2014

PARENT-CHILD INTERACTION IN SHARED-COMPUTER ACTIVITIES: AN EXPLORATORY STUDY EXAMINING PARENT-CHILD INTERACTION WITH A MOBILE DEVICE

Marjan Petkovski
petk2350@mylaurier.ca

PARENT-CHILD INTERACTION IN SHARED-COMPUTER ACTIVITIES: AN EXPLORATORY STUDY EXAMINING PARENT-CHILD INTERACTION WITH A MOBILE DEVICE

by

Marjan Petkovski

THESIS

Submitted to the Department of Psychology

in partial fulfillment of the requirements for

Master of Arts in Psychology

Wilfrid Laurier University

Abstract

The present exploratory study examined the shared-computer behaviours of parent-child dyads in order to examine how (and if) parents interact with their children when using mobile digital devices and parents' perceptions of their child's technology use. Little is known about how technologies are used with young children and how to maximize and support young children's learning when they are introduced to these technologies. In total, 104 parents (n = 72 mothers and n = 32 fathers; one parent per child) participated in an observation session where parent-child interactions using a mobile device (Apple iPad™) were recorded in order to observe first-hand the supports and exchanges between parent and child. Parents displayed verbal, emotional-verbal, physical and emotional-physical supports. Parents completed a survey that assessed their perceptions of their children's technology use as well as the verbal, emotional and physical supports parents report providing to support their children's use of technology. Following the observation session, parents were interviewed to report their feelings about their experience in the study, whether they feel they should help their child when their child is using technology, how parents introduced technology and/or games on technology to their child(ren), and parents' opinions on which critical aspects are important to address when deciding to use or not use technology. Results indicate that although parents do not differ as a function of gender or experience (novice versus advanced users of mobile devices) for the amount and type of support they provide their child while interacting with the iPad™, they provide a great deal of supports to their child. Results will be important for parents, educators, and child care providers as they make clear parents' perceptions, behaviours and personal experiences in introducing technology to their children.

Keywords: parent-child interactions, shared-computer activities, technology, mobile device, iPad

Table of Contents

List of Tables

List of Figures

List of Appendices

Parent-child interaction in shared-computer activities: An exploratory study examining parent-child interaction with a mobile device

Technology is part of everyday life in North America, the "Western World" and increasingly so throughout the developing world. For example, statistics suggest that by 2002, 60% of Canadian households owned a personal computer (Statistics Canada, 2004), by 2009 77.1% of Canadians had home Internet access (Statistics Canada, 2010), and by 2012 that number grew to 80% (Ipsos Reid, 2012). A growing number of Canadians also have access to mobile Internet with 37% having access in 2012 compared to 5% in 2001 (Ipsos Reid, 2012). In the United States of America, 65% of children aged 3 to 17 had access to home computers and other technologies by 2005 (e.g., electronic games; Calvert, Rideout, Woolard, Barr, & Strouse, 2005) and 85% of children in the European Union aged 9 to 16 use the Internet for completing schoolwork (Davies, 2011). Comparatively, in developing nations such as Uganda, technology use (more specifically, mobile phone use) has seen a rapid diffusion, quadrupling between 1998 and 2001 from 0.41 mobile telephone subscribers per 100 people to 1.72 (Meso, Musa, & Mbarika, 2005). Clearly, digital technologies are a ubiquitous feature for most children growing up in the twenty-first century.

As children are being born into an increasingly technologically-advanced world in which digital devices and media are present in their daily experiences (Calvert et al., 2005), their initiation to these devices is occurring earlier than in previous generations (McCarrick & Li, 2007). Given the presence of and early introduction to computer technologies in the everyday lives of so many individuals, especially children, it is important to examine and understand how children are introduced to these devices and how their earliest interactions with computer

technologies unfold. The present study investigated parents' reactions regarding their children's use of mobile technology and parents' use of technology together with their children.

Roadmap

In order to establish the importance of examining parents' roles for the introduction of computers, it is first important to lay the groundwork that defines our current understanding of young children's experiences with computers and the critical role parents can play in their children's early learning in general and more specifically with respect to computers. The following sections will review the current literature to identify each of these important concerns. Specifically, the review highlights what is currently known about young children and computers with a focus on identifying what does and does not help young learners to approach, navigate and learn from computer technology. Next, the review outlines issues pertaining to introducing technology and technological devices to young children with a focus on the benefits and concerns of parents and educators. Finally, the review highlights parental support of young children's learning with a focus on parents providing scaffolded instruction to their young learners as well as parents' role in guided interaction and shared computer activities.

Children and technology

Perhaps the most salient place that children come into contact with technology is through educational systems. Though many children may be exposed to technology at home, the appropriation of technology as a potential learning tool has seen the presence of computer technologies increase dramatically, and often systematically, in schools around the world. The presence of computer technologies within educational systems has been increasing steadily over the past two decades. For example, during the 2003-2004 school year, the Information and

Communications Technologies in Schools Survey (ICTSS) reported that 99% of all elementary and secondary schools in Canada had computers (Statistics Canada, 2004). Many countries have initiatives to promote and use technologies on a broad scale. For example, Australia recently invested $2.4 billion to foster development of the infrastructure to support consistency and ease of use of digital computer technologies in the classroom ("Digital Education Revolution," n.d.). It is intended to prepare students for further education and to be able to work and live in a digital world.

In the Western world, and North America in particular, computers are being integrated because they offer unique instructional alternatives and supports for individual learners. For example, computers can support and provide a mechanism to encourage collaborative learning among students (Mercer, Warwick, Kershner, & Staarman, 2010). Instructional advantages are also evident as a function of the multimedia possibilities available with computers. Some schools with multimedia classrooms include technologies such as interactive whiteboards, which allow information such as text, images, and video to be presented and manipulated on large touch-sensitive screens (Mercer et al., 2010). In most schools, desktop computers are readily found in classrooms, libraries and/or computer labs. The increase in access and availability of different computer-based technologies means that children are becoming prominent users and relying on technological devices such as computers for everyday learning opportunities and for homework outside of the formal instructional time (Davies, 2011).

Technology has also become an important instructional tool in the classroom. From a teaching perspective many devices have been introduced which can change the way that teachers provide instruction or instructional opportunities. For example, whiteboards allow for more diversity in how teachers engage children in any particular task than traditional "blackboards."

Most notably, whiteboards can be used to encourage learners to engage interactively in a lesson which changes the delivery method from traditional teacher-to-student instruction consistent with classic blackboard presentations to a more interactive and engaging experience for students (Shenton & Pagett, 2007). These instructional changes are also starting at a very early point in children's lives (Mercer et al., 2010; Stephen & Plowman, 2008). As mentioned earlier, computer technology can be used to engage students in peer collaboration and joint learning experiences (Mercer et al., 2010) as well as providing a 'dialogic space' where students may share ideas and engage with their peers and teachers in such a way as to learn from the perspective of others (Mercer et al, 2010). Although computers can alter instructional approaches, their presence only changes instruction when teachers accept them as unique pedagogical tools (Mueller, 2010) and plan to use them accordingly. In many cases the potential instructional gains from computer technologies are not realized as computers are under-utilized in the classroom (Plowman, Stephen, & McPake, 2010). Clearly, the advantages conferred by computers in educational contexts are greatly impacted by the role teachers give computers in their teaching (Prestridge, 2012). Formal instructional contexts, though, are not the only environments where children are exposed to technology.

Computer technology has also become more prevalent in young children's lives before they enter formal schooling, including early childhood education environments (Ko, 2002; Stephen & Plowman, 2008; Wang & Hoot, 2006; Wood, 2001), and children are becoming prominent users of technology before they are even able to read or write (McKenney & Voogt, 2010). Therefore, teachers and early childhood educators play an important role in influencing, supporting and extending young children's experiences with technological devices by providing guided interaction with classroom computers (McCarrick & Li, 2007; McKenney & Voogt,

2009; Stephen & Plowman, 2008) and using technologies to promote learning in areas such as extending knowledge of the world, acquiring operational skills and developing dispositions to learn (Plowman et al., 2010). Children are also influenced by and engage with various forms of digital technologies in the home such as computer games, drawing tools, PlayStation™, and other e-games (Carrington, 2001; Davidson, 2011).

Despite the growing numbers of young children who appear to be gaining exposure, skill and experiences with technology, there is little available research that maps out how children initially encounter technology. We also know little about how to maximize and support young children's learning when they are introduced to these technologies. The introduction of children, particularly young children, to computer technology has seen both support (e.g., Shade & Watson, 1990) and concern (e.g., Elkind, 1996; Healy, 2003). Specifically, a growing body of literature supports technology use as an important contributor to early learning (Korat & Or, 2010). For example, exposure to computer–based instructional opportunities yields gains in problem solving, language skills, intelligence, and structural knowledge (Clements & Samara, 2003; Haugland, 1999; Vernadakis et al., 2005). Apart from specific gains, evidence also indicates that young children quickly acquire the navigational skills required to use computer – based technologies to generate learning products. For example, Couse and Chen (2010) found that young children between three and six years of age quickly acquired the skills required to use a stylus-interfaced tablet to represent their ideas and learning through a drawing activity. In addition, Michael Cohen Group and United States Department of Education (USDOE; 2011) found that children as young as 2 years of age were capable of using tablets to perform simple tasks such as counting and matching, learning through exploration (i.e., touch, repeat, trial and error). Finally, learning is enhanced as a result of greater engagement in the learning task for

some computer-based activities. For example, Chang, Mullen and Stuve (2005) found kindergarteners that used Personal Digital Assistant (PDA) technology exhibited high engagement and were able to easily manipulate a stylus used for writing and drawing on the device.

However, authorities, including the American Academy of Pediatrics (1999, 2001), have clearly stated that very young children (children younger than 2 years of age) should not be exposed to screen media (e.g., television, computers) and that children older than 2 years of age should be limited to 1 to 2 hours of screen time per day. Parents, therefore, may feel competing pressures to avoid exposing their young children to screen media, while worrying that by doing so they may inhibit or retard their children's media literacy as well as their opportunities to learn (Calvert et al., 2005; Wood, Specht, Willoughby, & Mueller, 2008). Although the issue of introducing children, particularly young children, to computers and technology in early childhood education may still linger (e.g., Cordes & Miller, 2004), most recent research supports the benefits and use of technology for young children's social and cognitive development (e.g., Stevenson, 2011; Mercer et al., 2010; Stephen & Plowman, 2008; Wang & Hoot, 2006). Recent research also supports the use of technology in making children savvy media users by learning to become autonomous users of technology (Calvert et al., 2005; Plowman et al., 2010) and providing experiences in order to develop operational skills to use a remote control, navigate and find specific websites, or operate other home devices (e.g., DVD player) independently and autonomously (Plowman et al., 2010). Accordingly, debates continue on the desirability and true value of technology for young learners (Plowman & Stephen, 2003).

Concerns for parents can be diverse. For example, one concern that parents may have is that technology-enhanced toys may detract children from using imagination during play (Bergen,

Hutchinson, Nolan, & Weber, 2010). These types of toys may also detract children from time spent playing with non-technology-enhanced toys, spending less time engaged in fundamental play with objects (Bergen et al., 2010). However, parents may be keen on the idea of trying new devices in order to help their children learn. This is the case with mobile devices that parents may use to engage their children in academic/scholastic games and activities either at home or elsewhere. For instance, the fundamental properties of an e-book, that many parents purchase for their children to be able to read and interact with while on the go, the text and illustrations are consistent with the printed version of the same book. However, multimedia features such as animation, music, sound effects, illuminated text, and reading of the text out loud by a narrator are integrated into the software (de Jong & Bus, 2003). Thus, the interactivity aspect of the e-book can increase children's involvement in the activity and allows children to be active, independent, and initiating partners (de Jong & Bus, 2003; Fisch, Shulman, Akerman, & Levin, 2002; Kim & Anderson, 2008; Smith, 2001). However, an alternative view has also been suggested – that many of the existing e-books emphasize multimedia, colours, sounds, and graphics, but are not necessarily suitable for promoting young children's language and literacy. They do not necessarily contain important options such as highlighting a section of the text which may indeed help support children's awareness of print (de Jong & Bus, 2003; Shamir & Korat, 2006). Given the variable opinions available in the literature as well as in the everyday press, parents face a challenging decision regarding whether to introduce their children to computers/technology and when to do so to maximize their children's gains and minimize any potential concerns.

In line with parental guidance and interaction during computer/technology use, some researchers (e.g., Fisch, Shulman, Akerman, & Levin, 2002; Kim & Anderson, 2008; Korat &

Or, 2010; Smith, 2001) have examined parent-child interactions with digital or e-book reading. For example, Korat and Or (2010) and have found that e-book reading yielded more discourse initiated by the child and more responsiveness to maternal initiations than reading from a printed book. These parent-child interactions are important as it provides children with scaffolded instruction and helps to strengthen skill sets in various domains. Korat and Or (2010) concluded that the reading context has a significant influence on parent-child interactions and this may, in turn, have different effects on children's early literacy development. Similarly, Oz (2009) investigated the effects of a home-based early intervention in mathematics on a sample of families in poverty and found that children's and parents' use of a software program where they work collaboratively at home resulted in children's increased number sense skills.

Parents supporting learning

There is no doubt that parents play a major role in supporting their children's learning and fostering positive early learning experiences for their children (Davies, 2011; Neumann, Hood, & Neumann, 2009). Literacy instruction, including early reading skill development, is one area where parental involvement has been shown to have significant impact on children's learning. For example, parents often consider reading books to their young children as a fundamental and important activity for their children's language and literacy development (Murase, Dale, Ogura, Yamashita, & Mahieu, 2005) and parents take advantage of this event as an opportunity to expand their children's cognitive development (e.g., general world knowledge, vocabulary, awareness of books and print; Korat & Or, 2010). In dialogic reading, for example, parents take an interactive approach and engage with their children when reading picture books to them by asking questions or encouraging children to elaborate on their explanations (Zevenbergen & Whitehurst, 2003). It is clear that most parents want to assist their children

(Evans & Shaw, 2008) and that when they do so, at least in traditional domains such as reading and mathematics, their children show cognitive and social gains (Eagle, 2012).

Does this form of instructional support also appear for young children using computers? Findings by Davies (2011) indicate that many parents (67%) also provide support to their older children still living at home (e.g., young adults) when they are on the computer with parental involvement in their children's learning decreasing as the children grew older. Parents reported providing their children with opportunities to gain the necessary and essential skills and experiences (e.g., conducting Internet searches, building a personal website) required by a future information society (Davies, 2011). Nevertheless, there is still much that remains unexplored in understanding how parent-child interactions can stimulate the development of emerging skills in young children.

To that point, it is interesting to examine how parents support their children using different digital devices at different ages. Young children have greater gross-motor control than they do fine-motor control and this makes it difficult for very young children to be autonomous users of technology, requiring parental guidance in using computers and technology (Calvert et al., 2005). For example, parents may provide physical support by helping their children hold the mobile device in front of them, verbal support by instructing them where on the screen they should look, or emotional support by providing positive and encouraging words while using the mobile device. In addition, one of the first ways that children are introduced to and use technology is from the comfort of their parent's (mother's) lap (Shade & Watson, 1985, as cited in Calvert et al., 2005). Subsequently, children develop and strengthen their fine-motor skills and are able to use their hands to navigate and click a mouse (Calvert et al., 2005). Furthermore, with

respect to mobile devices like the iPad™, children's fine-motor skills may transfer to actions such as touching, tapping and swiping.

Parental support, therefore, is a potentially important contributor to early experiences with technology. Examination of the various kinds of support parents provide their children that affords positive learning experiences when young children use mobile technologies with their parents is critical in order to determine what kind of parental support can maximize learning gains. The concept of scaffolding, as initially introduced by Vygotsky (1978), offers a theoretical framework for examining parental support in shared-computer activities.

Scaffolding

Vygotsky's (1978) socio-cultural perspective offers a natural framework within which parent-child interactions may be examined. Vygotsky (1978) envisioned that guided interactions (e.g., instructional dialogue) with an adult, or more-skilled peer, could afford a higher level of thinking within the child's zone of proximal development (ZPD). The ZPD was conceptualized by Vygotsky (1978) as the distance between the actual or true developmental level as may be determined by independent problem-solving and the level of potential development as may be determined by problem-solving through guided interactions with an adult or a more-capable peer. Scaffolding, then, refers to the use of techniques or tools that would allow a child to reach a particular goal that would otherwise be unattainable through unassisted efforts (Wood, Bruner, & Ross, 1976). In other words, it is the presentation of tasks that are slightly above the child's current competence (tasks that are challenging but not overwhelming) that motivates the child and permits them to achieve and learn more than they would unaided by an adult or more-skilled peer (Hogan & Pressley, 1997; Kohlberg & Mayer, 1972; Neumann et al., 2009).

Similarly, the concept of the tools of the culture was viewed by Vygotsky (1978) as the specific cultural tools that children acquire, handed down to them by more experienced members of society. These tools of the culture facilitate the acquisition of higher mental functions – deliberate, symbol-mediated behaviours that may take different forms depending on the cultural context. In this regard, the presence of computer-based technological devices and, in particular, recent devices such as tablet computers, smartphones and other mobile devices may be viewed as tools of the culture in today's Western societies and North America. These devices are used to communicate, educate, entertain and facilitate work. As such they serve multiple functions, some of which directly support and advance higher mental functions. Understanding the introduction of these cultural tools to young children and the supports used to facilitate that introduction may be key to understanding how these tools are best used to facilitate learning.

Scaffolding in the digital age. Accordingly, it is important to illustrate the significance of scaffolding and parental behaviours that permit and indeed support children's learning. It was thought that if learning was scaffolded by parents, then children would be able to not only accomplish the particular task at a higher level, but they would also be able to internalize their thinking, strategies, or mechanisms used to be able to approach other similar tasks (Rogoff & Gardener, 1984). In the present electronic/digital age, many households have mobile technologies from which children could gain valuable instructional opportunities if they were provided access and the support required to use the devices. Parents are in a unique position to provide access and scaffolding that can support their children's introduction to mobile technologies. Mobile devices such as the Apple iPad™ are designed in such a way that even very young users can use them easily. Specifically, unlike traditional desktops, iPads™ employ touch and swipe technologies, actions which are natural and easily performed by young children. With

assistance, children are able to approach and use the iPad™ and with scaffolded support matched to their increasing competence with the devices, their skills could become strengthened which would allow them to be autonomous users and use the devices with minimal support and supervision from parents.

Yelland and Masters (2007) identified three different types of scaffolding that occur during interactions with computers. The first type, *cognitive scaffolding*, involves such strategies as modeling and asking questions by the adult that aids in conceptual and procedural understanding. Cognitive scaffolding helps to develop children's understanding of concepts. For example, parents might point the child's attention to something on the screen while reading an e-book and ask questions of their child. The second type, *affective scaffolding*, is when positive encouragement and feedback are provided to the child to assist and expand their learning to higher levels of thinking and operating. An example of affective scaffolding would be encouraging the child to try again if they are unsuccessful in a particular task. The third scaffolding type, *technical scaffolding*, refers to the inherent features of the touch-screen device itself that scaffold the child's learning and facilitates understanding and problem-solving skills. For example, an alphabet application that provides feedback to the child and changes the level of difficulty based on the child's successes or failures would be considered technical scaffolding. The present study borrows from these categories and extends them in order to more fully capture parents' self-reported and observed scaffolding. For example, technical scaffolding as defined by Yelland and Masters (2007) includes supports specific to the device but may not necessarily include additional prompts specific to learning in general such as positioning the child to allow them to stay on task or see critical information. The present study, therefore, included more global scaffolding categories in a self-report measure (i.e., verbal, emotional, and physical

scaffolding) and derived categories based on observation (i.e., verbal, emotional-verbal, physical, and emotional-physical scaffolds) to capture the broad range of device-specific and instructional context scaffolds parents could employ when interacting with their child to use a mobile device, specifically, the iPad™.

Mobile devices. Mobile touch-sensitive devices such as the Apple iPad™ and Samsung Galaxy Tab™ are becoming increasingly prominent (Murray & Olcese, 2011; Rideout, 2011; Tahnk, 2011). A recent survey in the United States by Rideout (2011) found that more than half (52%) of children 0 – 8 years of age (N = 1,384) had access to touch-screen devices at home (such as smartphones, iPods™, or tablet computers). Mobile devices afford the opportunity for on-demand-learning when and where the learner wants (Traxler, 2007). This concept of learning has been widely researched as situated learning; however, the introduction of mobile devices adds a new dimension to situated learning. Martin and Ertzberger (2013) designate this on-demand type of learning as *here and now* learning as it allows children to access information at any time and from anywhere. The expanding reach of learning is complemented by an increased usability in design.

Touch-sensitive devices allow for an easier to use and more intuitive interface for children (McManis & Gunnewig, 2012). The simple mobility of the device affords children the ability to lay the tablet in their lap or use it on the floor or in any environment around their home (their bedroom, their play area, etc.) and the large size of the touch-screen interface found on tablets makes it easy to use for children. In addition, the interactive multimedia capabilities of tablets can stimulate visual, auditory, tactile, and kinaesthetic sensory systems and the response to children's input is instant, providing immediate feedback (Cooper, 2005; Tahnk, 2011). In effect, this enables children to be able to quickly learn to use the technology and explore new

things, learn new skills, and gain early literacy knowledge (McManis & Gunnewig, 2012). As mobile devices are starting to make an appearance in people's everyday lives, it is important to understand how individuals are using and interacting with these devices. Moreover, it is important to understand how these new devices are being used with young children. However, little research has examined the use of mobile devices with young children either in educational contexts or at home (Plowman, Stevenson, Stephen & McPake, 2012). There is a lack of empirical research that examines the use of new tablet technologies, especially with young children and their parents/caregivers, and the role of the family in supporting young children's learning with technology (Plowman et al., 2012). The majority of the extant literature examining tablet use with students has been conducted with older students, has relied on teacher-child reports, or lacked strong empirical findings.

For example, researchers have explored the use of mobile technology among older children and youth who experience specific learning challenges including helping students with Autism Spectrum Disorders develop vocational and daily living skills through the use of an iPhone™ (Bereznak, Ayres, Mechling, & Alexander, 2012), using mobile phones to help children and adolescents with depression (e.g., Whittaker et al., 2012), and promoting physical activity (e.g., Lau, Lau, Wong, & Ransdell, 2011). Researchers have also examined parent-child interactions with mobile devices such as a LeapPad™ (e.g., Eagle, 2012) and e-books (e.g., Korat & Or, 2010). Where the literature becomes sparse, however, is in examining the interactions between parent and child while using a tablet computer like the iPad™. In particular, parents' scaffolding and support strategies and behaviours, as well as the impact of their familiarity with the mobile device (e.g., novice users as opposed to experienced users) have not

been examined in great depth. However, this may be due to the fact that tablets and other electronic mobile devices such as smartphones are a fairly new phenomenon.

Studies that have examined the use of technologies in the home have found that parents scaffold their children's use of mobile technologies through parent-child interactions while shopping online, reading the newspaper, writing e-mails, browsing the Internet, or checking the weather (Plowman et al. 2011, 2012; Wohlwend, 2010; Tahnk, 2011). By parents helping their children when they are having difficulties, being positive, and encouraging their children to solve problems helps to reduce children's frustration and allows them to sustain their engagement through challenging tasks (McManis & Gunnewig, 2012).

Previous research has shown that the nature of the scaffolding process is dynamic – a process that must be modified to suit the circumstances of implementation (Yelland & Masters, 2007). Both child expertise and parent expertise with the technologies therefore should predict parental scaffolding. For example, the case can be made that parents who are familiar with using certain technologies will have the necessary skills to scaffold their children's learning, while less-technology-skilled parents may not be able to effectively contribute to the process. Similarly, children who show greater skill should receive and require less scaffolding than those who are less skilled or experienced with using a novel mobile device.

Similar to shared-reading and shared-television viewing, shared-computer experiences may allow the kind of active parental involvement that is necessary to mediate how children come to understand the information they experience as well as making the children more savvy media consumers (Gentile & Walsh, 2002). A great deal of research shows that parents want to support their children's learning and that this support significantly enhances their children's

development (e.g., Evans, Mansell, & Shaw, 2006; Sénéchal, & LeFevre, 2002). Although several researchers have examined parental views toward technology for older children and teens, little is known about parents' attitudes and experiences with respect to technology and early childhood. Therefore, through observational means, the present study will examine first-hand the nature of the parent-child interactions that take place when children and parents engage in shared-computer activities using a mobile device.

The parents' role. Thus, the parents' role in interacting with their children during computer/technology use is of vital importance. It is, therefore, essential to consider shared-computer activities between parents and children, particularly those occurring at a young age and when children are introduced to technology. It is important to understand parents' perspective in interacting with their children when using technology as parents play a fundamental role in determining how effective and advantageous using computer technology may be (Wood et al., 2008). Particularly important are the interactions that occur between parent and child – interactions that afford various important supports such as verbal and physical guidance and scaffolding as well as emotional support while children use technology. Where the extant literature on the topic of technology use and parent-child interactions becomes sparse is in the area of research examining parent-child shared-computer activities with new mobile technology such as tablet computers. The present study provides a context for understanding if and how parents support their children's introduction to mobile computer technology.

As part of the examination of parent's roles, potential differential contributions as a function of parent gender must also be considered. In much of the existing literature that contrasts mothers' and fathers' play with young children, mothers and fathers have been shown to differ in the play they engage in with their young children (Caldera, Huston, & O'brien, 1989).

Differences in play that have been documented range from the degree of physical involvement (Caldera et al., 1989) to the endorsement of stereotypes (Eccles, Jacobs, & Harold, 1990). Specifically, fathers tend to engage in more physical and boisterous play than mothers. In addition, research on toy play interactions indicates that fathers tend to be more gender-stereotypic than mothers (Wood, Desmarais, & Gugula, 2002).

Apart from play contexts with children, it is important that gender be considered when exploring new technologies or new uses of technologies to ensure that gender preferences are understood. Initial research regarding computer use indicated that males self-reported more use of technology than did females. However, current research findings do not typically indicate differences in time spent using technology between males and females. Although there are typically no robust gender differences in experience or amount of use regarding computer technology, there are often subtle differences in how women and men use computer technologies (i.e., use for gaming versus use for communication; Fallows, 2005; Hilbert, 2011).

Given that the present study seeks to understand early interactions regarding mobile devices with both mothers and fathers, and past research with children at play and between men and women indicates differences may be apparent, it is essential to consider gender as an important consideration in this study.

The present study

The present study explored parental support when technology is used by their young children. In particular, parents' decisions, opinions, self-reported scaffolding and observed scaffolding were examined. Survey tools permitted examination of beliefs and self-reported scaffolding while an observational session allowed for a first-hand examination of parental

scaffolding when using mobile technology (i.e., an iPad™) with their young children. Specifically, mothers and fathers were asked to play for 10 minutes with an iPad™ with their young child. Observations were made and coded to determine whether parents scaffold their child through the play session, and if scaffolding is provided, what types of scaffolding are offered. Follow-up interviews allowed for assessment of the generalizability of the observed sessions to typical technology-based interactions between the parent and child.

Hypotheses and research questions

Overall, one overarching research question and three specific hypotheses were tested in the present study. The overarching question relates to the exploratory nature of this study in examining and documenting the different types of support that parents provided children when engaged interactively using an iPad™. The first hypothesis explored whether parents experienced in the use of mobile devices (users) differed from inexperienced parents (non-users) in the types of supports they offered their child. Consistent with gender differences in play evident in the existing literature, the second hypothesis explored whether gender differences existed between mothers and fathers and the types of interactions/scaffolds they provided their children. The third hypothesis examined whether there were developmental differences in the types or amount of supports that were provided for children (e.g., younger children would require and receive more support than their older peers). The final research question assessed whether there existed an interaction of experience, age, and parent gender, as differences among mothers and fathers and users and non-users may be specific to a particular constellation of these factors.

Method

Participants

In total, 104 parent-child dyads participated in one interactive iPad™ play session. Seventy-two mothers (M_{age} = 35.40 years, SD = 4.81, range = 23 – 50 years of age) and 32 fathers (M_{age} = 37.10 years, SD = 4.85, range = 25 – 47 years of age) completed two surveys, one interview and engaged in interactive play with their 2-6 year old child. There were no significant age differences between mothers and fathers, t(102) = 1.86, p = .07. Among the parents, 76% self-identified as being familiar with the iPad™ device they were asked to use in the observation session (n = 28 males, n = 51 females) and 24% were new to the mobile device (n = 4 males, n = 21 females). Those who self-reported as having familiarity with the iPad™ (or other tablet computers) were coded as "users" and those unfamiliar with the iPad™ were considered "non-users" in subsequent analyses. Most parents indicated some level of higher education: undergraduate degree (35.6%); Master's degree (24%); college diploma (13.5%); post-doctorate (8.7%); or a doctorate degree (6.7%). A smaller proportion of the sample reported having less education with 6.7% reporting some post-secondary education and 2.9% having a high-school diploma. Two participants did not report their education level.

Children included 50 girls (M_{age} = 46.21 months, SD = 13.22, range = 24.3 – 68.9 months), and 54 boys (M_{age} = 44.59 months, SD = 14.92, range = 22.8 – 75.9 months). There were no significant age differences between girls and boys who participated in the study, t(102) = -.58, p = .56).

All participants were treated in accordance with APA/CPA ethical standards (see Appendix A for consent form).

Recruitment

Participants were recruited from local daycares, early childhood education centres, community centres, recreation centres and day camps in South-western Ontario. All participants were able to speak English and used English throughout the observation session. Participants could complete the one pre-observational survey and the observational session (including the post-observation survey and interview) at their convenience. These two components could be completed at different times. Participants who completed the pre-observational survey could enter their email address for a draw for one of 20 gift certificates (valued at $50 each). In addition, parent-child dyads received $25 compensation to cover gas/travel costs and their time for participating in the observational session.

Materials and measures

Materials included a pre-observation survey, the observational session, a post-observation survey and a brief post-observation interview. The survey and interview components were completed by one parent who also participated in the observed interactive play session. The 10-minute, observed interactive play session involved the introduction of an iPad™ for parents and their child to use. The measures and equipment are described in detail below.

Pre-observational survey

The pre-observational survey was administered prior to the observation session. Parents could choose to complete the survey online or in hard copy. This survey was comprised of items specific to the present study as well as measures that were used for another larger study examining parent use of technology, literacy and numeracy. For the present study, only questions dealing with demographic information and parental beliefs regarding the timing for the introduction of technology to their child were included.

Demographic information collected included the parent's gender and age, the child's gender and age, and the parent's highest level of education. Parents' beliefs about the introduction of technology for their children were assessed through one question. Specifically, parents were asked to identify at what age they would introduce technology in general to their child with 12 answer options that increased in 6-month increments from "Birth" to "After 6 years of age."

Technology equipment

Each parent-child dyad was given one iPad™ (Model A1430, version 5.1.1 9B206 operating on iOS 6.1.2) at the beginning of the observational session. In addition to default applications/software typically available on an iPad™, 12 other applications were downloaded for the present study and these applications remained consistent throughout the duration of the study (i.e., the applications were not updated). The 12 reading- and math-based applications were chosen based on user reviews and ratings and top selling applications in the Apple App Store "Education" category in June, 2012.

Seven applications (Reader Rabbit™ Preschool, Reader Rabbit™ Kindergarten, Reader Rabbit™ 1st Grade, Super Why™ v.1.4.1, Super Why™ Alpha Boost v.1.1, abc PocketPhonics v.2.01, and Little Writer – The Tracing App for Kids v.1.2) targeted reading and literacy skills, and five applications targeted numeracy skills (Monkey Math School Sunshine v.1.2, Bugs & Buttons v.1.3, TeachMe™: Toddler v.2.3.1, TeachMe™: Kindergarten v.3.4, TeachMe™: 1st Grade v.3.2). The Reader Rabbit™ applications targeted literacy skills through games and activities such as identifying letters and sounds, reading, and phonics. The Super Why™ applications also targeted literacy skills through activities that involved a letter hunt, writing out

letters, and rhyming words. The Pocket Phonic and Little Writer applications targeted letter sounds and writing through a letter-tracing activity. The Monkey Math School Sunshine application targeted numeracy skills through interactive games that engaged children in number sequencing, patterning, counting, adding and subtracting. Similarly, the Bugs & Buttons application also included activities such as counting, sorting, and pattern recognition. Finally, the three TeachMe™ applications featured counting numbers, colours, addition, and subtraction. In addition to these applications, the iPad™ also contained the default applications such as photos, camera, calendar, and music.

The iPad™ was housed in a protective spongy jacket called "iGuy™" (see Figure 1) shaped like a figure with sponge arms and legs. Apart from protection, these extensions enhanced manoeuvrability by allowing the iPad™ to be held by arms and also allowed the iPad™ to stand independently on the feet when placed on a flat surface.

Post-observation survey

The post-observation survey was comprised of 19 questions (See Appendix B for the survey). The first 2 forced-choice (yes/no) questions assessed whether parents let their child use mobile technologies and if they downloaded programs for their child to use on the mobile technologies. For parents who responded "yes" to downloading applications, there was a further prompt for parents to select from 16 possible reasons all of the reasons they use for supporting their decision to download applications for their child.

Two questions assessed self-reported use of verbal and physical supports parents provided to support their children's use of technology. Both questions employed a 5-point Likert-type scale with anchors 1 = "Never" and 5 = "Almost Always." Fifteen possible verbal

prompts were provided with an additional open-ended "other" category and 14 physical prompts were listed with an open-ended "other" category. The open-ended "other" categories allowed parents to identify additional scaffolds/supports they used. Verbal supports included explicit instructions and hints to guide the child (e.g., "Providing hints but not complete instructions to help my child navigate the software"). Physical supports included direct physical contact (e.g., "Place your hand over your child's hand to help him/her navigate on the screen"). The verbal and physical support questions were subsequently divided into three categories, verbal, emotional, and physical supports/scaffolds. Specifically, 5 questions from the verbal prompts were coded as emotional because their primary function was to offer emotional supports (e.g., "'Yes, that's right!' 'Good job!' 'You can do it!'"), encourage the child to try something new or more challenging, and provide the child with confidence. The final three scales were comprised of 11 verbal, 5 emotional, and 13 physical supports.

The remainder of the post-observation survey assessed responses to the iPad™ used in the observational setting. Specifically, parents were asked to rate the familiarity, interest, ease of use, and comfort associated with using the iPad™. In addition, parents were asked to rate how similar the observation session was to typical interactions that parents have with their child(ren) involving technology.

Comfort using new/unfamiliar technology. Parents were asked to identify their comfort level in using new/unfamiliar technology through the following question, "How would you rate your comfort level with new mobile technology (e.g., using a new tablet, smartphone, other mobile software unfamiliar to you)?" The item was scored on a 5-point Likert-type scale with anchors ranging from "Very uncomfortable" to "Very comfortable."

Familiarity/Interest/Ease of use with iPad™. Four questions assessed familiarity, interest and ease of use of the iPad™. Specifically, parents were asked to identify whether they owned any of the devices they used in the observation session at home. Answer options included, "No, I do not own any of these devices," "Yes, I own a desktop computer," "Yes, I own a tablet (i.e. iPad™, PlayBook™, etc.)" and "Yes, I own both devices." Parents were also asked, "How familiar were you with the iPad™ we asked you to use?" (measured on a 5-point Likert-type scale with anchors ranging from "Not at all familiar" to "Completely familiar"), "How interesting did you find the iPad™?" (measured on a 5-point Likert-type scale with anchors ranging from "Not at all interesting" to "Very interesting"), and "With respect to ease of use, how would you rate the iPad™?" (measured on a 5-point Likert-type scale with anchors ranging from "Very difficult to use" to "Very easy to use").

Children's familiarity with the iPad™. Children's familiarity was assessed through three questions including, "How do you think your child responded to the iPad™?" (measured on a 5-point Likert-type scale with anchors ranging from "Did not like it at all" to "Liked it a lot"), "How would you rate your child's familiarity with the iPad™ we asked you to use?" (measured on a 5-point Likert-type scale with anchors ranging from "Not at all familiar" to "Completely familiar"), and "How would you rate your child's interest with respect to the iPad™ we asked you to use?" (measured on a 5-point Likert-type scale with anchors ranging from "Uninterested" to "Very interested").

Overall feelings. Overall feelings with using the mobile device and participation in the observation session were assessed through four questions. Parents were asked to identify how they found the observation session experience. The items from this section included, "Overall, how comfortable did you find the experience of using the iPad™ in the present study?"

(measured on a 5-point Likert-type scale with anchors ranging from "Not at all comfortable" to "Very comfortable"), "Overall, how similar was the observation session to the typical interactions you have with your child involving technology?" (measured on a 5-point Likert-type scale with anchors ranging from "Not at all similar" to "Almost the same"), "After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies *with* your presence/guidance?" and "After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies *without* your presence/guidance?" (both measured on a 5-point Likert-type scale with anchors ranging from "Never" to "Always"). The latter two questions also offered an open-ended response item, "If never, could you please state why not?"

Observational component

Each parent-child dyad participated in one 10-minute observational session with an iPad™. Parent-child dyads were given the iPad™ turned on and set at a comfortable volume level. A brief introduction to the iPad™ was given to review how applications are opened and closed as well as navigational functions. After the brief introduction, parent-child dyads were free to select from the 12 applications as well as typical applications/functions that appear on most iPads™ (e.g., photo album, camera, music, etc.).

Interview

After the post-observation survey was completed parents were asked to provide feedback regarding the observational session through a brief interview. Each parent was asked four questions including, "What were your general feelings about the session you had when using the iPad™ with your child?" "Do you feel that you should help your child when they are using

technology or do you feel that they should attempt to figure it out on their own?" "In general, we want to know how parents introduce technology to children (what works and what doesn't) so we are hoping you can share with us how you introduced technology and/or games on technology to your child?" and "You were asked in the survey to tell us whether you use technology with your child. If we asked you to summarize what you think is critical about making the decision to use/buy technology or not use/buy it or about doing it right, what would you say?" (See Appendix C for a list of the interview questions). The interview took approximately 5 minutes to complete, depending on the depth of parents' responses.

Procedures

Parents were asked to complete the pre-observation survey either online or via hard-copy, depending on parents' preferences. The pre-observation survey was part of a larger survey assessing computer technology in the lives of young children and took parents approximately 30 minutes to complete. Once parents had completed the pre-observation survey, they were invited to participate in a 10-minute observation session at a date and time of their convenience where they were observed while interacting with their child while using an iPad™. All parents accepted the invitation to participate in the observation session.

The observation session began with welcoming parents into the observation room. The room was organized to reflect a "home" environment with a loveseat, two child-sized tables with two chairs and a large oval alphabet carpet to cover the floor. Parents were invited to get comfortable prior to commencing the observation session. Parents were asked information relating to their child's name, child's birth date, their child's current age in years and months and whether the parent themselves were familiar with operating and navigating mobile tablets such

as an Apple iPad™ or BlackBerry PlayBook™. Parents that self-reported as having experience or familiarity with tablets like the iPad™ were coded as a "user" of mobile devices and those parents that self-identified as being unfamiliar with using tablets like the iPad™ were considered a "non-user." Parents were informed that they could rearrange the furniture in the room to suit their needs and that they could choose to be seated wherever was most comfortable for themselves and their child. Two full-sized chairs were provided near both child-sized tables for the parent.

Three cameras were set up in the room, two to provide a length-wise view of the entire room from both angles, and a third camera to provide a view from an elevated position. Finally, the parents were informed that two trained research assistants would be present in the room with them, sitting in two chairs at the end of the room by the cabinet for timing the 10-minute session and helping parents had they asked for assistance with the mobile device or had any questions throughout the observation session. The two research assistants sat quietly at all times so as to not disturb the parent and child. A brief overview was provided for parents to introduce them to the functions available on the iPad™ at the outset of the observation session. This included an introduction to the 12 applications downloaded onto the iPad™ (seven for reading and literacy and five for numeracy) as well as some general instructions regarding navigation (opening and closing applications, movement within applications, orientation of the device in portrait and landscape mode, volume control buttons, home button to exit applications, and the various menus consisting of default apps and downloaded games). Parent-child dyads were given 10 minutes to play with the iPad™ and their interactions and behaviours were video-recorded.

Following the observation session, parents were asked to fill out the short post-observation survey (approximately 10 minutes). Finally, in a brief post-observational session

interview conducted by the second research assistant (approximately 5 minutes in duration), parents were asked to provide some feedback about the observational session in which they participated. During this segment, one of the research assistants played with the child either on the iPad™ or with colouring books.

Results

The present study explored how (and if) parents support their young child when they are using technology. The study employed four different measures: a pre-observation survey, an observation session, an interview and a post-observation survey. The primary information gathered through the pre-observation survey concerned demographic information which is presented in the participants section of this document. Descriptive information regarding the remaining measures from each of these sources is introduced below, as are corresponding analyses. Comparisons using the proposed 2 (parent gender) versus 2 (user/non-user) comparison were not feasible given the smaller number of non-users available in the present sample. Instead, analyses are presented as separate analyses assessing the impact of gender (mothers and fathers) and experience (users/non-users). Caution is indicated in interpreting the analyses given the potential for increased error as a function of separating these comparisons; however, the exploratory nature of this research warrants that some analyses of the user/non-user designations be conducted.

Introducing technology to children

Parents were asked to indicate the age at which they would consider introducing digital technologies to children. Overall, all but one of the 12 six-month age groupings (i.e., 5.5 – 6

years) provided were selected by at least 3 parents (see Table 1) with the greatest proportions of parents indicating 1.5 – 2 years of age (24.3%) and 2 – 2.5 years of age (19.4%).

Age of introduction to technology was analyzed as a function of parent gender and experience (user/non-user). Two ANOVA analyses were conducted, one comparing mothers and fathers and the other users and non-users for the range of 12 6-month intervals for age of introduction. There were no significant differences between mothers and fathers ($F(1, 101) = .01$, $p = .91$). There were, however, significant differences between users ($M = 4.37$, $SD = 2.48$) and non-users ($M = 6.00$, $SD = 3.48$; $F(1, 101) = 6.65$, $p = .01$; $t(102) = 2.58$, $p = .01$) such that non-users reported they would introduce their child to technology at an older age than users.

Parents were also asked whether they permit their children to use mobile technologies in general (e.g., Cellphone/Smartphone, iPod™, iPad™, PlayBook™, Tablet Computer, etc.), and especially larger mobile technologies (e.g., iPad™, PlayBook™, LeapPad™, Vtech® toys, etc.), such as the one used in the interactive play session. Overall, more than 80% of parents indicated that their child played with mobile technologies in general (see Table 2). Chi square analysis revealed the percentage of parents that allow their child to use mobile technologies did not differ by gender, χ^2 $(1, N = 104) = .22$, $p = .64$. Interestingly, chi square analysis revealed differences in experience (user/non-user), χ^2 $(1, N = 104) = 19.48$, $p < .001$, such that, consistent with expectations, a greater proportion of users (91.1%) reported allowing their child to use mobile technologies than did non-users (52%). See Table 2 for frequencies.

Interestingly, in addition to high levels of affirmation of digital technology use in general, over 94% of parents allowed access to larger mobile devices such as the iPad™ used in the present study. Two ANOVA analyses indicated that access to devices such as the iPad™,

however, did not differ as a function of parental gender or experience ($F(1, 84) = 1.465$, $p = .23$ and $F(1, 84) = .73$, $p = .40$, respectively).

Among those parents who indicated that they did allow their children to use mobile devices, 80% indicated that they download applications for their children. Chi square analysis did not reveal significant differences as a function of parent gender among those who download applications for their children, χ^2 (1, N = 85) = .05, p = .82, or experience (user/non-user), χ^2 (1, N = 85) = 3.27, p = .07.

Parents who did download applications for their children were asked to identify the rationale(s) that supported their decision from a list of 15 possible choices (parents could indicate as many as were appropriate; see Table 3). The least endorsed rationales were building social skills, history and searching for information (10%, 5%, and 12.5%, respectively). Most other categories were selected by at least a quarter of the parents. The most frequently endorsed rationale was for fun or entertainment (56.7%). Although enjoyment was the singularly most endorsed reason, there were also several educational goals indicated such as developing specific skills including problem-solving (53.8% of parents), basic math (53.8% of parents), reading (51% of parents), language (47.1% of parents), and science (26% of parents), as well as building hand-eye coordination (46.2% of parents). Comparisons between mothers and fathers did not yield significant differences among the rationales identified, however, Chi square analyses revealed differences between users and non-users for eight of the rationales. Specifically, a greater proportion of users than non-users identified each of the rationales including 'building hand-eye coordination': χ^2 (1, N = 104) = 6.50, p = .011; 'building problem-solving skills': χ^2 (1, N = 104) = 6.32, p = .012; 'developing basic skills in math': χ^2 (1, N = 104) = 8.85, p = .003; 'developing basic skills in reading': χ^2 (1, N = 104) = 9.57, p = .002; 'developing basic skills in

language': χ^2 (1, N = 104) = 7.06, p = .008; 'arts and crafts': χ^2 (1, N = 104) = 5.91, p = .015; 'fun/entertainment': χ^2 (1, N = 104) = 8.20, p = .004; and 'occupying their child': χ^2 (1, N = 104) = 5.97, p = .015. For example, 53.2% of users selected 'building hand-eye coordination' as opposed to 24% of non-users and 60.8% of users selected 'building problem-solving skills' as opposed to 32% of non-users. (See Table 3 for a detailed summary).

Finally, parents were provided with three rationales that might account for their decision to allow their child to use mobile technologies (see Table 4). Overall, approximately 70% indicated that they were curious to see how their child responded to the technology while 53% indicated that their child explored it accidentally. Very few parents (9%) introduced their child following the recommendation to do so by a friend. Selection of these rationales did not differ as a function of parent gender for the three rationales, t(77) = 1.85, p = .07, t(75) = 1.07, p = .29, and t(80) = -.62, p = .535, respectively, or experience (user/non-user), t(77) = -.24, p = .81, t(75) = .11, p = .92, and t(80) = -.23, p = .82, respectively, for the three rationales.

In summary, parents were most likely to introduce technology to their children between one-and-a-half to two-and-a-half years of age and their reasons for doing so were diverse. Overall, mothers and fathers were similar in both the ages for introduction and the rationales identified. Experience with technology did impact responses. However, rather than indicating differences in rationales, users were more likely than non-users to support each of the selected rationales.

Self-reported scaffolding. The post-observation survey contained 11 items that assessed parents' self-reported verbal scaffolds, 5 items that assessed parents' self-reported emotional scaffolds, and 13 items that assessed parents' self-reported physical scaffolds. The three self-

reported scaffolding types were found to be highly reliable ($\alpha = .88$, $\alpha = .84$, and $\alpha = .88$ for the verbal, emotional and physical scales, respectively). A total scaffolding score was also constructed by aggregating the three subscales. This overall scaffolding scale was reliable ($\alpha = .71$). Positive correlations were found among the verbal, emotional, and physical support scales ($r = .65$, $p < .001$, $r = .62$, $p < .001$, and $r = .37$, $p < .001$ for the verbal and emotional scale, verbal and physical scale, and emotional and physical scale, respectively) indicating that parents who utilized one form of scaffolding were likely to use the other forms of scaffolding.

Hypothesis one examined whether users and non-users differed in the types of supports they offered their child. An overall, descriptive comparison of users and non-users (see Figure 2) indicates very slight differences. A MANOVA analysis was conducted between users and non-users for the three aggregated scaffolding scales on the survey measure: verbal scaffolding, emotional scaffolding and physical scaffolding. There were no significant differences in self-reported types of scaffolding as a function of parental familiarity with technology ($F(1, 71) = .60$, $p = .44$; $F(1, 71) = .67$, $p = .42$; $F(1, 71) = .02$, $p = .88$, respectively, for verbal, emotional, and physical scaffolding; see Table 5 for a summary of means).

Hypothesis two examined whether mothers and fathers differed in the types of supports they offered their child. Visual inspection of means (see Figure 3) suggests that mothers reported slightly more supports than fathers overall. A MANOVA analysis was conducted between mothers and fathers for the three aggregated scaffolding scales on the post-observation survey measure: verbal scaffolding, emotional scaffolding and physical scaffolding. There were no significant differences between mothers and fathers ($F(1, 71) = .36$, $p = .55$; $F(1, 71) = .20$ $p = .66$; $F(1, 71) = 1.33$, $p = .25$, respectively, for verbal, emotional, and physical scaffolding; see Table 5 for a summary of means).

To explore whether individual characteristics of parents or children influenced parents' self-reported scaffolding, a series of three regressions were conducted, one for each of the three categories of self-reported scaffolding on the post-observation survey. In all cases the type of scaffolding served as the dependent variable and child age, child gender, parent age, parent gender, and parent experience (user/non-user) served as the predictor variables.

All three models were non-significant (the overall models were not significant, $F(5, 76) = .94$, $p = .46$, $R^2 = .06$, $F(5, 76) = 1.25$, $p = .295$, $R^2 = .08$, and $F(5, 74) = 1.94$, $p = .099$, $R^2 = .12$ for the self-reported verbal, emotional and physical scaffolding scales, respectively). However, there was a trend for child gender approaching significance for the emotional scaffolding scale, $t(76) = -1.79$, $p = .08$ such that parents of male children ($M = 19.93$, $SD = 3.38$) reported providing more emotional supports than parents of female children ($M = 18.39$, $SD = 3.97$). Similarly for the self-reported physical scale, child age and child gender approached significance, $t(74) = -1.96$, $p = .054$ and $t(74) = -1.88$, $p = .064$, respectively. These two trends suggest that as child age increased parents provided fewer physical supports. In addition, parents of male children ($M = 36.05$, $SD = 10.41$) reported providing more physical supports than parents of female children ($M = 32.00$, $SD = 8.20$).

Observation session

Four video files were examined by three raters working as a group to identify types of scaffolding parents offered to their children during the interactive play session with the iPad™. These initial videos yielded four types of support: physical, verbal, emotional-verbal and emotional-physical, plus two additional categories, distractors and off-task. See Appendix D for a detailed description of each category and Table 6 for a summary of means. It is important to

note at the outset that there were no negative prompts identified in the interactive iPad™ sessions (such as negative comments toward the child's performance, ignoring, or physical reprimands).

Physical supports included holding the iPad™ for the child to use, placing a hand underneath the device to support it, placing the iPad™ down (e.g., on couch or table) for the child to use, pointing to the iPad™ screen (both in general and to a specific location), touching (pressing) the iPad™ screen for the child, adjusting the viewing angle of the iPad™, helping the child point to something by a hand-over-hand method, seating the child on their lap, readjusting their child's seating position, nodding or shaking their head to indicate approval or disapproval (often accompanied with a verbal or emotional-verbal support) and demonstrating a tilting action with the iPad™ for clarification on what the child is supposed to do in the game.

Verbal supports included repetition of the game instructions, providing clarification or rewording of game instructions (e.g., "oh, so what they want you to do is to pick the correct number from the list there."), reading aloud something written on the iPad™ screen (e.g., "so that says, 'Jack played a ___.'"); reading out a list of items, listing rhyming words, providing hints and examples (e.g., "'A,' like 'apple.'"), providing direct/step-by-step instruction (e.g., "now press on the green 'play' button.") asking direct or indirect questions (e.g., "where is the number seven?" versus "can you tell me where the triangle is?"), commenting or acknowledging something on the screen (e.g., "look at that, you got 3 stars"), telling the child to try again (e.g., "try that again."), and providing the child with corrective statements indicating that they are doing something wrong (e.g., "oops," "uh-oh").

Emotional-verbal supports consisted of verbal prompts that contained an emotional element including: praise, positive reinforcement and providing confidence (e.g., "good job,"

"you did it!" "you can do it," "there you go!" "you got it," "yes, that's right," "good girl/boy"), creating excitement and emotion through sound effects, gasps, and other vocalizations (e.g., "ooh," "woah!"), and laughing (creating a positive mood).

Emotional-physical supports were identified as physical supports with an emotional element including: touching the child (e.g., scratching or ruffling their hair, patting them on the back), physical expressions of praise (e.g., high-five, thumbs-up, shaking the child by the shoulders/their hand when they successfully accomplished something – often grouped with a verbal support such as positive reinforcement), kissing the child, facial expressions (e.g., smile, frown, grimace, shudder), and cuddling with the child or hugging the child.

The "distractor" category consisted of behaviours such as the parent being engaged in the task but not directly observing the child (e.g., looking around the room, adjusting personal belongings such as sunglasses, or glancing at their cell-phone), and looking at the researchers (e.g., asking for help with the device). Distractions were coded in this category if they were sustained for less than three seconds.

The "off-task" category consisted of behaviours/instances of distraction greater than three seconds in duration where the parent was visibly off-task and unengaged in the interactive activity with their child. Examples of these behaviours included external stimuli distracting the parent (e.g., cell-phone ringing), parents getting up from their seated position and interaction with their child to another location in the room (e.g., to retrieve something from a coat or purse or to turn off a ringing cell-phone), and if a researcher interrupted the session for software-related issues (e.g., volume was accidentally turned off by a parent or child).

Inter-rater reliability was established with three independent raters. The three raters coded 20% (21 files) of the video-recorded, observation sessions for these four categories with high inter-rater agreement. Specifically, comparisons between raters 1 and 2 and 1 and 3 each yielded an overall percent agreement of 92%. Within each category rates of agreement varied, but were above 80%. Specifically, raters 1 and 2 achieved 87.6% agreement for "physical supports," 80.8% for "verbal supports," 89.7% for "emotional-verbal supports," 94.5% for "emotional-physical supports," 99.5% for "distractors" and 99.6% for "off-task." Raters 1 and 3 achieved 86.8% agreement for "physical supports," 81.1% for "verbal supports," 90.4% for "emotional-verbal supports," 93.1% for "emotional-physical supports," 99% for "distractors" and 99.2% for "off-task."

A time sampling technique was used to code events in the observation session. Each 10-second interval of the 10-minute observation session was sampled for the four types of scaffolding: physical, verbal, emotional-verbal and emotional-physical supports. Given the relative infrequency of distracters or off-task incidents these categories were not examined in further analyses. The time samples for the four scaffolding types assessed throughout the observation session with the mobile device were aggregated and scales were created for physical, verbal, emotional-verbal, and emotional-physical scaffolds. The four scaffolding scales that were developed were found to be highly reliable ($\alpha = .99$, $\alpha = .94$, $\alpha = .88$ and $\alpha = .93$ for the physical, verbal, emotional-verbal, and emotional-physical scales, respectively). Correlations among these four types of scaffolding were conducted (See Table 7). Only 3 correlations were not significant. Specifically, physical scaffolding was not correlated with either emotional-verbal or emotional physical scaffolding and verbal scaffolding was not correlated with emotional-physical scaffolding, $r = .10$, $p =$ n.s. All other correlations were positive (smallest $r = .22$, $p < .05$ for

emotional-verbal and emotional-physical scaffolding and largest $r = .55$, $p < .01$ for verbal and physical scaffolding).

Consistent with hypothesis one, which examined whether users and non-users differed in the types of supports they offered their child, a MANOVA analysis was conducted between users and non-users for the four aggregated scaffolding scales on the interactive iPad™ session: verbal scaffolding, emotional-verbal scaffolding, physical scaffolding and emotional-physical scaffolding (see Figure 4 for a summary of means). There were no significant differences between users and non-users on any of these four scaffolding measures ($F(1, 102) = .23$, $p = .63$, $F(1, 102) = .61$, $p = .44$; $F(1, 102) = 3.14$, $p = .08$; $F(1, 102) = .01$, $p = .94$, for the physical, verbal, emotional-verbal, and emotional-physical scaffolding, respectively). However, the emotional-verbal comparison approached significance $F(1, 102) = 3.14$, $p = .08$, such that non-users engaged in more emotional-verbal supports ($M = 27.42$, $SD = 18.81$) than users ($M = 21.58$, $SD = 12.37$) in the 10-mintue iPad™ observation session (see Table 8 for a full summary of Means and Standard Deviations).

Consistent with hypothesis two, which examined whether mothers and fathers differed in the types of supports they offered their child, a MANOVA analysis was also conducted between mothers and fathers for each of the four aggregated scaffolding scales on the interactive iPad™ session: verbal scaffolding, emotional-verbal scaffolding, physical scaffolding and emotional-physical scaffolding. As seen in Figure 5, only small descriptive differences were evident. There were no significant differences between mothers and fathers on any of these four scaffolding measures, $F(1, 102) = .05$, $p = .83$, $F(1, 102) = .03$, $p = .87$; $F(1, 102) = .01$, $p = .93$; $F(1, 102) = 1.76$, $p = .18$ for the physical, verbal, emotional-verbal, and emotional-physical scaffolding, respectively (see Table 8 for a summary of means).

In summary, observed scaffolding of children during play with the iPad™ paralleled the outcomes of self-reported scaffolding by parents. Specifically, mothers and fathers did not differ in the types of scaffolding provided in the interactive play session with their child. Similarly, in general, there were also no differences between those familiar and unfamiliar with technology in terms of amount of scaffolding provided with the exception of the trend toward non-users providing more emotional-verbal scaffolds than users. Overall, this means that parents in this sample do not differ in the amount and type of scaffolds (i.e., physical, verbal, emotional-physical and emotional-verbal) they provide their child as a function of their gender (mothers versus fathers) or parental experience with technology (users versus non-users). Thus, parent gender or experience of using mobile technologies (parents experienced in using mobile devices versus novice users of mobile technologies) did not provide any significant advantages to one group versus the other as parents did not differ in the amounts or types of supports they provided their child in the 10-mintue iPad™ observation session. Interestingly, however, parents did offer a great deal of supports to their child throughout the 10-minute session. Specifically, the greatest type of scaffolding parents provided their child was verbal, with an average of 79.10 verbal supports (SD = 36.27) and an average of 76.41 physical supports (SD = 51.83) in the duration of the 10-minute interactive session. Emotional-verbal supports, although offered less frequently than verbal or physical supports, were still offered often, as parents gave on average 22.75 (SD = 14.40) emotional-verbal supports to their child throughout the 10-minute iPad™ session. Finally, the least offered support was the emotional-physical type, with an average of 5.78 (SD = 9.53) instances in the 10-minute period. Overall, then, it is interesting to see that although parents did not differ significantly in the amount and types of supports they provided their child, they still

exhibited a great deal of verbal and physical supports to their child when interacting with the mobile device in the iPad™ session. (See Table 8 for a summary of means).

Off-task child behaviour. Scoring of the videos also revealed that children were occasionally off-task or unengaged with the iPad™ activity. Two raters reviewed all observation videos and recorded the total number of times children were off-task as well as the duration of each instance that the child was not engaged. A total time off-task score was calculated by adding all individual off-task periods. Children varied in the number of off-task events (range = 0 – 15 instances; M = 1.37, SD = 2.80). Duration ranged from 0 to 158.86 seconds with two outliers of 304.07 and 311.44 seconds that were greater than 3 standard deviations from the mean (M = 12.88, SD = 31.11). Overall, however, children spent the vast majority of the time engaged with the technology and when they did become unengaged, it was for a short duration. (See Table 9 for a summary of means). Given these outliers, the previous observational data, and subsequent analyses using observational data were re-analyzed without the two outlier children's scores. No differences in outcomes were noted when these children were added or deleted from the calculations. Appendix E contains all analyses conducted with the two children added. All data reported in the present results section has these two children's data deleted from assessments involving the observations.

Individual characteristics and scaffolding

To explore whether individual characteristics of parents or children influenced the amount of scaffolding provided, a series of four regressions was conducted, one for each of the 4 categories of scaffolding observed in the interactive play session. In all cases the type of

scaffolding served as the dependent variable and child age, child gender, parent age, parent gender, and parent experience (user/non-user) served as the predictor variables.

For verbal scaffolding in the interactive observation session, the overall model was found to be significant ($F(5, 101) = 8.09$, $p < .001$, $R^2 = .30$). Both child's age ($\beta = -1.44$, $t(101) = -6.2$, $p < .001$) and parent age ($\beta = 1.44$, $t(101) = 2.21$, $p = .03$) predicted the amount of verbal scaffolding that parents provided in the interactive iPad™ session. As child age increased, the amount of verbal scaffolding parents provided their children decreased. Additionally, older parents provided more verbal supports than younger parents (see Table 8 for a summary of means).

The overall model for physical scaffolding in the interactive observation session was significant ($F(5, 101) = 6.07$, $p < .001$, $R^2 = .24$). Again both child age ($\beta = -1.81$, $t(101) = -5.27$, $p < .001$) and parent age ($\beta = 2.57$, $t(101) = 2.61$, $p = .01$) were significant predictors. Similar to verbal scaffolding, as child age increased, the amount of physical scaffolding parents provided their children decreased and older parents provided more physical supports than younger parents.

With respect to the two emotionally-based scaffolding supports in the interactive observation session, neither model was significant: emotional-verbal scaffolding, ($F(5, 101) = .74$, $p = .60$, $R^2 = .04$), emotional-physical scaffolding, ($F(5, 101) = .60$, $p = .70$, $R^2 = .03$; see Table 8 for a summary of means).

Post-observation survey

Parent's responses about themselves. Following the observation session parents were asked to indicate whether they owned an iPad™, a desktop computer or both. Overall, 53.8% of parents owned both, with 25% owning only a desktop computer. Few parents (13.5%) owned a

mobile device only (i.e., tablet) and very few (7.7%) owned neither a computer nor mobile device (see Table 10 for a summary of means). A comparison of mothers and fathers revealed no significant differences in the devices they owned from the observation session(s), $t(102) = .55$, $p = .59$. Interestingly, only 20% of non-users indicated not owning any device, most had a computer (48%) or both the computer and the iPad™ (20%). Only 12% of non-users indicated owning a tablet; no further analyses were conducted for these groups.

Parents were also asked to indicate how comfortable they are with new mobile technology (e.g., using a new tablet, smartphone, or other mobile software with which they are unfamiliar). A comparison of mothers and fathers revealed significant differences, $t(102) = 3.37$, $p < .001$, as fathers ($M = 4.25$, $SD = .88$) reported feeling more comfortable with using mobile technology that is new and unfamiliar to them than mothers ($M = 3.50$, $SD = 1.11$). Users ($M = 3.99$, $SD = .99$) and non-users ($M = 2.92$, $SD = 1.04$) also differed, $t(102) = 4.63$, $p < .001$, with users reporting greater comfort in using new or unfamiliar mobile devices. (See Table 11 for a summary of means).

Parents were asked to indicate how familiar they were with the iPad™ in the interactive observation session. A comparison of mothers and fathers revealed that mothers ($M = 3.31$, $SD = 1.39$) reported being less familiar with the iPad™ used in the present study than fathers ($M = 3.91$, $SD = 1.40$), $t(102) = 2.03$, $p = .045$. A comparison of users ($M = 3.90$, $SD = 1.27$) and non-users ($M = 2.20$, $SD = 1.04$) also revealed significant differences, $t(102) = 6.08$, $p < .001$, with users reporting greater familiarity with the iPad™ than non-users. (See Table 11 for a summary of means).

Parents were asked to rate how interesting they found the iPad™ in the interactive observation session. A comparison of mothers and fathers was non-significant, $t(101) = .39$, $p = .70$. Similarly, no significant differences were observed between users' and non-users' ratings of interest in the iPad™ used in the observation session, $t(101) = .89$, $p = .37$. (See Table 11 for a summary of means).

Parents were also asked to rate the ease of use of the iPad™ in the observation session. A comparison of mothers and fathers revealed no significant differences in the ease of use of the iPad™, $t(101) = 1.57$, $p = .12$. Similarly, there were no observed differences between users' and non-users' ratings of the ease of use of the iPad™, $t(101) = -.05$, $p = .96$. (See Table 11 for a summary of means).

In general, mean scores indicated that participants generally were comfortable with new mobile technology, and they were familiar and at ease with the iPad™ used in these observation session ($M = 3.73$, $SD = 1.10$; $M = 3.49$, $SD = 1.41$; and $M = 3.85$, $SD = 0.91$, respectively). Similarly, participants indicated a moderately high level of interest in the iPad™ device ($M = 3.85$, $SD = 0.91$). Overall, fathers reported being more comfortable and more familiar with using the iPad™ than mothers and users reported being more comfortable and familiar with the iPad™ than non-users. Overall, parents' ratings fell higher than the midpoint on the scale for their comfort with new technology, familiarity, ease of use, and their interest in using the iPad™. It is important to note, however, that there was great variability in parents' scores as is evident in the large standard deviations.

Parent's responses about their children. Parents' reports of their child's response to the iPad™ indicated an overall positive response ($M = 4.28$, $SD = 0.87$ rated on a 5-point Likert-

type scale with anchors 1 = “Did not like it at all” and 5 = “Liked it a lot”). See Table 12 for a summary of means. Subsequent comparisons of mothers and fathers revealed no significant differences, $t(98) = .65$, $p = .51$. Similarly, a comparison of users and non-users revealed no significant differences, $t(98) = .46$, $p = .64$.

Parents were asked to rate their child’s familiarity with the iPad™ in the observation session. Overall, parents indicated that they perceived their child to be moderately familiar with the iPad™ ($M = 3.16$, $SD = 1.32$ rated on a 5-point Likert-type scale with anchors 1 = “Not at all familiar” and 5 = “Completely familiar”). See Table 12 for a summary of means. A comparison of mothers and fathers revealed no significant differences in their rating of their child’s familiarity with the iPad™, $t(97) = 1.02$, $p = .31$. A comparison of users and non-users revealed that users ($M = 3.42$, $SD = 1.24$) reported their child being more familiar with the iPad™ than non-users ($M = 2.30$, $SD = 1.26$), $t(97) = 3.78$, $p < .001$.

Parents were also asked to rate their child’s interest with the iPad™ they used in the observation session. Overall, mean interest scores indicate that children were perceived to be fairly interested in the iPad™ ($M = 4.40$, $SD = 0.89$ measured on a 5-point Likert-type scale with anchors 1 = “Uninterested” and 5 = “Very interested”). See Table 12 for a summary of means. Comparisons of mothers and fathers and users and non-users revealed no significant differences in ratings between these groups, $t(98) = .24$, $p = .81$ and $t(98) = .68$, $p = .50$, respectively.

In general, parents perceived their child to be interested, somewhat familiar and responsive to the iPad™. Mothers and fathers did not differ in these ratings. Overall, users and non-users rated their children’s experiences similarly except with respect to familiarity where users rated their child as being more familiar with the iPad™. In general, parents’ scores fell

higher than the midpoint on the scales for each question assessing parents' responses about their child. It is important to note, however, that there was great variability in parents' scores.

Assessing the observation context

Parents were asked to evaluate the observation session through four questions. First, unlike the previous question that assessed parents' comfort with new/unfamiliar mobile technology, they were assessed on how comfortable they found the experience of using the iPad™ in the interactive play session with their child. Overall, parents rated their comfort using the iPad™ as fairly comfortable (M = 4.25, SD = 0.88; rated on a 5-point Likert-type scale with anchors 1 = "Not at all comfortable" and 5 = "Very comfortable"). There were no significant differences between mothers and fathers and users and non-users with respect to the perceived comfort of using the iPad™ in the observation session, $t(102) = .00$, $p = 1.00$ and $t(102) = 1.11$, $p = .27$, respectively.

Parents were also asked to report how similar the interactive iPad™ session was to the typical interactions they have at home with their child involving technology. Overall, parents indicated that the session was quite similar to the typical interactions they have with their child involving technology (M = 3.62, SD = 1.06 rated on a 5-point Likert-type scale with anchors 1 = "Not at all similar" and 5 = "Almost the same"). See Table 13 for a summary of means. No significant differences were found between mothers and fathers and users and non-users, $t(102) = -1.34$, $p = .18$ and $t(102) = -.99$, $p = .32$, respectively.

Parents were also asked to report whether, after having experienced the use of the iPad™ in the observation session, they would encourage their child to use similar mobile devices *with* them being present and *without* their presence/guidance. Overall, parents' ratings for

encouraging their child to use mobile technologies *with* their presence were moderate (M = 3.49, SD = 1.15 rated on a 5-point Likert-type scale with anchors 1 = "Never" and 5 = "Always"), indicating that they would encourage their child to use mobile technologies with their guidance a few times. Additionally, parents indicated that they would occasionally encourage their child to use mobile technologies *without* their presence and/or guidance (M = 2.50, SD = 1.67 measured on a 5-point Likert-type scale with anchors 1 = "Never" and 5 = "Always"). See Table 14 for a summary of means. It is important to note, however, that there was great variability in parents' scores to these items.

A comparison of mothers and fathers revealed no significant differences regarding the likelihood of encouraging their child to use similar mobile devices *with* or *without* the parent being present to support the child, t(102) = -.13, p = .90 and t(102) = .36, p = .72, respectively. Interestingly, a comparison of users and non-users revealed significant differences. Specifically, users (M = 3.67, SD = 1.08) would encourage their child to use similar mobile technologies as in the observation session with their presence/guidance more so than non-users (M = 2.92, SD = 1.19), t(102) = 2.95, p = .004. In addition, users (M = 2.66, SD = 1.11) also were more likely than non-users (M = 2.00, SD = 1.22) to endorse encouraging their child to use the iPad™ even when they were not present to support the child, t(102) = 2.52, p = .01.

In summary, the observation session was judged to be similar to interactive sessions at home and parents were relatively comfortable within the observation session and were able to navigate the iPad™ with great ease. Mothers and fathers did not differ with respect to likelihood that they would encourage their child to further explore the iPad™ regardless of whether they were present to supervise the child's play or not. Users, however, were consistently more likely to advocate for further exploration by their child, and their presence or absence during these

potential future play sessions was not a determining factor in encouraging subsequent exploration.

Exploratory analyses of variables predicting exploration with the iPad™

Two regression analyses were conducted to assess whether parent variables predicted whether parents would be likely to encourage their child to use mobile technologies such as the iPad™ in the future either when the parent was there to guide the child or when the parent was not there to guide the child. In both regressions there were 10 (ten) predictor variables (familiarity with the iPad™, their interest level in the iPad™, their rating of the ease of use of the device in the observation session, parents' rating on how they think their child responded to the iPad™, parents' rating on their child's familiarity with the iPad™, their child's interest with respect to the iPad™, parents' level of comfort with using the iPad™ in the observation session, the similarity of the session to typical interactions parents have at home with their child involving technology, child age, and parental experience).

Overall, both models were significant for when parents *were* and *were not* present to provide guidance, respectively ($F(10, 96) = 4.55$, $p < .001$, $R^2 = .35$ and $F(10, 96) = 4.28$, $p < .001$, $R^2 = .33$). Specifically, for the analysis assessing when parents *would be* present, three predictors were significant. There was a negative relationship evident in parents' ratings of ease of use of the iPad™, $\beta = -.41$, $t(96) = -2.18$, $p = .03$, such that as the ease of use decreased (i.e., parents rated the iPad™ more difficult to use), parents would increasingly encourage their child to use the device with parental guidance. Parents' ratings of their child's familiarity with the iPad™ was approaching significance, $\beta = .21$, $t(96) = 1.95$, $p = .055$, such that as the child's familiarity with the iPad™ increased, parents would increasingly encourage their child to use the

device with their guidance. Finally, parents' ratings of the similarity of the interactive session to the typical interactions they have at home with their child approached significance, $\beta = .22$, $t(96) = 1.87$, $p = .065$, such that the more similar parents reported the iPad™ session was to typical interactions involving technology at home, the more parents would encourage their child to use similar mobile technologies with their presence/guidance.

For the model exploring whether parents would encourage their child to use similar mobile technologies as in the observation session when they were not present to guide their child, again, three predictors were significant. Parent's ratings of how their child responded to the iPad™ was approaching significance, $\beta = .47$, $t(96) = 1.93$, $p = .057$ such that as the more parents' reported their child liked the iPad™, the more parents would encourage their child to use similar mobile technologies without their guidance. Parents' rating of their child's familiarity with the iPad™ was significant, $\beta = .27$, $t(96) = 2.40$, $p = .02$ such that as parents reported their child to be more familiar with the iPad™, the more they would encourage their child to use similar mobile technologies without their presence or guidance. Finally, parental experience (user/non-user) was also significant, showing a negative relationship ($\beta = -.69$, $t(96) = -2.19$, $p = .03$), such that users ($M = 2.66$, $SD = 1.11$) reported they would encourage their child to use similar mobile technologies without their presence/guidance more frequently than non-users ($M = 2.00$, $SD = 1.225$), $t(102) = 2.52$, $p = .01$.

Interview

The interview questions targeted parents' general feelings regarding the observation session they had participated in with their child using the iPad™, whether they believe that they should help their child when he or she is using technology or whether they feel their child should

attempt to figure it out on their own, how parents introduced technology to their child(ren), and a summary of what they believe is critical in making the decision to use or purchase technology or not to use or purchase it or perhaps about doing it in the *right* way. Two raters used an open-coding technique to capture emerging themes from the four interview questions. Emerging themes that shared ideas were regrouped under more abstract categories (Sahin, 2003). This process was continued until saturation occurred and all responses could be captured by the themes identified. An explicit code of theme labels and their definitions was developed (Boyatzis, 1998). Inter-rater reliability was 85% for the two raters independently coding 39 interview transcriptions (approximately 37% of the data). Disagreements were resolved by discussion. One rater coded the remaining 65 interviews. A detailed analysis of themes as a function of individual questions is presented in Appendix F. A summary of overall findings is presented here.

Summary of interview data

The majority of participants (76.9%) indicated positive affect toward the interactive iPad™ session. Remaining participants were either indifferent (11.5%) or indicated that they did not enjoy the session (11.5%). In addition, even though they were not asked specifically about the child's affect, 26% of participants indicated that their child appeared to enjoy the session.

With respect to parents' opinions regarding what they believe is critical about making the decision to use/purchase or not use/purchase technology or perhaps about how to do it *right*, more than half (55.8%) of parents mentioned that introducing technology is important, that technology cannot be avoided and will be a part of their child's world, and that their child will eventually need to learn how to use technology. Interestingly, almost a quarter of the sample

(22.1%) indicated that prior to the session they had not yet introduced their child to technology. Only 15.4% of parents mentioned that they had intentionally introduced their child to technology while 13.5% of parents mentioned that their child's introduction to technology had been unintentional. Unintentional introduction of technology included contexts outside of the home (i.e., through daycare) as well as inside the home (e.g., an older sibling (15.4%), spouse (5.8%) and imitating parents (9.6%)).

In terms of what should be provided to children when technology is introduced one response seemed to account for the majority of responses. Specifically, almost half of the parents (46.2%) mentioned that they seek age-appropriate, educational material when choosing games, applications, or technological devices for their child.

Many parents (40.4%) mentioned that that their child's use of technology should be regulated or constrained and that setting a daily time limit on technology use is important. Support and monitoring took many forms. For example, 20.2% of parents mentioned that they sit with their child and show them how to use technology and play with them together on technology. Some parents (18.3%) download games or applications on technological devices for their child to use. Some parents (13.5%) like to learn and explore the software before they allow their child access to it.

Approximately a quarter of the parents (22.1%) indicated that they typically allow their child to explore on their own when they use technology. Approximately an equal proportion of parents (24%) mentioned that they like to monitor their child when they are using technology. The reasons for introducing technology varied and included: child's interest and curiosity in

technology (21.2%), availability of technology in the home environment (21.2%), and keeping their child occupied (18.3%).

Among parents who expressed a negative opinion regarding technology use (21.2%), there were concerns regarding their child potentially becoming addicted to technology. Concerns also included extended periods of use, technology taking away time spent doing other activities, and that technology is generally overused in society. Safety (19.2%) was also important and included concerns related to online restrictions for inappropriate content.

The decision to purchase technology is a carefully considered one. Parents (15.4%) mentioned that they believe purchasing and using technology was important because it provides their child with a preparedness and the necessary skills for the future such as in school or in the workplace. Parents (14.4%) also mentioned neutral feelings about purchasing or using technology indicating that there is no right or wrong way to do it and that their child will learn to use technology when their time comes. The long-term use and benefits of a device were considered important (10.6%) when purchasing technology, such as whether the child will still be able to use it in five years, or choosing a device that the parent may be able to use as well. Some parents (9.6%) were concerned that their child would be at a disadvantage if they do not use or are not introduced to technology (i.e., in comparison with their peers that do use technology). Similarly, some parents (9.6%) also mentioned that they would purchase technology if their child expressed an interest in using technology. A small percentage of parents (7.7%) mentioned that they like to support and supplement their child's learning when they are using technology like providing hints or asking questions when their child uses technology. Finally, a few parents (4.8%) mentioned that they consider the durability of a device as one

reason when they are considering purchasing technology for their child (i.e., will the child break it?).

When asked about whether parents should help their child when he/she is using technology, most parents provided complex or multiple responses. For example, 44.2% of the participants mentioned that they like to take a combination approach to helping their child, that is, parents believe it is important to both help their child as well as allowing them to explore and learn on their own. The timing of parental intervention varied across parents with 41.3% of parents mentioning that they should allow the child to explore and try using the technology *before* they intervened to provide assistance and 36.5% preferring to help their child before allowing the child to work on their own. Almost a quarter (21.2%) of parents mentioned that they should not provide help but rather that they would encourage their child to explore and work on their own when he/she is using technology while 16.3% of parents felt that they should help their child when he/she is using technology.

Open-ended survey responses

Two raters read all of the responses to the six post-observation survey questions that contained an open-ended item (e.g., “other, please specify” and “if never, could you please state why not”) and codes were created to identify common themes. Overall, the number of participants responding to the six open-ended survey questions ranged from zero to 53 respondents. Given the very small numbers for five of the open-ended survey questions, these items were not analyzed any further. Two questions were answered more frequently by participants: why parents chose to introduce their child to technology (n = 53), and if parents would never encourage their child to use similar mobile technologies such as the iPad™ *without*

their presence or guidance, their rationale for why not (n = 22). Inter-rater reliability was established for those two questions. Inter-rater reliability for the question that assessed why parents chose to introduce their child to technology was 83% and inter-rater reliability for the question that assessed whether parents would encourage their child to use similar mobile technologies as in the observation session without parental presence or guidance was 90%. Disagreements in coding between the two raters were resolved through discussion.

When parents were asked why they chose to introduce their child to mobile technology, 11 themes were identified. Of these, nine overlapped with the interview questions and these are not re-introduced here. Of the two unique responses remaining, the notion of *entertainment*, was expanded to identify movies, shows, YouTube™ videos, and games as sources available on the device. The notion that a *touch interface is more intuitive* also arose. This theme captured the idea that mobile technology with a touch-sensitive interface makes it easier for children to use and is a more natural way for children to interact with and explore the technology.

Two questions (the last two post-observation survey questions) yielded a similar unique response that did not overlap with themes from the interview. In these situations parents qualified their response regarding whether they would encourage their child to use similar mobile devices like the iPad™ *with* or *without* being present or providing guidance as dependent on their child being older. In other words, parents in both cases mentioned that they would prefer to encourage their child to use similar mobile devices like the iPad™ once their child is older.

Discussion

Research has focused on children's use of technology in formal learning contexts such as schools and early learning contexts such as daycares (Willoughby & Wood, 2008). Most

recently, there is a growing trend to explore children's technology use at home. Available research examining technology use in the home, however, uses an expansive definition of "technology" which encompasses devices like television, DVD players, game consoles, and desktop computers that may be found within the home and readily accessible to children (e.g., Plowman, McPake, & Stephen, 2008). Much is already known about the impact of television and its related devices for children's development. Studies that examine the use of new digital technologies, however, including mobile devices (e.g., Apple iPad™, Blackberry PlayBook™, etc.) are only now emerging as these new devices are becoming more available. The present study provided an opportunity to understand how new mobile digital technologies impact families. Mobile technologies warrant examination because they afford different learning, play and social opportunities than traditional non-interactive technologies such as television. For example, tablets provide more opportunities to manipulate information than traditional books. Text can be highlighted as words are read aloud. In addition, children can highlight text as needed for review. Also, most software includes additional multimedia features to complement reading. Mobile devices may afford a variety of different interactions between parents and their child, such as dialogic reading, that provides greater collaboration. To date, the few studies examining mobile digital technologies with children (e.g., Bebell, Dorris, & Muir, 2012; Couse & Chen, 2010; Eagle, 2012; Stephen & Plowman, 2008) have focused on the use of these devices in settings outside of the home (i.e., in educational settings such as preschool and kindergarten).

The present study explored early technology use among parents and examined how, and if, parents interacted with their young child in a shared-computer activity with a mobile device. The study included both self-report (survey and interview) and observational data to assess

opinions, feelings and attitudes towards children's introduction to mobile technologies, how parents interact with their children when using mobile technologies, and their views on critical aspects to address when making the decision to use or purchase technology. The following sections review general findings about the introduction of technologies, followed by findings related to the observed interactions of parents and children.

Parents' views about technology use

Overall, the sample of parents in this study indicated an early age for considering the introduction of technology to their child. Over 43% of parents reported that they would introduce their child to technology between 1.5 – 2.5 years of age and more than half of parents (57%) reported that they would introduce their child between 6 months to 2.5 years. This timing is earlier than recommendations introduced by the American Academy of Pediatrics (1999; 2000) who suggest that children under the age of two years should not be exposed to screen time. The lack of agreement between what parents believe is good practice and what experts in early development indicate as appropriate could indicate a potential problem for children developmentally. Specifically, young children may be limited in the amount of valuable learning experience they have due to screen time. Alternatively, it may be the case that, since the time of posting these recommendations, developments in the design of software and hardware may have surpassed perceived limitations and could now permit an active and enriched experience for young children. Although no data is available for very young learners, aged two and under, studies have shown strong positive outcomes for children's use of technologies at an early age such that children who incorporate technology in their learning have displayed greater gains in various domains (e.g., problem-solving, structural knowledge and language skills) compared to their peers that do not use technology (Clements & Samara, 2003; Haugland, 1999; Vernadakis

et al., 2005). For example, Murray and Olcese (2011) document a positive effect of iPod™ literacy apps on young children's letter sound recognition, rhyming and vocabulary, particularly in children 3 years of age. Available literature, therefore, suggests potential gains rather than losses from early introduction to digital technology. Given that parents advocate for an early introduction, and that some children may be using technologies well before the recommended age for introduction, it would be an important next step to examine the learning and social impact of various technologies, especially mobile ones such as were used in the present study, for very young children.

In the present study, mothers and fathers did not differ with respect to the age at which they would introduce their child to technology. However, parental experience with technologies did impact timing. Specifically, non-users reported they would introduce technology to their child at a later age than users reported. In addition, non-users were also less likely to allow their child access to mobile technologies than users. It is not surprising that parents that are experienced in using mobile devices like the iPad™ would be more likely to introduce the technology to their child. For example, it would be more likely that they would have opportunities to introduce the technology to their children if they were using the technology when their child was present. In addition, children of users may simply have more access to various forms of technology perhaps due to availability of technological devices in the home.

Among those parents (80%) who indicated that they specifically download applications for their children, the majority did so to provide their child with a fun and entertaining experience. This consistency in response indicates that parents believe mobile technologies afford engaging experiences for their children. Several researchers have identified high engagement as a product of children's software and computers in general (e.g., Willoughby &

Wood, 2008). Several educational goals were also identified as considerations for downloading applications. Educational goals tended to involve developing specific skills including problem-solving, basic math, reading, language, and science, as well as building hand-eye coordination. These considerations reflect parents' desire to provide children with fun and entertainment as well as developing foundational academic skills (i.e., literacy, numeracy) and proficiency skills (i.e., hand-eye coordination). Interestingly, neither gender of the parent nor experience with technology discriminated among these rationales. Overall, parents perceive important potential learning outcomes when downloading applications for their young child to use.

Scaffolding when using technology

Providing young children with scaffolded instruction and the supportive situations that parents afford their children helps them to extend their existing knowledge and skills and transfer them to new learning experiences (Vygotsky, 1978). With this parental guidance, children internalize their knowledge of new concepts and ideas that will guide the child to success in similar tasks in the future. This independence enables the child to adopt greater responsibility and a greater feeling of personal accomplishment (Hogan & Pressley, 1997). The notion of scaffolding is traditionally conceptualized in formal educational contexts between a child and their teacher; however, it is also important to take into consideration that scaffolding occurs between parents and their children in informal contexts such as at home with mobile technologies. Design features inherent in mobile technologies (e.g., touch- and tilt-sensitive multimedia devices) may provide parents with unique opportunities to scaffold their children's learning when using these devices. It is well known that parents contribute a great deal in supporting their child's learning and in promoting positive early learning experiences for their

young children (Davies, 2011; Neumann, Hood, & Neumann, 2009) and new technological devices potentially provide more opportunities for parents to support their child's learning.

The present study offered an opportunity to compare self-reported scaffolding and observed scaffolding. Overall, the pattern of parents' self-reported scaffolding was consistent with what was observed. Interestingly, the observation sessions in the present study also encouraged the development of more refined or fine-tuned analysis of scaffolding that has been reported in previous literature. Specifically, parents were observed providing their child with four different types of scaffolding in the interactive iPad™ sessions (i.e., verbal, physical, emotional-verbal and emotional-physical). These extend the categories introduced by Yelland and Masters (2007). Yelland and Masters (2007) identified three types of supports (i.e., cognitive, affective, and technical scaffolding) where the present study extended the cognitive and affective categories by distinguishing verbal versus physical supports. Scaffolding afforded by the mobile device (i.e., *technical* scaffolding) was not examined as only parental scaffolding was targeted here. By expanding the scope of observable behaviours, the present study was able to capture parents' natural interactions with their children and parents' natural responses to their child's questions about the game/activity they were engaged in on the iPad™.

Studies have shown that children work more effectively and use higher-level processes and strategies when they are provided with scaffolded instruction from an adult (Yelland & Masters, 2007). Similarly, by providing examples for children to follow or imitate, modeling was found to be a central aspect of support for learning (Plowman, Stevenson, McPake, Stephen, & Adey, 2011). Parents in the present study did offer their children a great deal of support in the 10-minute time span they engaged with the iPad™. For example, parents provided, on average, 79 verbal supports in the 10 minutes they had to play with the iPad™ with their child. Similarly,

parents provided an average of approximately 76 physical supports to their child in the interactive play session. Emotional supports such as emotional-verbal and emotional-physical were offered less frequently but were provided nonetheless, with approximately 23 emotional-verbal supports and 6 emotional-physical supports in a ten-minute play session with their child. Clearly, parents were interacting with their children – and offering quite a bit of support. Parents engaged in a variety of supports such as verbal supports to help children understand content, physical supports to aid in manipulating the device, emotional-verbal supports to offer encouragement and praise and emotional-physical supports to acknowledge the child's successes (e.g., high-five for a job well done). Thus, it is evident that parents do support their children when they use technology.

Interestingly, neither experience with technology nor gender was predictive of differences in scaffolding either in the self-report or observation measures (i.e., hypotheses one and two). The consistency in scores across genders and users and non-users suggests that features specific to the child (e.g., child age and gender) or other environmental constraints are responsible for differences in the types of scaffolds parents provide their children. Given that parents did differentiate among the types of scaffolds provided, they indicate instead a focus or sensitivity to the needs of the child. There was one trend, however, suggesting that non-users provided more emotional-verbal supports to their child than users did in the 10-minute interactive session. This may be due to parents' own lack of familiarity with the mobile device and willingness to encourage their child more in order for them to be successful in the game. Although this was a trend, this may be an important consideration for future research when assessing parent-child interactions with these technologies, especially when challenging

situations might arise as parents with less experience may rely on different types of supports than those with greater skills in the area.

Consistent with hypothesis three, individual differences of parents and their child were examined to assess their impact on the types and amounts of supports children received. For the self-reported verbal scaffolding scale, there were no significant predictors, however child gender approached significance for both self-reported emotional and physical scaffolding such that parents with male children reported providing more supports than parents that participated with a female child. These results are consistent with a wide body of literature that boys receive more attention and esteem-building encouragement in educational settings than girls do, partly because boys tend to be more active and capture parents' and teachers' attention more so than girls (e.g., Dobbs, Arnold, & Doctoroff, 2004; Fagot, 1984; Fagot & Hagan, 1985; Sadker, 2000). Adults also generally treat boys and girls differently due to stereotyped and differentiated expectations they hold about what is typical for boys and girls (Eccles et al., 1990). It is possible that these tendencies and stereotypic principles may also impact the provision of more emotional and physical supports to boys rather than girls.

Interestingly, with respect to verbal scaffolding, both child age and parent age predicted the amount of verbal scaffolding parents provided their child such that, as would be expected, as child age increased, the amount of verbal scaffolding parents provided decreased. Additionally, older parents provided more verbal supports than younger parents in the interactive iPad™ session. Similarly, with respect to physical scaffolding, both child age and parent age were significant predictors of the amount of physical support parents provided their child. As child age increased, the amount of physical support decreased and older parents provided a greater number of physical supports than younger parents. Similar to how children's interactions with their peers

change as they grow, older parents interact differently with their young children than younger parents and parenting practices of older parents differ from younger parents (Auyeung, Burbidge, & Minnes, 2011). Specifically, older parents are more likely to show and feel less stress in their parenting efforts, use better coping strategies and more positive reinforcement than younger parents (Auyeung et al., 2011).

Importantly, parents were reducing scaffolding as their children increased in capabilities. Good scaffolding presumes that supports are tailored to the needs of the child and this appears to be evident in the present study. Parents were sensitive to age which may also reflect children's experience and growing abilities. Developmentally, younger children should require greater scaffolding support than their older peers as younger children have less fine-motor control than their older peers. In effect, this makes using technological devices that require precise inputs/commands difficult for very young children, requiring more parental assistance than older children (Calvert et al., 2005). It is harder, then, for younger children to be autonomous users of these devices and they may be more likely to require parental support before frustration sets in and the child loses interest in the task. With respect to mobile devices, although young children can manipulate the device with gross motor actions (e.g., holding the device with both hands, tilting or shaking the device), younger children may require parental assistance in more precise actions such as entering their name in order to begin playing a game or other actions within applications that require more refined motor skills.

None of the individual characteristic variables that were tested (i.e., child age, child gender, parent age, parent gender and parental experience) predicted emotional-verbal and emotional-physical scaffolding for the interactive iPad™ session. It seems that parents provide emotional supports – both in verbal form such as praise and encouragement and in physical form

such as smiles and hugs – regardless of their child's age or gender or whether parents are experienced in using mobile technologies or not.

Parental attitudes toward technology

Parent's attitudes. Parents were asked to rate their comfort level with respect to using new, unfamiliar mobile technology. Interestingly, fathers reported feeling more comfortable with new mobile technology than mothers and, with respect to parental experience, users reported being more comfortable than non-users with new mobile technology, which was expected. Parents did not differ in their ratings of their comfort level in using the iPad™ in the interactive play session with their child. Parents' familiarity with the iPad™ that they were provided in the interactive observation session with their child was also assessed. Interestingly, fathers reported being more familiar with the iPad™ than mothers and, as would be expected, users reported a higher familiarity than non-users. With respect to how interesting parents found the iPad™ and their ratings of the ease of use of the device, there were no differences between mothers and fathers or users and non-users.

It is not surprising that parents experienced in using mobile technologies would report higher ratings of comfort and familiarity with mobile devices. Parents inexperienced in using these devices would naturally take a more cautious, conservative approach to their self-ratings of comfort and familiarity with mobile technology.

Parent's responses about their child. Parents were also asked to rate how their child responded to the iPad™ and there were no differences between mothers' and fathers' ratings or users' and non-users' ratings. Parents also rated their child's familiarity with the iPad™ and a comparison of mothers and fathers did not reveal any differences. However, users reported their

child as being more familiar with the iPad™ than non-users. This may be due to increased exposure to similar mobile devices that children of parents that are 'users' have at home. With respect to parents' rating of their child's interest in the iPad™, there were no differences between these two groups. As was expected, parents that self-identified as being users rated their children as being more familiar with the mobile device in the observation session.

Parents were also asked, after having experienced the use of the iPad™ in the observation session, to rate how often they would encourage their child to use similar mobile devices *with* and *without* their guidance. On average, parents reported that they would more frequently encourage their child to use similar mobile devices *with* their presence and/or guidance rather than *without* parental assistance. This is consistent with a body of literature indicating that parents prefer to supervise their child's use of technology (e.g., Evans et al., 2006; Plowman et al., 2008; 2010). It also indicates that parents want to know how their children are interacting with the technology which is consistent with best practices.

Mothers and fathers were equally likely to encourage their child to use similar mobile devices and supervision (i.e., with or without their presence/guidance) did not differ as a function of gender. Users, however, reported that they would more frequently encourage their child to use similar mobile technologies than non-users. Similarly, it was found that parents' ratings of their child's familiarity with the iPad™ predicted both instances of how frequently parents would encourage their child to use similar mobile devices to the iPad™ used in the observation session. This is to be expected as parents that are experienced in using mobile technologies and are prominent users of mobile devices may be more inclined to encourage their child to use similar mobile technologies and rate their child as being more familiar with the iPad™ used in the interactive play sessions.

Interestingly, parents' reports of their child's familiarity with the iPad™ predicted how often parents would encourage their child to use similar mobile technologies both *with* and *without* parental presence/guidance. In other words, parents' ratings of their child's familiarity with the iPad™ was a significant predictor in both cases. It may be the case that parents want to encourage their child's learning and use of mobile technologies by reporting that they would encourage their child to use similar devices more frequently. On the other hand, parents may want their child to explore independently and be more autonomous when using mobile devices and thus reported they would more frequently encourage their child to use similar mobile device without their presence.

Parents' reflections on technology use

Overall, the general picture of parents and technology provided from the interview was not a surprising one. In fact, parents, regardless of experience with technology are careful and cautious consumers of technology, putting their child's best-interest first. In general, parents enjoyed the interactive session with their child, reporting a positive affect toward the iPad™ task as well as their child enjoying the session. As to whether parents should or should not help their child when he/she uses technology, the majority of parents reported that a combination approach is important such that both helping the child when they become frustrated and allowing the child to learn and explore on their own is important.

Some parents reported that their child had been unintentionally introduced to technology (either through observation of themselves using technology or to occupy their child in certain situations). On the other hand, a few parents identified that they had intentionally introduced their child to technology, mentioning such things as downloading software and applications for

their child to use, technology being readily accessible to their child or simply allowing their child to explore on technology on their own. More than half of parents reported that using technology is an important thing to do in that it will prepare their child for a future with digital devices and provide them with an advantage over children that have not been introduced to technology or are perhaps less frequent users of technology. Similar to results reported by Plowman, McPake, and Stephen (2010), parents noted cautions toward their child's use of technology, reporting that they like to regulate and monitor their child's use of technology (e.g., limiting screen time and supervise computer use). It came as no surprise that parents considered the developmental properties (i.e., age-appropriate) when considering purchasing software for their child.

Fidelity within the study

Several measures were used to ensure that the methods and assumptions involved in the design of the study were evident in the outcomes. Specifically, parents' perceptions toward the observational sessions were important indicators to explore. Parents' ratings of the similarity of the observation session to typical interactions they have at home with their child involving technology revealed no differences between mothers and fathers and users and non-users. Importantly, this measure served as a fidelity measure for the observation sessions as parents generally indicated that the sessions reflected their experiences at home rather than a unique experience specific to the lab setting. This was a positive outcome as the study sought to imitate the 'home' environment as much as possible.

Limitations and future directions

The one notable limitation in the present study was the small number of non-users relative to users of technology. Recruiting non users was a challenge. This is perhaps not

surprising given the age group of participants (parents of young children) as the vast majority of participants would, themselves, fall within the group identified as digital natives that have grown up with technology (Prensky, 2001). Perhaps it was more surprising that 25 non-users were found than none. In particular for the present study, however, the limited number of non-users warrants caution when interpreting the outcomes.

The present study did not include demographic information related to ethnicity and socio-economic status (SES) of participants. These factors could potentially play an important role in the way parents interact with their child when using a mobile device. Although the digital divide is narrowing and more and more families use and purchase technological devices, there is still a pattern of increased ownership and access in higher-income families (Roberts & Foehr, 2008). It is important to note the unique sample of participants in the present study as it consisted of a specific population of parents of which many reported post-secondary education (undergraduate, graduate, and doctoral studies). This unique, well-educated sample of participants may have greater access to mobile devices and thus have children that are more experienced in using mobile technologies. It is also important to consider that some mobile devices such as smartphones or tablets are simply expensive and out of reach for lower-income families making these devices non-accessible to young children. Although SES might not be the most important factor influencing young children's encounters with technology (Anand & Krosnick, 2005; Plowman et al., 2011), it is important to consider parents' SES as children with exposure to technological devices on a regular basis have greater opportunities to use and learn from mobile technologies than children that do not have access to similar devices. Future studies should explore the impact of these variables in order to provide a more comprehensive assessment of scaffolding afforded by parents when using mobile devices with their young children.

Future research must be conducted in order to obtain a more generalizable representation of the interactions that take place between parents and children when introducing their child to technology. Future research should also take into consideration the child's responses to parental scaffolding attempts – whether they are received, acknowledged and executed by the child or are ignored. An interesting question to address would be how much of the support parents provide is indeed necessary. As scaffolding is only effective if the child is met in their zone of proximal development (ZPD), it is interesting to explore whether parents' support when their child uses mobile devices is effective and relevant. Many parents indicated that they did allow their child to use mobile devices, whether it be their cellphone/smartphone, iPod™, iPad™, or other similar mobile device. It might also be important in future research to take into consideration the child's level of ability to use the mobile device, such as children that are novice users of mobile devices versus children that have had some exposure/experience with the same or similar device. This previous experience may be an important contributing factor that impacts parents' level of support they provide their child throughout the interactive play session. In essence, it is important to take into account the child's skills and abilities and whether they influence parents' level of support.

Conclusion and Implications

The present study explored first-hand the nature of the parent-child interactions that take place when children and parents engage in shared-computer activities using a mobile device. The results and implications of this study are important for parents, educators, and care providers as it makes clear parents' perceptions, behaviours and personal experiences in introducing technology to their children. The information gained from the present exploratory study is immediately pertinent in any setting where computer technology is being considered as an educational tool for

young children. Most notably, it is important to address that parents were very involved and interactive with their child when using the iPad™, and this is a good thing. Being an active contributor to children's learning by providing them with verbal, physical, and emotional components of these two basic support types is beneficial as children are able to engage more actively in learning tasks and have assistance from a more-skilled adult to aid in their learning. One note of caution to parents would be to monitor their children's use of technology as many parents (more than half) indicated that they would introduce their children to technology between 6 months and two-and-a-half years of age – earlier than recommended by authorities such as the American Academy of Pediatrics. However, as has been previously found, introducing technology and computers early in the educational system (particularly early childhood education environments), is viewed as a positive addition in early childhood education settings (Specht, Wood, & Willoughby, 2002). The present study extends the existing literature by examining informal learning contexts between parents and children to see how instruction and support is handled. Gaining an insight into the fundamental behavioural exchanges that occur between parent and child when using mobile technologies may help in understanding how to better support parents when using technology with their children. Given evidence of the potential for computer assisted instruction in informal learning contexts (Korat & Or, 2010), the present study also provides a foundation for sparking further research in the field.

Table 1 – *Ages that parents would introduce technologies to children summarized as a function of parent gender and familiarity with technology*

Age Range Provided	Gender		Experience		Total
	Male (n=32)	Female (n=71)	User (n=78)	Non-User (n=25)	N=103
1. Birth – 6 months	2 (6.3%)	2 (2.8%)	4 (5.1%)	0	4 (3.9%)
2. Just over 6 months to 1 year	4 (12.5%)	10 (13.9%)	11 (13.9%)	3 (12%)	14 (13.6%)
3. Just over 1.5 to 2	8 (25%)	17 (23.6%)	20 (25.3%)	5 (20%)	25 (24.3%)
4. Just over 2 to 2.5	5 (15.6%)	15 (20.8%)	15 (19%)	5 (20%)	20 (19.4%)
5. Just over 2.5 to 3	3 (9.4%)	7 (9.7%)	8 (10.1%)	2 (8%)	10 (9.7%)
6. Just over 3 to 3.5	5 (15.6%)	4 (5.6%)	9 (11.4%)	0	9 (8.7%)
7. Just over 3.5 to 4	0	3 (4.2%)	3 (3.8%)	0	3 (2.9%)

8. Just over 4 to 4.5	1 (3.1%)	4 (5.6%)	3 (3.8%)	2 (8%)	5 (4.9%)
9. Just over 4.5 to 5	0	3 (4.2%)	0	3 (12%)	3 (2.9%)
10. Just over 5 to 5.5	2 (6.3%)	2 (2.8%)	2 (2.5%)	2 (8%)	4 (3.9%)
11. Just over 5.5 to 6	0	0	0	0	0
12. After 6 years of age	2 (6.3%)	4 (5.6%)	3 (3.8%)	3 (12%)	6 (5.8%)

Note: Item was rated from 1 = “Birth-6 months” to 12 = “After 6 years of age” in 6-month increments.

Table 2 – *Summary of parents' responses regarding their child's mobile technology use*

Question	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
Do you let your child use mobile technologies (e.g., Cellphone/Smartphone, iPod™, iPad™, PlayBook™, Tablet Computer, etc.)?	27 (84.4%)	58 (80.6%)	72 (91.1%)	13 (52%)	85 (81.7%)
Do you download applications for your child to play with on mobile devices?	22 (81.5%) *n=27	46 (79.3%) *n=58	60 (83.3%) *n=72	8 (61.5%) *n=13	68 (80%) *n=85
Do you let your child use larger mobile technologies such as the one you used in the study (e.g., iPad™, PlayBook™, LeapPad™, Vtech® toys, etc.)?	27 (100%) *n=27	53 (91.4%) *n=58	70 (97.2%) *n=72	10 (76.9%) *n=13	80 (94.1%) *(n=85)

Table 3 – *Reasons for downloading applications*

Provided rationales for downloading	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
1. Building hand-eye coordination	18 (56.3%)	30 (41.7%)	42 (53.2%)	6 (24%)	48 (46.2%)
2. Strengthening reflexes	8 (25%)	17 (23.6%)	19 (24.1%)	6 (24%)	25 (24%)
3. Building social skills	3 (9.4%)	7 (9.7%)	8 (10.1%)	2 (8%)	10 (9.6%)
4. Building problem-solving skills	18 (56.3%)	38 (52.8%)	48 (60.8%)	8 (32%)	56 (53.8%)
5. Developing basic skills in math	18 (56.3%)	38 (52.8%	49 (62%)	7 (28%)	56 (53.8%)

6. Developing basic skills in reading	18 (56.3%)	35 (48.6%)	47 (59.5%)	6 (24%)	53 (51%)
7. Developing basic skills in language	17 (53.1%)	32 (44.4%)	43 (54.4%)	6 (24%)	49 (47.1%)
8. Developing basic skills in science	9 (28.1%)	18 (25%)	23 (29.1%)	4 (16%)	27 (26%)
9. Arts & Crafts	14 (43.8%)	19 (26.4%)	30 (38%)	3 (12%)	33 (31.7%)
10. History	2 (6.3%)	3 (4.2%)	3 (3.8%)	2 (8%)	5 (4.8%)
11. Searching for information	4 (12.5%)	9 (12.5%)	10 (12.7%)	3 (12%)	13 (12.5%)
12. Fun/Entertainment	19 (59.4%)	40 (55.6%)	51 (64.6%)	8 (32%)	59 (56.7%)

13. Developing skills for future school success	11 (34.4%)	30 (41.7%)	35 (44.3%)	6 (24%)	41 (39.4%)
14. Occupying your child	16 (50%)	31 (43.1%)	41 (51.9%)	6 (24%)	47 (45.2%)
15. My child asked for it	6 (18.8%)	19 (26.4%)	20 (25.3%)	5 (20%)	25 (24%)

Table 4 – *Summary of parent responses regarding why they chose to introduce their child to technology*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
1. My child explored it accidentally	10 (38.5%) *n=26	32 (60.4%) *n=53	36 (53.7%) *n=67	6 (50%) *n=12	42 (53.2%) *(n=79)
2. My friend(s) recommended using mobile technologies with my child	1 (4%) *n=25	6 (11.5%) *n=52	6 (9%) *n=67	1 (10%) *n=10	7 (9.1%) *(n=77)
3. I was curious as to how my child would respond to it	20 (74.1%) *n=27	37 (67.3%) *n=55	49 (70%) *n=70	8 (66.7%) *n=12	57 (69.5%) *(n=82)

Table 5 – *Summary of means for the three aggregated scaffolding scales on the survey measure*

Item	Gender		Experience		Total
	Male (n=26)	Female (n=51)	User (n=67)	Non-User (n=10)	N=77
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Verbal scale	36.27(6.03)	37.45(8.78)	36.76(7.64)	39(9.98)	37.05(7.94)
Emotional scale	19.23(2.83)	19.20(4.13)	19.06(3.80)	20.20(3.15)	19.21(3.72)
Physical scale	32.21(7.41) *n=24	34.98(10.38) *n=50	34.16(9.60) *n=64	33.60(9.74)	34.08(9.55) *n=74

Table 6 - *iPad™ Observation Session – Total number of instances for each scaffolding type*

Item	Gender		Experience		Total
	Male (n=31)	Female (n=71)	User (n=78)	Non-User (n=24)	N=102
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
1. Physical supports	75.77(58.82)	76.69(48.93)	74.53(53.29)	82.54(47.32)	76.41(51.83)
2. Verbal supports	80.90(35.32)	78.31(36.89)	80.19(37.23)	75.54(33.43)	79.10(36.27)
3. Emotional-verbal supports	22.71(16.08)	22.76(13.72)	21.31(12.54)	27.42(18.81)	22.75(14.40)
4. Emotional-physical supports	3.90(4.66)	6.61(10.93)	5.82(10.53)	5.67(5.24)	5.78(9.53)
5. Distractor	.48(1.29)	.72(1.42)	.59(1.22)	.83(1.81)	.65(1.38)
6. Off-task	.55(1.06)	.83(3.45)	.41(1.05)	1.83(5.69)	.75(2.93)

Table 7 - *Correlations comparing the iPad™ observations session verbal, emotional-verbal, physical, and emotional-physical scaffolding scales to each other*

	1	2	3	4
1. Verbal Scale	…	…	…	…
2. Emotional-Verbal Scale	.465**	…	…	…
3. Physical Scale	.554**	.186	…	…
4. Emotional-Physical Scale	.104	.222*	.083	…

Note: **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 8 – *Summary of means for the four aggregated scaffolding scales in the interactive iPad™ session*

Item	Gender		Experience		Total
	Male (n=31)	Female (n=72)	User (n=78)	Non-User (n=24)	N=102
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Verbal scale	81.40(35.13)	80.13(36.19)	82.04(36.44)	75.54(33.43)	80.51(35.70)
Emotional-verbal scale	22.76(16.05)	23.03(13.54)	21.57(12.37)	27.42(18.81)	22.95(14.27)
Physical scale	76.36(58.94)	78.81(48.93)	76.69(53.43)	82.54(47.32)	78.06(51.89)
Emotional-physical scale	3.91(4.66)	6.62(10.92)	5.84(10.52)	5.67(5.24)	5.80(9.52)

Table 9 – *Child off-task behaviour during interactive iPad™ session*

Item	N	M(SD)	Range	Minimum	Maximum
Number of times off-task - total	104	1.37(2.80)	15	0	15
Male Child	54	1.35(2.68)	15	0	15
Female Child	50	1.38(2.96)	15	0	15
Total time off-task - total	102*	12.88(31.11)	158.86 sec.	0.00 sec.	158.86 sec.
Male Child	52	13.60(31.58)	152.06 sec.	0.00 sec.	152.06 sec.
Female Child	50	12.13(30.91)	158.86 sec.	0.00 sec.	158.86 sec.

Note: * Outliers of 3 standard deviations from the mean were not included

Table 10 – *Devices from observation session owned at home*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
No, I do not own any of these devices	3 (9.4%)	5 (6.9%)	3 (3.8%)	5 (20%)	8 (7.7%)
Yes, I own a desktop computer	6 (18.8%)	20 (27.8%)	14 (17.7%)	12 (48%)	26 (25%)
Yes, I own a tablet (i.e. iPad™, PlayBook™, etc.)	4 (12.5%)	10 (13.9%)	11 (13.9%)	3 (12%)	14 (13.5%)
Yes, I own both devices	19 (59.4%)	37 (51.4%)	51 (64.6%)	5 (20%)	56 (53.8%)

Table 11 – *Comfort level with new mobile technology and presentation of mobile technologies – Parent*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
How would you rate YOUR COMFORT LEVEL with new mobile technology (e.g., using a new tablet, smartphone, other mobile software unfamiliar to you)?[A]	4.25(.88)	3.50(1.11)	3.99(.99)	2.92(1.04)	3.73(1.10)
How familiar were you with the iPad™ we asked you to use?[B]	3.91(1.40)	3.31(1.39)	3.90(1.27)	2.20(1.04)	3.49(1.41)
How interesting did you find the iPad™?[C]	3.91(1.09)	3.83(.83) *n=71	3.90(.89)	3.71(1.00) *n=24	3.85(0.91) *(n=103)
With respect to ease of use, how would you rate the iPad™?[D]	4.72(.63)	4.48(.75) *n=71	4.55(.71) *n=78	4.56(.77)	4.55(0.72) *(n=103)

Note: [A]Items were rated on a 5-point Likert-type scale with anchors 1 = "Very uncomfortable" and 5 = "Very Comfortable" ; [B]Items were rated on a 5-point Likert-type scale with anchors 1 = "Not at all familiar" and 5 = "Completely familiar" ; [C] Items were rated on a 5-point Likert-type scale with anchors 1 = "Not at all interesting" and 5 = "Very interesting" ; [D] Items were rated on a 5-point Likert-type scale with anchors 1 = "Very difficult to use" and 5 = "Very easy to use"

Table 12 - *Presentation of Mobile Technologies – Child*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
How do you think your child responded to the iPad™?[A]	4.37(.89) *n=30	4.24(.86) *n=70	4.30(.83) *n=76	4.21(.98) *n=24	4.28(0.87) *(n=100)
How would you rate your child's familiarity with the iPad™ we asked you to use?[B]	3.37(1.24) *n=30	3.07(1.35) *n=69	3.42(1.24) *n=76	2.30(1.26) *n=23	3.16(1.32) *(n=99)
How would you rate your child's interest with respect to the iPad™ we asked you to use?[C]	4.43(1.01) *n=30	4.39(.84) *n=70	4.43(.87) *n=76	4.29(.95) *n=24	4.40(0.89) *(n=100)

Note: [A] Items were rated on a 5-point Likert-type scale with anchors 1 = "Did not like it at all" and 5 = "Liked it a lot" ; [B] Items were rated on a 5-point Likert-type scale with anchors 1 = "Not at all familiar" and 5 = "Completely familiar" ; [C] Items were rated on a 5-point Likert-type scale with anchors 1 = "Uninterested" and 5 = "Very interested"

Table 13 - *Overall Feelings*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Overall, how comfortable did you find the experience of using the iPad™ in the present study?[A]	4.25(1.08)	4.25(.78)	4.30(.87)	4.08(.91)	4.25(0.88)
Overall, how similar was the observation session to the typical interactions you have with your child involving technology?[B]	3.41(1.10)	3.17(1.04)	3.56(1.08)	3.80(1.00)	3.62(1.06)

Note: [A]Items were rated on a 5-point Likert-type scale with anchors 1 = "Not at all comfortable" and 5 = "Very comfortable" ; [B] Items were rated on a 5-point Likert-type scale with anchors 1 = "Not at all similar" and 5 = "Almost the same"

Table 14 - *Encourage child to use similar mobile devices with/without parental presence*

Item	Gender		Experience		Total
	Male (n=32)	Female (n=72)	User (n=79)	Non-User (n=25)	N=104
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies WITH your presence/guidance?	3.47(1.08)	3.50(1.19)	3.67(1.08)	2.92(1.19)	3.49(1.15)
After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies WITHOUT your presence/guidance?	2.56(1.16)	2.47(1.17)	2.66(1.11)	2.00(1.22)	2.50(1.67)

Note: Items were rated on a 5-point Likert-type scale with anchors 1 = “Never” and 5 = “Always.”

Table 15 – *Interview themes – descriptions and parent examples*

Item	Description	Example
Parent Affect - Positive	Parents enjoyed the interactive iPad™ session, had a positive affect toward the iPad™ session, or enjoyed watching their child's reactions.	"I'd say it was fun." "It was kind of a neat experience." "It was interesting." "…enjoyed watching her reactions." "I think, too, like on their own, so just sitting there and letting her figure it out, it is kind of fun watching." "It was a good experience, yeah."
Parent Affect - Negative	Parents did not enjoy the interactive iPad™ session, did not like the games, or that it was difficult to use the mobile device.	"I was bored." "So to sit with her and watch her is frustrating." "Frustrating on my part." "Yeah, a little difficult." "Challenging."
Parent Affect - Neutral	Parents felt neutral or indifferent about the interactive iPad™ session.	"It felt fine." "It was neutral, really." "I didn't have any strong feelings one way or the other."
Parent Affect - Negative to positive	Negative to positive affect toward the iPad™ task: Bit confused to start.	"So, in a sense, the initial part a little frustrated but the back end of it a little pride again because I know he was able to manage that on his own."
Parent Affect - Preference	Parents preferred the iPad™ task over the desktop task in session. They reported that the iPad™ was more comfortable, more familiar, or easier to use than the desktop computer.	"The iPad™ is much more easier to grasp." "It's a more familiar interface." "It seemed to be…easier to use." "More exciting than the desktop." "She seemed more curious about the iPad™ than the computer." "Felt more comfortable with that…that's something I'm more familiar with." "I had more fun with that."
Child affect - Positive	Parents reported on their child's affect toward the interactive iPad™ session. Parents mentioned that their child enjoyed the iPad™ session.	"She definitely had fun with it." "…very intrigued, very engaged." "He's completely comfortable on it." "I could sense her excitement and just happiness being on it."

Child affect - positive to negative	Parent opinion on child's performance - positive to negative: interacted at first then lost interest.	"I think he was more engaged initially just because of the tactile and because it's something that's a little bit more kid-friendly."
Child affect - Negative	Parents reported on their child's affect toward the interactive iPad™ session. Parents mentioned that their child did not enjoy the iPad™ session, was not interested in the device or was confused.	"He's completely not really interested." "A little more confused maybe." "He kept choosing ones that were kind of above his level so he wasn't as involved with it." "He lost interest quickly."
Child affect - Negative to positive	Parents reported on their child's affect toward the interactive iPad™ session. Parents mentioned that their child was at first frustrated or bored but then became engaged by the end of the session.	"Now he's nice and engaged with it but he seemed to be a little bored there for a second." "So initially I found him getting a little frustrated because he wasn't sure what to do with them, but once he got the sound, then he had the prompts and he knew what to do and he could work that out, yeah."
Combination/Both	Helping your child when they are using technology is conditional/a combination of both helping and letting them figure it out on their own.	"A bit of both, actually." "I think there needs to be a balance." "I think I'd prefer to teach, but I found that she kind of figures things out herself." "I think it's a fair combination of both."
Combination/Both - Help first	Help first: Help to an extent but the child needs to figure it out on their own.	"I think I should provide a little bit of help at first, just to get them started, and then just let her go and figure it out herself." "I usually help them just to get the gist of the game, and then I let them...figure it out."

Combination/Both - Child First	Child first: Let the child explore and play first, and the parent intervenes if the child needs help.	"I'll let him play with it for a while and if he appears frustrated then I'll come in and try to help." "I like him to attempt to figure it out on his own until he needs my help." "I'm someone that will just let her move the mouse, let her do all the things and if she does need help, try and explain it as opposed to doing it for her."
Parents should help	Yes, parents should help their child when their child is using technology.	"No, I usually help them." "At [child]'s age, I think having some help is good." "I like to provide the guidance as I did - help her figure out what she should do." "Oh no I think they need a lot of scaffolding, especially at the beginning 'cause they don't even know what button to press let alone what the game's asking."
Neither	Parents should neither help their child nor leave them to explore on their own when they are using technology: Neither is the case - Neither help nor let child figure it out on their own.	"I don't think either is the case yet."
Child should figure it out	Child should explore/figure out on their own without parental guidance or assistance.	"I think it is better to probably let them figure out on their own." "I usually try to have them figure it out." "I think it's better if she can work it out for herself 'cause then she has more accomplishment to it."
Unintentional	Child's introduction to technology was accidental/unintentional, not done purposefully.	"But the introduction has been not actually on purpose." "…but with *him*, I don't know, it was just, uh, accident." "So he got introduced at daycare, and at school - kindergarten."

Unintentional - Parent using device	Child's introduction to technology was accidental/unintentional. Parent was using the device, the child was interested/watched, parents accidentally discovered what the child was capable of, imitation of parental use.	"So we have the computer in our living room, and we use the iPad™ around them and through observation they pick up on it and get interested in it sort of on their own." "…but then in terms of like the PlayBook™, I think we just discovered by accident that she was capable of touching things and figuring it out..." "With both children…it has been imitation."
Unintentional - Occupy	Child's introduction to technology was accidental/unintentional. The technology/device keeps the child occupied.	"…we introduced like the YouTube™ videos I guess…to keep her occupied." "…so that's where we started using the iPod™, it was just to watch a Dora™ video when I needed her to be, you know, quiet or content…" "Because most people probably have their cellphone with them and you can occupy them, like with some games..."
Intentional	Child's introduction to technology was intentional/purposeful, parent guided/directed.	"What we've done with our kids is we've introduced them with mobile apps, you know, the iPad™ in particular." "It was already in our home and then we just introduced the kids." "I just gave her my phone when she was like one. Like, 'here, play with it.'"
Intentional - Spouse does it more	Child's introduction to technology was intentional/purposeful - spouse does it more than the parent that participated in the interactive iPad™ session.	"My wife does it more than me." "I would say my husband is more involved in teaching technology to [child's name] and actually being there…" "My husband is a software developer so he kind of introduced him more so than I did."

Intentional - Downloads games	Child's introduction to technology was intentional/purposeful. Parent downloads games/applications for their child (recommended from friends, child's daycare/school, or App Store).	"The things that we've downloaded have been, you know, like a very simple paint kind of application, like those sorts of things." "I think usually it's recommendations from friends." "If a friend tells us they've had good experiences with a game then we'll get it." "…and then we downloaded a few games that they recommended from the daycare." "It was sort of what we could find out there, what were the top games or top apps for kids and learning and see what was there."
Intentional - Accessible	Child's introduction to technology was intentional/purposeful. Technology is accessible to the child at home; child observes parents using technology; technology is just present around the child.	"We have them [technology] all around the house so it's always been accessible to him." "It started with her seeing us doing it - both my husband and I have our own computers at home…"
Intentional - Hasn't introduced technology	Parent has not introduced child to technology; There is no focus on technology at home; Parents haven't reached the stage to introduce technology to their child.	"Well I haven't really done a lot of it." "I wouldn't say that I've had any sort of plan in introducing them to technology at this point..." "We don't have a huge focus on technology at home." "…but I don't put a lot of energy in trying to prioritize that." "We don't do a whole lot of it at this stage." "…we haven't really reached that stage."
Intentional - Allow child to explore	Parent lets child explore/use technology on their own without parental guidance or assistance.	"…so we just let him play on it as he wants." "…and then I think with things like this it's- it's about letting them explore. Let them figure out what works, what doesn't work…just learning by trial and error."

Intentional - Together	Parent sits with child and shows child how to use the device/plays with child.	"I'll sit her beside me and I'll show her." "…so we sit together and we figure out how- how the game works." "If it was a new application that's very similar, we'd sit down together, we'd work through it." "So I would sit down with him. I'd say, 'this is my phone, let me show you how to work it' and then we would go into it and I would show him the various means by which to navigate throughout the device itself."
Child guided/directed - Older sibling	Older sibling of the child uses technology/device. Child watched their older sibling use technology.	"He's got an older sibling so it kind of just happens." "…she was watching him and wanted to do whatever big brother did…" "And with her it was even earlier. She saw him playing games and she just wanted to do everything he could do."
Child guided/directed - Child's curiosity/interest	Technology was introduced because the child expressed curiosity/interest (self-initiated interest in using technology).	"She just kind of sees it and asks to try it…" "From a technological standpoint they've been very curious." "He started showing an interest in other people's cellphones because he likes getting his picture taken…" "If she picked up a phone she would swipe at it trying to figure out 'how does this thing...'"
Parent explores software beforehand	Parent learns/explores the software before giving it to the child to use.	"With the iPad™ ones, again, we just try them out." "I would like to see the technology or the game first and then make sure I'm happy with it and then at the beginning probably go through the game once…"

Parent's opinion about technology - Neutral	Parent feels neutral/indifferent about technology use. There is no right or wrong way to introduce or use technology.	"I would say there is no right or wrong way of doing it." "…there's no window for learning technology, like you can pretty much pick it up at any point in life." "It's out there, right, so he'll find it. Like, it'll show up in his life and I don't need to push it on him I think."
Parent's opinion about technology - Important to do	Introducing children to technology is important and needs to be done. Technology cannot be avoided.	"…they're necessary to a certain extent for work and getting by in life." "I think you should buy it. It's everywhere." "…you can't avoid technology, so I think it just needs to be done." "I think it needs to be done. Like in today's age it *has* to be done and I think the earlier it's done probably the better..." "I think it's important for them because going into school they're going to be on computers. It's something they've got to learn."
Parent's opinion about technology - Important to do - Future	Introducing children to technology provides them with preparedness for the future.	"…build the ability to use a computer, 'cause everything's computer-based now." "So I think to introduce it early is a bonus to them." "Critical I think is that it's future-proofing - this is how it's gonna be." "So pretty much the most important consideration I think is just for the future."
Parent's opinion about technology - Important to do - Disadvantaged	Children are at a disadvantage if they are not introduced to technology.	"If you don't get them into it early, potentially they'll be at a disadvantage." "He's gonna be exposed to it more than any of us ever have been and to avoid it is just useless, and it puts him behind."

Parent's opinion about technology - Negative	Parents' negative opinions about technology use. Parents are concerned/fear their child will become addicted to technology; Parents are concerned about extended periods of time spent on technology; Technology use takes away from other activities; Technology is overused in society.	"Moreover, I think it is quite addictive, like the computer games. Too many kids just get addicted to that and I wanna keep her away from that as far as possible." "I don't think there's any advantage in having your nine-month-old playing computer games." "I think that it would be really easy for little children to get sucked into the computer, so really, really easy, so that's why I want to keep them away." "I do worry about extended periods of time in front of the computer." "You can't really have kids sitting in front of technology 24/7." "Well my biggest concern with technology is that…people get zoned into just the technology and they don't interact with others." "Well I think that technology is overused in our society."
Parent's opinion about technology - Child interest	It is important that the child is interested (expresses an interest) in the technology.	"I think the buying would be more so once he shows more interest in something specific." "…it has to be them being able and being curious and creating an interest in what they're doing 'cause in our case, our kids are both much more interested in iPads™ than they are necessarily in desktops..."
Parent's opinion about technology - Don't purchase	Parent doesn't buy/download software for the child.	"We don't really buy it." "I would say I don't really purchase it for him - I make available what we have." "We really don't use very much software-based technology…it's mostly like mobile phone for pictures and things."

Management - Regulated	Technology use should be regulated/constrained; Limiting the amount of time children spend on technology.	"I think it has to be fairly well regulated and fairly well constrained." "…but I think kind of limiting how much time she gets." "It's only a small amount of time that he gets to use the iPad™ or iPod™ at home." "He doesn't usually have that much screen time."
Management - Monitor	It is important to monitor children when they are using technology.	"They've got to be supervised, but it can be arm's length I think." "Just monitoring it while she's young and kind of watching what she's doing." "But I would not recommend that [children] use it without any assistance. [Parents] have to be there all the time." "As long as we are watching what they are doing, I would definitely recommend technology."
Support	Being supportive to the child when they are using technology.	"Just being supportive, open, encouraging, relaxed, not making it like a chore…"
Support - Safety	Safety concerns: Allow the child to explore safely when they are using technology; Concerns about accidental purchases made on devices.	"…we want to make sure that he doesn't open up something that he shouldn't be or be exposed to something that he shouldn't be." "…you learn to put it on flight mode so they don't sign you up for Jamster™ because that's not fun either." "It makes a lot of sense to be able to lock it [mobile device] down and it's not very hard to do." "...if they get their own devices...they won't know what the password is because I don't want them to make purchases unsupervised until they're much older."

Support - Support/supplement learning	Parent supports/supplements child's learning when they are using technology (e.g., asking questions, providing hints).	"I found that works very well because all he needs is somebody to say something and then it gets in his mind and he starts working it out." "…it's like reading, you know, they get more out of it when you're talking to them and creating a dialogue, I think, about what's going on on the screen and that kind of thing." "But I try to ask leading questions - 'what do you think we have to do here?' - that sort of thing."
Choosing games/device - Age-appropriate	Games/applications that the child uses should be age-appropriate and educational.	"I think it has to be age appropriate." "What's critical is the education value." "Really at his age…we've got the child-specific technology." "I feel like it would be more a matter of just choosing the ones that are learning while engaging." "Making sure that what they have access to is stuff that is appropriate for their age."
Choosing games/device - Durability	Parents consider the durability of the device. Parent considers if the child will break the device.	"[iPad™] it's less fragile, there's less moving parts, the fact that you can drop it and so long as it's in a cushioned case, it's generally fine." "I like the LeapPad™ that we got her, the LeapFrog™ one, because that I can just leave with her - she's not going to break it." "My parents bought her her own tablet which functions to take pictures and do some of the things you can do on an iPad™, so we prefer her to play with that so she doesn't like break one of the more expensive devices."

Long-term use/benefits	Parent considers the long-term use of the device; choosing a device that is beneficial to both parent and child.	"So we debated, and it was cost-benefit whether to get a LeapPad™ or PlayBook™ tablet for himself, and we ended up doing the PlayBook™ tablet." "But I don't have anything that's specifically built for children. I want to be able to use it, too."

Table 16 - *Interview Codes*

Item	Males N = 32	Females N = 72	Users N = 79	Non-users N = 25	Male Child N = 54	Female Child N = 50	Total N = 104
Parent Affect - Positive	24 (75%)	56 (77.8%)	60 (75.9%)	20 (80%)	42 (77.8%)	38 (76%)	80 (76.9%)
Parent Affect - Negative	4 (12.5%)	8 (11.1%)	8 (10.1%)	4 (16%)	7 (13%)	5 (10%)	12 (11.5%)
Parent Affect - Neutral	4 (12.5%)	8 (11.1%)	11 (13.9%)	1 (4%)	7 (13%)	5 (10%)	12 (11.5%)
Parent Affect - Negative to positive	1 (3.1%)	0	1 (1.3%)	0	1 (1.9%)	0	1 (1%)
Parent Affect – Preference	11 (34.4%)	29 (40.3%)	30 (38%)	10 (40%)	18 (33.3%)	22 (44%)	40 (38.5%)
Child affect - Positive	8 (25%)	19 (26.4%)	18 (22.8%)	9 (36%)	13 (24.1%)	14 (28%)	27 (26%)
Child affect - positive to negative	0	1 (1.4%)	0	1 (4%)	1 (1.9%)	0	1 (1%)
Child affect - Negative	1 (3.1%)	3 (4.2%)	4 (5.1%)	0	3 (5.6%)	1 (2%)	4 (3.8%)
Child affect - Negative to	1 (3.1%)	1 (1.4%)	2 (2.5%)	0	2 (3.7%)	0	2 (1.9%)

positive							
Combination/Both	15 (46.9%)	31 (43.1%)	35 (44.3%)	11 (44%)	21 (38.9%)	25 (50%)	46 (44.2%)
Combination/Both – Help first	13 (40.6%)	25 (34.7%)	27 (34.2%)	11 (44%)	20 (37%)	18 (36%)	38 (36.5%)
Combination/Both - Child First	16 (50%)	27 (37.5%)	35 (44.3%)	8 (32%)	24 (44.4%)	19 (38%)	43 (41.3%)
Parents should help	5 (15.6%)	12 (16.7%)	14 (17.7%)	3 (12%)	11 (20.4%)	6 (12%)	17 (16.3%)
Neither	0	1 (1.4%)	1 (1.3%)	0	1 (1.9%)	0	1 (1%)
Child should figure it out	5 (15.6%)	17 (23.6%)	18 (22.8%)	4 (16%)	8 (14.8%)	14 (28%)	22 (21.2%)
Unintentional	4 (12.5%)	10 (13.9%)	13 (16.5%)	1 (4%)	10 (18.5%)	4 (8%)	14 (13.5%)
Unintentional – Parent using technology	4 (12.5%)	6 (8.3%)	7 (8.9%)	3 (12%)	7 (13%)	3 (6%)	10 (9.6%)
Unintentional – Occupy	8 (25%)	11 (15.3%)	15 (19%)	4 (16%)	9 (16.7%)	10 (20%)	19 (18.3%)
Intentional	5 (15.6%)	11 (15.3%)	13 (16.5%)	3 (12%)	7 (13%)	9 (18%)	16 (15.4%)
Intentional – Spouse does it more	2 (6.3%)	4 (5.6%)	6 (7.6%)	0	4 (7.4%)	2 (4%)	6 (5.8%)
Intentional – Downloads	5 (15.6%)	14 (19.4%)	15 (19%)	4 (16%)	11 (20.4%)	8 (16%)	19 (18.3%)

games							
Intentional – Accessible	7 (21.9%)	15 (20.8%)	19 (24.1%)	3 (12%)	10 (18.5%)	12 (24%)	22 (21.2%)
Intentional – Hasn't introduced technology	9 (28.1%)	14 (19.4%)	14 (17.7%)	9 (36%)	10 (18.5%)	13 (26%)	23 (22.1%)
Intentional – Allow child to explore	7 (21.9%)	16 (22.2%)	20 (25.3%)	3 (12%)	12 (22.2%)	11 (22%)	23 (22.1%)
Intentional – Together	6 (18.8%)	15 (20.8%)	14 (17.7%)	7 (28%)	12 (22.2%)	9 (18%)	21 (20.2%)
Child guided/directed – Older sibling	4 (12.5%)	12 (16.7%)	14 (17.7%)	2 (8%)	8 (14.8%)	8 (16%)	16 (15.4%)
Child guided/directed – Child's curiosity/interest	3 (9.4%)	19 (26.4%)	19 (24.1%)	3 (12%)	7 (13%)	15 (30%)	22 (21.2%)
Parent explores software beforehand	4 (12.5%)	10 (13.9%)	11 (13.9%)	3 (12%)	5 (9.3%)	9 (18%)	14 (13.5%)
Parent's opinion about technology – Neutral	3 (9.4%)	12 (16.7%)	8 (10.1%)	7 (28%)	9 (16.7%)	6 (12%)	15 (14.4%)
Parent's opinion about technology – Important to do	18 (56.3%)	40 (55.6%)	43 (54.4%)	15 (60%)	26 (48.1%)	32 (64%)	58 (55.8%)
Parent's opinion about technology – Important to do – Future	7 (21.9%)	9 (12.5%)	13 (16.5%)	3 (12%)	8 (14.8%)	8 (16%)	16 (15.4%)
Parent's opinion about technology – Important to do –	3 (9.4%)	7 (9.7%)	8 (10.1%)	2 (8%)	3 (5.6%)	7 (14%)	10 (9.6%)

Disadvantaged							
Parent's opinion about technology – Negative	7 (21.9%)	15 (20.8%)	13 (16.5%)	9 (36%)	7 (13%)	15 (30%)	22 (21.2%)
Parent's opinion about technology – Child interest	5 (15.6%)	5 (6.9%)	7 (8.9%)	3 (12%)	6 (11.1%)	4 (8%)	10 (9.6%)
Parent's opinion about technology – Don't purchase	1 (3.1%)	4 (5.6%)	3 (3.8%)	2 (8%)	3 (5.6%)	2 (4%)	5 (4.8%)
Management – Regulated	11 (34.4%)	31 (43.1%)	31 (39.2%)	11 (44%)	22 (40.7%)	20 (40%)	42 (40.4%)
Management – Monitor	5 (15.6%)	20 (27.8%)	19 (24.1%)	6 (24%)	13 (24.1%)	12 (24%)	25 (24%)
Support	0	1 (1.4%)	1 (1.3%)	0	1 (1.9%)	0	1 (1%)
Support – Safety	3 (9.4%)	17 (23.6%)	15 (19%)	5 (20%)	10 (18.5%)	10 (20%)	20 (19.2%)
Support –Support/supplement learning	1 (3.1%)	7 (9.7%)	4 (5.1%)	4 (16%)	6 (11.1%)	2 (4%)	8 (7.7%)
Choosing games/device – Age-appropriate	17 (53.1%)	31 (43.1%)	40 (50.6%)	8 (32%)	27 (50%)	21 (42%)	48 (46.2%)
Choosing games/device – Durability	1 (3.1%)	4 (5.6%)	4 (5.1%)	1 (4%)	2 (3.7%)	3 (6%)	5 (4.8%)
Long-term use/benefits	5 (15.6%)	6 (8.3%)	8 (10.1%)	3 (12%)	4 (7.4%)	7 (14%)	11 (10.6%)

Figure 1. iPad™ protective case, “iGuy™.”

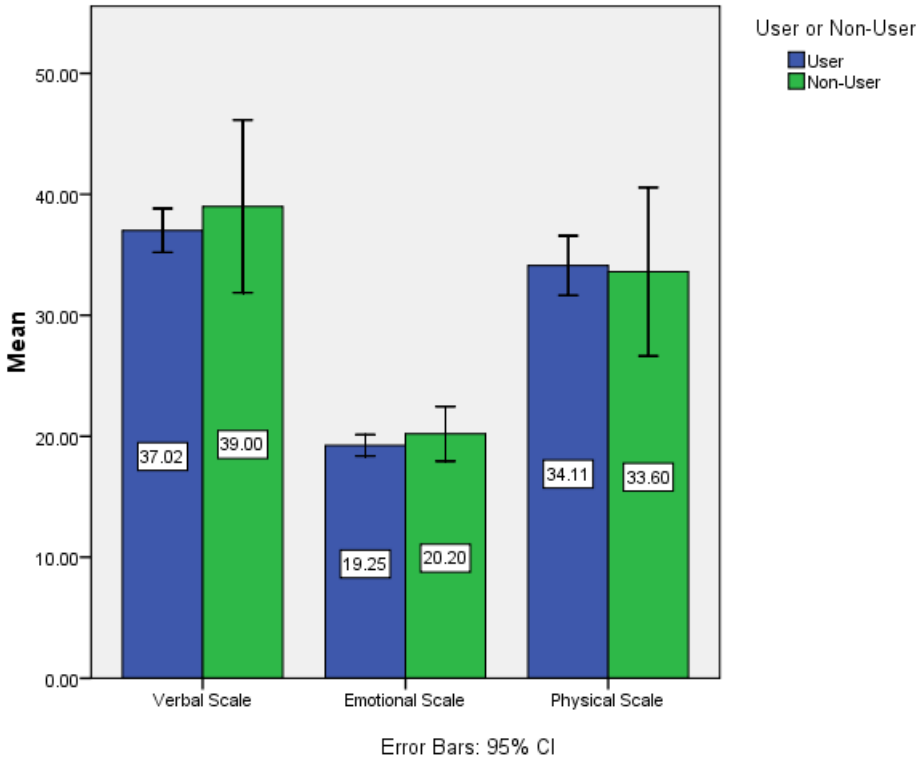

Figure 2: Means of users and non-users for the overall scaffolding scales from the post-observation survey.

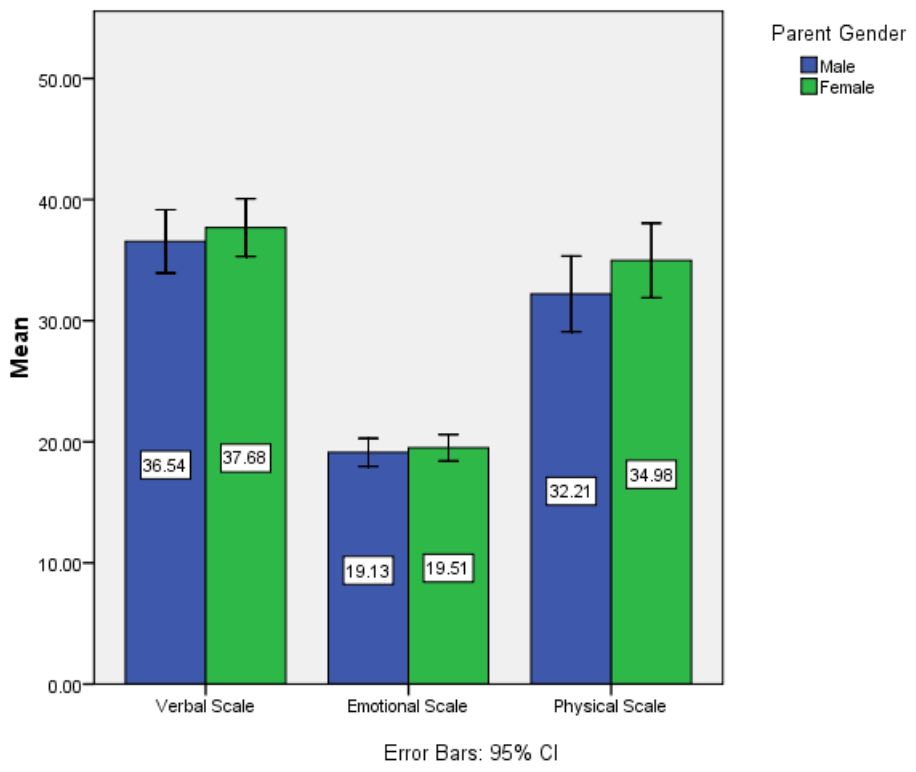

Figure 3: Means of male and female parents for overall scaffolding scales from the post-observation survey.

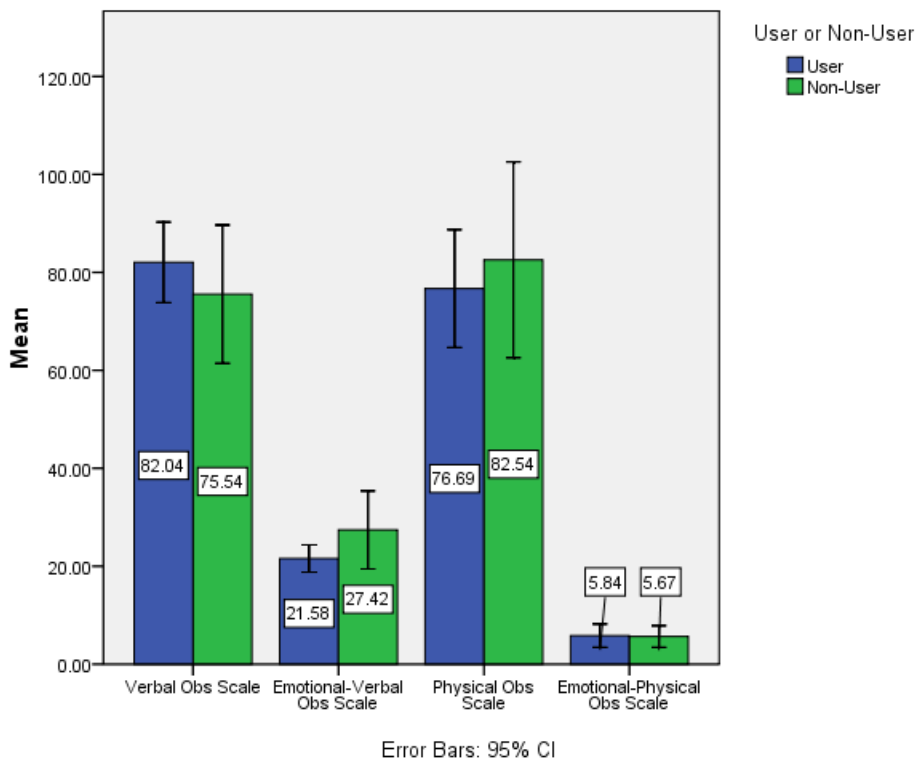

Figure 4: Means of users and non-users for the four overall scaffolding scales from the observation session.

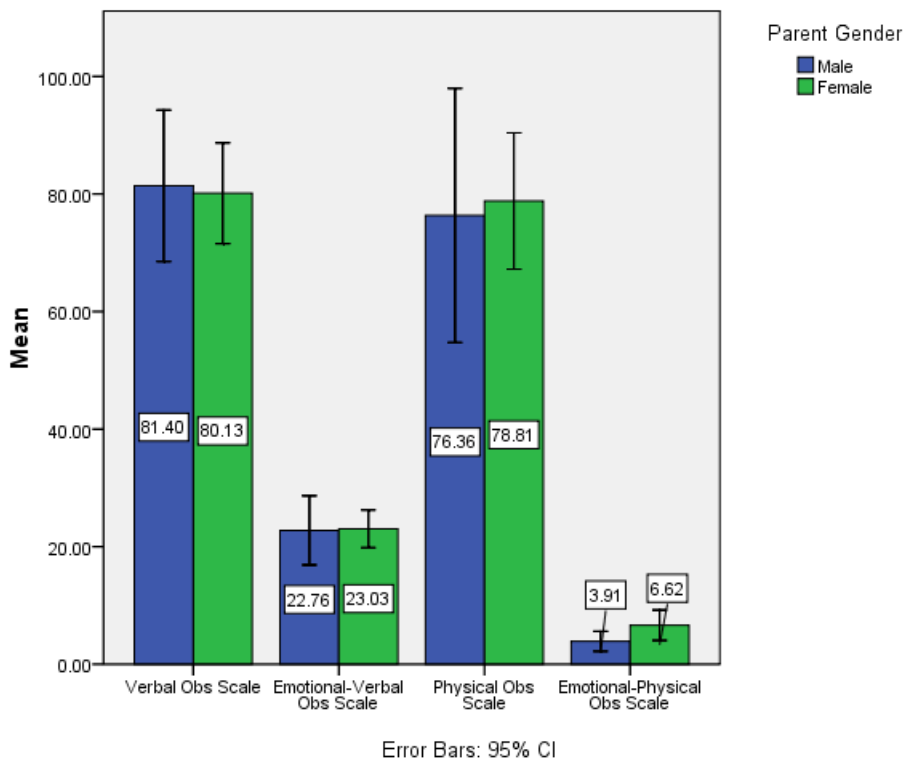

Figure 5: Means of male and female parents for the four overall scaffolding scales from the observation session.

Appendix A: Consent Form

INVITATION TO PARTICIPATE IN A RESEARCH PROJECT

Consent Form

Title of Project: Parents supporting computer use in children

Researchers: Dr. Eileen Wood, Domenica De Pasquale, Marjan Petkovski and Kendra Hutton

University Affiliation: WILFRID LAURIER UNIVERSITY

Department of Psychology

We are writing this letter to invite you to participate in a research study that examines parents and young children's use of computers. At present there is very little information that looks at how parents use or choose not to use technology with their children in their home. The purpose of this study is to understand how parents feel about using technology with young children ranging in age from 3-6, how children handle technologies if they are permitted to use them, and how parents might help young children to handle computers especially when children are using them for the first time. The study has two different parts. First, we are asking 500 parents to complete a survey, either online or in hard copy format. Second we would like a smaller group of 80 parents (40 mothers and 40 fathers) to allow us to watch them interact with their child either using software on a typical desktop computer or using an iPad. We are including both of these to see if there are differences in how stationary versus mobile devices are used. Parents can choose to just participate in the survey or to participate in both the survey and the observation components of the study. Understanding what parents think about technologies and what they do with their children around different types of technologies will allow us to understand how to best support young children learning to use technology.

This study is being carried out by a developmental researcher at Wilfrid Laurier University (Eileen Wood) and two graduate students (Domenica De Pasquale and Marjan Petkovski) and an Honour's thesis student (Kendra Hutton).

INFORMATION

Parents in the study will be asked to complete one survey. The survey asks some general questions about the parent and the child (for example age and gender) but does not ask for personal information that would identify the parent or child (no names, addresses etc.) followed by questions related to technology use in the home and parents perceptions about technology use

for their child. The survey will also ask about software used by children, household rules regarding technology use, and more general questions about activities your child likes to engage in beyond technology. The survey will take about 20-30 minutes to complete.

Some parents may also volunteer to participate in an observational session. In these sessions parents and their child will be given an opportunity to play with either reading software or an iPad. There are two different observational sessions but parents and their children will only participate in one. The first observational setting examines the use of desktop computers. In these sessions, parents and their children will have an opportunity to play with two different software packages for about 10 minutes each. The two packages are well known commercial software packages that are seen in many stores yet they are different in design and content. The two software types will allow us to assess whether different software encourages children or parents to play differently. In the second observational setting each parent and child dyad will be given an iPad to play with for approximately 15 minutes. We will video and audio record these sessions to allow us to analyze them later. One of the following researchers or research assistants will organize and run the sessions: Dr. Eileen Wood, Domenica De Pasquale, Marjan Petkovski, Kendra Hutton, Dr. Amanda Nosko, Karin Archer or Anja Krstic.

At the end of the observational session, each parent will be asked some short interview questions (about 5-10 minutes) to find out what they thought of the materials and devices, how interesting/ appropriate the software or devices were for their child, and how similar the observational setting would be to their normal interactions with computers at home. The total time commitment for this study is between 60-75 minutes.

RISKS

There are few foreseeable risks associated with participating in this study. However, you might feel uncomfortable answering some questions on the survey. These feelings are normal and should be temporary. If this is the case, please feel free to leave any questions you do not want to answer blank. You can also stop completing the survey if you are uncomfortable with the questions.

Parents and children who participate in the observational sessions also may find some of the software or devices difficult to navigate. This too is normal and you and your child can ask for assistance from researchers at any time. You may also take breaks and/or withdraw from the observational part of the study at any time.

BENEFITS

At present computers (mobile and more stationary) are appearing in many homes. Technology is a prominent feature of young children's lives, yet we know very little about how technologies are used with young children. We also know little about how to maximize and support young children's learning when they are introduced to these technologies. The results of this study will be important for parents, educators and care providers as it will give us an idea of parents' perceptions and personal experiences when introducing technology to young children.

CONFIDENTIALITY

Data for parents who complete only the survey is completely anonymous. There is no way that the data could be traced back to you. Confidentiality of data cannot be guaranteed for the few moments while the information is being sent over the Internet, but the data will be stored securely once it is received. Data for parents who agree to participate in the observation sessions will initially be confidential but will become anonymous. This means that at first no one but the researchers and research assistants (Dr. Eileen Wood, Domenica De Pasquale, Marjan Petkovski, Kendra Hutton, Dr. Amanda Nosko, Karin Archer and Anja Krstic) will see your responses on the survey or will be able to connect the observational session with your survey responses. Because we would like to be able to connect the survey and the observations, we will give each person who participates in the observations a code number. That number will be placed on the survey that you complete. After you finish the session that is taped, the things that were said during the session will be written out and then what happened in the session will be recorded. Once that is done (by December 28, 2013) the tape will be destroyed by Dr. Wood and the information will only be identified by the code number. Similarly, what is said at the short interview will also be coded with this code number. The code number will allow us to match up all the data for each person. Once the data are matched, the list identifying each participant's name with the code number will be destroyed by Dr. Wood and only the code number will be left. From that point on, all information will be anonymous. No identifying information will be present in the data, therefore, ensuring complete anonymity. Only group data for the scaled information will be presented in subsequent summaries of the study, therefore, no one will be able to know you or your child's individual responses or what you did in any part of this study. The data will be kept for approximately 7 years. The electronic data will be stored on a password-protected computer, and the paper data (including hard copy consent forms) will be stored in a locked cabinet. All data will be securely stored in Dr. Wood's locked research lab at Wilfrid Laurier University. After 7 years (July 31, 2019), the paper and de-identified electronic data will be shredded, destroyed and carefully disposed of by Dr. Wood.

COMPENSATION

As a small token of our appreciation all parents completing the survey will have an opportunity to go to a separate link to enter a draw for the chance to win one of 20 gift certificates for $50. The odds of winning are 1 in 25. You will be asked to go to a separate link to provide an email contact. The draw will take place at the end of the study (by December 28, 2013) and winners will be selected randomly from those who provided contact information (email address). Winners will be notified through their email address. We will ask for mailing information and send you a gift certificate for $50 for a retail outlet of your choice (limited to chain or easily accessible outlets, for example malls, gas chains, food chains). In addition, parents who agree to participate in the observational sessions with their child will receive $25 in cash to cover gas/travel expenses as well as their time. Finally, (Name of Centre or School) will receive $2 for each child that participates in the study.

CONTACT

If you or your child have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study) you may contact the researcher, Dr. Eileen Wood, Department of Psychology, Wilfrid Laurier University, Waterloo, ON N2L3C5 at 519-884-1970 ext. 3738 or Domenica De Pasquale through email at depa7310@mylaurier.ca or by phone at 519-884-1970 ext. 3359. You may also contact Marjan Petkovski through e-mail at petk2350@mylaurier.ca and Kendra Hutton through e-mail at hutt2560@mylaurier.ca or by phone at 519-884-1970 ext. 3359. This project has been reviewed and approved by the University Research Ethics Board (REB Approval Number: #3105). If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Robert Basso, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 5225 or rbasso@wlu.ca.

PARTICIPATION

To participate in this study, your child must be within the range of 2-6 years of age. You and your child's participation is in the study is voluntary. If you and your child decide to participate, you and your child may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you or your child withdraw from the study before data collection is completed your data will be removed from the study and destroyed. You and your child have the right to omit any question(s) or procedure(s) you choose. To ensure your anonymity all completed data is stored without identifiers (i.e., your name) and therefore we cannot remove your data once completed.

FEEDBACK AND PUBLICATION

The results of this research may be used for presentations at conferences (for example, Canadian Psychological Association) and in research journals such as Developmental Psychology. Some parts of the study might also be summarized as part of thesis documents for Domenica De Pasquale, Marjan Petkovski and Kendra Hutton. If you would like to see a summary of the findings, a summary will be posted at Wilfrid Laurier University on the bulletin board outside of the Psychology main office on the second floor of the Science Building by January 7, 2014. You will also have the opportunity to submit an email address (via a link at the end of the survey) if you would like to receive a summary of the research findings electronically.

Appendix B: Post-Observation Survey

INVITATION TO PARTICIPATE

*** Please enter the code you were given (e.g., LYCAB###___). Following the code number please include the last 3 letters of your LAST name (e.g., if your last name is "Smith" your code becomes: LYCAB###ITH).**

*** Please read the following consent form and if you agree to participate in the study, please click on "I agree" to continue.**

- I agree
- I disagree

Mobile Technology

1. **Do you let your child use mobile technologies (e.g., Cellphone/Smartphone, iPod™, iPad™, PlayBook™, Tablet computer, etc.)?**

   - Yes
   - No

2. **Do you download applications for your child to play with on mobile devices?**

   - Yes
   - No

3. **Please check as many of the following reasons that reflect why you download these applications.**

   - Building hand-eye coordination
   - Strengthening reflexes
   - Building social skills
   - Building problem-solving skills
   - Developing basic skills in math
   - Developing basic skills in reading
   - Developing basic skills in language
   - Developing basic skills in science

- Arts and crafts
- History
- Searching for information
- Fun/entertainment
- Developing skills for future school success
- Occupying your child
- My child asked for it

Other reasons: Can you please tell us these reasons?

_____

4. **Please tell us why you chose to introduce your child to mobile Technologies. Please check all that apply.**

	Yes	No
My child explored it accidentally	○	○
My friend(s) recommended using mobile technologies with my child	○	○
I was curious as to how my child would respond to it	○	○

There are many reasons for introducing a child to mobile technologies including the three above. Please list any reasons we did not mention which are true in your case.

_____

Large Mobile Technology

5. **Do you let your child use larger mobile technologies such as the one you used in the study (e.g., iPad™, PlayBook™, LeapPad™, Vtech® toys, etc.)?**

- Yes
- No

6. **Of the following, which VERBAL prompts do you use to help your child when your child is using mobile technology (e.g., iPad™, PlayBook™, Vtech® toys, LeapFrog™ toys, etc.)?**

	(1) Never	(2)	(3) Sometimes	(4)	(5) Almost Always
Repeating information provided in the software	○	○	○	○	○
Reading aloud information provided in the software	○	○	○	○	○
Explaining how the software works	○	○	○	○	○
Rewording my own instructions or instructions from the software	○	○	○	○	○
Giving additional examples in addition to software	○	○	○	○	○
Providing hints but not complete instructions to help my child navigate the software	○	○	○	○	○
Providing direct step-by-step instructions to guide the child in how to use the technology	○	○	○	○	○
Telling him/her that he or she is doing well	○	○	○	○	○
Telling him/her to try again	○	○	○	○	○
Telling him/her that what he or she is doing is incorrect	○	○	○	○	○
Asking questions of my child (e.g., "What happens next?" "How did that work?")	○	○	○	○	○
Offering emotional supports (e.g., "Yes, that's right!" "Good job!"	○	○	○	○	○

"You can do it!")					
Encouraging your child to try something new (e.g., to try new software)	○	○	○	○	○
Encouraging your child to try something more difficult (e.g., to try a more challenging game/activity/level)	○	○	○	○	○
Aiding your child in their progress on a particular task (e.g., "You are on the right track.")	○	○	○	○	○
Providing confidence (e.g., "I know you can do it/are capable")	○	○	○	○	○

7. **Of the following, which PHYSICAL prompts do you use to help your child when your child is using mobile technology (e.g., iPad™, PlayBook™, Vtech® toys, LeapFrog™ toys, etc.)?**

	(1) Never	(2)	(3) Sometimes	(4)	(5) Almost Always
Provide a booster seat	○	○	○	○	○
Adjust screen location/angle	○	○	○	○	○
Adjust screen properties (font size, brightness, etc.)	○	○	○	○	○

Buy devices made specifically for children	○	○	○	○	○
Sit beside child (YOU holding mobile device)	○	○	○	○	○
Sit beside child (CHILD holding mobile device)	○	○	○	○	○
Let your child sit on your lap while you use/hold the device	○	○	○	○	○
Let your child sit on your lap while the child uses the mobile device	○	○	○	○	○
Place your hand over your child's hand to help him/her navigate on the screen	○	○	○	○	○
Move your child's hand to the correct place on the screen	○	○	○	○	○
Point directly at or touch important information on screen	○	○	○	○	○
Point in general to the screen	○	○	○	○	○
Hold the portable device so your child can use it	○	○	○	○	○

Comfort using new/unfamiliar technology

8. **How would you rate your comfort level with new mobile technology (e.g., using a new tablet, smartphone, other mobile software unfamiliar to you)?**

	(1) Very uncomfortable	(2) Somewhat uncomfortable	(3) Somewhat comfortable	(4) Comfortable	(5) Very Comfortable
Rating	○	○	○	○	○

Familiarity / Interest / Ease of use with iPad™

9. **Do you own any of these devices at home?**

   - ○ No, I do not own any of these devices
   - ○ Yes, I own a desktop computer
   - ○ Yes, I own a tablet (i.e., iPad™, PlayBook™, etc.)
   - ○ Yes, I own both devices

10. **How familiar were you with the iPad™ we asked you to use?**

	(1) Not at all familiar	(2) Somewhat familiar	(3) Familiar	(4) Very familiar	(5) Completely familiar
Rating	○	○	○	○	○

11. **How interesting did you find the iPad™?**

	(1) Not at all interesting	(2) Somewhat interesting	(3) Neutral	(4) Interesting	(5) Very interesting
Rating	○	○	○	○	○

12. With respect to ease of use, how would you rate the iPad™?

	(1) Very difficult to use	(2) Somewhat difficult to use	(3) Neutral	(4) Somewhat easy to use	(5) Very easy to use
Rating	○	○	○	○	○

Children's familiarity with the iPad™

13. How do you think your child responded to the iPad™?

	(1) Did not like it at all	(2) Liked it only a bit	(3) Somewhat liked it	(4) Liked it	(5) Liked it a lot
Rating	○	○	○	○	○

14. How would you rate your child's familiarity with the iPad™ we asked you to use?

	(1) Not at all familiar	(2) Somewhat familiar	(3) Familiar	(4) Very familiar	(5) Completely familiar
Rating	○	○	○	○	○

15. How would you rate your child's interest with respect to the iPad™ we asked you to use?

	(1) Uninterested	(2) Somewhat uninterested	(3) Neutral	(4) Somewhat interested	(5) Very interested
Rating	○	○	○	○	○

Overall Feelings

16. Overall, how comfortable did you find the experience of using the iPad™ in the present study?

	(1) Not at all comfortable	(2) Somewhat uncomfortable	(3) Somewhat comfortable	(4) Comfortable	(5) Very Comfortable
Rating	○	○	○	○	○

17. Overall, how similar was the observation session to the typical interactions you have with your child involving technology?

	(1) Not at all similar	(2) A little bit similar	(3) Similar	(4) Very similar	(5) Almost the same
Rating	○	○	○	○	○

18. After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies *with* your presence/guidance?

	(1) Never	(2) Sometimes	(3) A few times	(4) Most of the time	(5) Always
Rating	○	○	○	○	○

If never, could you please state why not?

_____

19. After having experienced the use of the iPad™ in the present study, how often would you encourage your child to use similar mobile technologies *without* your presence/guidance?

	(1) Never	(2) Sometimes	(3) A few times	(4) Most of the time	(5) Always
Rating	○	○	○	○	○

If never, could you please state why not?

_____

Appendix C: Interview Questions

1. What were your general feelings about the session you had when using the iPad™ with your child?

2. Do you feel that you should help your child when they are using technology or do you feel that they should attempt to figure it out on their own?

3. In general, we want to know how parents introduce technology to children (what works and what doesn't) so we are hoping you can share with us how you introduced technology and/or games on technology to your child?

4. You were asked in the survey to tell us whether you use technology with your child. If we asked you to summarize what you think is critical about making the decision to use/buy technology or not use/buy it or about doing it right, what would you say?

Appendix D: Interactive iPad™ observation session scaffolding types and descriptions

Type of Scaffold	Description
Physical	Holding the iPad™ for the child to use; Placing a hand underneath the device to support it; Placing the iPad™ down (e.g., on couch or table) for the child to use; Pointing to the iPad™ screen (both in general and to a specific location); Touching (pressing) the iPad™ screen for the child; Adjusting the viewing angle of the iPad™; Helping the child point to something by a hand-over-hand method; Seating the child on parent's lap; Readjusting their child's seating position; Nodding or shaking their head to indicate approval or disapproval (often accompanied with a verbal or emotional-verbal support); Demonstrating a tilting action with the iPad™ for clarification on what the child is supposed to do in the game.
Verbal	Repetition of the game instructions; Providing clarification or rewording of game instructions (e.g., "oh, so what they want you to do is to pick the correct number from the list there."); Reading aloud something written on the iPad™ screen (e.g., "so that says, 'Jack played a ___.'"); Reading out a list of items; Listing rhyming words; Providing hints and examples (e.g., "'A,' like 'apple.'"); Providing direct/step-by-step instruction (e.g., "now press on the green 'play' button."); Asking direct or indirect questions (e.g., "where is the number seven?" versus "can you tell me where the triangle is?"); Commenting or acknowledging something on the screen (e.g., "look at that, you got 3 stars"); Telling the child to try again (e.g., "try that again."); Providing the child with corrective statements indicating that they are doing something wrong (e.g., "oops," "uh-oh").
Emotional-Verbal	Verbal prompts that contained an emotional element including: Praise, positive reinforcement and providing confidence (e.g., "good job," "you did it!" "you can do it," "there you go!" "you got it," "yes, that's right," "good girl/boy"); Creating excitement and emotion through sound effects, gasps, and other vocalizations (e.g., "ooh," "woah!"); Laughing (creating a positive mood).
Emotional-Physical	Physical supports with an emotional element including: touching the child (e.g., scratching or ruffling their hair, patting them on the back); Physical expressions of praise (e.g., high-five, thumbs-up, shaking

	the child by the shoulders/their hand when they successfully accomplished something – often grouped with a verbal support such as positive reinforcement); Kissing the child; Facial expressions (e.g., smile, frown, grimace, shudder); Cuddling with the child or hugging the child.
Distractor	Behaviours such as the parent being engaged in the task but not directly observing the child (e.g., briefly looking around the room, adjusting personal belongings such as sunglasses, or glancing at their cell-phone momentarily); Looking at the researchers (e.g., asking for assistance with the device). Distractions were coded in this category if they were sustained for less than three seconds.
Off-task	Behaviours/instances of distraction greater than three seconds in duration where the parent was visibly off-task and unengaged in the interactive activity with their child. These behaviours included external stimuli distracting the parent (e.g., cell-phone ringing), parents getting up from their seated position and interaction with their child to another location in the room (e.g., to retrieve something from a coat or purse or to turn off a ringing cell-phone), and if a researcher interrupted the session for software-related issues (e.g., volume was accidentally turned off by a parent or child).

Appendix E: Analyses conducted with the two outliers included

The following section summarizes analyses of parental scaffolding during the observational sessions when the two children identified as outliers due to off-task behaviour are included. The pattern of outcomes in these analyses does not change from the pattern with the children removed from analyses.

Consistent with hypothesis one, which examined whether users and non-users differed in the types of supports they offered their child, a MANOVA analysis was conducted between users and non-users for the four aggregated scaffolding scales on the interactive iPad™ session: verbal scaffolding, emotional-verbal scaffolding, physical scaffolding and emotional-physical scaffolding (see Figure 4 for a summary of means). Analyses yielded results that mirrored analyses with the children excluded. That is, there were no significant differences between users and non-users on any of these four scaffolding measures ($F(1, 104) = .32$, $p = .57$, $F(1, 104) = .32$, $p = .57$; $F(1, 104) = 3.04$, $p = .08$; $F(1, 104) = .02$, $p = .88$, for the physical, verbal, emotional-verbal, and emotional-physical scaffolding, respectively). However, the emotional-verbal comparison approached significance $F(1, 104) = 3.04$, $p = .08$, such that non-users engaged in more emotional-verbal supports ($M = 27.12$, $SD = 18.47$) than users ($M = 21.52$, $SD = 12.31$) in the 10-mintue iPad™ observation session.

Consistent with hypothesis two, which examined whether mothers and fathers differed in the types of supports they offered their child, a MANOVA analysis was also conducted between mothers and fathers for each of the four aggregated scaffolding scales on the interactive iPad™ session: verbal scaffolding, emotional-verbal scaffolding, physical scaffolding and emotional-

physical scaffolding. There were no significant differences between mothers and fathers on any of these four scaffolding measures, $F(1, 104) = .05$, $p = .83$, $F(1, 104) = .000$, $p = .99$; $F(1, 104) = .02$, $p = .89$; $F(1, 104) = 1.83$, $p = .18$ for the physical, verbal, emotional-verbal, and emotional-physical scaffolding, respectively.

For verbal scaffolding in the interactive observation session, the overall model was found to be significant ($F(5, 103) = 8.07$, $p < .001$, $R^2 = .29$). Both child's age ($\beta = -1.39$, $t(103) = -6.2$, $p < .001$) and parent age ($\beta = 1.52$, $t(103) = 2.36$, $p = .02$) predicted the amount of verbal scaffolding that parents provided in the interactive iPad™ session. As child age increased, the amount of verbal scaffolding parents provided their children decreased, and older parents provided more verbal supports than younger parents.

The overall model for physical scaffolding in the interactive observation session was significant ($F(5, 103) = 6.29$, $p < .001$, $R^2 = .24$). Again both child age ($\beta = -1.80$, $t(103) = -5.38$, $p < .001$) and parent age ($\beta = 2.57$, $t(103) = 2.66$, $p = .009$) were significant predictors. Similar to verbal scaffolding, as child age increased, the amount of physical scaffolding parents provided their children decreased and older parents provided more physical supports than younger parents.

With respect to the two emotionally-based scaffolding supports in the interactive observation session, neither model was significant: emotional-verbal scaffolding, $F(5, 103) = .67$, $p = .64$, emotional-physical scaffolding, $F(5, 103) = .64$, $p = .67$.

Appendix F: Interview Themes

Emerging themes

Of the four interview questions, 12 themes emerged from parents' responses. The first interview questions yielded three major themes, the second and third interview questions yielded four major themes each, and the fourth interview question yielded five major themes. See Table 15 for a detailed description of themes and parent examples.

Interview question 1: "What were your general feelings about the session you had when using the iPad™ with your child?" The first interview question assessed parents' general feelings regarding the interactive iPad™ session they participated in with their child. Three themes emerged: parent affect, child affect, and preference.

Parent affect. Parental affect included five sub-themes: *positive*, *negative*, *neutral*, *negative to positive*, and *preference*. *Positive* affect (76.9% of parents) reflected positive, fun, and interesting impressions of the sessions whereas ne*gative* (11.5% of parents) reflected feeling that the session was unengaging, boring, frustrating, or difficult. The *neutral* sub-theme (11.5% of parents) meant that parents did not feel either positively or negatively about the session. The sub-theme *negative to positive* (1% of parents) captured parents' responses that the session started off negatively (i.e., frustrating), but then turned positive. Finally, the *preference* sub-theme (38.5% of parents) captured parents' responses that they preferred the interactive iPad™ session more than they did the desktop session. See Table 16 for a summary of means.

Child affect. The second theme of the first interview question captured parents' responses regarding their child's affect toward the interactive iPad™ session. Four sub-themes were identified: *positive*, *positive to negative*, *negative*, and *negative to positive*. *Positive* (26%

of parents) referred to the child enjoying the interactive session. *Positive to negative* (1% of parents), indicated that the child started off enjoying the interactive session and then got frustrated. *Negative* (3.8% of parents), referred to their child's frustration in the interactive session such as their disinterest in the task or their confusion when they played more challenging games. *Negative to positive* (1.9% of parents), reflected children starting off being frustrated or bored in the interactive session and then having fun by the end. See Table 16 for a summary of means.

Parent's responses to the interview question that assessed their general feelings toward the interactive play session did not reveal anything extraordinary. Parents reported positive, negative and neutral affect toward the task, as well as directional (negative to positive) affect. Interestingly, although it was not part of the interview question that was asked, parents also commented on their preference for the iPad™ session rather than the desktop session. Similarly, parents reported positive, negative, and directional (positive to negative and negative to positive) affect for their child regarding the interactive play session. These themes reflected what was to be expected from parents' responses – there were no unique themes mentioned in the first interview question that assessed parents' general feelings toward the iPad™ session.

Interview question 2: "Do you feel that you should help your child when they are using technology or do you feel that they should attempt to figure it out on their own?" The second interview question assessed parents' perceptions about whether they feel they should help their child when he/she is using technology or allow them to explore on their own without parental guidance. Four themes emerged in the second interview question: combination/both, parents should help, neither, and child should do it on their own.

Combination/Both. This theme (44.2% of parents) reflected parents' responses that helping their child when they are using technology is conditional (i.e., that both helping their child first and also allowing the child to explore on their own is important). It also contained two sub-themes: '*help first*' and '*child first*'. The first sub-theme, *help first* (36.5% of parents), reflected parents' responses that when their child is using technology, parents should provide some help to their child before they let them explore on their own. The second sub-theme, *child first* (41.3% of parents), reflected parents' responses that reflected that parents encourage their child to work on their own when they are using technology and that they would provide assistance if their child required it. See Table 16 for a summary of means.

Parents should help. The, 'parents should help,' theme (16.3% of parents) captured the belief that parents should help their child when they are using technology and that it is important to help the child figure out how to use the technology or what is required of them in the game. See Table 16 for a summary of means.

Neither. The third theme, 'neither' (1% of parents) captured parent's responses that parents should neither help their child nor leave them to explore on their own when they are using technology. See Table 16 for a summary of means.

Child should figure it out. The fourth theme, 'child should figure it out' (21.2% of parents) captured parents' responses that their child should explore and attempt to figure it out on their own when they are using technology, without parental guidance. See Table 16 for a summary of means.

Parents' responses to the second interview question that assessed whether they would help their child when he/she is using technology revealed no surprising themes. The themes that

emerged from parents' responses were what one would expect to find – some parents prefer to use a combination of both helping their child and allowing them to figure things out on their own; some parents prefer to help their child regardless if the child requires assistance; some parents were undecided and stated that neither helping the child nor allowing them to explore on their own was true in their case; and some parents believe that their child should attempt to explore on their own first and only intervene if they feel their child requires assistance.

Interview question 3: "In general, we want to know how parents introduce technology to children (what works and what doesn't). We are hoping you can share with us how you introduced technology and/or games on technology to your child." The third interview question assessed how parents introduced technology to their child. Four themes emerged from the third interview question: unintentional, intentional/parent guided, child guided, and parent explores software beforehand

Unintentional. The 'unintentional' theme (13.5% of parents) reflected parents' responses that their child was introduced to technology unintentionally or accidentally – that there was no explicit intentionality to their child's introduction to technology. The 'unintentional' theme included two sub-themes: *parent using technology*, and *occupy*. *Parent using technology* (9.6% of parents) reflected parents' responses that children were introduced to technology due to parents using digital devices around their children and their child observed them using it. *Occupy* (18.3% of parents) reflected parents' responses that children were introduced to technology with the intention of keeping them occupied (e.g., in the car, while cooking dinner). See Table 16 for a summary of means.

Intentional. The second theme of the third interview question, 'intentional' (15.4% of parents) was a general category that captured parents' intentional introduction of technology to their children. The 'intentional' theme included six sub-themes: *spouse does it more, downloads games, accessible, hasn't introduced technology, allow child to explore,* and *together*. *Spouse does it more* (5.8% of parents) reflected parents' responses that the participant's spouse introduces their children more to technology. *Downloads games* (18.3%), reflected parents' responses that they download games or applications for their child, either on their own from online or recommendations from friends or the child's daycare. *Accessible* (21.2% of parents), reflected parents' responses that technology is readily accessible to the child (i.e., at home) to use. *Hasn't introduced technology* (22.1% of parents), reflected parents' responses that they have not introduced their child to technology just yet or that there is no strong focus on using technology at home. *Allow child to explore* (22.1% of parents), reflected parents' responses that they let their child explore and use technology on their own. Finally, the sub-theme *together* (20.2% of parents), reflected parents' responses that they sit down with the child and show the child how to use a piece of technology or how to play a game. See Table 16 for a summary of means.

Child guided/directed. The third theme of the third interview question, 'child guided/directed' captured parents' responses that reflected a child-initiated introduction to technology. The 'child guided/directed' theme included two sub-themes: *older sibling* and *child's curiosity/interest*. *Older sibling* (15.4% of parents), reflected parents' responses that an older sibling of the child uses technology and the child has been introduced to technology in this way. *Child's curiosity/interest* (21.2% of parents) reflected parents' responses that the child expressed a self-initiated interest in technology. See Table 16 for a summary of means.

Parent explores software beforehand. The fourth theme of the third interview question, 'parent explores software beforehand' (13.5% of parents) captured parents' responses that reflected parents learning or trying out the software before giving it to their child. See Table 16 for a summary of means.

There were no surprising themes that emerged from the third interview question that assessed how parents introduced technology to their child. The themes that emerged revealed that some parents did not take any particular measures to introduce their child to technology and it had just occurred spontaneously or unintentionally. On the other hand, there were parents that reported that they did intentionally introduce their child to technology or that they have not yet introduced their child to technology. Parents also reported that their child has been introduced to technology by means of siblings or their own self-exhibited curiosity. Some parents also reported that they like to explore the software their child will use beforehand to make sure it is appropriate for them. All of these themes did not offer a unique insight into how parents introduced their child to technology – parents may do it unwittingly or they may have a direct intention for their child to learn to use technology.

Interview Question 4: "You were asked in the survey to tell us whether you use technology with your child. If we asked you to summarize what you think is critical about making the decision to use/buy technology or not use/buy it or about doing it right, what would you say?" The fourth and final interview question assessed parents' opinions regarding what they believe is critical about making the decision to use/purchase or not use/purchase technology or perhaps about how to do it *right*. The fourth interview question yielded five themes: parent's opinion about technology, management, support, choosing games/device, and long-term use.

Parent's opinion about technology. The first theme of the fourth interview question, 'parent's opinion about technology,' included 5 sub-themes: *neutral, important to do, negative, child interest,* and *don't purchase. Neutral* (14.4% of parents), reflected parents' responses that there is no right or wrong way to use technology. *Important to do* (55.8% of parents) reflected parents' responses that they believe it is important to introduce children to technology and use/buy technology. This sub-theme included two sub sub-themes: *future* and *disadvantaged. Future* (15.4% of parents) reflected parents' responses that it is important to use and buy technology because it prepares their child for the future. *Disadvantaged* (9.6% of parents), reflected parents' responses that children that are not introduced or use technology will be at a disadvantage among their peers that do use technology. The sub-theme *negative* (21.2% of parents) reflected parent's negative opinions about technology use such as worries about their child becoming addicted to technology, concerns over using technology for extended periods of time, and that technology is overused in society. *Child interest* (9.6% of parents) reflected parents' beliefs that it is important to use or buy technology if the child expresses an active interest. *Don't purchase* (4.8% of parents) reflected parents' responses that they don't purchase or download software for their child to use. See Table 16 for a summary of means.

Management. The second theme that emerged in the fourth interview question, 'management,' included two sub-themes: *regulated* and *monitor*. The first sub-theme, *regulated* (40.4% of parents), reflected parents' responses that their child's technology use was regulated or constrained and limiting the amount of time children have access to technology was also important. The second sub-theme, *monitor* (24% of parents), reflected parents' responses that they like to monitor their child when they are using technology and supervise their child. See Table 16 for a summary of means.

Support. The third theme that emerged from the fourth interview question, 'support' (1% of parents), reflected parents' responses that they like to be supportive when their child is using technology. The 'support' theme included two sub-themes: *safety* and *support/supplement learning*. The first sub-theme, *safety* (19.2% of parents), reflected parents' responses of safety concerns when their child is using technology, particularly regarding their child to explore safely and not be exposed to something inappropriate as well as concerns about accidental purchases. The second sub-theme, *support/supplement learning* (7.7% of parents), reflected parents' responses that indicated they support their child or supplement their learning when they are using technology such as asking questions and providing hints. See Table 16 for a summary of means.

Choosing games/device. The fourth theme that emerged from the fourth interview question, 'choosing games/device,' reflected parents' opinions about the appropriate requirements when choosing games or applications for their child to use or requirements when choosing a digital device for their child. The fourth theme included two sub-themes: *age-appropriate* and *durability*. *Age-appropriate* (46.2% of parents), reflected parents' responses that games, applications, or devices the child used should be at an appropriate age/developmental level for their child. *Durability* (4.8% of parents), reflected parents' concerns of the durability of the device and their opinions that the device should be child-friendly. See Table 16 for a summary of means.

Long-term use/benefits. The fifth theme that emerged from the fourth interview question, 'long-term use/benefits' (10.6% of parents), reflected parents' responses of considering the long-term use and benefits when choosing to purchase a particular technological device and that choosing a device that is beneficial to both the parent and the child is important. See Table 16 for a summary of means.

Parent's responses to the fourth interview question that assessed their opinions on what is critical when making a decision to use/buy technology or not use/buy technology did not reveal any surprising themes. Parents reported their opinions about technology use through positive, negative, and neutral themes, as well as expressing that it is important to use and purchase technology, stating that it is in their child's best-interest to do so (e.g., prepares them for the future). Parents also commented on their monitoring and support strategies for when their child(ren) use technology, stating that regulation and monitoring technology use is important. It was no surprise that parents also commented on their concerns for their child's safety when he/she uses technology, stating concerns for protection when exploring online and inappropriate material. As was expected, parents reported that they like their child to use age-appropriate material (e.g., games, applications) and child-friendly (i.e., durable) devices. Some parents also alluded to considerations of the long-term use of devices they purchase, stating that they take into account the features of the device and whether family members can share the use of the device. Overall, it is evident that parents like to be cautious about purchasing technology, noting the best-interest of their child for reasons that they would do so.

References

American Academy of Pediatrics. (1999). Media Education. *Pediatrics, 104,* 341-342.

American Academy of Pediatrics. (2001). Media Violence. *Pediatrics, 108,* 1222-1226.

Anand, S. & Krosnick, J. (2005). Demographic predictors of media use among infants, toddlers, and preschoolers. *American Behavioural Scientist, 48*(5), 539-561. doi: 10.1177/0002764204271512

Auyeung, K., Burbidge, J., & Minnes, P. (2011). Perceived parental stress: The relative contributions of child and parent characteristics. *Journal on Developmental Disabilities, 17*(2), 10-20.

Bebell, D., Dorris, S., & Muir, M. (2012). *Emerging results from the nation's first kindergarten implementation of iPads. Research summary.* Auburn: Auburn School Department. Retrieved on May 11, 2014, from https://s3.amazonaws.com/hackedu/Adv2014_ ResearchSum120216.pdf

Bereznak, S., Ayres, K. M., Mechling, L. C., & Alexander, J. L. (2012). Video self-prompting and mobile technology to increase daily living and vocational independence for students with autism spectrum disorders. *Journal of Developmental and Physical Disabilities, 24*(3), 269-285. doi:10.1007/s10882-012-9270-8

Bergen, D., Hutchinson, K., Nolan, J. T., & Weber, D. (2010). Effects of infant-parent play with a technology-enhanced toy: Affordance-related actions and communicative interactions. *Journal of Research in Childhood Education, 24*(1), 1-17. doi:10.1080/02568540903439342

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code Development*. Sage Publications, Inc, Thousand Oaks, CA.

Caldera, Y. M., Huston, A. C., & O'Brien, M. (1989). Social interactions and play patterns of parents and toddlers with feminine, masculine, and neutral toys. *Child Development, 60*, 70-76.

Calvert, S. L., Rideout, V. J., Woolard, J. L., Barr, R. F., & Strouse, G. (2005). Age, ethnicity, and socioeconomic patterns in early computer use: A national survey. *American Behavioral Scientist, 48*(5), 590-607. doi:10.1177/0002764204271508

Carrington, V. (2001). Emergent home literacies: A challenge for educators. *The Australian Journal of Language and Literacy, 24*(2), 88-100.

Chang, Y. M., Mullen, L., & Stuve, M. (2005). Are PDAs pedagogically feasible for young children? *T.H.E. Jouranl, 32*(8), 40-42. Retrieved on April 23, 2014, from http://thejournal.com/articles/2005/03/01/are-pdas-pedagogically-feasible-for-young-children.aspx

Clements, D. H., & Sarama, J. (2003). Young children and technology: What does the research say? *Young Children, 58*(6), 34-40.

Cooper, L. Z. (2005). Developmentally appropriate digital environments for young children. *Library Trends, 54*(2), 286-302.

Cordes, C., & Miller, E. (2004). *Tech tonic: Towards a new literacy of technology*. Retrieved

July 4, 2012, from http://www.eric.ed.gov.remote.libproxy.wlu.ca/PDFS/ED485737.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. doi: 10.1080/15391523.2010.10782562

Davidson, C. (2012). Seeking the green basilisk lizard: Acquiring digital literacy practices in the home. *Journal of Early Childhood Literacy, 12*(1), 24-45. doi:10.1177/1468798411416788

Davies, C. (2011). Digitally strategic: How young people respond to parental views about the use of technology for learning in the home. *Journal of Computer Assisted Learning, 27*(4), 324-335. doi:10.1111/j.1365-2729.2011.00427.x

de Jong, M. T., & Bus, A. G. (2003). How well suited are electronic books to supporting literacy? *Journal of Early Childhood Literacy, 3*(2), 147-164. doi:10.1177/14687984030032002

Digital education revolution. (n.d.). Retrieved July 2, 2012, from Australian Government, Department of Education, Employment and Workplace Relations website, http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Pages/default.aspx

Dobbs, J., Arnold, D. H., & Doctoroff, G. L. (2004). Attention in the preschool classroom: The relationships among child gender, child misbehaviour, and types of teacher attention, *Early Childhood Development and Care, 174*(3), 281-295.

Eagle, S. (2012). Learning in the early years: Social interactions around picturebooks, puzzles and digital technologies. *Computers & Education, 59*, 38-49.

doi:10.1016/j.compedu.2011.10.013

Eccles, J. S., Jacobs, J. E., & Harold, R. D. (1990). Gender role stereotypes, expectancy effects, and parents' socialization of gender differences. *Journal of Social Issues, 46,* 183-201.

Elkind, D. (1996). Young children and technology: A cautionary note. *Young Children, 51*(6), 22-23.

Evans, M. A., & Shaw, D. (2008). Home grown for reading: Parental contributions to young Children's emergent literacy and word recognition. *Canadian Psychology, 49*(2), 89-95. doi:10.1037/0708-5591.49.2.89

Fagot, B. I. (1984). The consequents of problem behavior in toddler children. *Journal of Abnormal Child Psychology, 12*(3), 385–396. doi: 10.1007/BF00910654

Fagot, B. I., & Hagan, R. (1985). Aggression in toddlers: Responses to the assertive acts of boys and girls. *Sex Roles, 12*(3-4), 341–351. doi: 10.1007/BF00287600

Fallows, D. (2005). *How women and men use the internet | pew Internet & American life project :* Pew Internet and American Life Project. Retrieved August 7, 2012, from http://pewinternet.org/Reports/2005/How-Women-and-Men-Use-the-Internet.aspx

Fisch, S. M., Shulman, J. S., Akerman, A., & Levin, G. A. (2002). Reading between the pixels: Parent-child interaction while reading online storybooks. *Early Education and Development, 13*(4), 435-451. doi:10.1207/s15566935eed1304_7

Gentile, D. A., & Walsh, D. A. (2002). A normative study of family media habits. *Journal of*

Applied Developmental Psychology,*23*(2), 157-178. doi:10.1016/S0193-3973(02)00102-8

Haugland, S. W. (1999). What role should technology play in young children's learning? Part 1. *Young Children, 54*(6), 26-31.

Healy, J. M. (2003). Cybertots: Technology and the preschool child. In S. Olfman (Ed.), *All work and no play...how educational reforms are harming our preschoolers.* (pp. 83-110). Westport, CT, US: Praeger Publishers/Greenwood Publishing Group, Westport, CT.

Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics. *Women's Studies International Forum, 34* 479-489. doi:10.1016/j.wsif.2011.07.001

Hogan, K., & Pressley, M. (1997). *Scaffolding student learning: Instructional approaches and Issues.* Cambridge, MA: Brookline Books, Inc.

Ipsos Reid Corporation. (2012). The Ipsos Canadian inter@ctive Reid Report. 2012 fact Guide. The Definitive Resource on Canadians and the Internet. Retrieved July 2, 2012, from http://www.ipsos.ca/common/dl/pdf/Ipsos_InteractiveReidReport_FactGuide_2012.pdf

Kim, J. E., & Anderson, J. (2008). Mother-child shared reading with print and digital texts. *Journal of Early Childhood Literacy, 8*(2), 213-245. doi:10.1177/1468798408091855

Ko, S. (2002). An empirical analysis of children's thinking and learning in a computer game context. *Educational Psychology, 22*(2), 219-233. doi:10.1080/01443410120115274

Kohlberg, L., & Mayer, R. (1972). Development as the aim of education. *Harvard Educational Review, 42*, 449-496.

Korat, O., & Or, T. (2010). How new technology influences parent—child interaction: The case of e-book reading. *First Language, 30*(2), 139-154. doi:10.1177/0142723709359242

Lau, P. W. C., Lau, E. Y., Wong, D. P., & Ransdell, L. (2011). A systematic review of information and communication technology-based interventions for promoting physical activity behaviour change in children and adolescents. *Journal of Medical Internet Research, 13*(3), 44-61. doi:10.2196/jmir.1533

Martin, F. & Ertzberger, J. (2013). Here and now mobile learning: An exploratory study on the use of mobile technology. *Computers & Education, 68*(1), 76-85. doi: http://dx.doi.org/10.1016/j.compedu.2013.04.021

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 and Education, 52*(4), 719-729.

McKenney, S. & Voogt, J. (2010). Technology and young children: How 4-7 year olds perceive their own use of computers. *Computers in Human Behavior, 26*(4), 656-664. doi:10.1016/j.chb.2010.01.002

McManis, L. D. & Gunnewig, S. B. (2012). Finding the education in educational technology with early learners, Young Children, 67(3), 14-24. doi:

https://www.naeyc.org/yc/files/yc/file/201205/McManis_YC0512.pdf

Mercer, N., Warwick, P., Kershner, R., & Kleine Staarman, J. (2010). Can the interactive whiteboard help to provide "dialogic space" for children's collaborative activity? *Language and Education, 24*(5), 367-384.

Meso, P., Musa, P., & Mbarika, V. (2005). Towards a model of consumer use of mobile information and communication technology in LDCs: The case of sub-saharan Africa. *Information Systems Journal, 15*(2), 119-146.

Michael Cohen Group & USDOE [US Department of Education]. (2011). *Young children, apps and iPad.* Retrieved on November 5, 2013, from http://mcgrc.com/wp-content/uploads/2012/06/ipad-study-cover-page-report-mcg-info_new-online.pdf

Mueller, J. (2010) *Computer integration in elementary and secondary schools: Variables influencing educators. Dissertation Abstracts International Section A: Humanities and Social Sciences*, 2387. Retrieved July 8, 2012, from http://search.proquest.com/docview/622204222?accountid=15090

Murase, T., Dale, P. S., Ogura, T., Yamashita, Y., & Mahieu, A. (2005). Mother-child conversation during joint picture book reading in japan and the USA. *First Language, 25*(2), 197-218. doi:10.1177/0142723705050899

Murray, O. T., & Olcese, N. R. (2011). Teaching and learning with iPads, ready or not? TechTrends, 55, 42–48. doi: 10.1007/s11528-011-0540-6

Neumann, M. M., & Neumann, D. L. (2013). Touch screen tablets and emergent literacy. *Early Childhood Education Journal*. doi: http://dx.doi.org/10.1007/s10643-013-0608-3

Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal, 36*(4), 313-319. doi:10.1007/s10643-008-0291-y

Oz, A. S. (2009). *Computer-supported collaborative learning between children and parents: A home-based early intervention study to improve the mathematical skills of young children at risk for learning disabilities. Dissertation Abstracts International Section A: Humanities and Social Sciences, 69*(11), 4293.

Plowman, L., & Stephen, C. (2003). A benign addition? Research on ICT and pre-school children. *Journal of Computer Assisted Learning, 19*(2), 149-164. doi:10.1046/j.0266-4909.2003.00016.x

Plowman L., McPake J. & Stephen C. (2008) Just picking it up? Young children learning with technology at home. *Cambridge Journal of Education 38* (3) 303-319. doi: 10.1080/03057640802287564

Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young children and technology in the home. *Children and Society, 24*(1), 63-74. doi: 10.1111/j.1099-0860.2008.00180.x

Plowman, L., Stephen, C., & McPake, J. (2010). Supporting young children's learning with technology at home and in preschool. *Research Papers in Education, 25*(1), 93-113. doi:10.1080/02671520802584061

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 fo Computer Assisted Learning, 27*(), 361-371. doi: 10.1111/j.1365-2729.2011.00432.x

Plowman, L., Stevenson, O., Stephen, C., & McPake, J. (2012). Preschool children's learning with technology at home. *Computers and Education, 59*(1), 30-37. doi: 10.1016/j.compedu.2011.11.014

Prensky, M. (2001). Digital natives, digital immigrants. *MCB University Press, 9*(5). Retrieved April 27, 2014, from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Prestridge, S. (2012). The beliefs behind the teacher that influences their ICT practices. *Computers & Education, 58*, 449-458. doi:10.1016/j.compedu.2011.08.028

Rideout, V. (2011). Zero to eight: Children's media use in America. San Francisco, CA: Common Sense Media. Obtained May 11, 2014, from http://www.commonsensemedia.org/sites/default/files/research/zerotoeightfinal2011.pdf.

Roberts, D. F., & Foehr, U. G. (2008). Trends in media use. *The Future of Children, 18*(1), 11-37.

Rogoff, B., & Gardener, W.P. (1984). Guidance in cognitive development: An examination of mother-child instruction. In B. Rogoff & J. Lave (Eds.), *Everyday cognition: Its development in social contexts.* Cambridge, MA: Harvard University Press.

Sadker, D. (2000). Gender equity: Still knocking at the classroom door. *Equity and Excellence in Education, 33*(1), 80-83.

Sahin, T. Y. (2003). Student teachers' perceptions of instructional technology: developing materials based on a constructivist approach. *British Journal of Educational Technology, 34*(1), 67-74. doi: 10.1111/1467-8535.d01-7

Sénéchal, M., & LeFevre, J. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development, 73*(2), 445-460. doi:10.1111/1467-8624.00417

Shade, D. D., & Watson, J. A. (1990). Computers in early education: Issues put to rest, theoretical links to sound practice, and the potential contribution of microworlds. *Journal of Educational Computing Research, 6*(4), 375-392.

Shamir, A., & Korat, O. (2006). How to select CD-ROM storybooks for young children: The teacher's role. *Reading Teacher, 59*(6), 532-543.

Shenton, A., & Pagett, L. (2007). From bored to screen: The use of the interactive whiteboard for literacy in six primary classrooms in England. *Literacy, 41*(3), 129-136. doi:10.1111/j.1467-9345.2007.00475.x

Smith, C. R. (2001). Click and turn the page: An exploration of multiple storybook literacy. *Reading Research Quarterly, 36*(2), 152-183.

Specht, J.A., Wood, E., & Willoughby, T. (2002). What early childhood educators want to know about computers to enhance the learning environment. Canadian Journal of Learning and Technology, 28(1), 31-40

Statistics Canada. Adapted from the report Joanne Plante and David Beattie (2004) .

"Connectivity and ICT integration in Canadian elementary and secondary schools: First results from the Information and Communications Technologies in Schools Survey 2003-2004 ". Culture, Tourism and the Centre for Education Statistics - Research Papers. Statistics Canada Catalogue number 81-595-MIE20040017, free. Retrieved June 24, 2012, from http://www.statcan.gc.ca/pub/81-004-x/200409/7017-eng.htm#ref.

Statistics Canada. (2010). Internet use by individuals, by location of access, by province. Retrieved July 1, 2012, from http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/comm36a-eng.htm

Stephen, C. & Plowman, L. (2008). Enhancing learning with information and communication technologies in pre-school. *Early Child Development and Care, 178*(6), 637-654. doi:10.1080/03004430600869571

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*, 336-346. doi:10.1111/j.1365-2729.2011.00430.x

Tahnk, J. (2011). Digital milestones: Raising a tech-savvy kid. Parenting.com, November (pp. 78–84).

Traxler, J. (2007). Defining, discussing, and evaluating mobile learning: The moving finger writes and having writ… *International Review of Research in Open and Distance Learning, 8*(2), 1-12

Vernadakis, N., Avegerinos, A., Tsitskari, E., & Zachopoulou, E. (2005). The use of computer-

assisted instruction in preschool education: Making teaching meaningful. *Early Childhood Education Journal, 33*(2), 99-104. doi: 10/1007/s10643-005-0026-2

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

Wang, X.C. & Hoot, J.L. (2006). Information and communication technology in early childhood education. *Early Education and Development, 17*(3), 317-322.

Whittaker, R., Merry, S., Stasiak, K., McDowell, H., Doherty, I., Shepherd, M., et al. (2012). MEMO—A mobile phone depression prevention intervention for adolescents: Development process and postprogram findings on acceptability from a randomized controlled trial. *Journal of Medical Internet Research, 14*(1), 169-179. doi:10.2196/jmir.1857

Willoughby, T., & Wood, E. (2008) *Children's learning in a digital world*. Malden, MA: Blackwell Publishing.

Wohlwend, K. E. (2010). A is for avatar: Young children in literacy 2.0 worlds and 1.0 schools. *Language Arts, 88*(2), 144-152. Retrieved on April 23, 2013, from http://www.academia.edu/561004/A_Is_for_Avatar_Young_Children_in_Literacy_2.0_Worlds_and_Literacy_1.0_Schools

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry,17*(2), 89-100. doi:10.1111/j.1469-7610.1976.tb00381.x

Wood, E., Desmarais, S., & Gugula, S. (2002). The impact of parenting experience on gender stereotyped toy play of children. *Sex Roles, 47*(1), 39-49.

Wood, E., Specht, J., Willoughby, T., & Mueller, J. (2008). Integrating computer technology in early childhood education environments: Issues raised by early childhood educators. *Alberta Journal of Educational Research, 54*(2), 210-226.

Wood, J. (2001). Can software support children's vocabulary development? *Language Learning & Technology, 5*(1), 166-201.

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

Zevenbergen, A. A. & Whitehurst, G. J. (2003). *Dialogic reading: A shared picture book reading intervention for preschoolers*. In Van Kleek, A., Stahl, S., & Bauer, E. B. (Eds.), On reading books to children: Parents and Teachers (170-191). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.