad

Both Tim and Nadine's presence and role were important in guiding children's learning and exploration of the different apps on the iPad. Children usually take turns to explore an app (s) of their interest within a group setting. These ranged from a focus on literacy and numeracy or art to music. The teachers' talk with the children as they work on an app not only benefitted the individual child but also served to model to other children ways such talk can be useful to their own and the group's learning. Tim explained:

We talk about things that are happening. Ask questions for provocation, allow(ing) the children to come up with their own theories about things and for children to work through the questions. So our provocations lead them to more questions and their questions will lead them to exploring the specific scenario so in this case its exploring the app on the iPad to fulfil their questions. (Tim)

A sample teacher-child talk within a group setting where a numeracy app was used by one of the children is shown below. Here, Nadine played an important role in questioning, working through an early numeracy (counting) task and involving the other children in supporting the learning process:

Nadine, with a child [Child D], and five other children in a group (Child E, F, G, H, I)

Nadine: You need to start with number one. Do you know where number one is?

(Child D looks for the correct number to start the game)

Nadine: You're at number three now.

Child E: Number three! Look!

Nadine: What number do you need now? What comes after four?

Child D and three other children: Eight!

Nadine (counts with her fingers visibly while pointing through the numbers on the app): 1, 2, 3, 4..?

Child F: Five!

Child G: Now what comes after five?

Child D : Six!

Nadine: Six! Well done Child D.

(Child D proceeds to finish the game which leads up to number eight)

Child F: Then seven!

Child G: Then eight!

Nadine: Well done (clapping and cheering occurred in the group to acknowledge each other's achievements).

At other times, the teacher talk shifted from a focus on learning about a content area of interest to guiding children to exercise agency in their learning process (e.g. in terms of accessing, selecting and creating their own content). An example where Nadine guided a child's (Child J) use of an app called *PuppetPal* is as follows:

Nadine: Do you want to select a picture? (She points to a few different characters that Child J can choose from).

Child J: I've taken mine. It's down at the bottom. (Nadine helps him to scroll down the screen).

Nadine: Oh there you are. Ok what is this going to be about?

Child J: Hmm, (points to an object).

Nadine: Oh that, what about the dragon? (J selects that too)

Nadine: Ooh, I think we might have enough. Now what do we do J?

(Child J proceeds to try to move his puppet but seems to be stuck).

Nadine (guides him verbally): Maybe (hold) the neck, down here. (J manages to move his character around.).

Nadine: Should we press record? (She guides J to press the button). So now it's recording your movement.

(Child J moves his puppet character. Two to three other children start to select other puppet characters to interact with Child J's created puppet).

The nature of the teacher talk in these two examples illustrate the different ways teachers scaffold children's understanding of learning about content and important processes associated in creating their own content. We had anecdotal reports from the teachers on how some of the children were able to provide important scaffolds to one another's iPad-supported learning in the form of peer talk after observing the way the teachers had talked with them/their peers.

### **3. Teachers supported children's developing digital literacy awareness, dispositions and skill**

As iPad use was generally new to most of the children, Tim and Nadine would take opportunities to demonstrate and remind children about ways of working and using the iPad. Both teachers

demonstrated for example, the use of sweeping, and pinching finger movements on the iPad's touchscreen to move things around on the iPad screen. They also showed children where to locate an app and how to get started with a particular app/game. Some examples of their reminders on using different iPad features include:

Slide this button, push this over ... here, go to this one here, see this thing [light] flashing, you need to move your fingers here. See the green arrow, you need to get out of the way, follow the arrow (to move around in a game app).

Remember your swipy finger? (to move to a different screen).

Put your finger in the middle. Keep it still (to change the size of a photo or select a photo to move it to a different location).

Press cancel. We don't want to buy it (to cancel advertisements on pop up ads when particular apps are used).

It was important to note that the children's learning about iPad use was never the sole focus on its own but emerged within contexts of children's use. Teachers guided and reminded children on ways of using the iPad as and when needed or when the children got stuck. Once children became familiar with using the iPad, they often shared this expertise with other children thereby reducing the overall dependency of the children on the teachers. Nadine explained:

One child, he hadn't used an iPad or seen one before. I showed him once about pressing the arrow to the next picture and the pincer, stretching your fingers to stretch it. I only had to tell, show him once and with the next lot of children he was in there showing them what they had to do. (Nadine)

Teacher guidance and support for children's individual and shared iPad use was essential as only a limited number of iPads were available to be shared within a group setting. Nadine explained:

I think the biggest challenge is that it's [iPad] not a normal tool for them. It's not been there for very long and they really enjoy using it, which mean(s) there is a huge crowd of children wanting to use it. (Nadine)

Further to this children also had to be reminded about the rules and ways of working together on the iPad (e.g., regarding turn taking, respect, responsibility and care when using the iPad) (see Figure 8). Tim explained that once children became familiar with and knew how to use the iPad, it was important to set ground rules to manage their and others' iPad use within the group to ensure each child had a fair and equitable turn:

[If the children fight and want to have a turn] That can be quite difficult. It can be managed by saying 'stop'. If they aren't going to obey the rules then they need to go somewhere else because they are not being fair to the other children that are having a turn at the moment. They are getting quite good at drawing pictures that they want to draw. They used to just scribble and it wouldn't really look like what it's supposed to look like. Now they are actually drawing pictures and they don't want other children's input into their picture. They don't want somebody else ruining it. (Tim)

Nadine, for example, would remind children about the rules as well as provide an explanation for them to help children become aware of appropriate iPad use in their context as part of their growing digital awareness and use:

Nadine: Ok what's the rule? ... While someone is using the iPad, nobody else is...?

Children: No one is allowed to touch it.

Nadine: That's right, yes unless she asks you, sometimes our friend needs (to ask) for help.

Children: We need to wait until we have our turn.

Nadine: Yes and when we have too many fingers on the screen, it doesn't work, it's confused and it doesn't know what it to do.

Children: That's too many and then it will stop.

Nadine: That's right.



Figure 8. A child working on the iPad with a timer. Nadine is just beside her  
(Note: Keeping a timer is one way of managing iPad use and ensuring equitable turns for the children).

Over time as children came to observe the expectations regarding iPad use they were able to moderate their own and their peers' ways of working/managing iPad use. Tim described the breadth of important learning outcomes and associated processes that could be made possible through the iPads' affordances including learning of content and valued social interaction skills surrounding iPad use (e.g., turn taking, communicating):

The flexibility of [iPad] technology now means it can be beneficial to many, many facets of learning. If the child has an interest in literacy and numeracy ... if the apps are loaded onto the iPad, and children have an interest in those then they can use those apps and they can get benefits out of it. So they can learn lit(eracy) and numeracy and ... they can draw letters and count and read letters. There are other things they can do like art and even just games that help children learn the interface of the iPad which in turn help(s) them understand a little bit more about technologies. Then there is the context around which the iPad is used, so they can use it in a group so they are having social skills developing, communication skills, turn taking skills, all those social context(s) are made apparent to the children and these are quite beneficial. (Tim)

A parent of Child 3 commented on the value of children learning to regulate their social and managerial skills around iPad use:

It's [the iPad] not like a tool that is just lying around and kids can just handle it. There's so many things connected with it. I was just observing a very interesting situation. Yesterday when we came to crèche, there were two kids sitting with the iPad. A third child was just joining them and he was asking Tim if he could be the third on the list. Sometimes Tim make(s) a list on whose turn is after who [to use the iPad]. Tim was like, "No, today you have to self-regulate your sharing". I thought it was great that you can really connect so many adult learning skills and different learning skills to the iPad. (Parent of Child 3)

In these examples, the teachers scaffold ways of using the iPad including making explicit ways of managing iPad use. Such sessions occurred in the context of children's iPad supported learning experiences. They help children to become aware of, and develop the skills to use the iPad appropriately including extending these skills to regulating their own and their peers' behaviour related to iPad use. These dynamic teacher guidance and teacher-child interactions were central to

children's developing skills, confidence and dispositions for productive iPad use and could be transferred/will be applicable in other contexts where touchscreen devices are used. This process was not without its challenges as some iPad apps were new to both teacher and child and at times both had to undertake trial-and-error strategies together to ascertain how a particular app worked. At other times, some functionalities had to be turned off or ignored (for example, pop-up advertisements). However, teachers' considered these incidents as part of their emergent practice in educating children on iPad use.

Overall, using the iPad to support their practice meant that both teachers could draw from a range of strategies and activities that were planned for and emergent, based on children's interests. Tim explained the value of being able to do this:

It worked really well to set up an activity like the FaceTime and helmet and let the iPad be and not dictate what the children have to use that activity for. If I am telling the children how to use it, they are not getting the experiential learning out of it and they are not able to explore themselves. If I don't set up those activities, they [the children] are still able to explore the iPad but there are many facets aspects of the technology they are not able to explore because of the limitations of them not having full access to the iPad. We don't let them [the children] go onto the Internet, for example, so they can't FaceTime by themselves. So it kind of is an emerging curriculum of both teacher and child-led experiences. (Tim)

## Research Question 1b: A Focus on Children's Response to using the iPad

### Research question 1b: How are young children responding to and taking up opportunities for learning and exploration?

Findings from the children's perspectives were generally congruent with those from the teachers' perspectives. On the whole the children responded positively to using the iPad at the Centre. In particular, the children:

1. Used the iPad keenly and eagerly.
2. Spontaneously interacted and supported one another's learning with the iPad.
3. Developed key skills for iPad use through their own discovery and from observing other children.

### 1. Children were generally keen and eager to use the iPad

Children participated in a range of iPad supported activities where they learned about basic literacy (the alphabet) and numeracy (counting numbers); created learning stories with their teachers; worked with photos; played games; listened to and sang along with rhymes and songs; listened to stories; drew pictures; watched educational *YouTube* clips; created their own learning resources; and, communicated with one another and with children at other locations. Of these, the more common ones are elaborated next.

A key feature that interested all case-studied children was the fact that they could play games on the iPad or rather the apps on the iPad. They found this fun and engaging, as illustrated next:

Tim: What do you enjoy most on the iPad?

Child 2: Uhm ... playing games.

Tim: Which game in particular?

Child 2: Ehm ... the robot game.

Children also enjoyed drawing/art activities on the iPad (see Figure 9) as one of the case study children (Child 3) commented:

Tim: Tell me about the picture....

Child 3: I drew them on the iPad.

Tim: What do you like about drawing on the iPad?

Child 3: Making picture.

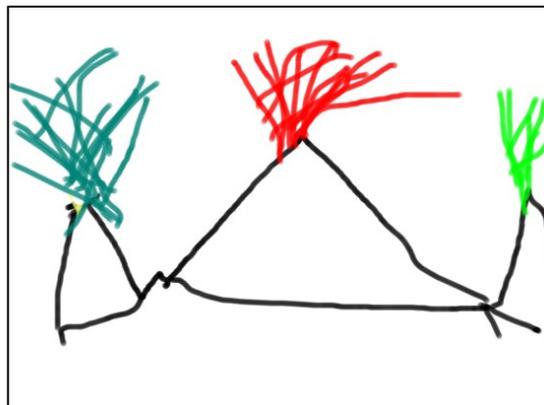


Figure 9. Sample drawing produced on the iPad and the final drawing generated on the iPad by Child 3

Through activities such as drawing the children took an active role in deciding how and what they would like to learn or explore when using the iPad.

Both teachers noted that the iPad provided opportunities for children to work and create things together. Children were particularly interested in creating their own learning resources such as stories and puppet shows with the app called Puppet Pals. To prepare for this activity, children would take photos of each other and different areas in the Centre then select their images and use the Puppet Pal app, for example, to create personalised puppet characters and background settings. Tim elaborated:

They can also use it [the iPad] to create things, videos and still images. We can take video on the iPad so they can act out a scene and someone can video and we can weave them together in iMovie. Or they can create a puppet show with an app called Puppet Pals which they really enjoy doing on the iPad we've got. They take photos of themselves, cut themselves out to make a puppet and move it around and record audio and movement at the same time. (Tim)

In this case, the iPad enabled children to co-construct stories and share these with an audience of their peers.

Children reported preferring to use the iPad and enjoying using it compared to the computer (point-and-click technologies). One of the case study children explained that the iPad contained games and was less complicated to use compared to a computer. As it was easy to use the iPad touchscreen, she just needed to be remember not to touch the 'Settings' app (unlike a computer which had more parts to consider):

Tim: Do you like using the iPad or the computer [at home] more?

Child 2: iPad more (smiled).

Tim: Why do you think you like using the iPad more?

Child 2: Because it has much more game and ... you don't get ... and you don't ... do anything wrong.

Tim: Why is it you don't do any wrong?

Child 2: Because you don't press anything what you know down here (pointing to the lower end of the iPad screen).

Tim: You means like if you're using the mouse sometimes you could click on the wrong things? And if you're using the screen, you don't?

Child 2: Yes.

Tim: Because you can touch the screen on the iPad but you can't touch the screen on the computer?

Child 2: Ya.

To sum up, children enjoyed using the iPad, especially to play games, draw pictures and create their own learning resources. Through activities such as drawing the children took an active role in deciding how and what they would like to learn or explore when using the iPad (see Figure 10 for a sample learning story of how children's learning interest are supported through the iPad).

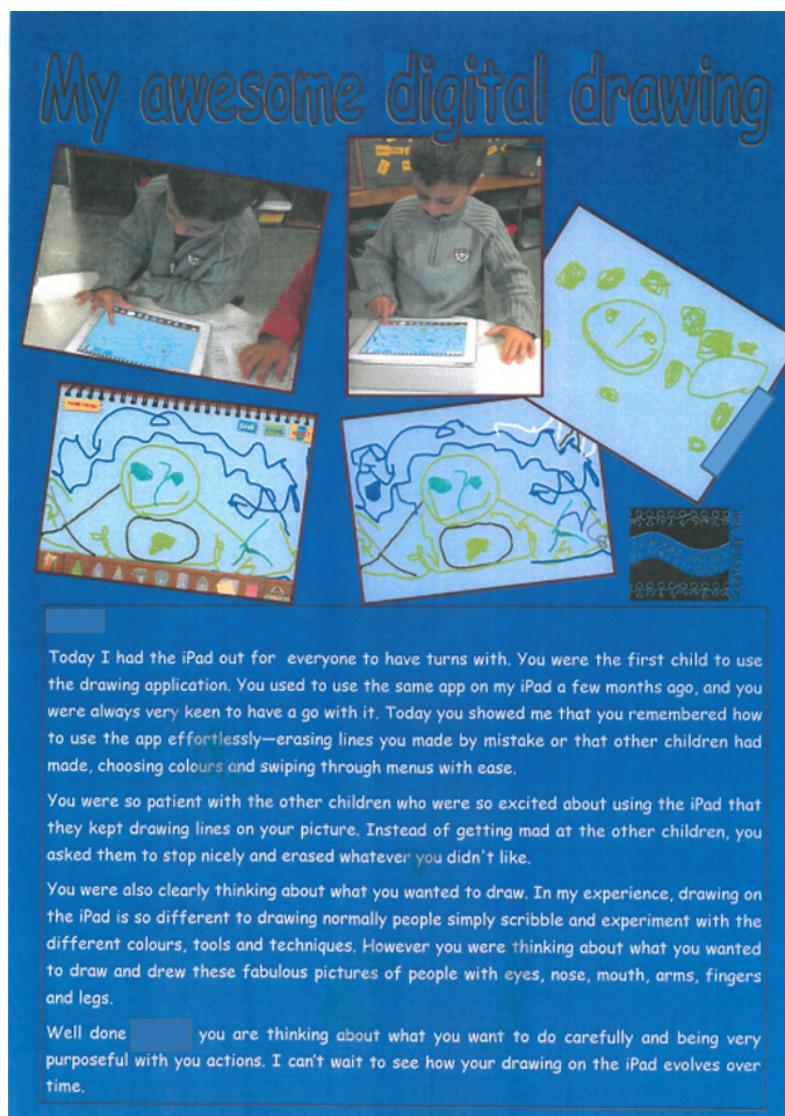


Figure 10. A learning story documenting Child 3's interest in using the iPad for drawing

Both teachers noted that the iPad provided opportunities for children to work and create things together. Children were particularly interested in creating their own learning resources such as stories and puppet shows with the app called *Puppet Pals*. To prepare for this activity, children

would take photos of each other and different areas in the Centre then select their images and use the Puppet Pal app, for example, to create personalised puppet characters and background settings. Tim elaborated:

They can also use it [the iPad] to create things, videos and still images. We can take video on the iPad so they can act out a scene and someone can video and we can weave them together in *iMovie*. Or they can create a puppet show with an app called Puppet Pals which they really enjoy doing on the iPad we've got. They take photos of themselves, cut themselves out to make a puppet and move it around and record audio and movement at the same time. (Tim)

In this case, the iPad enabled children to co-construct stories and share these with an audience of their peers.

Children reported preferring to use the iPad and enjoying using it compared to the computer (point-and-click technologies). One of the case study children explained that the iPad contained games and was less complicated to use compared to a computer. As it was easy to use the iPad touchscreen, she just needed to be remember not to touch the 'Settings' app (unlike a computer which had more parts to consider):

Tim: Do you like using the iPad or the computer [at home] more?

Child 2: iPad more (smiled).

Tim: Why do you think you like using the iPad more?

Child 2: Because it has much more game and... you don't get...and you don't .. do anything wrong.

Tim: Why is it you don't do any wrong?

Child 2: Because you don't press anything what you know down here (pointing to the lower end of the iPad screen).

Tim: You mean like if you're using the mouse sometimes you could click on the wrong things? And if you're using the screen, you don't?

Child 2: Yes.

Tim: Because you can touch the screen on the iPad but you can't touch the screen on the computer?

Child 2: Ya.

To sum up, children enjoyed using the iPad, especially to play games, draw pictures and create their own learning resources.

## 2. Children spontaneously interacted and supported one another's learning with the iPad

As children typically used the iPad in group settings, they could observe one another as they took turns exploring and working through different apps. Typically, this provoked a range of responses and interactions, usually helpful, from amongst the group. When a child was working with numbers and the alphabet, other children would observe, discuss and contribute suggestions for what the answer or choice of answers might be.

Child L: The number '2'. Do you see the number '2'? (Working on a numeracy app on the iPad).

Child M: That's 1! ... (Child M points out the number '1' following Child L's lead in identifying numbers, Child L continues with the game).

At other times disagreements over whether a peer had selected a wrong answer served as a teaching opportunity for the group:

Child N: That's '3'.

Child O: No, it's 4 (pointing to the number 4 on the iPad as a way to indicate that '4' is the correct answer and not '3').

Child P: It's 4 (in support of Child O).

Child O: It's 4! (raises his voice to affirm that '4' is the correct answer).



Figure 11. Children supporting one another in an iPad-based activity

Children helped one another co-construct their learning on the iPad. For example, older children might guide younger children in terms of the names of colours when creating drawings (see Figure 11). In this way, the children scaffolded one another's development of emergent literacies and skills as well as confidence in iPad exploration and use:

Child P (speaking to a younger child): Blue, do blue (younger child selects blue and starts to draw lines while working on a drawing app. Although the younger child is quiet, and new to the environment at the Centre, she enjoys using the iPad to explore learning about colours and drawing).

Child Q: Now do yellow, yes yellow (younger child complies).

Child P: Green, now do green (younger child follows).

Apart from supporting one another in learning about a skill or some content, children would demonstrate or remind one another about the rules/social etiquette related to using the iPad. They were aware of these rules as Tim and Nadine typically modelled and made them explicit as part of iPad use. Sample reminders included:

I'll turn it on for you. Here you go (a child passing the iPad to another after his turn had finished).

It's not your turn (one child reminding another who was trying to swipe his finger on the screen).

Write your name on the list (one child to another as a reminder about waiting for one's turn to use the iPad).

At times, while a child was working through an app, the topic or focus of the app might provoke conversations and the sharing of ideas and interests amongst some of the children within the group. For example a child might be working on an app focused on identifying the names of fruits. While he/she is working on the app, conversations and sharing between children would occur about their

likes of the different fruits, “I like bananas”, “I like pineapples”, “I like bananas, I want to eat it all up” which at times lead to friendly banter or hugs between children who shared a liking for the same fruit. From this, children were able to share their liking of different fruits, in this instance, which helped them get to know and better relate to one another.

Children supported one another in the investigation and sharing process by cheering and clapping one another on when a child successfully completed a game, puzzle and so forth on an app. They would call out “congratulations” affirming a child’s success using/mastering an app or idea. Such informal sharing and affirmation appeared important to celebrate the children’s success and to relate to one another at the Centre. Nadine explained how such celebrations occurring within the moment helped children feel supported and valued, an aspect that is not commonly seen in children’s general play activities. The small group setting was also less overwhelming for children compared to celebrations held in a bigger group.

I think it really offers opportunities for other children to celebrate each other’s success which doesn’t happen often in general play. It’s a smaller context, it’s not in a big environment and it’s less overwhelming. Lots of children get really overwhelmed when they are the centre of attention whereas when it’s in a group like this, it’s less scary. (Nadine)

### 3. Children learnt to use the iPad on their own and from observing others

Children primarily learn to use the iPad through discovery or practising through trial and error and subsequently from observing other children (also their teachers). Tim gave an example of a child who picked up the skills to use the iPad after exploring on it for a very short period of time. The child was able to transfer this skill to other touchscreen devices at a later time:

I think just the speed at which children pick up new things. Some of them pick it up really fast. This one boy who has picked up the iPad really fast. He picked up my iPad really fast. And when we got onto the iPod touch he was able to manipulate it into whatever he wanted to do, which can be a scary thing. I gave it to him to take to another teacher 20 metres away from me. In that time, he had closed the camera and opened up the *Safari* app. He was just pushing buttons. He could have come up with anything. We need to be more vigilant with the security on those devices. But at the same time it shows that he has a real interest in it and that he is picking it up really quickly. And he transferred the knowledge from the iPad to the iPod touch very quickly. (Tim)

One of the case studied children added that he too learnt to use the iPad on his own:

Tim: How do know to push that button to close it? Did anyone teach you that or you learn it by yourself?

Child 4: I learn it myself.

Nadine thought that children were less fearful than adults in the way they approached using it, hence they were able to learn how to use it more quickly in comparison:

They don’t seem to have any fear around that might not be the right button to push. They just go for it. (Nadine)

Nadine added that the children learned to use the necessary finger movements to work on the iPad quite naturally. This was also in part from children observing one another:

I don’t think I’ve seen a child that has struggled with the iPad [finger movements come naturally]. I was surprised and I don’t know why I was so surprised and why I thought they wouldn’t grasp that straight away. I haven’t seen anyone who had not. All they really need is good observational skills, watching what other people do. (Nadine)

This was affirmed by one of our case study children who when asked how she came to know how to use the apps on the iPad, replied “I watched other children playing it”.

Children learning from observing and guiding one another meant that they did not need to rely on the teacher being present all the time and that their peers can be a knowledgeable resource as well:

It’s also there for the children that haven’t developed those skills yet and it doesn’t need to be me that’s guiding them it can be their peers. For children that are unsure what to do next, they might want to be holding the iPad but don’t actually have any idea about what to do with it. (Nadine)

Children’s mutual support for one another’s learning and interests was important in fostering productive and generative iPad use. It allowed the teachers to step back and children to take some ownership in exploring their interests and ideas. Nadine reflected on this process as follows:

It’s not teacher-led anymore. It’s about co-exploring and it’s not even about facilitating but about offering possibilities and ideas. They have their own ideas and they run with it once I show them. I think that lots of children are really competent in guiding their own learning and they know what they want to do and don’t need assistance in getting there. So this [the iPad] is another vehicle for them to do that. It’s also there for the children that haven’t developed those skills yet and it doesn’t need to be me that’s guiding them it can be their peers. (Nadine)

On the whole, children enjoyed using the iPad and were keen and eager to participate in a range of iPad supported learning opportunities. The affordances of the iPad (touchscreen, portability, mobility, Internet connected, apps) meant it was easy and engaging for children to use. A combination of independent exploration and observing (also modelling) other children’s iPad use facilitated children’s taking ownership in their developing iPad skills and use. The role other children play in supporting and affirming one another’s learning on the iPad, reminding one another about the relevant rules around iPad use were valuable to guiding and extending their skills to appropriately and productively learn with and through the device.

## **Research Question 1c: A Focus on Parents’/Caregivers’ Views on iPad use**

### **Research question 1c: How do parents’/caregivers’ views and children’s experiences in the home environment shape children’s response, skills and abilities in using iPads?**

All parents/caregivers of the case study children were generally positive about the impact of the iPad on their children’s developing digital awareness and confidence. Specifically:

1. Parents were open to and supported their children’s use of an iPad as a learning tool.
2. Parents viewed iPad use as a new form of literacy
3. Parents saw a need for rules and guidelines to manage children’s iPad use.

### **1. Parents were open to their child exploring the iPad and using it as a learning tool**

Parents were supportive of their children’s learning with an iPad. They believed iPad use could contribute to a richer learning experience for their child at the Centre. One of the parents commented on an improvement in her child’s speech development due to a combination of factors such as being introduced to and enjoying using the iPad. She considered the iPad provided a new and supportive social context to interact with peers:

For a while there I thought (Child 4) was a bit slow, like his speech and everything was a little bit delayed. I brought him in for tests and everything at one point. I had a

few people questioning whether there was anything and something like this [gesturing at iPad], I've seen so much growth in him and his progress over the last year. I am sure that the iPad and the new experiences that he's being having at Preschool has helped him heaps. (Parent of Child 4)

Parents also believed prohibiting children's access to digital technologies including iPads would be a disadvantage to their learning and experience of the world around them.

I think that really you are disadvantaging your children if you are not giving them more access than they get [at the Centre]. (Parent of Child 1)

Some parents downloaded apps similar to those available on the iPad at the Centre onto their own mobile devices (iPad or iPhone) so that their children could continue playing/using them at home.

We try to get ones [iPad apps] that are similar as the ones used [at the Centre] so that there is that familiarity. (Parent of Child 1)

If we go to a friend's place and they have an iPad, (Child 3) will be the first person to want to play with it. He uses it quite a lot in Preschool so he loves it, really really loves it. (Child 3) is into 'numbers' a lot so we need to see how we can put it on our iPhone to catch up with this development. (Parent of Child 3)

The reason they gave for this practice was a desire to facilitate closer home-Centre links by providing a sense of coherency for their children when using digital technologies and to extend their child's learning interests into the home.

Parents also thought it was important that each family consider their parenting style and family context. They acknowledged that family values and views of the role that technology can play in supporting learning can be very different.

I think it's very, very individual. Every parent has to decide very individually what their kid will see, what this kid is about, what their skills are and what can be improved. Especially if you think about what role this tool can play. I think this is very important, what kind of role we should give this tool. I think it's a question about the individual setting and the whole family's situation. It's very important to think about the role of the medium if it's the TV or whatever, it needs to be clarified. (Parent of Child 1)

For instance, one parent indicated they adopted the view that the iPad is just one of the many learning resources that children can take up to explore and use:

With (Child 2), she's only a kid, so she's just going to play games and have fun anyway but she quickly moves from something. I think exposing the iPad to this situation where it's just another tool, just like the swing outside, so in that context for the kids, it's a good healthy thing rather than it being on a pedestal where it's a prize for a good behaviour. That's risky as well. It's like sweets, giving candy for good behaviour, that motivates them to do good things but you only get rotten teeth and bad outcomes ultimately. (Parent of Child 2)

Another parent accorded a special status to iPad use in their household. They were concerned that their child did not become inundated with technologies. They recognised that the iPad could be used for a range of tasks—learning, playing, exploring—but still considered iPad time should be limited:

It's still special for (Child 3), that's what I appreciate because I think it should still be special. It shouldn't be like our neighbourhood boys have so much stuff, like iPods and so many different games and things on the computer so that it's here and there, that it's game is what you are playing all the time. I think it's far too much and I think it should stay special. It doesn't matter what you do with it whether it's learning or playing or exploring, it should still remain special. (Parent of Child 3)

## 2. Parents viewed iPad use as a new form of literacy

Parents viewed their children as belonging to a digital generation and were of the view that children developing the skills to use digital technologies and the iPad came easily to them.

Technology is what it is today. Little kids are using it and they know better how to use it than we do.... They just bang and get it. Maybe because they are at the age, children pick up things at a faster rate than adults do and they make it look easy. (Parent of Child 1)

When parents elaborated on reasons for the rapid uptake of iPad skills among this digital generation they alluded to the iPad's affordances, especially the touchscreen and tactile features which they considered were intuitive to use.

The main reason was technology was developing where really the standard keyboard is going out, even the miniature keyboard is going out and it's going to be flat screen/touchscreen. (Parent of Child 1)

I've found the difference between the tablet and the laptop—it comes down to seconds in booting up, it's quicker to flip that thing and it's there. I was very surprised at how quickly they [children] took to the interface. I think it's more about the tactile type approach and iconic, it's really simple for kids. (Parent of Child 2)

Children's seemingly fearless attitude when faced with new technologies and willingness to explore a new technology was said to be another reason for their iPad uptake.

Plus they don't have any problems about making mistakes and breaking machine. I try to explain things to my mother, for example, on how to use email, it's quite a different approach to when you are teaching kids. The kids just jump right into it. They ask you questions about 'why can't you do this' as opposed to 'what do I have to do to get to what I want'. They are already exposed and they are asking why can't I do other things. I found that really neat to watch. (Parent of Child 2)

This is a new generation is not like ours. I am completely overwhelmed, I have such a different access to this. I like thinking first then doing something. The kids do something then they start to think, that's really different. The thinking comes afterwards. It's more an exploration and play discovery first before you put the pieces together. (Parent of Child 3)

Parents noted that children were able to transfer their iPads skills to other devices at home such as the iPhone and even laptop computers. These included the skills to use other touchscreen devices and important processes relevant to learning such as searching for information, independent exploration and troubleshooting problems including the confidence to undertake these tasks.

We don't have an iPad but we have an iPhone at home. This definitely supported his interest in the iPad. He is allowed to play. (Parent of Child 3)

No we don't [have an iPad at home]. I've got a laptop and he uses my laptop quite a bit. It's got the little touchpad and he finds his way around. Even though he can't read or write, he is actually very very good at finding what he wants, what he's interested in ... animals and nature, cows. So I think he must be getting it from the understanding, the ins and outs of using the iPad. So it's not specifically a factor of having so much the iPad but its more him finding his way around whatever challenges he is faced, to find a solution. He is doing it all himself like he's doing the actual thinking, doing. I think it helps his learning a lot when you're actually doing it, thinking it, doing it, his involvement. I think it will be great for him, the fact that he is...it's an independent learning tool which is possibly why he is learning so much at the moment because he is doing self-teaching/learning. That is definitely what he needs, just experiencing first hand for himself. (Parent of Child 4)

Parents believed that iPad use involved a form of literacy that was similar to that involved in learning and knowing about numbers (numeracy) or letters (in the full sense—literacy). In this learning process, they considered the knowledge and skills that children gained were connected and interweaved.

Technology has developed and at this preschool level in terms of the iPad. In fact I have seen them [children] at the computer as well. So I think ICT at any level, if it's not forced, it's part of play, it's part of games, and it's a good idea at this level [in Preschool]. They are going to get enough of it at school, they are going to get enough of really structured learning at school.... It's like the reading and writing thing I was saying before, while its done in a fun and game, non-structured way, by the time they get to school they already know how to hold a pencil, yes they can recognize letters, maybe not write them but certainly recognize them and have those skills. And I think really ICT is going the same way ..., another form of literacy. You do need to move with the times. (Parent of Child 1)

Another parent found that iPad use fostered learning processes that involved different literacies (e.g., number recognition and colour identification) in a more interconnected and fluid manner rather than in a structured way. She alluded to how this was much better than learning in a traditional manner.

With the iPad, you have access to something so you can do a couple of different things together, so things are combined which are not usually combined in a pre-structured way. So they (the children) start with just some numbers but then colours come in as well and they do some painting. They work with colours as well, so different things are connected. It's much more process related, it's always develops out of the moment, or the next step of learning or the next step of developing some skills just comes from the previous step, it develops from the previous step. It's not pre-structured in a way 'ok, here you have the tool to learn about this or that or that'. It's much more connected or interweaved. It's very good. (Parent of Child 3)



Figure 12. Children engaging with the iPad as a new form of (digital) literacy

Finally parents highlighted that the new (digital) literacy skills that their children were developing will be relevant to and likely to shape future teaching and learning practice and therefore better preparing them to participate in and succeed in their learning.

Lecturers would probably argue some of their students are expecting a spoon fed style learning rather than individual research and going out and answering questions rather than asking for the answers but if that's the way the whole world is learning or leaning to because of the standards and the way you get tested is that way, as long as

these kids are learning that, as long as they know how to run the system, that should be ok. I don't want a dislocation between what they are learning and this new radical style and they come up to this traditional one which hasn't move which I don't think is going to happen. I think it's happening the other way round. I think this new way of learning is pushing the traditional one out of the way so hopefully they will be coming through on top of the way. (Parent of Child 2)

### **3. Parents were concerned that rules and guidance are established to guide and manage iPad use**

Parents were keen that rules and guidance be established to guide and manage iPad use at home as well as at the Centre. They thought it was necessary to guide children about expectations around using the iPad. It was important that rules were explicit to children as part of responsible iPad use.

We are told to assist our kids while brushing their teeth until they are seven but we let them play computer games at four and that's not very sensible of course they need heaps of guidance, Because of this intuitivity [with using the iPad], (Child 3) can easily do silly things with the iPhone as well. He reorganized my whole folder structure on the iPhone once because it's so easy. (Parent of Child 3)

Basically our children have to do all that is required before they can get onto the iPad. It's not something that they can get out of the car after school that they can jump on. They need to do their homework and do everything and not just I'm multitasking dad. We've found that it was too much of an easy thing to get distracted ... if it's not managed properly, their behaviour diminishes so when they get off the iPad they are snappy and they are short tempered and it's because they are frustrated because they haven't got to that next level in whatever they have been doing. It's because it's unfettered exposure. (Parent of Child 2)

Parents also thought that rules were important to ensure a balance of indoor (screen time) and outdoor activities. Some parents used rules similar to the ones at the Centre at home to manage this aspect.

We have the same rules at home as at the Centre. We have a little carpet at home and that's where the iPad is used, you get the timer on and the kitchen clock goes off and then it's whoever else's turn is first or second and you get that few times and it's great. It's important, we don't want it [the iPad] to be the focus of everything. We do want them to go to school with that knowledge [of iPad use]. I wouldn't want them to overdo and end up being in a darkroom and never come out, never see them. I'd say to them 'Go out and get some fresh air and some colour in your cheeks'. (Parent of Child 1)

Overall, the four participating parents were supportive of their children using the iPad as part of the skills needed in this digital generation. They downloaded apps on their own mobile devices similar to those at the Centre so their child could continue playing/extending their learning and interests via the iPad. This helped maintain and extend home-Centre links and practice. Additionally, examining the value and role that iPads and technologies play within each family's context in shaping a child's learning interest was thought to be important because of its contribution to different home practices and expectations regarding children's use of iPads. Children were generally viewed as belonging to a digital generation and able to develop the necessary skills, dispositions and awareness needed to use the iPad and digital technologies. For parents it was important that rules and expectations regarding appropriate iPad use were made explicit to children. Some parents adopted rules that paralleled those used at the Centre to maintain the continuity between home-Centre iPad use.

## DISCUSSION AND CONCLUSION

The study set out to better understand the educational possibilities for using the Apple iPad in the early years from the perspectives of teachers, young children and their parents/caregivers. The findings indicate the iPad afforded a range of new and different educational opportunities for young children. These included greater access to information; the capture, review and creation of multimodal resources for, and representations of learning; and zooming in and out to examine resources and natural phenomena of interest. These actions were made possible through the iPad's portability/mobility, touchscreen capability, multimodal formats for data capture and creation, access to the Internet and to a wide range of educational apps. These features made the iPad appealing and served to foster their emerging literacy, communicative and participatory learning skills and understandings. While the study represents a convenience sample of teachers and young children in one ECE setting, the findings are consistent with those of others who have found the iPad to be appealing to young children and instrumental in supporting and extending their learning and active participation in their own and peers' learning (Dhir, Gahwaji, & Nyman, 2013; Falloon & Khoo, 2014; Verenikina & Kervin, 2011).

Teachers' iPad supported practice included a number of planned and emergent strategies to support child-led interests, expand children's learning opportunities and foster closer home-Centre links. Realising the iPad's potential was more likely when the teachers had a clear pedagogical frame and purpose for its use. Our teacher practice examples demonstrate the ways iPads can be seamlessly embedded into and expand teachers and children's teaching and learning experiences and how educators can take advantage of the affordances of technology by teaching with and through it as part of the Centre's social practice and their teaching repertoire (Carr, 2001).

We would like to emphasise the potential for iPad use to access and value the funds of knowledge that children bring with them from home into ECE settings (Plowman, Stevenson, McPake, Stephen, & Adey, 2011). Through sharing their knowledge and experiences they are empowered to continue sharing and contributing to their peers' learning in ways that are mutually enriching of each other's learning and awareness of the world around them.

The iPad supported learning opportunities helped to foster children's emerging literacies as well as social relationships and sense of belonging at the Centre. Past studies have indicated that the iPad's moderately sized screen size can serve as a public learning device to enhance young students' talk and collaboration (Falloon & Khoo, 2014).

Both teacher and parent reports indicate that young children tend to find iPad use less challenging than adults. Our findings reveal that children readily develop key skills for using the iPad through observation and trial and error practice. Teachers being present to guide and remind children of ways of using and managing the use of the iPad as and when needed or when the children got stuck were essential forms of interactions to scaffold children's awareness and development of appropriate iPad skills. These interactions (through talk and actions such as guiding children's fingers, pointing out icons to push) about and with the iPad not only benefitted the individual child but also any observing peers.

However, as Tim highlighted, a combination of teacher-led and child-led experiences is important for children's educational iPad use. Children observed teacher interactions and over time emulated these interactions to guide their peers' learning and exploration with and through the iPad. This helped them become 'wise' about their learning journey and served to model some of the ways talk and interaction can contribute to group learning (Carr, 2011, p. 1). As others have shown, quality teacher-child interactions are central to children developing the skills, confidence and dispositions they need for meaningful and productive engagement with iPads (Falloon & Khoo, 2014).

Finally, supportive home-ECE centre links can foster the development of children's exploration of the iPad in pursuit of their learning interests (e.g., Kucirkova, Messer, Sheehy, & Flewitt, 2013; Stevenson, 2011). Parents recognised the important role iPads and other digital technologies are

likely to play across all aspects of children's lives. Parents and teachers affirmed children were able to apply or transfer iPad skills and dispositions for use to other touchscreen or digital devices. Parents downloaded apps on their home mobile devices to allow children to continue playing and to extend their learning interest. They (as did the teachers) advocated for the use of guidelines to support and scope children's iPad use. Some parents adopted similar rules to those used at the ECE centre to maintain the continuity between home-Centre practices.

The findings have eight implications for curriculum and pedagogy in both ECE and early primary classrooms.

For young children's learning:

1. iPads are one of the wide repertoire of digital and mobile technologies available for today's young children to use to access resources to inform their, and their peers' learning. Young children are able to use iPads to express, share and communicate their ideas to others in multimodal ways that are appealing and meaningful to them. Young children are able to emulate teacher talk to help peers become aware of, and use, iPads productively within peer group learning.

For teaching practice:

2. Teachers valuing of children's interests and funds of knowledge is an important influence on how iPads come to be integrated into their teaching practice, and also helps to enrich learning.
3. Teacher recognition and understanding of the opportunities iPads offer and their deliberate incorporation of these opportunities can support young children's learning and exploration.
4. The quality of teacher talk and interaction is central to children becoming aware of and developing the skills, confidence and dispositions for meaningful and productive engagement with iPads.
5. Teachers' modelling and negotiation of guidelines (including limits and social etiquette) for children's use and sharing of iPads, when they are a limited resource, is essential to ensure appropriate and productive use.

For teacher learning:

6. For teachers to recognise the affordances that iPads offer they need time to explore and experiment with the iPad's different functionalities and possibilities. As teachers grow in confidence and expertise they can share and reflect on the possibilities for iPad use with colleagues, to the mutual benefit of both groups.

For use across ECE centres and homes:

7. Complementary practices and consistent guidelines are important in helping children make sense of the role the iPad can have as a tool to support their learning interests and explorations, both at the early childhood centre and in the children's homes.
8. iPad use in centre and home settings can provide a focus of communication between teachers and parents about children's learning, thereby strengthening home-centre links.

In concluding, this study was developed because of an interest in the growing importance of iPads in young children's daily lives. The study has led to a better understanding of the educational uses of the iPad and the ways it can be used to facilitate meaningful teaching and learning practices with young children. Young children can use iPads to pursue their learning interests and to explore the world around them. iPad use can support a range of teaching and learning practices and home-centre communication. Although young children can learn to independently use the iPad through observation and trial and error, children's use of the iPad for educational purposes is enhanced by their interaction with teachers and peers. It is our hope that the ideas, examples and issues raised by this study will contribute new avenues for discussion and policy about the potential for digital technologies use by young children.

## OTHER PUBLICATIONS/PRESENTATIONS ARISING FROM THIS PROJECT

- Khoo, E., Merry, R., & Bennett, T. (2015). *"I want to say..." : Privileging young children's voice in iPad-supported assessment for learning*. Manuscript submitted for publication.
- Khoo, E., Merry, R., Bennett, T., & Macmillan, N. (in press). *"Its about the relationships that we build": iPad supported relational pedagogy (Ngā Hononga) with young children*. Electronic book chapter, Digital Smarts.
- Khoo, E., & Falloon, G. (2014). *"Remember your swipy finger?" Understanding iPad mediated talk in young children's learning and exploration*. Paper presented at the AARE-NZARE 2014 Conference. Brisbane, QLD, Australia.
- Bennett, T., Khoo, E., Merry, R., & MacMillan, N. (2014, November). *Using the iPad as a communicative device to foster young children's spatial awareness*. Paper presented at the Conversations about Technology in the Early Years (CATEY) conference. Auckland, New Zealand.
- Khoo, E., Merry, R., Nguyen, N.H., Bennett, T., & MacMillan, N. (2014). Early childhood education teachers' iPad supported practices in young children's learning and exploration. *Computers in New Zealand Schools: Learning, Teaching, Technology*, 25(1-3), 3-20. Retrieved from <http://www.otago.ac.nz/cdelt/cinzs/otago063953.html>
- Merry, R., Khoo, E., Bennett, T., & MacMillan, N. (2013, July). *The "iPads N Kids" project: An exploration of the iPad's educational affordances*. Paper presented at the 50th Annual NZCA Conference & AGM. Wellington, New Zealand.
- Khoo, E., Merry, R., Bennett, T., Macmillan, N., & Nguyen, N. (2012, November). *Exploring the educational affordances of iPads for young children: The 'iPads N Kids' project*. Paper presented at the New Zealand Association for Research in Education (NZARE) Conference and Annual Meeting 2012. Hamilton, New Zealand.
- Khoo, E., & Merry, R. (2012, November). *The 'iPads N Kids' project: Research on iPads and opportunities for teaching and learning for young children*. Paper presented at the mLearning Day. University of Waikato, Hamilton, New Zealand.

## REFERENCES

- An, H., Wilder, H., & Lim, K. (2011). Preparing elementary pre-service teachers from a non-traditional student population to teach with technology. *Computers in the Schools*, 28(2), 170–193. doi:10.1080/07380569.2011.577888
- Armstrong, V., & Curran, S. (2006). Developing a collaborative model of research using digital video. *Computers & Education*, 46(3), 336–347. doi:10.1016/j.compedu.2005.11.015
- Austin American-Statesman. (2014, March 16). “Digital dementia” for our screen-addicted kids. *The Seattle Times*. Retrieved from [http://seattletimes.com/html/health/2023110779\\_healthdigitalxml.html](http://seattletimes.com/html/health/2023110779_healthdigitalxml.html)
- Bayhan, P., Olgun, P., & Yelland, N. J. (2002). A study of pre-school teachers’ thoughts about computer-assisted instruction. *Contemporary issues in early childhood*, 3(2), 298–303. Retrieved from <http://dx.doi.org/10.2304/ciec.2002.3.2.11>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101.
- Brown-Martin, G. (2010, May 11). Game changer: Is it iPad? Learning without frontiers: Our Blog [Web log message]. Retrieved from <http://www.handheldlearning.co.uk/content/view/64/>
- Campus Creche.(2014). *Campus crèche philosophy*. Retrieved from <http://www.campuscreche.co.nz/index.php?displaypage=philosophy.html>
- Carr, M. (2001). Let me count the ways. Analysing the relationship between the learner and everyday technology in early childhood. *Research in Science Education*, 31(1), 29–47. doi:10.1023/A:1012654110604
- Carr, M. (2011). Young children reflecting on their learning: Teachers’ conversation strategies. *Early Years*, 31(3), 257–270. doi: 10.1080/09575146.2011.613805
- Cochrane, T., Narayan, V., & Oldfield, J. (2013) ‘iPadagogy: Appropriating the iPad within pedagogical contexts’. *Int. J. Mobile Learning and Organisation*, 7(1), 48–65.
- Cole, M., & Engestrom, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 1–46). Cambridge, England.: Cambridge University Press.
- Cordes, C., & Miller, E. (2000). *Fool’s gold: A critical look at computers in childhood*. College Park, MD: Alliance for Childhood. Retrieved from <http://files.eric.ed.gov/fulltext/ED445803.pdf>
- 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), 75–98.
- Dhir, A., Gahwaji, N. M., & Nyman, G. (2013). The role of the iPad in the hands of the learner. *Journal of Universal Computer Science*, 19(5), 706–727. doi:10.1080/14616734.2012.672288
- Downes, T., Arthur, L., & Beecher, B. (2001). Effective learning environments for young children using digital resources: An Australian perspective. *Information Technology in Childhood Education Annual*, 2001(1), 139–153. Norfolk, VA: AACE. Retrieved from <http://www.editlib.org/p/8493>
- Education Review Office (ERO) Report. (2011). *Campus Creche Trust: Preschool 19/09/2011*. Retrieved from <http://www.ero.govt.nz/Early-Childhood-School-Reports/Early-Childhood-Reports/Campus-Creche-Trust-Preschool-19-09-2011>
- Ensor, T. (2012). Teaming with technology: “Real” iPad applications. *Journal of Adolescent & Adult Literacy*, 56(3), 193–193. doi:10.1002/JAAL.00127
- 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. Retrieved from <http://dx.doi.org/10.1007/BF02504683>
- Evans, M. (2013, March 28). Forget nap time; It’s app time. *Stuff.co.nz*. Retrieved from <http://www.stuff.co.nz/technology/digital-living/8481266/Forget-nap-time-its-app-time?cid=edm:stuff:dailyheadlines>

- Fagan, T., & Coutts, T. (2012). *To iPad or not to iPad?* Christchurch, New Zealand: CORE Education. Retrieved from <http://www.core-ed.org/thought-leadership/research/iPad-or-not-iPad>
- Falloon, G. (2013). Young students using iPads: App design and content influences on their learning pathways. *Computers & Education*, 68, 505–521. doi:10.1016/j.compedu.2013.06.006
- Falloon, G., & Khoo, E. (2014). Exploring young students' talk in iPad-supported collaborative learning environments. *Computers & Education*, 77, 13–28. doi:10.1016/j.compedu.2014.04.008
- Fleer, M. (2014). Digital positioning for inclusive practice in early childhood: The cultural practices surrounding digital tablets in family homes. *Computers in New Zealand Schools: Learning, Teaching, Technology*, 25 (1–3), 56–76.
- Hatherly, A., & Chapman, B. (2013). Fostering motivation for literacy in early childhood education using iPads. *Computers in New Zealand Schools: Learning, teaching, technology*, 25(1–3), 138–151.
- Hennessy, S., & Deaney, R. (2009). The impact of collaborative video analysis by practitioners and researchers upon pedagogical thinking and practice: A follow - up study. *Teachers and Teaching*, 15(5), 617–638. doi:10.1080/13540600903139621
- 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). Oxon, England: Routledge.
- Hu, W. (2011, January 4). Math that moves: Schools embrace the iPad. *The New York Times*. Retrieved from [http://www.nytimes.com/2011/01/05/education/05tablets.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2011/01/05/education/05tablets.html?pagewanted=all&_r=0)
- Jenkins, H., Purushotma, R., Clinton, K., Weigel, M., & Robison, A. J. (2006). *Confronting the challenges of participatory culture*. Retrieved from [http://digitalllearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS\\_WHITE\\_PAPER.PDF](http://digitalllearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF)
- Kaiser Family Foundation. (2005, January 2). *The effects of electronic media on children ages zero–six: A history of research—issue brief*. Retrieved from
- Khoo, E., Merry, R., Nguyen, N. H., Bennett, T., & MacMillan, N. (2014). Early childhood education teachers' iPad supported practices in young children's learning and exploration. *Computers in New Zealand Schools: Learning, Teaching, Technology*, 25(1–3), 3–20. Retrieved from <http://www.otago.ac.nz/cdelt/cinzs/otago063953.html>
- Kucirkova, N., Messer, D., Sheehy, K., & Flewitt, R. (2013). Sharing personalised stories on iPads: A close look at one parent–child interaction. *Literacy*, 47(3), 115–122. doi:10.1111/lit.12003
- 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, 175–184. doi:10.1016/j.compedu.2013.10.003
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Maykut, P., & Morehouse, R. (1994). *Beginning qualitative research: A philosophic and practical guide*. London, England: Falmer Press.
- McCarrick, K., & Li, X. (2007). Buried treasure: The impact of computer use on young children's social, cognitive, language development and motivation. *AACE Journal*, 15(1), 73–95.
- McKenney, S., & Voogt, J. (2009). Designing technology for emergent literacy: The PictoPal initiative. *Computers & Education*, 52(4), 719–729.
- Merriam, S. B. (2001). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
- Miletic, D. (2012, August 10). iPads helping or hindering infants? *Canberra Times*. Retrieved from <http://www.canberratimes.com.au/digital-life/tablets/iPads-helping-or-hindering-infants-20120809-23xc9.html>

- Ministry of Education. (1996). *Te Whāriki. He Whāriki Mātauranga mo nga Mokopuna o Aotearoa. Early childhood curriculum*. Wellington, New Zealand: Learning Media. Retrieved from <http://www.educate.ece.govt.nz/learning/curriculumAndLearning/TeWhariki.aspx>
- Nasir, N. S., & Hand, V. M. (2006). Exploring sociocultural perspectives on race, culture, and learning. *Review of Educational Research*, 76(4), 449–475.
- Ostaszewski, N., & Reid, D. (2010). iPod, iPhone, and now iPad: The evolution of multimedia access in a mobile teaching context. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2010* (Vol 2010, Number 1, pp. 2862–2864). World Conference on Education Media and Technology.
- Plowman, L., Stevenson, O., McPake, J., Stephen, C., & Adey, C. (2011). Parents, pre-schoolers and learning with technology at home: Some implications for policy. *Journal of Computer Assisted Learning*, 27(4), 361–371.
- Stephen, C., & Plowman, L. (2003). Information and communication technologies in preschool settings: A review of the literature. *International Journal of Early Years Education*, 11(3), 223–234. doi:10.1080/0966976032000147343
- Stevenson, O. (2011). From public policy to family practices: Researching the everyday realities of families' technology use at home. *Journal of Computer Assisted Learning*, 27(4), 336–346. doi:10.1111/j.1365-2729.2011.00430.x
- Timmermann, P. (2010). Is my iPad in my backpack. *Journal of Digital research & publishing*. Retrieved from [http://www.artichokewebdesign.com/ARIN6912/PDFs/Pilar\\_Timmerman\\_Digital\\_Education.pdf](http://www.artichokewebdesign.com/ARIN6912/PDFs/Pilar_Timmerman_Digital_Education.pdf)
- Verenikina, I., & Kervin, L. (2011). iPads, digital play and pre-schoolers. *He Kupu*, 2(5), 4–19.
- Wade, A. (2012, August 25). iPads bridge kindy generation gap. *New Zealand Herald*. Retrieved from [http://www.nzherald.co.nz/technology/news/article.cfm?c\\_id=5&objectid=10829371](http://www.nzherald.co.nz/technology/news/article.cfm?c_id=5&objectid=10829371)
- Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, M.A: Harvard University Press.
- Wertsch, J. V. (1998). *Mind as action*. New York, NY: Oxford University Press.
- Wolf, B. P. (2010). *A roadmap for education technology*. Boston, MA: University of Massachusetts. Retrieved from [http://telearn.archives-ouvertes.fr/docs/00/58/82/91/PDF/groe\\_roadmap\\_for\\_education\\_technology\\_final\\_report\\_003036v1.pdf](http://telearn.archives-ouvertes.fr/docs/00/58/82/91/PDF/groe_roadmap_for_education_technology_final_report_003036v1.pdf)
- Zevenbergen, R. (2007). Digital natives come to preschool: Implications for early childhood practice. *Contemporary Issues in Early Childhood*, 8(1), 19–29.



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