SHARING IS CARING: PROSOCIAL BEHAVIOURS, THEORY OF MIND, AND MEDIA AND TECHNOLOGY IN EARLY CHILDHOOD EDUCATION

by

Rachel Ralph

B.A., The University of British Columbia, 2007
B.Ed., The University of British Columbia, 2008
MET, The University of British Columbia, 2012

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES

(Curriculum and Pedagogy)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

April 2017

© Rachel Ralph, 2017

Abstract

This empirical study investigated the manifestation of prosocial sharing behaviours and how this interplayed with preschool-aged children's Theory of Mind (ToM), described in cognitive science as one's ability to ascribe mental states to others and how the ascribed states are used to explain and predict the actions of others, when using media and technology (M&T), i.e., iPads. The following research questions were explored: 1) In what ways do theory of mind and the prosocial behaviour of sharing manifest among preschool-aged children interacting with iPads?; 2) What are the effects of iPad use on the manifestation of theory of mind and prosocial behaviours of sharing among preschool-aged children?; 3) What are the possible connections between a child's theory of mind and their prosocial behaviour of sharing? The study is grounded in empathy-altruism theory, social exchange theory, and social learning theories. It employed a mixed methods approach that used design-based research (DBR) strategies and video ethnography for data collection. During the study, the children wore personable cameras, which captured data from their points of view to enhance the video captured by the researcher. Phases of the DBR included: a pilot feasibility study (prototype test) with practicing teachers (n=18), field study with preschool-aged children (n=3) (four years old), and definitive test group (n=5) (three and four years old) in another early childhood education (ECE) setting. The field study and definitive test phases included a teaching intervention for data collection and analysis: 1) Reading digital story *Mine,* 2) ToM storybook task battery, 3) Demonstration of *Chatterpix Kid*, and 4) Limited iPad to children ratio using *Chatterpix Kid* to animate pictures taken. Data were analyzed using qualitative open-thematic coding methods and statistical methods, including Chi-square and Cohen's Kappa for agreement. The qualitative and quantitative results indicated that all children participants had ToM attributes and incidents of prosocial behaviours occurred more

than nonsocial or antisocial behaviours when using media and technology. The study's findings underscore the importance of exploring *in situ* children's ToM, using point of view wearable cameras, and continued research to understand short and long-term implications of media and technology in early childhood education.

Preface

This research project was originally conceptualized by the author. The author was also solely responsible for writing this thesis, under the supervision of the thesis committee: Dr. Stephen Petrina, Dr. Marina Milner-Bolotin and Dr. Samson Nashon. Ethics approval was received on April 28, 2015 from the University of British Columbia Research Ethics Board (Approval Number #H06-80670) and kept valid until it was closed on April 28, 2016. Another ethics approval was received on May 9, 2016 from the University of British Columbia Research Ethics Board (Approval Number #H06-80670). The study was conducted in early childhood education centres in Richmond BC and Vancouver BC from April 14, 2016 until June 30, 2016. The research was partially funded by the Social Sciences and Humanities Research Council Insight Grant #435-2014-0510 under direction of Dr. Petrina.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AAP	American Academy of Pediatrics
Apps	Applications
BC	British Columbia
DBR	Design-Based Research
ECE	Early Childhood Education
M&T	Media and Technology
NAEYC	National Association for the Education of Young Children
PBS	Public Broadcasting Service
ToM	Theory of Mind
US	United States

Acknowledgements

I offer gratitude to the faculty, staff, colleagues, friends, and my fellow students at UBC, who have inspired me to continue working in this field.

Firstly to my dissertation committee included: Dr. Stephen Petrina (Supervisor), Dr. Samson Nashon (Committee Member), and Dr. Marina Milner-Bolotin (Committee Member). I would like to acknowledge the thorough and constructive commentary from my External Examiner Dr. Catherine Adams. I would to also acknowledge my University Examiners – Dr. Peter Gouzouasis and Dr. Marlene Asselin for their questions and support. I would like to thank Dr. Lee Gunderson for chairing my defense.

I would like to send out my deepest thanks to my Supervisor, Dr. Stephen Petrina. Your support throughout this journey has been insurmountable. Your consistent encouragement has helped me grow as a researcher, teacher, and scholar. I owe you a depth of gratitude for your insight, expertise and care. I know I could not have done this without you.

Thank you Dr. Samson Nashon for advising me in many ways. Thank you for sharing your vast knowledge and expertise. Your thoughtful ideas and constructive feedback have helped expand me as a scholar and researcher

Thank Dr. Marina Milner Bolotin for your care and expertise you provided in my work. Your efficient and constructive feedback was always greatly appreciated. It has been a pleasure collaborating with you throughout this journey.

I would like to acknowledge the How We Learn (HWL) research team for their ideas, collaborations and continued support throughout my time at UBC. Thank you for your valuable time and insights provided throughout this journey. I also need to thank Dr. Anne Phelan, my graduate advisor. Your continued expertise and support was greatly appreciated. Thank you for

everything that you do. I would like to also thank past and present peer advisors and my PhD cohort for your support. A special thanks needs to go to Cameron Duncan (PhD) for all things.

I need to also thank my friends and family. Mom, Dad, Nan, Papa, Tahnee, Nik, Everleigh, Leanne, Georgia, Kent, Bruce, Heather, and my husband Steve thanks for always supporting me! A special thanks is owed to Nan and Papa, without your support both morally and financially I would never be here. Mom and Dad for letting me be a student for almost my whole life so far. And to my aunt, Dr. Leanne Currie, for pushing me to my heights and helping me in so many ways. Finally, thank you Nutmeg and Lola. In every up and down and busy time during the past years have always provided me perspective and love and much needed dance breaks. Thanks for always thinking I'm amazing.

A thank you must go to my geniuses: Sheldon Cooper for showing me how to be unabashedly proud to be smart, J.K. Rowling for creating Hermione Granger and reminding me it's okay to be the smartest one in the room, Dr. Stephen Hawking for reminding me that even in the hardest times I can do this, Steve Jobs for letting me know it's okay to be stubborn and creative, and to Walt Disney for reminding me to never give up and always strive for a better tomorrow.

To my family for their forever support

To my husband Steve

This is probably the furthest page you are going to read to in this long document and you have supported me in so many ridiculous ways. Love you to infinity and beyond.

Chapter 1: Introduction

Currently, elementary and preschool children are using mobile, touchpad, or tablet devices, such as iPads, and a range of smartphones at home and in schools. In 2003, the computer to student ratio in Canada was 5:1 (Plante & Beattie, 2004). More recently, computer location and types of devices have changed, as many schools have more mobile devices and mobile labs than stationary labs. For example, in BC, districts such as West Vancouver claim that 90% of their elementary students use iPads in every classroom (Bains, 2014). Additionally, in the United States (US) over 4.5 million students are estimated to be using tablets every day (Etherington, 2013). The learning technologies and toys of children today are qualitatively different than the toys their parents grew up playing with (Stafford & Terpak, 2001; Turkle, 2015). A number of researchers associate negative effects resulting from over-exposure to digital media and technology (M&T), such as attention deficits, cyberbullying, physical inactivity, and selfishness (Adams & Thompson, 2016; Clayton, Osborne, Miller, & Oberle, 2013; Rosen, Whaling, Rab, Carrier, & Cheever, 2013). M&T encompasses a variety of devices and software, including: television, consoles, computers, mobile devices (i.e., smartphones, tablets, etc.) and the programming, software, and applications (apps) that many of these devices host. While, M&T has been associated with negative effects, there is also ample evidence of positive outcomes from uses of M&T. These include: deeper learning, increased motivation, more independent work, and increased confidence and curiosity (Flewitt, Messer, & Kucirkova, 2014; Karsenti, 2013; Lynch & Redpath, 2014). Children (ages 2-5) are often introduced to M&T by their parents, teachers, or peers in early childhood education (ECE) settings such as preschools, daycare centres, and classrooms. Children's altruistic and prosocial behaviours include: sharing, comforting, helping, and cooperating (Belacchi & Farina, 2012; Eisenberg, Hofer, Sulik, &

Liew, 2014; Radke-Yarrow et al., 1976).[1] During pre-school education, altruistic and prosocial behaviours emerge (Brownell, Svetlova, & Nichols, 2009; Dunfield, 2014; Eisenberg-Berg, 1981).

During the same developmental phase, at age 4, theory of mind (ToM) emerges (Blijd-Hoogewys, van Geert, Serra, & Minderaa, 2008; Song, Volling, & Lane, 2012; Weimer, Sallquist, & Bolnick, 2012). ToM is an individual's ability to understand the cognitive state of others, including their desires, beliefs, and knowledge (Astington, 1993; Premack & Woodruff, 1978; Wimmer & Perner, 1983). The emergence of altruistic and prosocial behaviours and ToM can be positively or negatively shaped by the introduction of M&T (De Simone, 2013; Edwards & Pye, 2011; Luzón, 2011). Recently, debates have arisen about the appropriate amount of screen time and other concerns regarding preschool-aged children using mobile devices. While these debates continue, the exposure and access to M&T for many children and families has become quite ubiquitous. As Adams and Thompson (2016) suggest, "the digital is everywhere" (p. 1). The ubiquitous nature of M&T challenges educational research to explore the impact on children.

This study explored how preschool-aged children's interactions with each other and iPads might impact their prosocial behaviours and ToM. The research is grounded in empathy-altruism theory, social exchange theory, and social learning theory. Design-based research (DBR) and video ethnographic methods facilitated qualitative and quantitative data collection. The research focused specifically on prosocial behaviours of sharing and ToM through iPad use. As a

[1] Cooperating can encompass other prosocial behaviours, including: helping, comforting and sharing acts. Therefore, I will not specifically refer to cooperating as a distinct prosocial behaviour.

prosocial behaviour, sharing can be defined as offering, showing, allowing use of an object, or turn-taking (Ramaswamy & Bergin, 2009). The interplay of sharing, ToM, and iPads has implications for ECE teaching and learning as well as for parents with preschool-aged children.

1.1 Statement of the Problem

Relatively few studies have explored the impacts of M&T for young children between the ages 2-5, especially regarding their use of iPads, and the impact on preschool-aged children's prosocial sharing behaviours and ToM. Several researchers have noted that parents and teachers prompt children to share by the age of 2 (i.e., food, toys, etc.) (Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Chernyak & Kushnir, 2013; Dunfield, 2014; Hay, Castle, Davies, Demetriou, & Stimson, 1999; Paulus, Gillis, Li, & Moore, 2013). Petrina, Feng, and Kim (2008) have stated that researchers are finding that "students direct and focus their attention toward technology in their world" (p. 378). Young children readily share physical objects, such as toys or stickers (Hay et al., 1999; Paulus et al., 2013), and can self-initiate sharing with computers (Medvin, Spargo, & Falcocchio, 2000; Muller & Perlmutter, 1984). However, it is unclear how prosocial sharing behaviours of young children are reinforced or suppressed through the use of media, technology, and digital devices, such as iPads. More importantly, there appears to be no research on how these devices affect a child's ToM. Research needs to explore how young children share or do not share when M&T, in particular when iPads are introduced into their preschool classrooms. Children under five years old spend almost four hours per day interacting with devices and this time increases to over seven hours per day between the ages five and ten (Childwise, 2016; Common Sense Media, 2013; Karsenti, 2013; Rideout, Foehr, & Roberts, 2010; Tandon, Zhou, Lozano, & Christakis, 2010). Also over 73% of preschool-aged children

use tablets (Childwise, 2016). The average time spent on devices continues to grow and the impact of these devices needs to be explored and not ignored. My research focuses particular on the use of iPads, as the ubiquitous nature of these devices needs to be explored. In particular, the impact of iPads needs to be further researched as there have been over 250 million iPads sold offering over 2.2 million apps and in particular over 300,000 for children (Alper, 2013; Apple, 2015, 2017; Hendela, 2014). My research explores questions relating to the growing gap in literature regarding the short- and long-term impacts of digital devices.

1.2 Research Questions

As described earlier, researchers have not explored the manifestations of prosocial sharing behaviours as it interacts with ToM and digital devices. This research is situated at the intersection of prosocial sharing behaviours, ToM, and M&T. The research focuses on iPad use with preschool-aged children who are beginning to display some of these behaviours and understandings. In particular, this research focuses on how preschool-aged children share or do not share and their understandings about the desires and feelings of others using their ToM when iPads are used. Grounded in the theoretical framework outlined below, three questions were formulated:

1. In what ways do theory of mind and the prosocial behaviour of sharing manifest among preschool-aged children interacting with iPads?
2. What are the effects of iPad use on the manifestation of theory of mind and prosocial behaviours of sharing among preschool-aged children?
3. What are the possible connections between a child's theory of mind and their prosocial behaviour of sharing?

1.3 Purpose of the Study

Sharing can be impeded or encouraged as children begin to understand how others feel or think. Therefore, an understanding of how sharing and ToM intersect is an important contribution to knowledge. This research contributes to knowledge of these topics and has implications for ECE parenting and teaching. Interaction with digital devices has supported and informed many people and even transformed daily routines and activities (Adams & Thompson, 2016). Given the ubiquity of M&T in childhood, parents and teachers have pressing concerns with whether children are benefitting or suffering as a result (Turkle, 2015). This research informs the pressing concerns of the ubiquity of M&T.

Previous research has explored how children learn using M&T (Petrina et al., 2008). Petrina et al. (2008) suggest that researchers have found that children can communicate with video, images, and text, and express themselves and have become more interactive with M&T. Their research, and other researchers, continues to explore how school-aged children, ages five and up, interact with M&T. Some researchers have begun to explore how preschool-aged children learn and interact with M&T (Flewitt et al., 2014; Lynch & Redpath, 2014; McPake, Plowman, & Stephen, 2013; Plowman, Stephen, & McPake, 2010). However, more research needs to explore how preschool-aged children are accessing and learning with devices. My research extends the review of Petrina et al. (2008) by focusing on how children under five years old learn using M&T. As M&T has become quite pervasive, continued research is needed, because the short- and long-term impacts of M&T on young children are contradictory or unknown. This research expands upon theories of social exchange, altruism, empathy, and social learning by including M&T in ECE.

1.4 Theoretical Framework

The research employs three theoretical foundations: social exchange theory, empathy-altruism theory, and social learning theory. Social exchange theory addresses relationships and how we interact by having, giving, and taking (Cook & Rice, 2006; Emerson, 1976; Homans, 1961; Thibaut & Kelley, 1959). Empathy-altruism theory explores how empathy towards a person in need and having an ability to unselfishly assist another impacts lives (Batson, 1991; Toi & Batson, 1982). Social learning theory addresses a series of social processes through which we learn and learn how to act (Bandura, 1977). The three theories are explained in more detail in the subsequent sections. *Figure 1* displays a Venn diagram with a centre-shaded part to show where each of the three theories overlaps and where prosocial behaviours emerge.

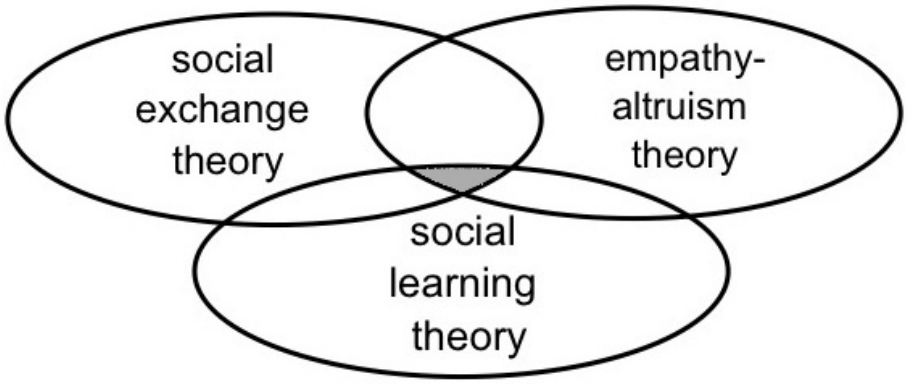


Figure 1. Theoretical perspectives grounding my research.

Figure 2 shows how social exchange, empathy-altruism, and social learning theories intersect and encompass prosocial behaviours of sharing and ToM, in the context of M&T for my research study. The figure displays prosocial behaviours as an intersection of each theory; ToM

as primarily integrated into empathy-altruism theory and strongly linked to prosocial behaviours, and M&T as the broader context of study are presented in detail later in this chapter.

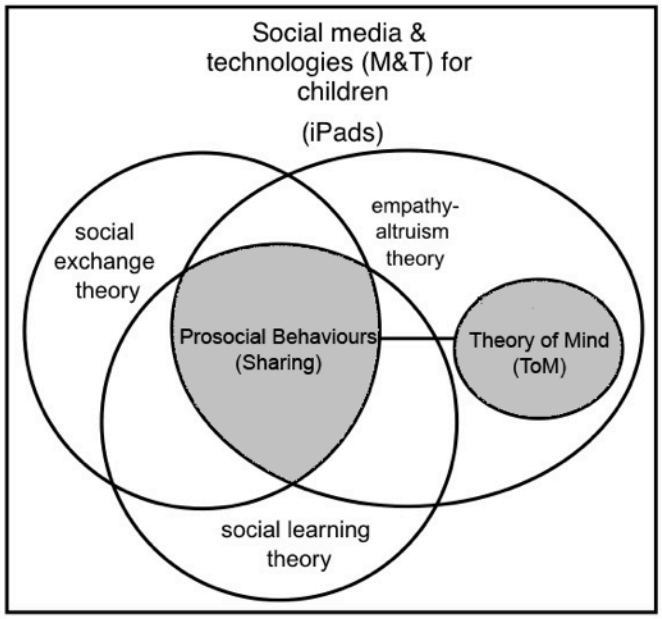


Figure 2. Theoretical underpinnings and my research focus in grey in the context of M&T.

1.4.1 Social Exchange Theory

Social exchange theory was developed by the social psychologists Thibaut and Kelley (1959) and sociologists Homans (1961) and Blau (1964). It focuses on relationships. Within this theory, all relationships have-give-and-take (Cook & Rice, 2006; Emerson, 1976; Homans, 1961; Thibaut & Kelley, 1959). In particular, Thibaut and Kelley (1959) suggest that our relationships depend upon:

- our perceptions of balance between what we put in and what we take out,
- the kind of relationship that we believe we deserve, and
- the chances of having a better relationship with someone else.

In a have-give-and-take scenario, our actions are dependent upon others; this is considered an extrinsic motivation. For example, if a child has a cookie and wants to share this cookie with another child, their decision will be based upon their perceptions of how others will react. If they share the cookie will they get something in return? Do they share the cookie because they want to share the cookie with a friend or do they not share the cookie with that friend but with another because there is something better to exchange? Thibaut and Kelley (1959) also posit that relationships are strengthened by mutually acceptable rules. In the cookie example, maybe one child has the cookie and can choose to eat it all or split it in half and share it with another. By deciding to split or share the cookie, a regulation or control is introduced. The sharing or splitting is often preferred by the weaker or lower member in the relationship; i.e., the cookie-less child hoping for a piece. Social exchange can also include complementary needs (i.e., possessions or talents) (Winch, 1952). Maybe one child shares his cookie because he needs the other child to share his milk. Or maybe another shares the cookie because she needs the other child to teach her how to tie her shoe. The exchange of needs is reciprocal.

Reciprocity includes sharing that can be an exchange or giving of ideas, thoughts, feelings, and physical objects. Sharing also refers to an individual acting to benefit another individual by offering, showing, allowing use, or turn taking of an object (Belacchi & Farina, 2012; Brownell, Svetlova, et al., 2013; Eisenberg et al., 2014; Hay, Caplan, Castle, & Stimson, 1991; Persson, 2005; Radke-Yarrow et al., 1976). Sharing is commonly affiliated with 'other-oriented sharing' (Brownell, Iesue, Nichols, & Svetlova, 2013). In other words, a child gives up something tangible to benefit someone else. For preschool-aged children, other-oriented sharing often involves a physical resource or a tangible object, such as toys, stickers, and food.

The research in this study focuses on sharing because it is a central part of social exchange theory. Also, preschool-aged children's early education focuses on social behaviours and more specifically on learning how to share. Sharing is determined by relationships and decisions, which are also influenced by feelings that are often associated with empathy. The next section will briefly describe empathy-altruism theory.

1.4.2 Empathy-Altruism Theory

Empathy-altruism theory posits that how we feel influences how we act (Batson, 1991; Toi & Batson, 1982). For example, if we feel empathy towards another person who is in need, we are likely to assist that person without any selfish thoughts. Altruism is defined as "discretionary behaviours that specifically aid another person" (Bragger, Rodriguez-Srednicki, Kutcher, Indovino, & Rosner, 2005, p. 305). In other words, altruism is a desire to help others and demonstrates a lack of selfishness. Empathy is defined as "the ability to understand and appreciate another person's feelings, experiences, etc." and is also the ability to recognize actions as being connected to emotional states (empathy. (n.), 2016; Schwartz, 2002, 2013; Snyder, Lopez, & Pedrotti, 2011). Often there is confusion between empathy and sympathy and it is important for understanding to delineate the difference between the two. **Error! Reference source not found.** compares sympathy and empathy (Batson, 2009; Bierhoff, 2002; Decety, 2011; Wispé, 1986).

Further, empathy can be divided into three types: affective, cognitive, and compassionate empathy. The first type, affective empathy, also known as emotional empathy, refers to a person's response to another's mental state based on their emotional or arousal state (de Waal, 2007; Rogers, Dziobek, Hassenstab, Wolf, & Convit, 2007; Shamay-Tsoory, Aharon-Peretz, &

Perry, 2009). Affective empathy results from an emotional contagion. For example, a baby cries because it hears another baby crying, which evokes an emotional state. The second type of empathy is cognitive empathy, which is the capacity to understand another person's mental state (Gerace, Day, Casey, & Mohr, 2013; Rogers et al., 2007). An example of cognitive empathy is when a torturer knows how to best hurt someone without feeling any sympathy towards their victim. The torturer is not emotionally responding to a person. Cognitive empathy has been interchangeable with ToM or perspective taking because ToM is about responding to another person and the ability to understand another person's mental state in other research (Gerace et al., 2013; Rogers et al., 2007). The third type of empathy is compassionate empathy. Compassionate empathy is demonstrated when someone who understands what someone else is going through and takes an action to help (Batson, 2009; de Waal, 2007; Toi & Batson, 1982). For example, a child who falls down and is crying is given a hug for comfort and a Band-Aid to stop the knee from bleeding. Actions resulting from compassionate empathy can be altruistic or prosocial. My research will focus generally on empathy, encompassing all types.

Table 1. Comparing sympathy and empathy.

	Sympathy	**Empathy**
Definition	• The awareness of another's feelings and being affected by the condition and feeling similar	• The attempt to comprehend another's feelings or experiences
Attributes	• Focus on other • I am the other person (compassion) • Objective: well-being of another person • Personal • Way of relating	• Focus on self • 'As if' I were the other person (putting self in their shoes) • Objective: understanding the experience or feelings of other • From one to another or one to a group • Way of knowing

NOTE: adapted from Batson, 2009 (used with permission)

Empathy-altruism theory grounds concepts of prosocial behaviour and ToM. As previously stated, ToM is an individual's ability to understand the cognitive states of others, including their desires, beliefs, and knowledge. Based on the larger theory of empathy-altruism, prosocial behaviours and ToM have deeper connections to moral reasoning, or the ability to tell the difference between right and wrong often with concern for others. Kohlberg (1958) describes three stages of moral development at different ages:

- Preconventional morality – children
- Conventional morality – adolescents & young adults
- Postconventional morality – older adults

Preconventional morality is demonstrated when children know the difference between right and wrong. Conventional morality is the social morality that most adolescents and adults demonstrate through moral decisions, which are often based on understanding the importance of others based on basic principles of respect and fairness. Postconventional morality is the highest stage of moral development in which an individual has his or her own morals and ethics to guide behaviours. Postconventional morality is often gained later in life. More recent research by Bierhoff (2002) extends Kohlberg's work by suggesting that children are able to move beyond preconventional morality. Bierhoff (2002) has identified five levels of prosocial moral reasoning that occur during childhood including:

1. Hedonistic, self-centered orientation: to benefit oneself; direct reciprocity
2. Needs of others orientation (i.e., he/she is sad)
3. Approval orientation (conformity to social reinforcement) and stereotyped orientation (good or bad person)

4. Empathic orientation (concern for others, perceptive taking, vicariously experience emotions)
5. Internalized orientation (responsibility, normative perspective) (p. 68)

Bierhoff (2002) suggests that as children develop through adulthood they develop from lower levels or simple forms of reasoning to higher more elaborate forms of reasoning. A child could advance as they get older or as they learn more from a social group (i.e., prosocial moral reasoning levels are not restricted by age as initially suggest by Kohlberg (1958)) (Bierhoff, 2002). Kohlberg 's developmentalism has been critiqued in various ways, see Gilligan (1982); Kohlberg, Levine, and Hewer (1981); (Tappan, 1997). For example, Gilligan (1982) argues that one of the biggest flaws of Kohlberg's work was the exclusion of females (Tappan, 1997). Another critique explores the issues of ignoring the influence of cultural experiences on moral reasoning (Kohlberg et al., 1981; Tappan, 1997). This dissertation will not explore the finite details of Kohlberg, but the findings will further the current critiques by suggesting complexities of moral reasoning in early childhood.

Prosocial moral reasoning and the ability to share are often linked to empathy. My research extends empathy-altruism theory and explores sharing and ToM together. This section was a brief description of empathy-altruism theory. The next section describes the third theoretical perspective: social learning theory.

1.4.3 Social Learning Theory

Social learning theory focuses on a series of processes in psychology and human thought and behaviour: vicarious process, symbolic process, and self-regulatory process (Bandura, 1977). The first process is a vicarious process, which is a process of learning by observing another

person's behaviours and the consequences of that behaviour. For example, a younger sibling may observe that the consequence that happens when their older sibling does not do their chores is to have their video game taken away. Vicarious process allows children to learn appropriate behaviour "without having to form them gradually by tedious trial and error" (Bandura, 1977, p. 12). In other words, a vicarious process is a process of learning from other's mistakes or successes. The second process, symbolic process, is the ability to use symbols to represent events, experiences, or communicate with others. Images and verbal symbolic representations expand the techniques for "analyzing thought and the mechanisms by which thought regulates action" (Bandura, 1977, p. vii). Symbolic modeling, in which behaviours are displayed, can include various media, such as, books, films, television, online resources, etc. For example, a person can learn from what a character in a book or movie experiences. The third process, self-regulatory process, suggests that people are able to control their own behaviour, but that behaviour is often influenced by environmental factors. Self-regulatory capacities are generated from cognitive supports and consequences for one's own actions that are supported by external influences (Bandura, 1977). Self-regulation is the "self-directive process by which learners transform their mental abilities into academic skills" (Zimmerman, 2002, p. 65). In other words, it is about being self-aware and intrinsically motivated and having the skill to apply knowledge appropriately. For example, early in education children are taught to walk and not run in the hallways at school and at some point the children are able to regulate themselves without reminders from their teachers to walk and not run.

Overall, social learning theory suggests that rules that have been inherited from an authority figure, or larger cultural norms will dictate behaviour through modeling (Berkowitz, 2004; Eisenberg, 1982). According to social learning theory sometimes no new behaviour is

learned, rather one may behave neutrally or behave based on what is socially approved (Bierhoff, 2002). In other words, when we behave a certain way, for example sharing a cookie, we aren't doing this action because we have learned about sharing; rather we share because that is what the teachers or parents expect us to do. According to Bierhoff (2002), socially approved behavioural modeling is strongly linked to prosocial behaviour, because "[behavioural] models frequently function as releasers that contribute to the performance of prosocial behaviour in children" (p. 74). Children have learned the behaviour previously, but now rely on modeling or cues to facilitate behaviours.

These three theoretical foundations, social exchange, empathy-altruism, and social learning, are key theoretical concepts in my research.

1.5 Prosocial Behaviours of Sharing: A Brief Introduction

Altruism and prosocial behaviours are defined as one person or persons acting to benefit another or others; however, a prosocial act could also include a reciprocal action. A reciprocal action is defined as the action of sharing with those who have been generous in return (Feldman, Bamberger, & Kanat-Maymon, 2013; Fujisawa, Kutsukake, & Hasegawa, 2008; Hay et al., 1999; Warneken & Tomasello, 2013). For example, sharing a toy and getting a different toy in return. Prosocial behaviours can be reciprocal and altruistic behaviors are not. The two complementary terminologies, altruism and prosocial, are distinct terms. Altruism is exclusively unidirectional, whereas prosociality also includes reciprocity (Bouchard et al., 2015). For instance, when a child shares a toy with a peer in an altruistic way gives the toy and receives nothing in return. Moreover, there is no expectation of reciprocity. If the sharing of the toy is a prosocial act the child may not receive anything in return or expect reciprocity, but the child

could receive a thank you or another toy in exchange. Altruism has a narrower focus in which perspective taking and empathy are at the core and is primarily unidirectional whereas a prosocial behaviour is broader and also reciprocal (*Figure 3* adapted from Bierhoff (2002) Fig 1.1 used with permission).

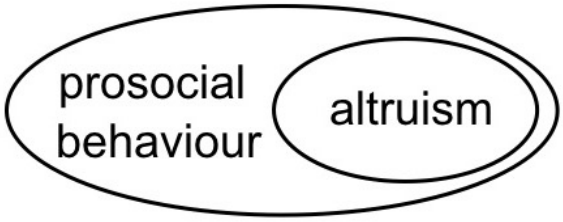


Figure 3. Relationship between prosocial behaviour and altruism.

In this study the term prosocial is used as the primary term because it encompasses altruism, and as stated earlier, prosocial behaviours include helping, comforting, and sharing (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Radke-Yarrow et al., 1976; Strand, Pula, & Downs, 2015). My research specifically focuses on the act of sharing, which is a broader term that includes both prosocial behaviour and altruism (*Figure 4* adapted from Bierhoff (2002) Figure 1.1 used with permission).

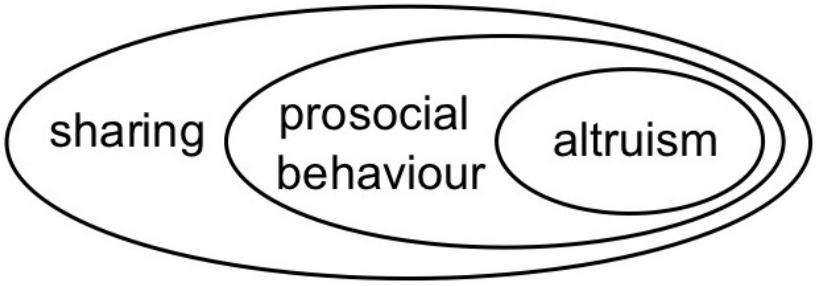


Figure 4. Relationship between sharing, prosocial behaviour, and altruism.

Altruism, prosocial behaviour, and sharing are narrower concepts within the theoretical perspectives of social exchange theory, empathy-altruism theory, and social learning theory. Prosocial behaviours and sharing will be described in more detail in Chapter 2. The following subsections briefly describe each theoretical perspective.

1.6 ToM: A Brief Introduction

As previously stated, ToM is an individual's ability to understand the cognitive states of others, including their desires, beliefs, and knowledge. ToM refers to how other people think, dream, and how one understands or interprets other people's thoughts or feelings (Clarke, 2003). In short, ToM describes how children understand how others may be thinking or feeling. Children's understanding of ToM and conscious control of actions and thoughts increase throughout their education (Muller, Liebermann-Finestone, Carpendale, Hammond, & Bibok, 2012). ToM develops through social interactions, which can strongly influence the development of prosocial behaviours (Moore, Bosacki, & Macgillivray, 2011; Weimer et al., 2012). A child has the ability to take another child's perspective and respond accordingly. For example, a girl is using a toy phone and sees another child waiting to use the same play phone. The girl realizes that the other child wants to use the phone because the other child is frowning or sighing and waiting. Or perhaps the other child asks, "Can I have turn?" and the girl responds by giving the phone to the other child. ToM is described in more detail in Chapter 2.

1.7 Media and Technology (M&T)

The increased use of mobile devices in classrooms has prompted a shift in the pedagogical approach to M&T. In the early years of microcomputers, researchers found that

children preferred working at a computer with another individual compared to working alone (Muller & Perlmutter, 1984). At that time, it was suggested that computers provided a focus for social interaction and further encouraged cooperation likely because a limited number of computers were available in the neighbourhood or classroom, which forced cooperative sharing. As M&T are gradually becoming ubiquitous in children's lives, children's interaction with M&T has become much more independent. Recent research on screen time has also suggested that the growing access to digital devices hinders social interaction and can cause detrimental effects of attention deficit disorder and other negative effects described in detail in Chapter 2.

Children can communicate through speaking, symbol recognition, and the production of written language including the use of a touchscreen or keyboards have expanded traditional literacies. As they begin to communicate, they may or may not understand and develop cultural conventions, such as politeness, taking turns, or other prosocial behaviours. Learning to be literate, digitally and otherwise, and the development of prosocial behaviours include interpreting signs and sense-making (Rowsell & Harwood, 2015). There are many mobile devices that children access; however touchpads or tablets, and in particular iPads, have become ubiquitous in 21st century classrooms. Devices have become more portable, affordable, efficient, and prominently used (Flewitt et al., 2014; Karsenti, 2013; Lynch & Redpath, 2014). In order to explore the influence of devices on children learning, the development of their prosocial behaviours, and ToM, more research is needed. In particular, iPads are used in education more than other tablets, dominating the market at 75% worldwide and 90% of the Canadian education market (Karsenti, 2013). iPads encourage increased social learning, communication and collaboration, creativity, motivation, concentration, and independence (Flewitt et al., 2014; Lynch & Redpath, 2014). Even though some preliminary research suggests banning the use of

these devices, as described in more detail in Chapter 2, we need more research as the ubiquitous nature of these devices is undeniable.

More accurately, research is needed regarding how young children use and learn with M&T, and in particular with mobile devices, to better understand any short- and long-term effects. This dissertation explores prosocial sharing behaviours and ToM with M&T that may increase researchers' understanding of how new devices, such as iPads, shape children's ToM or configure into the development of their prosocial sharing behaviours.

1.8 Terminology

For the purpose of this study the following operational definitions of key terms are provided:

Altruism refers to "discretionary behaviours that specifically aid another person" (Bragger et al., 2005, p. 305). Altruism is a desire to help others and demonstrates a lack of selfishness. Altruism may also be present when one person acts in a way to benefit another. Altruism is often associated with feelings of empathy. In this study, altruism is defined as a unidirectional action that benefits another. There is no expectation of reciprocity. In other words, altruism is an act that is one-sided with no expectation of mutual returns. For example, a young child shares a toy with another child and does not expect anything in return.

iPads/Touchpad/Tablets are handheld mobile devices with a touchscreen interface. There are a number of terms to describe these devices, including: touchpads, tablets, mobile devices, and notebooks. For this research, I refer to tablets as a general descriptor of these devices. More specifically, I employ the term iPads as these devices are commonly used in research and in the education market. iPads are the trademark device of Apple and are "a small portable computer

activated by touching the screen" (ipad. (n.d.). 2016). Although my use of media and technology (M&T) primarily refers to these devices and associated apps, the larger scope of the research also uses M&T to refer to other physical things common to childhood, including digital toys.

Prosocial behaviours are actions exhibited by children to benefit another person including: sharing, helping, comforting, and cooperation (Belacchi & Farina, 2012; Eisenberg et al., 2014; Radke-Yarrow et al., 1976). Prosocial behaviours, or prosociality, can also include reciprocity (Bouchard et al., 2015). For this research, I use the term prosocial behaviours to describe unidirectional and reciprocal acts in which one individual acts to benefit another individual.

Reciprocity is defined as the action of sharing with those who have been generous in return (Feldman et al., 2013; Fujisawa et al., 2008; Hay et al., 1999; Warneken & Tomasello, 2013). For this research, I refer to reciprocal actions as responding to a positive action with a similar positive action. For example, a young child shares a cookie and the other child shares a toy in return. The opposite of reciprocal action is *non-reciprocal action*, which includes a child behaving in a sharing manner but without the sharing behaviour being returned.

Sharing is an individual's ability to willingly give ideas, belongings, and feelings or to use, participate, enjoy by dividing or distributing or apportions (Bergin, Bergin, & French, 1995; Brownell, Iesue, et al., 2013). In this research, sharing refers to prosocial behaviours where the individual acts to benefit another individual, which may be reciprocal or non-reciprocal. Sharing includes: turn-taking, offering, showing, and allowing use of an object.

Theory of mind (ToM) is an individual's ability to understand the cognitive states of others (Astington, 1993; Premack & Woodruff, 1978; Wimmer & Perner, 1983). ToM includes one's ability to understand another's desires, beliefs, and knowledge. Sometimes ToM is called

'folk psychology' or 'mind reading skills' (Blijd-Hoogewys et al., 2008). In the current study, ToM refers to the child's mind and how the child understands the beliefs or feelings others. For example, children who *have* ToM understand that when they share it makes others happy or when they hit someone it makes that other person sad or upset. Also, when a child expresses a desire to "have a turn", a child would share or not share responding to a desire. ToM describes how children understand how others may be thinking or feeling.

Zone of Proximal Development (ZPD), developed by Vygotsky (1978), describes the place where children are between actual developmental levels and potential developmental levels while under peer or adult guidance, through demonstration or other cues. Teachers, parents, or peers scaffold learning to assist children in the ZPD.

1.9 Dissertation Overview and Structure

This dissertation is divided into five chapters. Chapter 1 introduces the reader to an overview of my research including the purpose, statement of the problem, research questions, and a brief description of the theoretical framework. Chapter 2 is a literature review that explores the concepts of prosocial and antisocial behaviours through socialization, ToM and theory of nasty minds. Chapter 2 includes a discussion of M&T and digital literacy with iPads in ECE, to provide an understanding of how this research contributes to the literature.

Chapter 3 presents the methodology used for this study including the research design, data collection, and data analysis. This research used mixed methods framed in the methodologies of design-based research (DBR) and video ethnography. Grounded theory was used in the data analysis. The chapter presents each methodology, including: a brief history, other studies that have used these methods, challenges with the methodology, and a synthesis of

how DBR and video ethnography were used in the study. Also included is a description of how data collection was carried out using iterations as recommended by DBR (i.e., the feasibility study prototype test, the field study, and the definitive test). Chapter 3 concludes with a description of how data were analyzed using grounded theory. Chapter 4 presents the findings. The chapter is organized by the iterations of the prototype test, the field study, and the definitive test. These results are presented through the iterations and are further discussed through each research question and key themes. Chapter 5 concludes the dissertation by providing a summary, discussing the strengths and limitations of the current study, and the implications for future practice, policy, and research.

Chapter 2: Literature Review

2.1 Introduction

This chapter, organized thematically, explores the concepts of prosocial behaviours and ToM in preschool-aged children. The current research on prosocial behaviours focuses specifically on sharing behaviours. Sharing behaviours are developed at young ages (2-5), similar to ToM, emerging as early as age four. This chapter explores the challenges of aggressive and antisocial behaviours and the theory of nasty minds, and the use of M&T in ECE classrooms or spaces (Happé & Frith, 1996). The discussion of M&T in ECE focuses on tablets (i.e., iPads) in classrooms, including challenges and benefits of their presence. Based on a thorough review of current literature, researchers have a very limited understanding of how new devices, such as iPads, shape manifestations of ToM or configure into the development of prosocial sharing behaviours. This literature review concludes by describing the need for continued research in this area. In particular, as M&T has become ubiquitous and continues to become more accessible to young children, our understanding of the impacts of M&T needs to be continuously researched.

2.2 Methods for Conducting a Literature Review

Seven large databases were searched for articles, including: Canadian Business and Current Affairs (CBCA) Complete, Education Research Complete (ERC), Education Resources Information Centre (ERIC), Education Source, JSTOR Collection, PsycINFO, and Web of Science. Additionally Proquest Dissertation and Theses database was also searched. Authors and subjects were searched within these databases. A general library search and an Internet search

engine were also used to identify any materials that may have been overlooked by the constrained search terms.

2.3 Search Strategy and Criteria

The following terms and combinations were used for the literature searches: ‘preschool education’, ‘early childhood education’, ‘preschool children’, ‘preschool’, ‘four year olds’; ‘prosocial’, ‘prosocial behaviour(s)’, ‘altruism’, ‘sharing’, ‘cooperating’; ‘theory of mind’, ‘mind reading’, ‘feelings’, ‘empathy’; ‘technology’, ‘media’, ‘iPads’, ‘tablets’, ‘touchpads’, ‘mobile devices’. The inclusion criteria comprised of studies involving prosocial behaviours and sharing, ToM, M&T with iPads in preschool classrooms or with preschool-aged children in ECE settings. In the initial search, over 1000 articles and books were identified. Articles and books were removed for the following exclusion criteria: research involving adults, newsletters, technology reviews, pedagogical approaches for teachers, as well as any duplicates.

Several themes emerged from this search, including: social behaviours for preschool-aged children, antisocial behaviours for preschool-aged children, ToM in preschool-aged children, and M&T use in ECE. The following sections will thematically discuss the final results of these searches.

The first section will explore the sub-themes that emerged from the literature review of social behaviours for preschool-aged children, including: prosocial behaviours for preschool-aged children, sharing behaviours for preschool-aged children, how social behaviours influence sharing, and antisocial behaviours of preschool-aged children.

2.4 Social Behaviours for Preschool-Aged Children

Children exhibit a variety of behaviours at a very young age by mimicking their parents' actions, language, and watching every move that everyone makes around them as part of social learning (Bandura, 1977; Plowman, McPake, & Stephen, 2008). The early behaviours are positive and negative. They could be learning their please and thank yous. They could be learning how to pick their nose. They could be learning how to say hello or goodbye or they could be learning curse words. Learned behaviours are based upon the social situation in which they are immersed. In many social situations, whether at home or at school, children are learning both prosocial and antisocial and aggressive behaviours. The following sections address prosocial behaviours and especially sharing behaviours.

2.4.1 Prosocial Behaviours of Preschool-Aged Children

The term prosocial behaviour is not commonly used, but has positive connotations. The word 'prosocial' does not appear in many non-academic dictionaries and is an unfamiliar term to most people. The academic term "prosocial" refers to an act intended to benefit others, for reciprocal or non-reciprocal purposes. Bergin et al. (1995) describe these behaviours as characteristics of a child "who is good at making other people feel good" (p. 84). The positive behaviours can be contrasted with antisocial and aggressive behaviours that offend or attack others (Belacchi & Farina, 2012). As early as 18 months old, children are under heteronomous conditions in which the children are dependent upon another person, parent, guardian or teacher, who encourage the increased relational cognitive mechanisms that further socialization (Piaget & Inhelder, 1969). In other words, parents, teachers or siblings externally encourage initial prosocial behaviours as young children's internal processing emerges. As children begin to

internalize sharing behaviours, there is a transformation of behaviour from interpersonal to intrapersonal (Vygotsky, 1978). The initial external mental processes become internal. The behaviours are structured by moral realism in which "obligations and values are determined by the law or the order itself" (Piaget & Inhelder, 1969, p. 125). Moral reasoning is indicative of age and young children are capable of preconventional morality based on social reinforcement (Kohlberg, 1958). For example, children tell the truth because their parents have told them it is bad to lie or they share their toys with their siblings because their parent or teachers have instructed that this is how to behave properly. Literature suggests that prosocial behaviours are internalized by a child's second birthday (Alper, 2013; Brownell, Iesue, et al., 2013; Dunfield, 2014; Eisenberg-Berg, Haake, Hand, & Sadalla, 1979; Radke-Yarrow et al., 1976). For example, Brownell, Iesue, et al. (2013) describe how 18-24 month old children (n=51) participated in sharing tasks. They found that children who were 24 months old shared more spontaneously and frequently than 18 month old children. Prosocial behaviours are essential parts of children's cognitive developments, socialization, and contribute to school readiness and success (Hartas, 2011; Ramaswamy & Bergin, 2009).

Three types of prosocial behaviours include: helping, comforting, and sharing. My research focuses on sharing; however, I also provide brief explanations of the other prosocial behaviours.

Helping. Children are willing to help others when participating in activities that encourage alleviating someone's need for assistance (Dunfield, 2014; Dunfield et al., 2011; Radke-Yarrow et al., 1976; Warneken & Tomasello, 2013). For example, a researcher would put an object out of their reach in such a way that the object would be closer to the child than to them. The researcher would then try to reach for the object and see if they would pick up and

pass the object back (Dunfield et al., 2011; Warneken & Tomasello, 2013). If the child assisted the researcher then a prosocial helping behaviour occurred.

Comforting. Another prosocial behavior exhibited by preschool-aged children is comforting. Dunfield et al. (2011) define comforting as an action to alleviate an emotional need and recognizing that someone is in a negative affective state. For example, when a child expresses some sort of pain, another child provides a source of comfort by providing physical reassurance (such as a hug) or a verbal reassurance (asking if they are okay) (Dunfield et al., 2011).

As I have briefly described helping and comforting behaviours, I now provide a more detailed description of sharing behaviours, as one of the primary foci in my research.

2.4.1.1 Sharing Behaviours for Preschool-Aged Children

Sharing may be caused by an individual's willingness to share or give ideas, belongings, and feelings (Bergin et al., 1995; Brownell, Iesue, et al., 2013). As described earlier, sharing can also refer to an individual acting to benefit another individual by offering, showing, allowing use, or turn taking of an object that can be encouraged by reciprocity. Reciprocity describes the action of sharing with those who have been generous in return (Feldman et al., 2013; Fujisawa et al., 2008; Hay et al., 1999; Warneken & Tomasello, 2013). A reciprocal action is responding to a positive action with a similar positive action. As an exchange of favours occurs, especially when it is an exchange of items, individuals become more prosocial. However, an exchange of favours does not always need to be tangible. It can be a simple hug or thank you given in return. Early in life, reciprocity occurs between parents and children that supports early socialization skills (Feldman et al., 2013). In particular, Feldman et al. (2013) studied 86 families observing mother-

child and father-child reciprocal behaviours. They found that children who had experienced mother-child or father-child reciprocity demonstrated lower aggression and higher social competence in social situations at school. As infants become toddlers, sharing reciprocity transfers from parents to the inclusion of peers. Many studies suggest that children are more likely to share with their friends as they progress throughout ECE (Hay et al., 1999; Paulus et al., 2013; Paulus & Moore, 2014; Warneken & Tomasello, 2013). Moreover, friendship and reciprocity are affiliated by the balance of social contracts in which children expect a reciprocal friendship (Fujisawa et al., 2008). A social contract is reflective of the social exchange theory wherein there is an expectation of balance between have, give, and take within a relationship.

Sharing occurs to benefit a recipient, such as sharing a toy, a cookie, or a sticker to a friend who is sad or crying. Even though sharing can begin as early as 18 months, the aptitude for sharing tends to increase with age (Sommerville, Schmidt, Yun, & Burns, 2013). However, as children approach the age of five and up they may exhibit increased selfishness as they more actively calculate merit and the personal cost of sharing (Warneken & Tomasello, 2013). Contradicting research suggests that sharing does not decline and children are more prosocial as they get older (Persson, 2005; Sommerville et al., 2013). For most children, age is not a factor; rather, sharing is dependent upon the cost of sharing. The cost of sharing can be understood as a potential loss, or a risk of embarrassment by giving away something or an action not being reciprocated by another individual (Chernyak & Kushnir, 2013). Literature states that children are less likely to share and exhibit increased selfishness when the cost is high (Dunfield, 2014; Dunfield et al., 2011; Moore & Macgillivray, 2004; Paulus & Moore, 2014; Warneken & Tomasello, 2013). Cost can cause a change in the relationship reflective of social exchange theory. A child may become friends with someone else based on the chances of having a better

relationship with someone else, someone who decreases the cost of sharing. As prosocial behaviours develop throughout childhood, children are carefully navigating social situations. They are attempting to understand relationships and how social behaviours influence these relationships. They are also attempting to understand ownership.

Around the age of two, children are figuring out what is mine, what is yours, and what is worth sharing. As the understanding of ownership increases, the willingness to share may decrease (Brownell, Iesue, et al., 2013). Children will likely share if it does not require giving everything up. Children's decisions may be between a costly choice, a non-costly choice, and no choice (Chernyak & Kushnir, 2013). A costly choice is the choice of keeping something for you or sharing it completely with someone else. Sometimes children do not want to share if it requires a sacrifice. For example, if they have a sticker and can choose to keep it or share with someone else completely, the costly choice may impede a sharing behaviour. However, many younger children have demonstrated costly sharing acts (Chernyak & Kushnir, 2013; Kuhlmeier, Dunfield, & O'Neill, 2014). For example, children will share a sticker with a sad puppy rather than keeping it for themselves in order to make that puppy happy (Chernyak & Kushnir, 2013). A non-costly choice is sharing an item and keeping an item with no loss. In this case, they have two stickers and can keep one and share one or keep both. No choice means they are instructed to share the resource and do not get to decide. No decision is reflective of social norms and social learning theory when parents and teachers instruct the child to share or to take turns. Sharing is more frequent when it is a non-costly act (Brownell et al., 2009; Paulus et al., 2013; Paulus & Moore, 2014).

Children share more often when they have participated in sharing or prosocial behaviours previously (Chernyak & Kushnir, 2013; Paulus et al., 2013). Children tend to share more when

they have more items to share yet those with very little can be very generous. Young children are beginning to understand ownership, but they are also beginning to understand justice. Many children believe in the fair distribution of goods. They believe that goods should be quantitatively equally divided (Dunfield, 2014; Sommerville et al., 2013). The primary belief for most young children is the distribution in equal numbers. However, as children mature, they begin to understand value. Children, generally above two years old and more increasingly at the age of five, understand that some items are more valuable than others and distribution is not about quantity; rather it is an exchange in value (Chernyak & Sobel, 2015; Fujisawa et al., 2008). For example, if children are given three stickers, but one is special with sparkles, children may value the special sticker as worth two of the regular stickers and may share in other, non-equal number ways.

Moreover, in order for children to share, they need six skills, as suggested by Eisenberg (1982), connecting to the theories described in Chapter 1. Children should have the ability to:

- consider a variety of alternative acts,
- understand the importance of intention to act,
- recognize the other person's needs,
- empathize,
- reason morally according to past conceptual principles, and
- self-regulate one's behaviour (p. 200).

The six prosocial abilities listed above are what Eisenberg (1982) suggests that one needs in order to behave in a prosocial way and what is needed to share. These abilities may occur all at once, or maybe only one is the motivating factor behind the prosocial act.

In this section, I identified key ideas regarding sharing. In particular, sharing includes offering, showing, allowing use, and turn taking. I described reciprocity, its connections to social exchange theory, and how reciprocal actions can create positive outcomes in a child's future. Also, I described the different costs of sharing, as well as the six skills needed in order to share. The next section describes antisocial behaviours.

2.5 Antisocial Behaviours for Preschool-Aged Children

For preschool-aged children, antisocial behaviours are more accurately identified as aggressive behaviours. In contrast to prosocial behaviours, antisocial behaviours are often hostile and aimed at a victim through direct or indirect aggression (Belacchi & Farina, 2012; Hatakeyama & Hatakeyama, 2012). Antisocial behaviours can be proactive, hostile aggression or reactive, defensive aggression for preschool-aged children (Persson, 2005). Proactive aggression is a goal-oriented behaviour in which the aggressive behaviour will cause a reward, for example, a robbery. Hostile or reactive aggression is often displayed in retaliation to something. A child hits another child and then they hit back. Defensive aggression is usually when a child is being picked on and they are defending an attack with a reason. Impeding prosocial behaviours includes a child maintaining possession and protecting the area that the object is located, or even pushing, hitting, kicking, or performing other physical abuse towards another child (Eisenberg-Berg, 1981; Eisenberg-Berg et al., 1979). Often children exhibit antisocial behaviours to defend a favourite object or play area. For example, children will verbally defend an object or play area by crying or screaming loudly when a toy they are playing with is taken away or saying "no" when someone else tries to play with them. Antisocial and aggressive behaviours are dependent upon others through socialization and can have negative influences on academic futures.

Unfortunately, children who exhibited antisocial behaviours, or children lacking prosocial skills have a much more difficult time in future education settings. “Prosocial behavior predicts academic achievement and social adjustment in school” (Ramaswamy & Bergin, 2009, p. 527). Children who are antisocial often have competency and academic failures (Hartas, 2011; Ramaswamy & Bergin, 2009). Many children “may lack the ability or motivation to act for the benefit of another person” (Persson, 2005, p. 83). Early manifestations of antisocial behaviour could be associated with a lack of understanding, underdeveloped empathy, or a pre-ToM state. For my research and purposes of simplicity, I use antisocial as the primary term.

This section described how antisocial behaviours could influence a child’s social and academic future. The following sections describe how social behaviours influence the socialization of children.

2.6 How Children’s Social Behaviours Influence Children’s Socialization

As children enter an ECE classroom, their exposure to social situations expands. Literature states that socialization is essential to cognitive development (Brownell, Svetlova, et al., 2013; Dunfield, 2014; Eisenberg-Berg, 1981; Vygotsky, 1978). Socialization is described as a learning process that involves the development of an individual’s sense of self (Sharp, 2015). Vygotsky (1978) suggests that early socialization impacts an individual’s ability to learn. Socialization impacts affective systems during the emergence and development of prosocial behaviours and increased socialization encourages prosocial behaviours. For example, children who are less interactive with peers are less likely to share with other children (Eisenberg-Berg, 1981). Socialization skills or lack of skills can create a division amongst children. Children who exhibit prosocial behaviours may not want to affiliate with antisocial or aggressive children.

Children often form friendships based on peer affiliations (Dahl, Schuck, & Campos, 2013; Eivers, Brendgen, Vitaro, & Borge, 2012; Fabes, Hanish, Martin, Moss, & Reesing, 2012; Fujisawa et al., 2008; Liao, Li, & Su, 2014). With a ToM at work, children who display prosocial behaviours often affiliate or play with other peers who also display prosocial behaviours. In other words, children will share toys with other children who also share toys. Children who display antisocial behaviours often affiliate or play with other peers who also display antisocial behaviours. Peers who are aggressive tend to associate with other children who are also aggressive (Eivers et al., 2012; Persson, 2005). If children with prosocial abilities associate with each other then antisocial or aggressive children have rare opportunities to interact with other children who are prosocial (Fabes et al., 2012). The different social interactions and peer affiliations have also demonstrated a gender division through expressed behaviours.

Social groups in ECE are often divided by gender. Boys play with boys and girls play with girls. Children are more likely to share with the same gender than the opposite (Hay et al., 1999; White, Ensor, Marks, Jacobs, & Hughes, 2014). A number of researchers suggest that boys are more aggressive and defensive than girls (Eisenberg-Berg, 1981; Eivers et al., 2012; Hartas, 2011; Radke-Yarrow et al., 1976). Aggressive children tend to associate with each other, as prosocial children spend time with similar peers (Eivers et al., 2012; Fabes et al., 2012). In the case of Eivers et al. (2012), boys displaying aggressive behaviours associated together, while girls displaying prosocial behaviours had strong peer relationships with other girls. Also, most girls rated aggressive behavior as unacceptable whereas boys viewed antisocial behaviours as more acceptable (Eivers et al., 2012). Girls are typically prosocial, especially when demonstrating sharing behaviours (Bouchard et al., 2015; Hay et al., 1999; Warneken & Tomasello, 2013; White et al., 2014). However, teachers and parents' normative beliefs often

posit traditional gender roles. Teachers associated higher empathy and prosocial behaviours to girls than boys (Belacchi & Farina, 2012; Bouchard et al., 2015; Fabes et al., 2012). Gender normative beliefs are based on gender stereotypes. Girls have typically been described as sweet nurturers who are more obedient than the counterpart boys who are competitive and aggressive (Gilligan, 1982). Some researchers found that gender did not predict actual behaviour (Alper, 2013; Bouchard et al., 2015; Fabes et al., 2012). In those cases, girls did not demonstrate more prosocial behaviours than boys. Gender divisions influence behaviour, but basic social skills more accurately reflects these divisions.

For some children, socialization develops through scaffolding. Learning in ECE is often affiliated with behavioural concepts (Vygotsky, 1978), such as prosocial behaviours and communication. For some children, internal processing of behaviours is encouraged or scaffolded by a teacher or parent who prompts learning in the zone of proximal development (ZPD). The ZPD is the place where children are between actual developmental levels and potential developmental levels while under peer or adult guidance, through demonstration or other cues (*Figure 5*) (Vygotsky, 1978).

Some children may share implicitly, whereas others may need encouragement or specific direction. For example, older siblings would share with their younger siblings and thus demonstrating sharing behaviours that would be mimicked by the younger sibling at another time (Van Berkel et al., 2015; White et al., 2014). Younger children's selfish behaviours detract from sharing with others (Hay et al., 1991). Therefore, sharing may need scaffolding by cues from researchers, parents, or teachers, including verbal or visual. In Brownell, Iesue, et al. (2013) and Brownell, Svetlova, et al. (2013) scaffolded sharing occurred through cues, such as: non-verbal, verbal, verbal and gesture, explicit request, and demonstration of sharing.

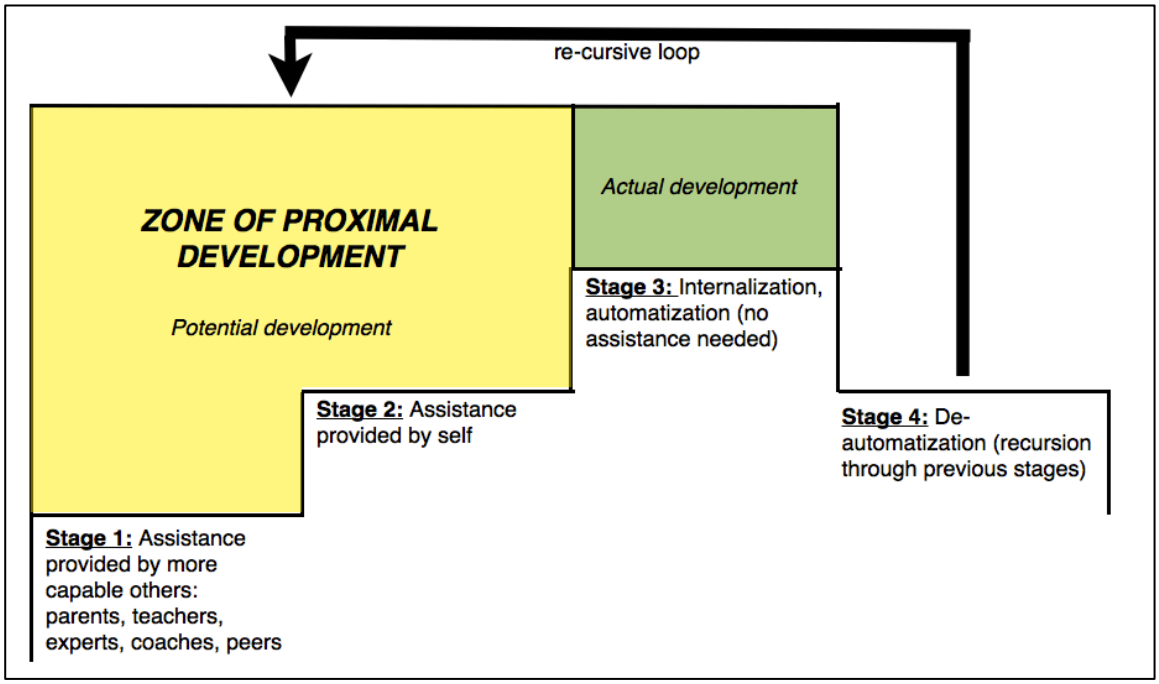


Figure 5. Zone of proximal development (ZPD).

This section has explored the complex situation of socialization by describing how children associate into divided groups. These behaviours can be affected by scaffolding. The following sections explore ToM and theory of nasty minds and their manifestations alongside of prosocial and antisocial behaviours.

2.7 Theory of Mind (ToM) in Preschool-Aged Children

To reiterate, ToM is an individual's ability to understand cognitive states of others, including their desires and beliefs. The mind encompasses thoughts, beliefs, intentions, and knowledge (Johnson & Wellman, 1982). ToM is a child's ability to understand the thinking or viewpoints of their peers. ToM contradicts Piaget's theory of an egocentric middle childhood

that describes children having difficulties understanding the viewpoints of others (Piaget, 1951). Piaget and Inhelder (1969) suggest that children have difficulties in taking the points of view of others, especially when the language of young children is quite egocentric. Once the child reaches the operations stage, age seven and above, he or she can speak from the point of view of others (Piaget & Inhelder, 1969). Additionally, ToM contradicts Kohlberg's moral reasoning in that children can only be in the preconventional morality phase (Kohlberg, 1958). Children can possibly be in the conventional or even postconventional morality phase. In other words, children can understand the importance of others and behave respectfully. Other research describes children understanding the point of view of others and the development of their ToM can progress from ages three to five (Yagmurlu, 2014) and be formally traced to appear by the age of four (Blijd-Hoogewys et al., 2008; Lane, Wellman, Olson, LaBounty, & Kerr, 2010; Song et al., 2012; Weimer et al., 2012). ToM suggests that Piaget's initial egocentric concepts and Kohlberg's phases may be inaccurate for some children. In other words, young children have the ability to understand other's feelings or thoughts and increases throughout their years in ECE (Doherty, 2008; Muller et al., 2012; Song et al., 2012; Yagmurlu, 2014). ToM can lead to peer acceptance by the age of five (Slaughter, Dennis, & Pritchard, 2002). In other words, when children demonstrate the ability to understand their peer's feelings and thinking they develop stronger peer groups. For example, a child who is empathetic towards their friend's feelings will maintain that friendship over an extended period of time. Children's ToM progresses through social interactions, which can strongly influence the development of their prosocial behaviors, reflective of social learning and empathy-altruism theories (Hay et al., 1999; Moore et al., 2011; Sutton, Smith, & Swettenham, 1999; Weimer et al., 2012; Wu & Su, 2014; Yagmurlu, 2014). For instance, if I have something I want, such as a cookie, I am happy. If that cookie is not given,

or taken away or is finished, I am sad. The simple feelings and emotional understandings are initially communicated through facial expressions (Weimer et al., 2012), such as smiling and laughing, or frowning and crying.

ToM was initially studied by Premack and Woodruff (1978) asking "Does the chimpanzee have a theory of mind?" This was followed by Wimmer and Perner (1983), who wanted to expand the initial study to include four and five year old children. Wimmer and Perner (1983) began the false-belief task, as the method to study ToM. The false belief task tests a child's ability to predict what another person will think based on misleading information (Blijd-Hoogewys et al., 2008; Doherty, 2008; Moore & Macgillivray, 2004). One test is the Smarties test that allows children to see a pencil put into a Smarties container and the children are asked what another person will think is in the container. The children have the true belief and the other person will hold an incorrect belief as they did not see the pencil put into the Smarties container. Children are successful if they understand that people act based on their beliefs, even if the beliefs are wrong (Blijd-Hoogewys et al., 2008). ToM tasks continued to provide evidence that children around the ages of four and five are capable of maintaining a ToM. Additional tasks include: emotion recognition, desire-based emotion, seeing-leads-to-knowing, line of sight, inference of perception based action, belief- and reality-based emotion, second order emotion, message-desire discrepant, second-order false belief (Appendix F) (Flavell, 1992; Fodor, 1992; Hadwin, Baron-Cohen, Hawlin, & Hill, 1996; Hutchins, Bonazinga, Prelock, & Taylor, 2008; Hutchins, Prelock, & Bonazinga, 2011; Mitchell, Saltmarsh, & Russel, 1997; Silliman et al., 2003; Sullivan, Zaitchik, & Fager-Flusberg, 1994).

Recently, a survey conducted by *Sesame Workshop* called 'K is for Kind: A National Survey on Kindness and Kids' described three-quarters of parents and four-fifths of teachers

worrying that the children live in an unkind place and underline "the importance of having strong social-emotional skills" (Durand, 2016). Social cognitive comprehension and emotional understanding are essential to prosocial or antisocial behaviours (Liao et al., 2014; Moore et al., 2011). Certain emotions can cause an empathetic response where children are developing an understanding for the mental states of others (Moore & Macgillivray, 2004), which can guide prosocial behaviours. Not only should children understand mental states, but they need to care about the mental states (Moore & Macgillivray, 2004). Children can understand that someone is sad, but they also need to care that the person is sad. Parents and teachers want children to care and not live in an unkind place. When caring occurs, young children may exhibit prosocial behaviours. For example, a child can understand that someone is sad and want to share an item, a cookie, with them to make them happy instead of sad. Young children are aware that prosocial actions can have emotional influences (Paulus & Moore, 2015). Wu and Su (2014) suggest that children have a better understanding of the desires of others and thus share more spontaneously in response to predicted desires. Spontaneous sharing and a better understanding of the desire of others could be ascribed to the development of ToM at the age of four. In particular, they found children shared more spontaneously, more quickly and more items when their ToM was advanced (Wu & Su, 2014). Researchers suggest how sophisticated ToM and emotional understanding can incite children to focus on the needs of others and behave in prosocial ways.

ToM has progressed through empirical research and has limited critiques. See Hobson (1991); Hutchins et al. (2008); Hutto (2008); Leudar and Costall (2009); McCabe, Leudar, and Anataki (2004); Reddy (1991); Reddy and Morris (2004); Zahavi (2002) for more detailed concerns with ToM. These researchers critique ToM's methods, assumptions, and philosophy of mind. They suggest that ToM has issues regarding methods and measurement resting on

assumptions and philosophy to assume that ToM is observable and accurate. In particular, one of the main critiques is the problematic measures of ToM using the false-belief task (Hutchins et al., 2008; Leudar & Costall, 2009). My research suggests that this measure and other task test measures are not necessarily the most accurate measure of a child's ToM. Despite these concerns, ToM is commonly linked to prosocial behaviours in ECE research (Eisenberg et al., 2014; Hay et al., 1991; Hay et al., 1999; Liao et al., 2014) and will be discussed as part of this research. ToM, as one of the motivators for behaviours, will be discussed in more detail in Chapter 4.

This section described ToM and how empathy emerges through emotional understanding, which can encourage children to behave in prosocial ways. As children negotiate initial social interactions, understandings can be influential towards prosocial behaviour or antisocial behaviours. The following section describes when someone has a negative ToM, also known as the theory of nasty minds.

2.7.1 'Nice' or 'Nasty' Theory of Minds

Early ToM tests, such as the Smarties test, were use to describe a neutral ToM (Blijd-Hoogewys et al., 2008; Doherty, 2008; Moore & Macgillivray, 2004; Wimmer & Perner, 1983). However, Happé and Frith (1996) suggest the need to explore and identify a distinction between 'nice' and 'nasty' ToM. They developed a 'theory of nasty minds' based on a study of children from troubled homes. As a possible motivation for nice or nasty behaviours, a nice or nasty theory of mind can contribute to how a child acts. Nasty behaviours include antisocial behaviours, such as bullying, excluding, manipulating, lying and spreading rumours (Liao et al., 2014; Renouf et al., 2010; Ronald, Happé, Hughes, & Plomin, 2005; Sutton et al., 1999;

Yagmurlu, 2014). Nasty behaviours can be social or relational or physical actions (Liao et al., 2014; Renouf et al., 2010). Physical aggression is often the first aggression exhibited, as children hit or pinch or bite when their desires are unmet and can be expected when children's language is underdeveloped. As children develop language and communication, physical aggression becomes unnecessary; however, physically aggressive acts still occur.

We often associate physical aggression with stereotypical forms of bullying. In traditional cartoons, we have seen characters like Bluto from *Popeye* or Biff Tannen from *Back to the Future.* Traditional bullies are cast as 'oafish' and large, stupid, and pick on someone who is a lot smaller or smarter. Bullies often resort to physical aggression, like Bluto punching Popeye in the face or Biff bashing his knuckles on George McFly's forehead. The traditional bullies also rely on verbal abuse such as name calling, like Biff often calling people 'buttheads'.

ToM, or a person's ability to understand the cognitive state of others, can increase indirect aggression (Renouf et al., 2010). Indirect aggression takes place when ToM is quite advanced and a person becomes a skilled manipulator (Renouf et al., 2010; Ronald et al., 2005; Sutton et al., 1999; Yagmurlu, 2014). In modern films, skillful manipulation was impressively demonstrated by *Mean Girls* character Regina George. She demonstrates sociocognitive skills where bullying becomes indirect and relational rather than direct physical aggression (Liao et al., 2014; Sutton et al., 1999). In contrast to other aggressive behavior research, females tend to have nastier ToM than males (Liao et al., 2014; Ronald et al., 2005). Regina George displays traditional bullying manners through verbal abuse by calling her 'friend' a 'whore'. However, her power actually comes from manipulation. If her 'friends' don't wear the right colour, they can't sit with her. If people bother her, she spreads rumours. If she wants empathy from her peers, tears come easily to her eyes and are just as easily wiped away. The level of Regina's

nasty mind is quite high. As Regina gets nastier, the more her friends crave her approval and acceptance. She manipulates situations to her benefit. Her ToM is quite remarkable, as she understands when people are upset by her actions and uses this to further control the situation. Unfortunately, many of her 'friends' and schoolmates have difficulties removing themselves from this toxic situation because of their need to fit in or their affiliation with like-minded peers. Children who have strong prosocial behaviours tend to avoid this type of indirect aggression (Renouf et al., 2010). Even though prosocial behaviours are desired over aggressive or nasty minds, social conflict can promote the development of understanding (Doherty, 2008). Having children participate in problem solving situations allows them to develop further understanding when conflict arises. Often ToM and strong prosocial behaviours can lead to conflict resolution, which continues to emerge and evolve throughout childhood.

In this section, I described the spectrum of ToM, from nice to neutral to nasty, and how it influences peer affiliations in school. Understanding the emergence of ToM at the age of four can influence decisions for future pedagogical approaches in ECE. The following section focuses on themes related to M&T, including, M&T in ECE, digital literacy and multiliteracies, iPads, challenges using M&T, and concluding with why we need M&T in ECE.

2.8 M&T Use in Early Childhood Education (ECE)

Computers, and earlier technological devices were much more socially designed, providing a focus for social interaction and encouraging cooperation; however, computers and mobile devices have also hindered social interaction (Turkle, 2015). In many instances, school computers were located in the low-traffic and removed-from-play areas, while in other instances laptops and devices preoccupy children and adults in all locations of the home (Plowman &

Stephen, 2007). Additionally, the initial adoption of M&T was impeded by the need for constant supervision to ensure no damage would occur to these fairly expensive devices. As M&T devices have become more cost effective and mobile, the constant need for supervision or the storage of devices in secure and out of the way places has shifted if not significantly reduced; however, numerous other problems, such as cyberbullying, have arisen. In 2003, the computer to student ratio in Canada was 5:1 (Plante & Beattie, 2004). At this point, only half of the computers were located in the classrooms and half were placed in computer labs located somewhere else in the school (Plante & Beattie, 2004). Computer location and types of devices have changed, as many schools have more mobile devices and mobile labs than stationary labs. For example, in districts such as West Vancouver, a majority of their elementary students use iPads (Bains, 2014). As indicated earlier, in the US, over 4.5 million students use tablets every day (Etherington, 2013). The increase and shift of mobile devices infiltration into classrooms has prompted a shift in the pedagogical approach to M&T.

M&T have seemingly enriched ECE classrooms, which perhaps is most pronounced in Montessori and Reggio Emilia programs; however fierce debates on distinctions between and value of 3D physical and digital M&T artifacts or objects within ECE remain (Healy, 1998; MediaSmarts, 2013; NAEYC, 2012; Neuman & Neuman, 2014; Turkle, 2015). In Healy (1998), the participants interacted with 3D physical tablets and other objects as well as with digital images (moving and still) or virtual objects. In Neuman and Neuman (2014), the literature reviewed describes how tablets with print-based designs encourage the development of early literacy skills. Plowman, Stevenson, Stephen, and McPake (2012) explore how children interact with toys and technology in home settings. In particular, they look at digital devices including: computers, mobile phones, DVDs, game consoles, MP3 players, and traditional toys, such as

pretend play, puzzles and jigsaws, toys and dolls, cars, and musical instruments. In this 14 family case study, one-third to one-quarter of the toys had some technological element (Plowman et al., 2012). More research needs to be conducted to explore further impacts of digital devices, especially as newer devices enter the market.

This section briefly summarized changes in digital forms of M&T in classrooms. The following section explores definitions of digital literacy and how multiliteracies shift educational experiences.

2.8.1 Digital Literacy and Multiliteracies

As M&T increasingly influence curriculum and pedagogy, students develop digital literacies, albeit of various forms. Kang (2012) compiled two definitions from Futurelab's *Digital Literacy across the Curriculum Handbook* and the European Information Society:

- To be digitally literate is to have access to a broad range of practices and cultural resources that you are able to apply to digital tools. It is the ability to make and share meaning in different modes and formats, to create, collaborate and communicate effectively and to understand how and when digital technologies can best be used to support these processes.
- Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (p. 1067)

Definitions of digital literacy tend to derive from Gilster (1997): "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (p. 1) (Bawden, 2008). Lankshear and Knobel (2008) note the cluster, umbrella, or "web" of literacies typically associated with digital literacy: "ICT/computer literacy, information literacy, technological literacy, media literacy, communication literacy, visual literacy, network literacy, e-literacy, digital competence, digital Bildung, and the like" (p. 4). For instance, MediaSmarts (2013) adopts the "umbrella" approach for 'Digital Literacy Fundamentals'.

These definitions reveal the difficulties in supporting learners to become digitally literate and the difficulties in achieving digital literacy. The complexity of digital literacy also includes the use of: interactive media, such as software programs, applications (apps), broadcast and streaming media, television, eBooks, the Internet, and other content to "facilitate active and creative use by young children" (NAEYC, 2012, p. 1). On mobile devices, an app is a software program that is designed for a particular purpose. Apps' purposes range from social media to banking to maps to gaming to much more. Digital literacy has been slowly adopted as part of core curricular outcomes. In particular, the use of iPads have rapidly encroached the market with over 3 million sold in the first weeks of release in 2010 and over 338 million sold by 2016 and have been used to "facilitate the development of emergent literacy skills" in controversial ways (Apple, 2015, 2016, 2017; Neuman & Neuman, 2014, p. 231). For example, Dennis (2016) tested an intervention to teach verbs using an iPad app, *Book Writer*, and the results indicated some positive gains in expressive vocabulary. Also, Neuman and Neuman (2014) describe how some apps can support the pre-alphabetic stage of reading development by understanding the meaning from the icons or symbols on the touch screens. Children are able to use iPads when

they are in preliterate stages. Even if they cannot read text, children are able to derive meaning from the symbols or icons on the touchscreens as well as configure the devices themselves (Neuman & Neuman, 2014; Plowman et al., 2012). For example, a young boy cannot read text, but he was able to recognize the graphics and logo of Disney's *Toy Story* app and select it to play (Learmonth, 2010). M&T demand reflective practice for digital, media and technological literacies and multiliteracies, and raise questions of the nature of literacy and postliteracies (Petrina, 2014).

Multiliteracy expands upon traditional print literacy (Alper, 2013; Beschorner & Hutchison, 2013; Jenkins, 2006) and encompasses skills of multi-modality and operational skills in communication and cultural conventions (McPake et al., 2013). Additionally, apps have been created to expand on these literacies such as letter names, sounds, phonological awareness, and early writing (Neuman & Neuman, 2014). These apps address some of the skills identified with digital literacy. Children also communicate through speaking, symbol recognition, and the production of written language including the use of touchscreens or keyboards. As they begin to communicate, they may or may not understand and develop cultural conventions, such as politeness, taking turns or other prosocial behaviours. Learning to be literate and the development of prosocial behaviors include interpreting signs and sense-making (Rowsell & Harwood, 2015). Devices, such as iPads, can encourage this sense-making as preschoolers will poke, touch, swipe, and pretend, to demonstrate their emergent multi-literate behaviours (Roskos, Burstein, & You, 2012). Children are in a pre-digital literacy stage. Similar to a pre-literacy stage when a child learns to hold and turn pages of a book or begins to recognize letters, attributes can be attributed to a pre-digital literacy stage; for example, learning to hold the iPad,

touching, swiping, or tapping, and recognizing app symbols. However, sometimes a child's M&T home life is not always reflected in schools and vice versa.

Informal or home settings continue to outpace the learning of digital literacies in school (Aronin & Floyd, 2013; Wang, Hsu, Campbell, Coster, & Longhurst, 2014). By the time children are entering ECE they have had access to range of devices, such as mobile phones, smartphones, televisions, game consoles, DVD and MP3 players, tablets, iPods, iPads, as well as desktop and laptop computers (Aronin & Floyd, 2013; Plowman et al., 2012). Many researchers have encouraged the continued education of practitioners to incorporate multiple devices into their classrooms (Flewitt et al., 2014; McPake et al., 2013). Some literature suggests that there is deeper learning, increased motivation, more independent work, and increased confidence and curiosity through enthusiastic use of M&T (Flewitt et al., 2014; Lynch & Redpath, 2014; O'Hara, 2011).

In this section, I briefly reviewed definitions and concepts of digital literacies and multiliteracies and described how digital devices are infiltrating both homes and schools. In the following section, I consider the influence of tablets, and in particular iPads on education and development.

2.8.2 iPads

There are many mobile devices that children access; however, tablets, and in particular iPads have more recently infiltrated classroom settings. iPads have multiple uses that may be limited in other tablet devices (Crescenzi, Jewitt, & Price, 2014; Rowsell & Harwood, 2015). The features of touch in iPads are important for young children. The iPad, in particular, allows for wider ranges, more touches, and more complex sequences for touch than other tablets on the

market (Crescenzi et al., 2014). For example, multiple children can touch an iPad at the same time, which is restrictive in some apps and in other devices as well. Also, iPads have recently upgraded with more accurate finger tracing than other devices on the market. As touch is essential to young children's development, iPads complex touch features are less constrained than other devices. Typically, digital devices impact us on audio-visual levels, watching with limited interaction; however, iPads allow for a haptic dimension. Touch interfaces influence cognitive abilities, as touch is a primary form of interaction for young children and it extends their understanding (Crescenzi et al., 2014; Mangen, 2010; Neuman & Neuman, 2014). Even though early touch interactions may be referring to physical contact with other people, the touch interaction with iPads is still an influential part of extending understanding. Moreover, haptic perception through tactile senses takes children beyond scanning and browsing into more interactive behaviours (Mangen, 2010; Roskos et al., 2012). Preschool-aged children's fine motor skills are less developed, but they are able to use their fingers in various apps (Moyer-Packenham et al., 2015). These apps continue to help refine children's fine motor skills. iPad features are often included in other tablet devices; however, based on literature, previous research, and the abilities listed above, I will focus on iPad devices specifically.

iPad devices have become more portable, affordable, and efficient (Flewitt et al., 2014; Karsenti, 2013; Lynch & Redpath, 2014). Since iPads entered the market only in the last six years, and more recently in schools, research is quite new, but it is rapidly occurring. iPad devices allow for material, physical, and virtual productions, as well as multiple opportunities to blend these together (Rowsell & Harwood, 2015). Additionally, iPads are one of the most "cutting-edge, culturally powerful yet enigmatic technological tools" for young learners that are

available (Flewitt et al., 2014, p. 3).[2] Apple's education program encourages the purchase of iPads for schools as they offer high volume discount prices of devices and apps (Apple, 2015). There are over 250 million iPads sold offering over 2.2 million apps and in particular over 300,000 for children (Alper, 2013; Apple, 2015, 2017; Hendela, 2014). Additionally, iPads are used in education more than other tablet devices predominating the market at 75% worldwide and 90% of the Canadian education market (Karsenti, 2013). For the US, 58% of parents claim to download apps for their children, making it not surprising to see preschool and toddler apps as the most popular category in the app store, monopolizing 72% of top paid apps (Common Sense Media, 2013; Shuler, Levine, & Ree, 2012).

Based on market trends, the influence of iPads in the classroom continues to grow and there are many benefits in choosing to integrate iPads into current curriculum. These include: increased social learning, communication and collaboration, creativity, motivation, concentration, and independence. Children's social learning is fostered by communication and collaboration allowing for cognitive growth through social interaction (Beschorner & Hutchison, 2013; Plowman et al., 2012). The use of iPads fostered communication and collaboration with peers, but also between teachers and students (Karsenti, 2013; Roskos et al., 2012). Moreover, iPad integration supports multiple forms of communication through various modes of media that allow oral, written, and graphic communication that enable the majority of children to participate in multiple activities that may be restrictive in other devices or low-tech options (Flewitt et al., 2014; McPake et al., 2013). The multimodal approach encourages creative endeavors. Children use a variety of apps to create multimedia products including voice recordings, video recordings,

[2] Disclosure: I am an avid early adopter and user of Apple products in my teaching practice, and for the purposes of research, have expertise with iPads.

graphics, and text (Arnott, Grogan, & Duncan, 2016; Flewitt et al., 2014; Karsenti, 2013; McPake et al., 2013). Creativity encourages independent thinking and the ability to produce and think on an independent level is fostered through iPad use (Flewitt et al., 2014; Lynch & Redpath, 2014; Masek, Murcia, & Morrison, 2012). Educators can use iPads to allow learners to work at different paces and styles (Masek et al., 2012). Children become independent users much more quickly than they did with previous devices. iPad use further inspires increased motivation and concentration for students (Axelsson, Andersson, & Gulz, 2016; Flewitt et al., 2014; Lynch & Redpath, 2014; Masek et al., 2012). Children are able to make their own choices (Beschorner & Hutchison, 2013) and they enjoy working beyond skill and drill apps. Additionally, children are highly motivated with heightened concentration that allows for more advanced literacy skills and information technology skills (Flewitt et al., 2014; Karsenti, 2013).

Navigation on iPads, or more generally surface or touch devices, is easier than on other types of devices (Lynch & Redpath, 2014). Typically, teachers need to provide more technical assistance when using a desktop or laptop computer, as there are multiple access points and attachments. Software capabilities are more complicated on desktops and laptops. With iPads, children are able to navigate through apps and the touchscreens with minimal scaffolding, much more quickly than other devices (Flewitt et al., 2014; Karsenti, 2013; Lynch & Redpath, 2014). Children are able to use iPads more independently and require less help as iPads have simple operating systems (Lynch & Redpath, 2014). They suggest that the simplicity of closing the app and opening the app on the iPad often resolves the problem; an action that most children can do independently. The ease of use supports competence and increases individual motivation for children. The interface and simplistic aesthetics of iPads are abundant that allow children to move more quickly towards their potential developmental level. iPads are replacing traditional

large, standalone computers in classrooms. They are portable, light, and fairly small in size, with minimal buttons and simple software.

This section explored the numerous benefits associated with the inclusion of iPads in education. However, there needs to be continued research examining the influence of iPads and M&T in ECE classrooms, as this hardware and software continue to develop, and especially as the children who are in ECE now are the first generation to be born with iPads and various digital touch devices in existence. In order to explore research related to iPad use, challenges of M&T need to be explored. The following section explores the challenges of M&T.

2.8.3 Challenges with M&T

Criticisms and critiques of M&T are complex. For instance, the webpage for the American Academy of Pediatrics (AAP) dedicated to Media and Children recommends that parents and pediatricians limit screen time for children and offer non-electronic formats of entertainment, such as paper books or board games. They suggest that screen time strongly influences health and academics, but also provides access to questionable media content (American Academy of Pediatrics (AAP), 2014; Powell, 2014). The AAP's primary recommendation is for screen-free zones and to limit children over the age of two to no more than one or two hours a day. They also recommend that children under the age of two should not have any exposure to M&T, as their brains are developing and learn best from personal interactions and not screens. The AAP (2014) has described the benefits of limiting TV time, and even suggest hiding the remote.

One major health concern in the US is obesity that has been linked to increased screen time. The White House Task Force on Childhood Obesity (2010), with the assistance of Michelle

Obama, put forth through an initiation called 'Let's Move' in which a report supported the AAP's screen time recommendations and further encouraged more physical activity. Many studies suggest that there is a direct relationship between obesity through lack of physical activity and increased screen time (Chavarro, Peterson, Sobol, Wiecha, & Gortmaker, 2005; Ham, Sung, & Kim, 2013; Jordan & Robinson, 2008; Lacy et al., 2012; Olds, Ferrar, Gomersall, Maher, & Walters, 2012). Lack of physical activity has increasingly become a concern and there have been reports describing boys who were exposed to over three hours of screen time per day also had higher body-mass index and more fast food consumption (Ham et al., 2013). Additionally, these children were more adverse towards exercise. Girls were experiencing similar situations, when screen time was increased their body-mass index also increased (Chavarro et al., 2005). Some studies also suggest that children whose media screen time exceeded five hours a day had the highest body fat percentage and were at risk for obesity (Jordan & Robinson, 2008). The Canadian Health Measures Survey (CHMS) reports trends similar to the US. Factoring in excessive screen time, in the fall of 2016 the *ParticipACTION Report Card on Physical Activity for Children and Youth* gave Canada an F for sedentary behaviour and D- for the overall physical activity of its children and teens (ParticipACTION, 2016).

Lack of sleep is also related to increased screen time. Researchers suggest that lack of sleep has detrimental effects on children's activity levels and their ability to perform well in academic settings (Gentile, Li, Khoo, Prot, & Anderson, 2014; Magee, Lee, & Vella, 2014). Children's total media use was significantly associated with sleep duration (Magee et al., 2014). The more screen time, the less sleep. The less sleep, the lower the energy levels and the lower the performance in school. Low energy levels and low school performance can impact self-

esteem that causes emotional and peer problems. Additionally, emotional problems and poorer family functioning intensifies for each additional hour of screen time beyond the recommend two (Hinkley et al., 2014). Antisocial behaviours of children and exposure to media violence were directly linked; more exposure was equal to more antisocial behaviour (Gentile, Reimer, Nathanson, Walsh, & Eisenmann, 2014), including: peer victimization, bullying, and cyberbullying (Adams, 2012; Adams & Thompson, 2016; Gentile, Li, et al., 2014; Jordan & Robinson, 2008; Uhls et al., 2014; van Geel, Vedder, & Tanilon, 2014). Children are "in touch with their classmates and the world differently" through a digital wireless presence in their bedrooms rather than in a "relational community of the neighbourhood playground and streets" (Adams, 2012, p. 269). Turkle (2015) states that many of us have removed ourselves from the corporeal conversation and into a digital or virtual one. The projection into a digital or virtual community has led to a high level of anonymity and cyberbullying. Children's access to the Internet makes it easier to become narcissistic, anxious, antisocial, or aggressive as the anonymity and addiction is prevalent (Edwards & Pye, 2011; Rosen et al., 2013). Unfortunately, many subjects of peer victimization often ideated or attempted suicide (van Geel et al., 2014). As these detrimental side effects amass, many people are required to react. Multiple news reports continue to display the advice from the AAP and further perpetuate the potential detrimental effects. However, many families are making decisions based on their family values and circumstances rather than specified AAP recommendations (Plowman et al., 2010).

In academic settings, many teachers believe that M&T, and in particular, iPads, are over-stimulating and distracting, take away from outside play time, focus on texting over talking, and are too fast paced (Flewitt et al., 2014; Karsenti, 2013). Also, early use of M&T in classrooms was only for play and without a pedagogical purpose (Morgado, 2008). At this point, it is unclear

whether, for children, the benefits of M&T outweigh the disadvantages (Edwards & Pye, 2011). As devices have been rapidly introduced to the market, research has struggled to keep up. More research needs to be conducted regarding potential benefits of M&T, especially within classroom settings and more particular, in early childhood settings. This section introduced many of the concerns regarding M&T use. The following section identifies the need for further research regarding M&T in ECE classrooms.

2.8.4 Why Do We Need M&T in ECE?

Even though some research suggests the detrimental effects of M&T, especially on young children, a nuanced approach to M&T integration is slowly becoming the consensus. In particular, the AAP has revised their initial ban on devices statement. They do recommend parents to prioritize unplugged time for infants and toddlers, but recognize that "some media can have educational value for children…[and] that this be high quality programming" (American Academy of Pediatrics (AAP), 2016). They continue to make positive recommendations towards *Sesame Workshop* and Public Broadcasting Service (PBS) programming. The AAP, *Sesame Workshop*, and PBS ideas reflect digital literacy definitions of helping children understand what they are seeing and having those critically reflective discussions.

Similarly, some theories and traditions of early childhood learning, such as Montessori and Waldorf, recommend cautious introductions of digital M&T (Dunn, 2000; Tosco, 2015). Despite some research studies, the overall health effects of M&T on children is unclear (Plowman et al., 2010). In particular, the research describing the detrimental effects of M&T focuses on screen-time, where children are passive observers rather than interactive participants in M&T. The inclusion of M&T has been integrated into ECE by referring to the National

Association for the Education of Young Children (NAEYC) position statement on M&T. The NAEYC alongside the Fred Rogers Center support the AAP in discouraging obsessive screen use under the age of 2 as early brain development occurs; however, they also understand there may be appropriate times for screen use at this young developmental age (American Academy of Pediatrics (AAP), 2014, 2016; "Fred Rogers Center," 2014; NAEYC, 2012). For example, appropriate screen time would be a Skype or FaceTime call with grandparents or trying an interactive app or watching *Sesame Street* and participating in a *Sesame Workshop.* The NAEYC has developed principles to guide the appropriate use of M&T tools and interactive media in early childhood programs (Appendix D). The NAEYC and the Fred Rogers Centre are aware of concerns and have developed the following position statement:

> Technology and interactive media are tools that can promote effective learning and development when they are used intentionally by early childhood educators, within the framework of developmentally appropriate practice, to support learning goals established for individual children. (NAEYC, 2012, p. 5)

Research is needed to demonstrate how young children use and learn M&T to better understand any short- and long-term effects (Pitman, 2008). One aspect to explore is the choice of apps. How to choose appropriate apps can be difficult and time consuming, but this selection can be supported by using the four pillar model of Hirsh-Pasek et al. (2015). They describe how:

> humans learn best when they are *actively* involved (‘minds-on’), *engaged* with the learning materials and undistracted by peripheral elements, have *meaningful* experiences that relate to their lives, and *socially interact* with others in high-quality ways around new material, within a context that provides a clear learning goal. (p. 7)

Another way of choosing apps can be grouped into two categories: open and closed (Flewitt et al., 2014). Open-ended apps encourage children to participate as creators or designers constructing activities often in a no-fail environment (Lynch & Redpath, 2014; Neuman & Neuman, 2014). These differ from closed apps, which play explicit roles in traditional print literacy and numeracy skills (Flewitt et al., 2014; Lynch & Redpath, 2014). The open-ended apps allow children to make something which is more personalized (Lynch & Redpath, 2014). Research is needed to determine how apps shape children's cognitive abilities (Neuman & Neuman, 2014). It is essential to select M&T that "allow children opportunities to discover make choices…to explore, imagine and problem-solve" (Beschorner & Hutchison, 2013, p. 17). In ECE, these choices are often based upon pre-existing program goals. The school goals and program styles are standard in each program and with the recent influx of M&T a number of ECE centres are attempting to include M&T into their programming. There are a variety of program styles that ECE centres follow, including: High/Scope, Reggio Emilia, Head Start, Child Care, Waldorf, and Montessori, or a blended system using parts from several programs. These programs posit varying aspects of learning (*Table 2*).

A pedagogical purpose to M&T integration should align with ECE goals (Aronin & Floyd, 2013; Morgado, 2008). For example, Reggio Emilia practices include technology and distributed cognition that are integrated into play (Alper, 2013). Other programs have many possible places for M&T integration into their features. High/Scope programs, for example, could integrate M&T into their active learning goals, Waldorf could incorporate M&T into their doing-making-doing ideals, and Head Start integration could be in teaching children of all developmental levels. These ECE programs have many options in aligning M&T pedagogically with their key goals.

Table 2. ECE program features, teacher's role, and theoretical base.

Program	Main features	Teacher's Role	Theoretical base
High/Scope	• Plan-do-review teaching-learning cycle • Emergent curriculum – not planned in advance • Children help determine curriculum • Key experiences guide the curriculum in promoting children' active learning	• Plans activities based on children's interests • Facilitates learning through encouragement • Engages in positive adult-child interaction strategies	• Constructivist • Piaget • Dewey • Vygotsky
Reggio Emilia	• Emergent curriculum – not planned in advance • Curriculum based on children's interests and experiences • Project-based curriculum • Active learning • Thousand languages of children – symbolic representation of work and learning • Atelier (art/design studio)	• Works collaboratively with other teachers • Organizes rich in possibilities • Acts as a recorder for the children, helping them trace and revisit their words and actions • Atelierista (teacher trained in the arts)	• Constructivist • Piaget • Dewey • Vygotsky
Child Care	• Comprehensive health, social and educational services • Program quality determined by each program • Each program has its own curriculum	• Provides care and education for the whole child • Provides a safe and secure environment • Collaborates with and involved families	• Whole child • Maturationist
Head Start	• Curriculum and program outcomes determined by performance standards • Fully sponsored and funded • Broad spectrum of comprehensive services, including health and nutrition, administrative support, and parent involvement • Parents and the community play a key role in program operation • No national curriculum – created at a local level	• Teach to and provide for all children' developmental areas (social, emotional, physical, and cognitive) • Provide programs that support needs (socioeconomic, cultural, and individual) • Involves family and community in all parts of the program	• Whole Child • Maturationist • Intervention approach to addressing child an societal problems
Waldorf	• Whole child – head, heart, and hands – is educated • Arts integrated into all curriculum areas • Study myths, lores and fairy tales to promote imagination and multiculturalism • Learning is doing-making and doing • Learning is non-competitive	• Acts as a role model exhibiting Waldorf values • Provides an intimate classroom atmosphere full of themes for caring about eh community, and the natural and living world • Encourages children natural sense of wonder, belief in goodness, and love of beauty	• Anthroposophy • Rudolf Steiner • Whole child

Program	Main features	Teacher's Role	Theoretical base
	• Developmental phases of each child are followed	• Creates a love of learning in each child • Main-teacher stays with the same class from childhood to adolescence	
Montessori	• Prepared environment supports, invites, and enables learning • Children educate themselves (self-directed learning) • Sensory materials invite and promote learning • Set curriculum regarding what children should learn (stay close to Montessori ideas) • Multi-age grouping • Students learn by manipulative material and working with others • Learning takes place through the senses	• Follows child's interests and needs • Prepares an environment that is educationally safe and interesting • *Direct* unobtrusively as children engage in small group or self-directed activities • Observes, analyzes, and provides materials and activities appropriate for the child • Maintains regular communications with the parent	• Respect for children • Whole child • Active learning • Absorbent mind

Note: Adapted from Edwards (2002) and Morrison (2006)

In BC, the Early Learning Advisory Group established an early learning framework that "refers to the emerging and expanding of young children's physical, intellectual, emotional, social, and creative capacities" (Early Learning Advisory Group, 2008, p. 2). The early learning framework written for parents, teachers, or caregivers, is meant to support the child, as they are a person with "complex identities, grounded in their individual strengths and capacities, and their unique social, linguistic, and cultural heritage" (Early Learning Advisory Group, 2008, p. 4). Recognizing BC's unique social and cultural landscape, this framework also reflects the Convention of the Rights of a Child (The United Nations, 1989) as well as BC regulations on early childcare practices. Most importantly the framework identifies the five key areas of development, common across all programs described in *Table 2*, including:

1. aesthetic and artistic development
2. emotional and social development

3. intellectual development
4. physical development and well-being, and
5. the development of social responsibility.

In the Language and Literacy area, the learning goal related to M&T is: "communicate thoughts and experiences creatively using many different forms of expression" (Early Learning Advisory Group, 2008, p. 29). More specifically for preschool-aged children: "what opportunities do children have to use technology to explore their thoughts and ideas (e.g., computer software, websites, cameras, camcorders)?" (Early Learning Advisory Group, 2008, p. 30). Since the Early Learning Framework's publication in 2008, M&T has evolved dramatically and therefore this early learning framework needs updating to current and potentially future technological practices. In particular, my research can provide opportunities to include M&T into Social Responsibility as well as expanding into more learning goals in Language and Literacy.

Even though some parents reminisce and romanticize a 'golden age' of childhood surrounded by inspiring, developmental, physical M&T, this was never the reality for children in most countries of the world (Plowman et al., 2010). Children now enter schools within curricula and policies framed for 21st century learning (Beschorner & Hutchison, 2013) and parents are striving to find a balance with all of these plugged in and unplugged activities.

2.9 Chapter 2 Summary

As concerns and fears regarding antisocial and aggressive behaviours and the influence of M&T on young children accumulate, there is a need for future research. Research into prosocial behaviours and ToM through children's interactions with M&T has possibilities for positive interventions. Researching prosocial behaviours and ToM has the potential to provide findings

and insights into attributes of M&T in ECE. This chapter described prosocial behaviours as an ability of an action to benefit another, focusing on behaviours that include reciprocal and nonreciprocal actions in which children share by offering, showing, allowing use, or turn taking. The prosocial behaviours emerge alongside of ToM where children begin to understand the cognitive states of others. As these behaviours manifest, children are in their early states of socialization and learning in ECE classrooms. M&T is being integrated into these classrooms at a rapid rate, especially with the emergence of tablets or iPads into the education market. Researchers do not have an adequate understanding of how new devices, such as iPads, shape ToM or configure into the manifestation of prosocial sharing behaviours. An empirically based understanding of how these elements interplay will have direct consequences for early intervention, education, and parenting. The next chapter explores methodological choices and design elements of methods utilized in the research.

Chapter 3: Methodology

3.1 Introduction

The purpose of this chapter is to describe the methods used in this research. Two methodologies, design-based research (DBR) and video ethnography, were used to carry out qualitative and quantitative data collection and analysis in the investigation of prosocial sharing behaviours and ToM of preschool-aged children using iPads and other technologies. The methodologies were used to inform a dynamic understanding of complex phenomena and facilitate the collection of meaningful data. DBR was used as an interventionist, iterative method and as a way of connecting theory and research to practice (Brown, 1992; Collins, 1992). Video ethnography uses recording techniques to capture a description of a cultural or social group or system (Creswell, 2013; Heath, Hindmarsh, & Luff, 2010). DBR and video ethnographic techniques are well suited to the investigation of prosocial sharing behaviours and ToM of preschool-aged children because they facilitate the collection of a large volume of data while capturing field-based practices, which can be transcribed into narratives to describe the culture of a classroom. For the same reasons, these methodologies are also relevant to use when exploring M&T practices, and in particular children's iPad practices.

In this chapter, each methodology is described, including its origins and identifying characteristics. Methodological challenges and complementary features for my research are also addressed. I describe in detail the DBR phases of my research, research participants, procedures used, and ethical considerations. This is followed by a description of analytic methods, including open thematic coding and both qualitative and quantitative analysis. The methodology chosen for this research was grounded in the three research questions:

1. In what ways do ToM and the prosocial behaviour of sharing manifest among preschool-aged children interacting with iPads?
2. What are the effects of iPad use on the manifestation of ToM and prosocial behaviours of sharing among preschool-aged children?
3. What are the possible connections between a child's ToM and their prosocial behaviour of sharing?

3.2 Design-Based Research in ECE Settings

Brown and Collins introduced DBR in the early 1990s as an interventionist, iterative methodology that could link research theory to research and practice (Brown, 1992; Collins, 1992). The term interventionist refers to an educational design change that may disrupt current practice. DBR was developed to carry out research by creating innovative educational designs that can refine educational environments and link theory to practice (Brown, 1992; Collins, Joseph, & Bielaczyc, 2004). Brown (1992) evolved the DBR approach by creating authentic studies of learning that were outside of the laboratory, called 'design experimentation'. Concurrently, Collins (1992) was attempting to describe a 'design science', similar to aerospace engineering, that systematically tested various designs. The paradigm has evolved into a methodology for studying innovative learning environments, which often include technologies, in authentic, real-world classroom settings (Sandoval & Bell, 2004). The characteristics of DBR are essential to its use (*Table 3*).

Table 3. DBR characteristics definitions and usage in research study.

DBR Characteristic	Characteristic Defined	How it was used in my research
Interventionist	This approach introduces an innovative intervention design or practice to disrupt current education practices (Anderson & Shattuck, 2012)	A designed teaching intervention was created using iPads to encourage sharing behaviours through designed sharing scenarios.
Pragmatic	This approach allows researchers to connect theory to practice (Reimann, 2011; Wang & Hannafin, 2005)	Based on social exchange, empathy-altruism, and social learning theory, a designed intervention connected the theories to practice in ECE classrooms.
Collaborative between researchers and practitioners	This allows researchers and teachers to co-construct the intervention by identifying the problem and designing the solution (Dede, 2005; Jacobson, 2014; Wang & Hannafin, 2005)	The early pilot stage allowed for feedback from practicing teachers. Also, the ECE teacher in the field study co-constructed the sharing scenarios.
Iterative and flexible	There are multiple iterations or phases that are flexible as they may change throughout the study based on analysis and feedback from the researchers and participants (Anderson & Shattuck, 2012; Design-Based Research Collective, 2003; Jacobson, 2014).	Each phase allowed for analysis and feedback from the researcher, as well as the participants. Iterations allowed for analysis and refinement until a 'successful' intervention was developed.
Integrative	This method employs a multi-methodological approach that collects data through multiple methods that is both formative and summative (Barab & Squire, 2004; Edelson, 2002).	Data was collected iteratively to allow for formative assessment, which influenced the following phases and iterations.
Situated in authentic 'real-world' settings	This method captures data outside of traditional laboratory settings, in authentic classrooms or in situ settings (Brown, 1992). Authentic 'real-world' settings can be single classrooms, multiple classrooms at a school, or even multiple classrooms across a district or districts.	Data was captured in authentic ECE classrooms. The two sites that were visited were the children's ECE classroom that they attended every day or every other day.

While DBR might appear to be new, it is actually grounded in foundational constructivist theories such as Vygotsky's sociocultural theory, Bruner's knowledge construction, and Dewey's discovery learning. These constructivist methods encourage students to explore concepts and

become active participants in educational research (Bruner, 1967; Dewey, 1916, 1929; Vygotsky, 1978).

Several researchers have used DBR methods to design experiments in educational environments for all different age groups (Barab & Squire, 2004; Collins et al., 2004; Design-Based Research Collective, 2003; Kelly, 2004; Sandoval & Bell, 2004; Wang, 2012). DBR in ECE settings has great potential because preschool-aged children's prosocial behaviours are significantly increased when there is an intervention (Ramaswamy & Bergin, 2009). In other words, specifically teaching children how to share, help, or comfort others and consistently addressing these behaviours increases prosocial behaviours, which eventually will become independent actions. Mangen (2010) suggests the need for more in-depth theorizing on the use of M&T in ECE. Observing and intervening with preschool-aged children's prosocial behaviours using M&T through DBR will inform theorizing these phenomena.

Collaboration between the researchers and practitioners is another distinguishing element of DBR. Many ECE teachers are valued contributors to the design of curricula. Therefore, ECE teachers can be or ought to be actively involved in establishing the interventions or artifacts for DBR; a practitioner may be co-researcher. The DBR process can also be centered around the success of an artifact (Joseph, 2004), such as a piece of hardware, software, or practice, and often in the form of information and communication technology (ICT) (Amiel & Reeves, 2008). Conditions for success in DBR differs from other scientific or medical conditions for success. The scientific or medical conditions for success can be akin to taking antibiotics (Dede, 2004). For DBR, the design and intervention or innovation could be quite successful in a specific way, at a specific interval, with a specific group, in a specific setting. DBR's success does not mean it is generalizable to all situations, but the intervention has expansive possibilities, depending on

the case, and can be woven into other DBR iterative processes. The intervention can continue to be tested and integrated into many educational settings with various adaptations.

DBR is also iterative (Anderson & Shattuck, 2012; Design-Based Research Collective, 2003; Jacobson, 2014). One iterative approach reflects Collins (1992) suggestion of creating a design that is tested, analyzed, and redesigned to ensure success. The iterative process of DBR is formative research that is founded on the premise that it is important to design studies that reflect suggestions made by teachers and students (Edelson, 2002). In my research, it was important to include the suggestions of teachers and preschool-aged children when refining the design of the intervention; these will be discussed in detail later in this chapter and Chapter 4.

DBR often utilizes an integrative, mixed-methods approach. In practice, data collection methods, such as interviews, observation, surveys, experiment designs and many more that are chosen, often change throughout the design process. Mixed-methods tend to be 'messy', however rigorous (Hoadley, 2004; Kelly, 2004) and the data collected are both formative and summative (Barab & Squire, 2004; Edelson, 2002). Formative data help refine the design of the artifact or intervention through iterations. Adjusting the research to reflect the teacher as co-researcher and children as participants influences not only the design of the intervention but also the methods by creating 'successful' outcomes. These influences are explained in greater detail later in this chapter.

DBR can be used in a variety of settings including one-on-one (teacher experimenter and student), classroom experiments, pre-service teacher development, in-service teacher development, or school and school district experiments (Cobb, 2003). My research focused on preschool-aged children in ECE classrooms. Situating research in an ECE classroom reinforces "understanding of young children's social and cognitive skills" (Muller & Perlmutter, 1984, p.

16). The section below on coding and data analysis described the techniques and descriptive and inferential statistics for quantitative data collection and analysis.

Despite the possibilities of DBR in authentic ECE classrooms, there are several challenges with this methodology. These challenges are addressed in the next sub-section.

3.2.1 Challenges in Using DBR

Successful DBR implementation has to overcome challenges in three main categories including: bias, methodological challenges, and theoretical clarity. The first category includes researcher bias and the Hawthorne effect.

One challenge in using DBR is researcher bias. The researcher works closely with the participants, which can challenge objectivity (Anderson & Shattuck, 2012; Design-Based Research Collective, 2003; Kelly, 2004). However, by ensuring rigour and detailed descriptions of the methods, it is possible to encourage experiments that are replicable and testable (Hoadley, 2004). Additionally, utilizing other researchers for inter-rater reliability may reduce bias. The goal of DBR is not necessarily replicability or generalizability, rather it is to "problematize the completed design and result implementation" for local settings by sharing the artifact and rich descriptions (Barab & Squire, 2004, p. 8). Unfortunately, since DBR is not replicable it may also not be generalizable or transferrable (Sandoval & Bell, 2004; Wang & Hannafin, 2005). However, the analysis of data at two levels, as suggested by Wang and Hannafin (2005) and the inclusion of the practitioners in the research design, can help reduce bias. There is a call for argumentative grammar (Kelly, 2004; Reimann, 2011) and concerns regarding epistemological issues (Walker, 2010). Argumentative grammar is "the logic that guides the use of a method and that supports reasoning about its data (Kelly, 2004). For DBR, argumentative grammar is similar

to qualitative research in which the effectiveness of a design is situational (Reimann, 2011). In other words, the argumentative grammar is restricted in DBR to a specific classroom with a specific teacher and specific students using specific tools. This can be resolved through the understanding, which is similar to other qualitative studies, goal that DBR is not about generalizability. The epistemological issues focus on the complexity of mixed methods and that DBR takes mixed methods for granted (Walker, 2010). The epistemological concerns can be resolved by using rigourous practices from other research, as Walker (2010) suggests, looking to engineering for research guidance. In my research, using DBR and video ethnography together enhanced rigour and will be described in detail later in this chapter. Despite the above issues, DBR continues to be a methodology that connects experimental or intervention research and educational practice.

A second bias challenge with DBR is the Hawthorne effect, which suggests that participants behave differently when engaged in a research study as opposed to a regular situation and can produce positive results because they know they are being observed due to the intervention, artifact, or close relationship with the research designer and participants (Brown, 1992). The traditional view is that positive results may be false because of the influence of the researcher. However, DBR requires a paradigm shift for researchers (Wang & Hannafin, 2005) where instead of thinking of 'positive results' as 'bad', positive results are thought of a good because they reflect that the participants' feedback has been effectively integrated into the design. For example, when the children were using or not using M&T, prosocial behaviours were quite frequent, which could suggest a false positive, but it is an important observation of the positive intervention that was designed. Another form of possible false positives was children behaving in a certain way because the cameras were around. However, many current cultural

practices have children growing up in front of a camera with many pictures and videos taken of their day-to-day behaviours by parents, grandparents, and other guardians. In my research, at times the children seemed to be distracted by wanting to make sure the camera recorded them; however this only occurred once or twice over the scenarios. For example, the children wanted to show their work and pictures that they created to the camera, which was actually facilitating sharing rather than discouraging it.

Another challenge with DBR is the Bartlett effect that is a methodological challenge that is observed when there are too much data and the researcher needs to select what is most important, therefore leaving out some data, which could also be a part of research bias as the researcher can pick and choose data. The challenge is that some of the data that are left out might be important, therefore risking missing out on important information. One solution, suggested by Wang and Hannafin (2005) is to analyze data immediately and continuously. They suggest coding data at two levels in which level one is used to describe the research setting and process, while level two is a distillation of level one data to explain the design and constructing design principles. The Design-Based Research Collective (2003) further explains that the data obtained using DBR methods is a thick descriptive dataset that needs to be systematically analyzed. The data should be analyzed to a level that helps promote objectivity and reduce the sense of being overwhelmed by the abundance of data collected. In my research, the data were analyzed immediately and continuously. Software, such as NVivo (QSR International, 2016), a qualitative video analysis software which are described later in this chapter and Chapter 4, was utilized to assist in the organization and analysis process.

A third category of DBR challenges is theoretical clarity, which includes the Dewey effect and similarities to other methodologies. The Dewey effect is defined as all research is

based on Dewey's 'readiness to learn' and 'discovery learning' and that any research after Dewey's work is nothing new or surprising and everything is Constructivist learning strategies that encourage students to actively learn in the process of exploration and experiences (Brown, 1992; Dewey, 1916) Despite the Dewey effect and a sentiment that nothing is new, research needs to continue. We need to learn more and DBR assists in doing more theoretical, empirical and methodological work. My research continues to push the boundaries of DBR by answering currently unanswered questions. In particular, my research extends methodological work through empirical research and a newly tested intervention that is quite unique in these settings.

The second theoretical clarity concern for DBR is the similarity to other methodologies. Several researchers suggest that DBR is similar to research in discovery learning, curriculum development projects, and action research (Anderson & Shattuck, 2012; Barab & Squire, 2004; Dede, 2005; Edelson, 2002; Jacobson, 2014; Reimann, 2011; Shavelson, Phillips, Towne, & Feuer, 2004; Wang & Hannafin, 2005). DBR is unique from other methodologies through its distinct combinations of characteristics. DBR is descriptive, not prescriptive (Edelson, 2002). DBR is not about defining or creating hard and fast rules, rather it is about providing detailed descriptions from the participants. Action research and DBR also have many similarities. They are participatory and have similar epistemological, ontological, and methodological underpinnings (Anderson & Shattuck, 2012; Jacobson, 2014). However, DBR has a design phase to construct artifacts, models, interventions, and prototypes, which separates it from action research. Also, the research designer works closely with the teacher, but is not the teacher as would be prescribed in action research (Anderson & Shattuck, 2012; Dede, 2005; Wang & Hannafin, 2005). Collaboration with practitioners makes DBR distinct from action research. Utilizing the practitioner's empirical knowledge allows researchers to provide high-quality input

into practice, based on theory and research findings. As a common methodology within the learning sciences, there are elements that make DBR different from other formative evaluations. As stated, DBR emphasizes connecting design interventions with theory, while testing and forming new theories (Barab & Squire, 2004). DBR is also similar to an integrated learning design framework where the framework's broad context helps map DBR, as it includes exploration of design with attempts for enactment at a local and broader context (Bannan-Ritland, 2003). All of these features combined are what makes DBR unique from other methodologies and all of these characteristics are integral to my research study.

Despite these challenges and concerns, DBR was quite suitable for my research. Another supportive methodology for my research relies on ethnographic techniques, such as audio-visual or video recording. The next section describes video ethnography in ECE settings.

3.3 Video Ethnography in ECE Settings

Video ethnography is defined as using video in qualitative research to record naturally occurring events in day-to-day life experiences and habits. The video can be analyzed and re-analyzed and can be shown and shared with others, including researchers and the participants themselves (Heath et al., 2010). Video ethnography is founded on the traditions of ethnography. Ethnographers, initially, conducted their fieldwork by travelling to a space and physically entering a site. With the advent of M&T, the concept of space has been transformed from a physical space to an online virtual space. Hammersley and Atkinson (2007) suggest that "ethnographies of digital life itself are important aspects of contemporary social research" (p. 137) and many ethnographers attempt to employ the use of audio and video technologies to support data collection (Creswell, 2013; Erickson, 2011; Erickson & Wilson, 1982; Fetterman,

1989). Before further examination of video ethnography as a methodology, it is essential to understand the fundamental influence of ethnography on video ethnography.

3.3.1 Understanding Ethnography: A Brief Overview

Ethnography, which is "a description and interpretation of a cultural or social group or system", has been a longstanding methodology for anthropology and is frequently used in the social sciences (Creswell, 2013, pp. 58-59). In contrast to quantitative methodologies which often focus on hypothesis testing (Hammersley & Atkinson, 2007), ethnography focuses on examining behaviours and ways of life. Ethnography is a prolonged observation of a group and attempts to record the day-to-day lives of people (Creswell, 2013). In particular, using participant observation as a method for a researcher to take "part in the daily activities, rituals, interactions, and events of a group of people" (Musante, 2014). Originating from cultural anthropologists, such as Müller (1733-43), Boas (1858-1942), Malinowski (1884-1942), Benedict (1887-1948), and Mead (1901-78), the beginnings of ethnography were focused on studies of comparative cultures. Several of these researchers initiated early adoption of audio or video ethnographic approaches. In particular, Mead used photographs as a form of visual ethnography to illustrate children's play (Heath et al., 2010) and Boas made 16 mm films of the Northwest Coast Native Americans rituals in the early twentieth century (Erickson, 2011). Ethnographers attempt to find out what people do (behaviours), what they say (language), and what they make use of (artifacts) (Creswell, 2013). Before discovering what people do, refining the research problem is essential. Malinowski (1922) suggests looking at "foreshadowed problems", defined as a problem or topic of interest, to mold theories and be flexible in understanding (p. 9) and the "foreshadowed problems" can become the research questions (Hammersley & Atkinson, 2007). As data

collection proceeds, the research question(s) can be refined. This brief explanation of ethnography gives the grounding for introducing audio-visual ethnography, described in the next section.

3.3.2 Audio-Visual Data in Ethnography

Video ethnography, sometimes known as audio-visual ethnography, enhances observational field notes. Video recording devices have become relatively inexpensive and allow researchers to record in 'natural' settings, such as classrooms (Heath et al., 2010). When conducting research with preschool-aged children, video recordings of the ECE classroom should be a part of data collection to understand, explore, and research digital aspects of education. The examination of digital spaces can include: virtual classrooms, social networks, various websites, and blended learning environments. Visual data are integral to contemporary social actions and organizations and is supported by the captured audio. Many people are forgiving if a camera is shaky or taken at a strange angle, because sometimes a shaky camera, for example, could be a part of the cinemagraphic impact; however, poor quality audio is often not forgiven (Shrum, Duque, & Ynalvez, 2007). Researchers need to pay attention to the capturing of audio data by using high-quality microphones, multiple microphones, or other high-quality audio devices to record audio while a camera captures the video and not only the sounds, but also the silences that can arise in different situations (Shrum et al., 2007). Silence can lead to interesting data, as suggested in Shrum et al. (2007) observations of silence in the wake of Hurricane Katrina. They found that the silence in a once populated noisy area was intriguing and contributed to their data in ways they did not expect. My research addresses the sounds and the silences by including both audio and video captured moments that can be superior to

photographs alone.

Photography captures moments in time that enhance ethnographic data; however, photos can only capture a moment whereas video can capture a segment in time (Shrum et al., 2007). Video can capture a social process over time and not just a fleeting moment captured in photographs. Video can collect rich data that has some permanence (Pearce, Arnold, Phillips, & Dwan, 2010) and can lend itself to microanalysis. As "digital recording devices become more sophisticated, portable, and user friendly" recording devices can assist in the capturing of rich data (Adams & Thompson, 2016, p. 96). Most standard digital video (DV) formats can record 29.97 frames per second, where some high-definition (HD) cameras can capture as many as 60 frames per second. The capture rate supersedes what a human could do with a still image camera. However, sometimes still photographs can enhance data, especially in future publications and presentations. Many video cameras include options to capture photos, or take individual frames from the video and transform them into still photographs. The current research study relied heavily on video recordings because accurately measuring social behaviours and ToM could have been easily missed if hand-written notes had been the only method of data collection. Audio recordings alone would also not be sufficient to capture the social behaviours and ToM manifestations, as visual data were central for analysis and re-analysis.

Video also allows students to become storytellers of their own work. Students can become co-producers of data, using cameras to record their own videos or video diaries (Hammersley & Atkinson, 2007; Pink, 2001). Participatory video creation encourages empowerment, self-representation, collaboration, and the exploration of ideas (Blazek & Hranová, 2012; Pink, 2001). Children can tell their own stories. When the participants are co-creators and co-researchers, they expand the collection of data that could be restricted by one

researcher with one camera. Adams and Thompson (2016) even suggest that digital recording devices could also serve as co-researchers by "generating, storing, sharing, and extending data" (p. 98). Young children are often non-literate or in pre or early literacy phases and they rely on oral approaches, which is similar to early ethnographic research in non-literate cultures (Blazek & Hranová, 2012; Hammersley & Atkinson, 2007; Shrum et al., 2007). By providing young children with opportunities to create and capture stories using video, their voice can be heard. In this research study, children wore a personable camera, which captured data from their point of view to enhance the video captured by the researcher's point of view camera. Children also created their own stories using iPad apps and software.

Mead, one of the early cultural anthropologists explored visual ethnography in children's play in 1929 and predicted that "younger generations will teach older generations how to think and learn" (Rowsell & Harwood, 2015, p. 145). Children are consumers of M&T, but they have also become teachers and have used iPads to become creators, producers, and inventors (Rowsell & Harwood, 2015). "Young children are dynamically interpreting the world around them on a daily basis, making and remaking" texts, images, and videos through various blended M&T techniques (Rowsell & Harwood, 2015, p. 145). In their study of children ages 3-5 year olds (n=71), Rowsell and Harwood (2015) suggest that children are engaging and creating with digital devices. Video can capture the rich descriptions of young children's lives and provide them opportunities to contribute to knowledge production (Blazek & Hranová, 2012).

Video data can be repeatedly viewed and analyzed and can form an archive (Heath et al., 2010). The use of video in qualitative research allows an ethnographer to enhance their study because video recordings have an increased capacity for analysis and manipulation of data, and it is possible to reanalyze footage even after work has been published (Hayashi & Tobin, 2012;

Pearce et al., 2010). Using video recordings and manipulating digital data "demands new capabilities and knowledge" that early ethnographies didn't allow (Adams & Thompson, 2016, p. 114). Video enables a "fine-grained scrutiny of moments of social life" (Heath et al., 2010, p. 3) which could be quite limited from a researcher's hand-written notebook in the chaotic setting of the ECE classroom. In the current study, the audio portion of the data was quite difficult to understand, because many of the participant's voices had a similar tone, and several had speech difficulties. The video recording assisted in the analysis process by being able to look at the child's mouth and vocal gestures while transcribing and analyzing footage to understand what was said.

Regardless of these capabilities, researchers are slow to adopt audio-visual ethnography. Language and written text have been much more common among methodological approaches (Romero & Walker, 2010). Photographs are often integrated with written text rather than in a stand-alone interpretive manner (Pink, 2001; Shrum et al., 2007). Researchers can listen to speech through audio recordings, but also view body language, eye contact and gaze, gestures, and facial expressions through video recordings (Heath et al., 2010). All of the visual elements were essential to observe the manifestation of social behaviours in this research study. The visual elements enhance the data collected (i.e., it was not always what the participants were saying, but what their actions were suggesting). Making the point, a meme has been repeated in the Web 2.0 era: "If a picture is worth a thousand words, then a video is worth a million". The use of video also allows the researcher to share the results of research both with academic colleagues and the general public (Heath et al., 2010). Videos need to be produced in authentic ways that tells the story of the participants in a reflective manner to contribute to research (Pink, 2001). Despite the positive potential elements of video ethnography, there are also many challenges.

3.3.3 Challenges with Using Video Ethnography in Research

Video ethnography has a number of methodological challenges that need to be addressed including: time, too much data, participants' comfort levels, and producing a narrative as opposed to a social science research report.

The first concern for video ethnographers is time, which can be limiting. Time to collect data is extensive in order to create rich descriptions (Creswell, 2013). Ethnographers enter a field and intend to stay in that field for extended periods of time. Unfortunately, restrictions around time can cause challenges. For example, an ethnographer may want to spend six months to a year (or longer) in a particular field collecting data, but financial constraints can restrict this time (Creswell, 2013). A restrictive budget can immediately reduce the amount of time in the field for the researcher and some data may not be as rich as preferred. Deadlines can also restrict data collection time (Creswell, 2013). Some researchers are working towards a deadline, from a department or supervisor for completion of a dissertation or thesis or for publication purposes. The deadlines impact researchers as they lose time in the field for data collection or data analysis. The time restriction in this study was the limits of a school year, January to June. To reduce this limitation, multiple iterations were conducted near the end of a school year, but before the year was over.

As with DBR, a second challenge for video ethnographers is the collection of too much data (Fetterman, 1989; Hammersley & Atkinson, 2007). Video-ethnographic data are extensive, but it is impossible for a researcher to collect data from every possible moment of the participants; even if they attempt to record the participants 24/7, the amount of data collected would be unmanageable (Hammersley & Atkinson, 2007). Researchers need to strategically

balance the collection of extensive data and the overwhelming amount of too much data. A recommendation to relieve this pressure is the constant organization of data, in particular through databases (Fetterman, 1989). My research utilized NVivo software (QSR International, 2016), for organization of data which were organized into each session, and sub-organized into each activity. There can also be issues with the videos that are recorded, since multiple video recordings are each only partial representations (Hammersley & Atkinson, 2007). The angle chosen by the ethnographer-researcher and whether the camera is fixed or mobile impacts the video data collected. The difficulty of using a fixed-camera is that not everything will be 'in-shot'. Cameras have become more mobile and have the ability to collect multiple angles, including personal. In the current study, young children wore personal wearable cameras to collect point of view data and supplement the two researcher cameras set up in stationary positions. At times the cameras were extremely effective as they not only captured video that was not captured by the researcher cameras, but also captured audio and acted as individual microphones for the children. Capturing audio was important because there were several times that the children would lay on the carpet or touch their t-shirts and the video would capture a covered lens.

A third challenge with video ethnography is participants' comfort levels with the researcher and being video recorded. Even though mobile cameras can increasingly improve data collection, some participants may not be comfortable with video recordings. The video camera could inhibit participation as some may not want to speak on camera (Shrum et al., 2007). Issues related to not wanting to speak or be on camera is up for debate since documentation of social life has become quite commonplace (Erickson, 2011). Many young children have become comfortable being in front or behind a camera, given that their lives have been documented

digitally from before birth, with their parents posting their ultrasound photos on social networks. However, some participants may not want to be videotaped for all or portions of a project. The majority of cameras on the market allow the use of still photographs and audio recordings as well as video recordings (Shrum et al., 2007). Children may be comfortable with being on camera, but some parents, who are the legal guardians of their children and can restrict participation, do not want their child recorded. Issues with obtaining consent from a parent to video recording their child will be discussed in the ethics section of this chapter.

The fourth challenge for video ethnography, and ethnography in general, is writing a narrative. Beyond data collection are the complexities of analysis and interpretation and the presentation of data. A common challenge for many ethnographers is writing the description as a narrative. Many researchers are comfortable with traditional social science research report writing and are uncomfortable with 'storytelling' (Creswell, 2013). Writing as a narrative can be challenging work, which requires practice, like any other type of writing. The narrative portion of an ethnographic research report may be the most challenging for many researchers but is essential to present a rich description of the phenomena and setting.

This section discussed video ethnography: foundations in ethnography, the use of audio-visual devices to capture, as well as some methodological challenges. The next section synthesizes DBR and video ethnography, showing how these two methodologies are similar and complement each other for this current research study.

3.4 Synthesizing DBR and Video Ethnography

DBR and video ethnography have many similarities and when used together can provide a comprehensive set of methods that complement the deficiencies of either individual method.

The similarities between the two methodologies, which are also similar in other methodologies, are length of research time and too much data that leads to rich descriptive narratives.

The first similarity is the length of research. Ethnographers and design-based researchers are required to spend a significant amount of time in the field to gather data (Design-Based Research Collective, 2003; Fetterman, 1989; Hammersley & Atkinson, 2007). Young children make progressive developments that can be observed over time spent in the classroom. Both methodologies encourage researchers to spend time in the field to capture authentic situations and trends over time. There are no specified lengths of times, but the time in the field can create a potentially unmanageable amount of data.

The second similarity between the two methodologies is gathering a large amount of data. It is recommended that both methodologies maintain an organized system in order reduce the abundance of data collected (Fetterman, 1989; Wang & Hannafin, 2005). Video ethnography captures an archived collection of data that can be organized and analyzed through software, like NVivo (QSR International, 2016). The researcher should not be overwhelmed by the amount of data collected if organized adequately, as described in earlier sections of this chapter. The purpose of an abundance of data is to gather and produce rich descriptions that are often written in narrative form (Barab & Squire, 2004; Hammersley & Atkinson, 2007). The researcher refines these thick descriptions from the captured data and produces narratives that are essential to the retelling of the social or cultural group or individual captured in the setting (Creswell, 2013; Design-Based Research Collective, 2003; Edelson, 2002; Fetterman, 1989).

DBR and video ethnography both have features that address deficiencies that arise in each methodology, including participants as co-researchers, refining the research questions and

study, day-to-day authentic situations, behaving differently when cameras are introduced, and bias.

The first complementary aspect addresses the need for video ethnography to capture authentic social or cultural practices by utilizing DBR's participant as co-researcher aspect. Video ethnography wants participants to be collaborators and DBR furthers the role of the participant as co-researchers (Dede, 2005; Fetterman, 1989; Jacobson, 2014). The participant collaborator may work together with the researcher to help refine the problem and make suggestions for the research. The research is grounded in the theoretical basis studied by the researcher, but enhanced by the participants. Video ethnography aims to capture the participant's point of view (Creswell, 2013; Spindler & Spindler, 1987), which is enhanced by the incorporation of DBR, because DBR advocates working closely with the participants encouraging them to contribute the research not only as a participant but also at a co-researcher level (Dede, 2005; Jacobson, 2014). The current study investigated theoretical underpinnings that are addressed in classrooms today. While working closely with the teacher during the preliminary stages of intervention, the designed intervention reflected theory and practice.

A second aspect of DBR is refining the research study and questions during the fieldwork. The flexibility of the methodologies allows the inquiry to refine and refocus during analysis that can lead to multiple iterations (Anderson & Shattuck, 2012; Collins, 1992; Hammersley & Atkinson, 2007; Malinowski, 1922). Through video ethnography, the analysis of data refined the design of the study (Collins, 1992; Creswell, 2013; Fetterman, 1989). Throughout the data collection, each scenario was analyzed and refined before the next session took place. Video ethnography enhanced the iterative process of DBR through multiple viewings, analysis and re-analysis. The participant children also provided feedback that led to

adjustment of the methods and approach to more appropriately reflect their level of understanding and abilities.

A third complementary aspect is how video ethnography maintains its connections to traditional ethnography as it intends to describe and analyze a 'day in the life' situation (Creswell, 2013). As such, video-ethnography can capture the culture of a classroom. DBR complements this as it also strives to capture authentic situations. Brown (1992) intended DBR to move away from research in a lab to capturing authentic in situ data.

Fourthly, children behave differently when a camera is recording every action. The children may produce false results because they know they are being observed (Brown, 1992). However, one of DBR's goals is to have positive results and the designed intervention will go through multiple iterations until a successful intervention or artifact is produced. Also, as suggested earlier, as M&T have become quite ubiquitous so have the experiences of children with being recorded as video documentation of their lives has become routine (Erickson, 2011).

Fifthly, researcher bias and how video ethnography can reduce DBR bias. As described earlier, in DBR the researcher works closely with the participants, which can challenge objectivity (Anderson & Shattuck, 2012; Design-Based Research Collective, 2003; Kelly, 2004). Video ethnographic methods may help to reduce the potential bias introduced in DBR because what is recorded on the screen is what happened. There are issues with what was recorded, as was suggested earlier with selected camera angles, however the video recordings may help to reduce researcher bias.

This section described the similarities and complementary features of DBR and video ethnography as working methodologies. The next two sections discuss ethical considerations for

working with young children, as well as the data collection techniques used in this current research study.

3.5 Ethical Considerations When Working with Children

When working with children, it is imperative consider ethical concerns. Researchers in Canada, as guided by the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (TCPS) and university research ethics boards, abide to a code of ethical standards. The ethical standards include: attention to privacy, awareness of potential exploitation, acquiring consent, avoiding deception, and understanding the impact of costs to benefits of research (Dockett, Einarsdottir, & Perry, 2009; Fetterman, 1989; Graham, Powell, Taylor, Anderson, & Fitzgerald, 2013; Hammersley & Atkinson, 2007; Hunleth, 2011; Musante, 2014). The code of ethical standards applies to all human subjects and each standard must be addressed when working with young children, including: consent and assent, privacy, avoiding deception, and being conscious of potential risks and exploitation.

A first standard to consider when working with young children is that acquiring consent means getting permission of the participant and the parent or guardian. Informed consent is a voluntary agreement to participate in an informed way and is the "informed, written consent of the parent or guardian when seeking to engage children in research" (Dockett et al., 2009, p. 286). Consent differs slightly from assent, which is also an expression of approval or agreement. The US *Code of Federal Regulations* for research defines assent as "a child's affirmative agreement to participate in research" (46.402b). Glantz (1998) notes that children give assent while parents or guardians give consent. In the current study, assent describes an agreement and willingness to participate. As preschool-aged children are mostly pre-literate, they are not able to

legally sign documents to confirm or deny participation, so children provided assent through verbal confirmation, a yes or a no, or non-verbal confirmation with a nod, or thumbs up. Assent and consent are ongoing processes in which the researcher needs to remain constantly vigilant to the children's feelings regarding participation (Dockett et al., 2009; Graham et al., 2013). Obtaining assent and consent to conduct research with children may take time, as a researcher builds trust in the field. Some children may never participate, and the researcher must constantly check-in with children and parents/guardians who do participate to reaffirm assent throughout the research process. Constant vigilance for assent can ensure the integrity of the data, but also can enhance the relationship between the participants and the researcher (Fetterman, 1989).

A second ethical consideration when working with young children is privacy. Privacy is a complex concept, especially with the increased presence of M&T in traditionally private spaces. Children may not fully understand expectations with privacy, especially with online access because the line between public and private places are blurred (Graham et al., 2013). Researchers must be careful and remember that the individual has the right to determine the uses of information recorded (Hammersley & Atkinson, 2007). Concerns with participants limiting information can be avoided by providing descriptive research designs and plans from the proposal stage and throughout the research process. The current research study does not have issues with the blur between public and private places online, rather more about the blur between public and private spaces in the ECE classroom. Many children in the ECE classrooms get up and go to the bathroom when they need to, which is a concern when they are wearing personal cameras. In order to reduce any concerns with privacy, it was important to check with the children if they needed to use the bathroom before putting the cameras on. Also, constant vigilance was necessary to watch where the children went when wearing the cameras.

A third ethical standard to be conscientious of is avoiding deception and reducing exploitation. Researchers must give provisions to allow participants to withdraw from the research process at any time (Dockett et al., 2009; Fetterman, 1989; Hammersley & Atkinson, 2007). Informing the parent(s)/guardian(s) of the ability to withdraw and detailed research process information should be included with the consent form. When working with children the risk of exploitation is higher than working with adults (Dockett et al., 2009; Fetterman, 1989; Hammersley & Atkinson, 2007). Researchers can reduce exploitation in many ways. For example, being aware to not be alone with children will ensure that exploitation has not occurred (Dockett et al., 2009). In the current study, being alone with the children was reduced by always having at least one teacher and multiple children in the room at all times. Parents were invited to sit in one part of the room while the children and the researcher sat in another. When a researcher is placed in power, researchers need to avoid exploitation not only by being forthright with the research process, but also by giving something back. Researchers can give something back, which can be in terms of services or payment (Hammersley & Atkinson, 2007). Often direct payment is not a recommended form of reciprocity as this may foster artificial participation (Fetterman, 1989). Instead, many researchers are encouraged to reciprocate. In educational settings, this often means offering time as an expert and helping teachers in working with students or teaching a lesson (Fetterman, 1989) or giving the children a chance to participate in the study and attend a free session with fellow classmates. Another way of reducing exploitation is by increasing authenticity. Authenticity can be increased by paying attention to the physical space of research (Dockett et al., 2009). By collecting data in a classroom or daycare centre, researchers can acquire authentic data from a natural setting. If researchers are creating a physical space for children to enter, they need to make sure that it provides children with

opportunities to explore the area because the physical layout influences the relationships of children to their space, teachers, and peers (Dockett et al., 2009). Both research settings in this study took place in the classroom of the participants' current ECE program, at time utilizing elements of the setting (i.e., a puppet theatre or carpet space). It is important to engage children in data collection and interpretation to ensure an interpretive framework is not the only perspective considered (Dockett et al., 2009). When working with young children, it may be difficult to not put an adult perspective on data and authentically represent children's perspectives. Authenticity can be encouraged by the use of multi-modal attributes that complement data and especially reflecting the epistemological issues of a research field (Romero & Walker, 2010). Using audio and image representations allows for an authentic perspective as many young children are pre-literate and express their thoughts, ideas, and opinions orally.

A fourth standard to consider is the potential risks to the participants. Risks are always a part of research, but generally video ethnography and DBR are low risk methodologies, as they are about intervening or observing day-to-day activities in attempts to improve learning, teaching, lessons, etc. (Brown, 1992; Fetterman, 1989). When working with preschool-aged children, there are other ways to reduce risk, including providing participatory methods. For example, Hunleth (2011) describes the use of drawing and group discussions. Drawing and group discussion methods are the least invasive methods that allow children to express complex ideas and difficult emotions, and to engage in dynamic conversations that would not happen in a one-to-one setting with a researcher. By having children engage in participatory methods, authenticity of data increases. The current research allowed for several low-risk participation situations, including: conversations in group settings while children were listening to a story or

participating in another activity, drawing, or making. There was also a chance for the participants to view footage from previous sessions and provide comments.

Researchers have a responsibility to remain constantly vigilant in maintaining an ethical boundary that protects the researcher, the research, and the participants. As Punch (2002) concludes: "Researchers need to be reflexive throughout the research process and critically aware of the range of reasons why research with children may be potentially different from research with adults" (p. 338). The next section describes the data collection methods.

3.6 Data Collection

The current research study used video ethnographic techniques that included two researcher cameras for participant observation as well as multiple personal point of view cameras worn by participants: *Snapcam Ion*. The blue *Snapcam Ion* wearable cameras were worn when the children completed activities that were not directly led by the researcher (*Table 4*). The participants wore the cameras to capture their point of view, enhancing audio collection by having microphones close to the mouth of each participant. Also, the cameras captured moments that were not included in the shot of the researcher camera, explained in more detail later in this chapter and Chapter 4.Field notes describing observations were also taken. Collected data also included semi-structured interviews, open focus-group discussions, and artifacts from children's drawings and animations on the iPads using the *Chatterpix Kid* app. A ToM storybook task battery was used to evaluate the ToM of the children; see Appendix G example. Throughout the phases working with preschool-aged children, numerical data regarding social behaviours and ToM were collected. The data were collected for both qualitative and quantitative purposes, as

described in this chapter and in Chapter 4. The next section describes the research design, including the different phases of DBR, the participants, and the procedures for the research.

Table 4. The activities when participants wore a blue Snapcam Ion camera.

Phase	Scenario	Activity	Wore *Snapcam Ion* camera (yes or no)
Field study	1	1	No
		2	Yes
	2	1	No
		2	Yes
		3	Yes
		4	Yes
	3	1	No
		2	Yes
		3	Yes
		4	Yes
		5	Yes
		6	Yes
		7	Yes
Definitive Test	1	1	No
		2	No
		3	No
		4	Yes

3.7 Research Design

My research design utilized the DBR process that constitutes a design cycle evolved from models of predictive research, design research, and scientific research in education (Amiel & Reeves, 2008; Middleton, Gorard, Taylor, & Ritland, 2006). The design cycle has six phases, and multiple iterations can occur within and between phases (*Figure 6*) (Cobb, 2003; Design-

Based Research Collective, 2003; Jacobson, 2014; Middleton et al., 2006; Reimann, 2011; Van den Akker, 2006; Wang & Hannafin, 2005).[3]

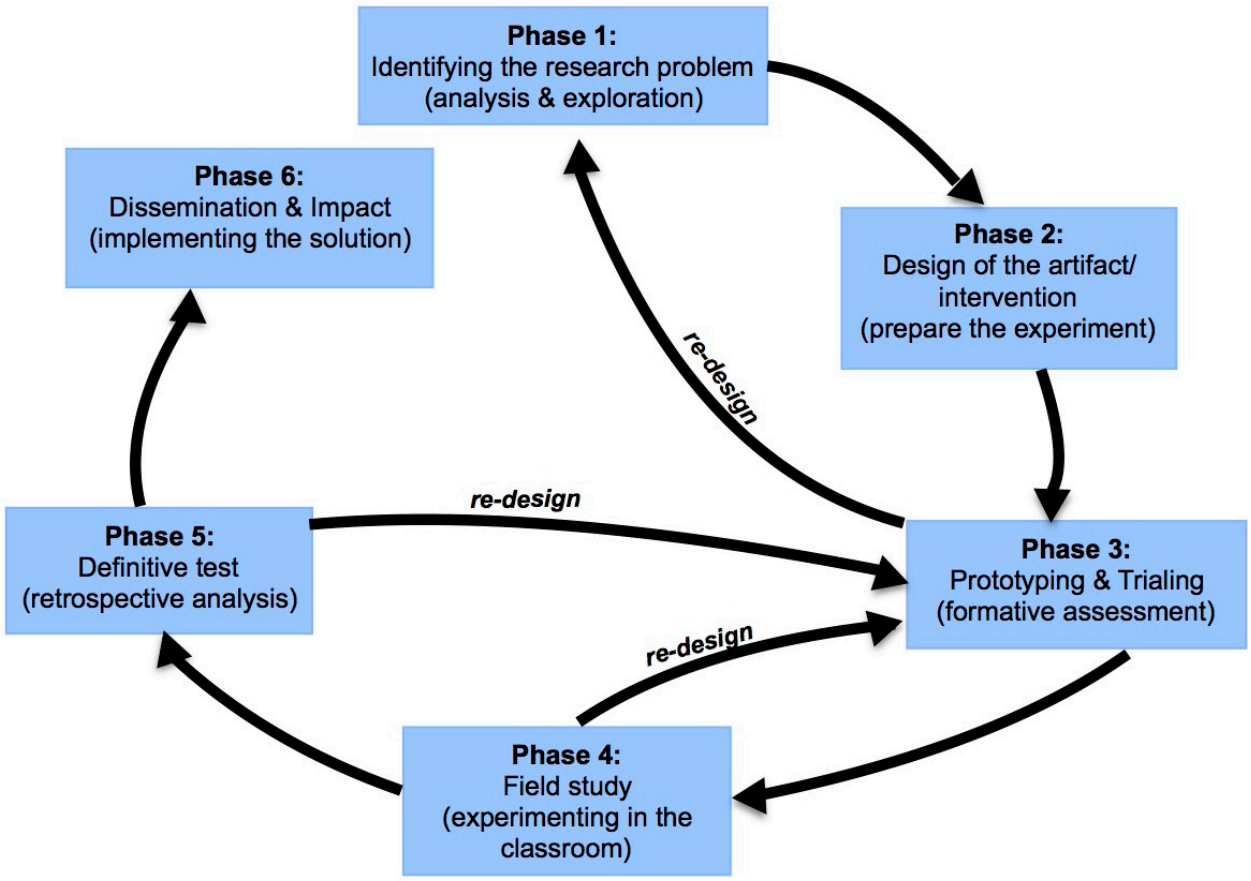


Figure 6. Design cycle for DBR.

- *Phase 1.* Phase 1, the analysis and exploration stage, begins with identifying the research problem, including: a focused literature review, reflection on research, and connecting theory to practice. The researcher is attempting to identify a gap or problem in research that needs

[3] Please note that Phase 1 is described in Chapters 1 and 2. Phase 6 is represented by this dissertation.

an intervention. For this study, Phase 1 was the focus on prosocial sharing behaviours in ECE, which can be impacted by ToM and M&T. The literature review was grounded in the theoretical foundations of social exchange, empathy-altruism, and social learning as identified in Chapter 1.

- *Phase 2.* Phase 2 is the preparation of the experiment; the researcher works in collaboration with the practitioner in the design. In education, this is often the teacher in the setting intended for research, in this case an ECE teacher. Based on information and suggestions of the practitioner, the researcher attempts to design an artifact (i.e., a new piece of software) or an intervention (i.e., a different teaching strategy).
- *Phase 3.* Phase 3, prototyping and trialing, is a formative assessment that is primarily qualitative in the form of interviews, observations and focus groups to get feedback on the artifact or intervention and to identify effects. During this phase, the researcher decides whether the artifact or intervention is ready for the field study or if the intervention needs to go back to the first phase and be grounded in deeper research and theory.
- *Phase 4.* During Phase 4, the field study, the prototype is used and the experimentation begins in an authentic (i.e., classroom) setting. The phase continues the process of collaboration with the practitioner (in this case with the teacher), as the artifact or intervention is tested in the authentic setting; the researcher gets reactions from both teacher and students, and uses the reactions to refine the product through analysis and re-design, which can cycle through until there is a 'successful' artifact or intervention. Video ethnography was incorporated directly in this phase.
- *Phase 5.* Phase 5 is the definitive test that includes a retrospective analysis in which the 'successful' artifact or intervention are taken to other sites or tested with other participants to

ensure validity of the product/artifact. Additionally, the analysis includes a detailed reflection on data within the design context, and information from past research, theory and practice. Video ethnography was also incorporated directly in this phase.

- *Phase 6.* Phase 6 is the dissemination phase where the successful artifact or intervention should have solved the problem and can now reflect upon theory and practice. This phase can also recommend future research based on the successful artifact or intervention designed.

Table 5 describes Phases 3, 4, and 5, including the dates the research was conducted, the programs and participants of the study and the particular focus during that phase.

Table 5. Data collection phases dates, programs, participants, and focus.

Phase	Date	Program	Participants	Focus
3	January-February 2016	• British Columbia Teachers • January-April	• Practicing Kindergarten to Grade 12 Teachers • n=18	Prototype testing, app selection, intervention testing, Storybook feedback
4	March-May 2016	• ECE Preschool half-day • September-June	• Preschool-aged children and Teacher • n=3 (2 girls, 1 boy; age 4) • n=1 (teacher)	Intervention iterations – sharing scenarios, app selection, Digital storybook, ToM storybook
5	June 2016	• ECE Preschool full-day • Year round	• Preschool-aged children • n=5[4] (3 girls, 2 boys; ages 3-4)	'Successful' scenario from Phase 5: Digital storybook, ToM storybook, iPad app sharing intervention

The next sections go into more details of Phases 2-5, including the design of the artifact or intervention, the participants, and the procedures for each participant group.

[4] There were six participants, but one participant was not able to attend the main research session, therefore was withdrawn from the study.

3.7.1 Phase 2.1: Customizing the Storybook

One feature of designing the DBR intervention was customizing a storybook to facilitate the ToM Storybook task battery. In the intervention, a digital story on an iPad would be read in order to elicit discussions around sharing behaviours. Leo Lionni's book, *It's Mine*, is about two frogs who are extremely selfish. The two frogs were selfish until one day when a storm came and they realized that selfish actions could be dangerous and if they shared it would save them, as they learn from an elder toad. *It's Mine* is often read to young children in primary education to open discussions about sharing. I adapted Leo Lionni's text and drew my own digital illustrations, changing the main characters to hedgehogs and the elder to a wise owl, to a digital story to read with the children. My illustrated copy, *Mine,* was read using an iPad (*Figure 7*).

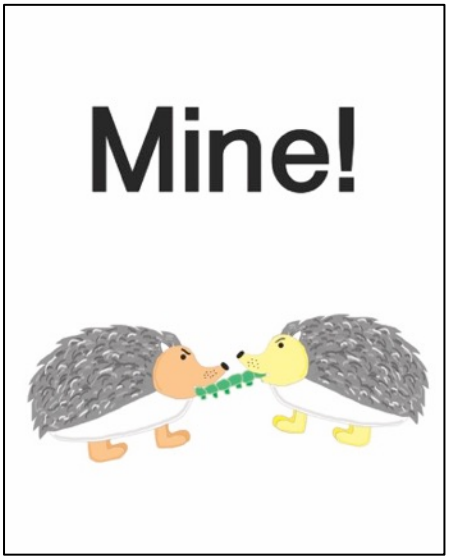


Figure 7. Mine digital picture book, text by Leo Lionni and illustrated by Rachel Ralph.

The digital storybook was shared for feedback with the teachers who participated in the feasibility study (see below, Procedures, Stage 3). Using an iPad, I read this story to the children and also read the ToM storybook task battery (Appendix E). Also, I created stick puppets for the

children to use alongside the ToM storybook task battery to engage the children in active ways (see below, Procedures, Scenario 2). Customized storybooks are a common, important feature of research into children's ToM (Houssa & Nader-Grosbois, 2016; Hutchins, Bouyea, & Prelock, 2014).

3.7.2 Phase 2.2: Designing the Intervention

As *Figure 6* describes, Phase 2 is the preparation of the experiment or intervention. In this current study, Phase 2 was the design of an intervention based on theoretical underpinnings and previous research. While consulting with an ECE teacher, the researcher discovered that the culture of this classroom was one without M&T devices were used in that program. The ECE program occasionally used a CD player and all listening stations had been removed. A lack of devices was an important consideration for the introduction of iPad devices into the classroom during the research, as it could influence how the children valued the devices; however, for sharing behaviours, the children had many opportunities to experience sharing with their peers and moderated by their teachers in the culture of the classroom. In particular, there were two old unplugged phones the children played with and needed to take turns with, as they were quite popular toys. After discussions with the teacher and other teachers, the researcher explored the Apple App Store to decide what apps to use in the intervention. To reiterate, an app is self-contained software on a mobile device.

When choosing iPad apps to use in the intervention, the four pillar model of Hirsh-Pasek et al. (2015) was used. The four pillar model includes: active learning, engaged learning, meaningful learning, and socially interactive learning. The four pillars were helpful in the

selection of apps, as stated earlier, there are over 80,000 education apps and over 72% of them are for early childhood education, which can be quite overwhelming.

Active learning. Active learning is not a new concept in education. Of course, Dewey and Montessori, and Piaget and Vygotsky, explored active learning and play for decades. Hirsh-Pasek et al. (2015) expand on Piaget and Vygotsky's active learning and play in the context of M&T and call it 'minds on' in which mental effort is required. The app should not promote 'minds off' in which mindless tapping or swiping occurs, rather effort and learning should be purposeful. Playing with the app cannot just be stimulus-related responses. For example, when playing *LEGO®DUPLO®Train* app, children don't just tap to get the train moving, they need to load cargo, build bridges, and participate in more problem solving activities.

Engaged learning. Engaged learning is grounded in Fredricks, Blumenfeld, and Paris (2004) three kinds of engagement: behavioural, emotional, and cognitive. Behavioural engagement is how children learn through conditional and the engagement includes rule following, participation, and effort. Emotional engagement is demonstrated by affective reactions. Cognitive engagement is the investment in learning and ability to problem solve. Behavioural, emotional, and cognitive engagement can create apps that include distractors (Hirsh-Pasek et al., 2015). Preschool-aged children are predisposed to distractors, therefore, app developers need to be aware of the levels of engagement and avoid distractors like extraneous animations or sound effects that do not add to the primary understanding of content. For example, *Doodlebuddy* drawing app has a sound effect for every item used, which may reduce the actual drawing, as children are more concerned with making a funny noise. *Skitch* may be a better choice in a drawing app as there are no sound distractors.

Meaningful learning. Meaningful learning includes "learning with a purpose, learning new material that is personally relevant, and linking learning to preexisting knowledge" (Hirsh-Pasek et al., 2015). Meaningful learning is using apps beyond rote memorization and making material personally relevant to the learner. For example, *My Talking Angela* app is a pet cat that gets children to take care of her, by feeding her, dressing her, playing with her and more, which could reflect prior experiences. The app experience simulates playing with other dolls or action figures or even taking care of their own pet.

Socially interactive learning. Socially interactive learning can have a direct impact on learning. In particular, socially interactive learning can impact language learning and understanding in school (Hirsh-Pasek et al., 2015). The design of most apps typically allows for response, but some are not fully interactive or adaptive. However, app design can incorporate social interaction with face-to-face interactions (i.e., collaborating on a project or game), mediated interactions (i.e., *FaceTime* or *Draw Together* or *Minecraft*), and support social relations with on-screen character (i.e., characters responding to children's speech (Hirsh-Pasek et al., 2015), as seen in *My Talking Angela.*

Based on the four pillars, and discussions with practicing teachers (ECE and primary), parents, and empirical experience as a technology teacher, several apps were chosen to load onto the research iPads. The apps were: *PuppetPals, PuppetPals 2, Sock Puppets, Book creator, My story, Chatterpix Kid, FairyTale, Skitch, LEGO®DUPLO® Trains, LEGO® Juniors Quest, LEGO® City my City, Kodable, My Talking Angela, My Talking Tom, Cookie Maker* and *Doodlebuddy*. These apps were used during Phases 3-5.

The designed intervention included:

1. Read *Mine* digital storybook to facilitate discussion regarding sharing

2. ToM storybook task battery
3. Demonstration of *Chatterpix Kid* app by researcher to participants
4. *Chatterpix Kid* with limited iPad to children ratio

These four activities will be tested in the feasibility study as a prototype test that will be described in the next section.

3.7.3 Phase 3: The Feasibility Study (Prototype Test)

As described earlier, Phase 3 is the prototype stage of the research. During the formative assessment, feedback based on my intervention was gathered.

3.7.3.1 Participants

The participants were practicing teachers in the British Columbia school system (n=18) who teach a variety of subjects and grades ranging from kindergarten to grade 12. The teacher participants were also students in a Master's of Education program and were chosen due to their expertise in M&T and teaching. Each participant signed a consent form and video/image release form, see Appendix I example of consent form. Although, demographic information was not explicitly captured because the research was about inviting a diverse group of participants without segmenting by demographics, the participants represent a wide variety of cultural and socio-economic backgrounds as well as teaching experience. Homogenous convenience sampling was used, Even though these teachers were not from an ECE setting, the majority teaches primary grades (kindergarten to grade three). Also, these teachers were chosen due to their expertise with M&T in education.

3.7.3.2 Procedures

During the prototype testing, there were three stages of collecting data. The first stage consisted of a participant trial of the app and the designed intervention. The second stage was a larger focus group interview. The final stage was an optional questionnaire to evaluate a digital story.

Stage 1 - Trial of app and designed intervention. The designed intervention included three activities involving a sharing scenario. The first activity involved reading the digital story, *Mine*, described earlier. The second activity involved participating in a ToM storybook task battery to test the children's ToM levels. The third activity involved the children's independent use of the iPad. In groups of two, the children would draw a picture, sharing crayons and paper, together. They would then share one iPad and use the app *Chatterpix Kid,* to animate their picture. As *Chatterpix Kid* only allows one animation at a time, the app encourages children to speak together and take turns touching the screen.

During the first stage of this phase of the research, the participants were tasked with a mini-version of the intervention designed for preschool-aged children. In groups of 2, the teacher participants were asked to draw an animal or robot and use *Chatterpix Kid* to animate their drawing and give it a voice. The participants did not need instructions on using the app, as they had prior experience using *Chatterpix Kid*. Once each group created their animation, they shared their work by displaying the animations on the classroom projector.

Stage 2 – Focus Group Interview. During the second stage, there was a semi-structured interview with all participants. The semi-structured interview consisted of three questions:

1. What sharing behaviours were elicited in this activity?
2. What changes could elicit more sharing?
3. What are other app suggestions?

The questions were asked to all participants at once (n=18), and allowed opportunities for anyone who wished to speak to provide answers to each question.

Stage 3 – Optional Questionnaire. During this prototype phase, the digital storybook, *Mine*, was shared with the individuals who participated. These participants were given an optional online questionnaire to elicit feedback on the book. The optional questionnaire consisted of 11 items, including 6-Likert-style and open-ended short-answer (Appendix C). Based on the feedback from the group interview and from the optional survey, minor adjustments were made to the research intervention and to the digital storybook. No major concerns or issues arose. The designed research was ready to move forward to Phase 4: the field study

3.7.4 Phase 4: The Field Study (Iterative Process)

Phase 4 in the DBR iterative process uses the results of the prototype testing and experimentation and brings the designed intervention to an authentic classroom setting – the field study. The designed intervention is then tested and analyzed through multiple iterations and receiving feedback from teachers and students in a refinement process. During the iterative cycle described in this dissertation there were three iteration scenarios. During these scenarios different apps and activities were tested before the 'successful' intervention was ready for the definitive test.

3.7.4.1 Participants

The participants in the field study were preschool-aged children aged four (n=3) and their teacher (n=1). The student participants were located within the Southwest of BC and attended an ECE program in the mornings from September to June at a local community centre. Demographic information was not explicitly captured because the research was about inviting a diverse group of participants without segmenting by demographics; however, the participants represented cultural and socio-economic diversities. There were two girls and one boy, and all were age four. Convenience sampling was used. The teacher, also from Southwest BC, signed the consent and image/video release forms. However, as the children are underage, their consent and image/video release forms were signed by their parent(s)/guardian(s). Verbal and visual checks were used throughout the study to confirm the child's assent.

3.7.4.2 Procedures

The procedures during the field study consisted of three scenarios. The teacher was consulted during the scenarios and participated in a semi-structured interview after the second scenario.

Scenario 1. Scenario one consisted of two activities: Reading the digital story, *Mine,* and drawing with crayons and stickers. During the first scenario the researcher read the digital picture book *Mine.* Participants were asked simple questions (i.e., is this good or bad?) during the reading. The digital story helped facilitate the pre-interview process. A semi-structured interview was conducted after the storybook. Initially the researcher intended to spend time asking all of the questions (see Appendix A for all questions). However, the children began to fidget and became distracted. The researcher realized that the children were reaching their

limited attention span limits and ended the pre-interview quickly. Adjusting to their levels, the rest of the questions were asked while the children were drawing and working through the next activity.

When the children were drawing, they wore personal point of view blue *Snapcam Ion* cameras. The children were allowed to draw whatever they chose, using two pieces of paper and a shared set of 12 crayons. A limited number (20) of stickers were also available to the children. During the drawing time, post-interview discussions occurred. After scenario one was completed, a research analysis took place through the DBR iterative process, which contributed to the development of scenario two.

Scenario 2. Scenario two consisted of four activities: ToM storybook task battery, creating a pirate story using *Toontastic Jr.* (3:1 children to iPad), drawing a picture and animating with *Chatterpix Kid* (1:1 children to iPad), and free time on iPad (1:1 children to iPad). The second scenario utilized the ToM Storybook task battery, read by the researcher to the children using an iPad, of 15 test questions with nine tasks that ascend in difficulty presented in a storybook format (Appendix E). The storybook format was chosen specifically for preschool-aged children as the designed ToM storybook task format was designed in a way for children to participate (Hutchins et al., 2014). Additionally the storybook uses full colour images that are dynamic and keep the children's interest. Each question related back to a ToM domain. For all tasks in the ToM storybook task battery, "children were presented with one correct response option and three plausible distracters, making the chance of correct responding in the absence of ToM knowledge equal to 25%" (Hutchins et al., 2014, p. 90). Participants had a set of stick puppet faces with four possible emotions. Participants were asked to hold up the different 'feelings' at different time points of the story (*Figure 8*). The stick puppets allowed for group participation, as

well as facilitated children who preferred non-verbal answers. Children also raised their hands or pointed at the iPad screen.

Figure 8. ToM emotion stick faces that the children held up to answer ToM questions.

Once the ToM storybook was completed, the next activity was testing a multiple user app *(Toontastic Jr.).* In the first user-led iPad activity, the participants created a story together (three participants to one iPad) using *Toontastic Jr.* All three children touched the screen, either at the same time or taking turns. Also, all three children spoke, at the same time or taking turns, and added voices to the story. Once completed, the children watched their created story. The second iPad activity was one-to-one interaction with an iPad (one participant to one iPad). Children drew a creature, or animal, and used *Chatterpix Kid* to animate the animal's mouth to talk (*Figure 9*).

Figure 9. Participant 1 *Chatterpix Kid* animation.

Once the animal was animated, the children were allowed 'free time' on the iPads. There was no prescribed action or app to play; children were allowed to choose their own activity or game to play. Participants used a variety of apps on the iPad, including: *Toontastic Jr., PuppetPals 2, Book creator, My story, Chatterpix Kid, LEGO®DUPLO® Trains, LEGO® Juniors Quest, LEGO® City my City, My Talking Angela, and Cookie Maker.* After scenario two was completed, the teacher participant participated in a semi-structured interview (Appendix B). Data analysis took place through the DBR iterative process, which contributed to scenario three.

Scenario 3. The third and final scenario with the field study included seven activities: watching and discussing past recorded sessions, colouring puppets with crayons, video recording a puppet show with an iPad, watching the recorded puppet show, two participants using *Chatterpix Kid* (2:1 children to iPad), three participants using *Chatterpix Kid* (3:1 children to iPad), and free time on iPad (1:1 children to iPad).

During the first activity, children were invited to reflect on prior sessions in an open-ended discussion by watching video footage. In the second activity, the participants shared one box of crayons and were asked to colour in a stick puppet to use in a puppet theatre. The children used an iPad to record the puppet show and used one puppet theatre and one iPad. Once the children had watched the puppet show, there was a shift in activities. One participant chose to colour another stick puppet, while the other two completed a *Chatterpix Kid* activity together. The children, with the iPad, took pictures of objects in the room and animated the mouth to talk. After several minutes, the third child joined the other two participants and together they created a *Chatterpix Kid* animation (three participants to one iPad). The final activity consisted of one-to-one interaction with an iPad (one participant to one iPad). There was no prescribed action or app to play; children were allowed to choose their own activity or game to play. Participants used a variety of apps on the iPad, including: *Chatterpix Kid, LEGO®DUPLO® Trains, LEGO® Juniors Quest, My Talking Angela, and My Talking Tom.* After scenario three was completed, data analysis took place through the DBR iterative process. The 'successful' designed intervention included four activities:

1. Read *Mine* digital storybook to facilitate discussion regarding sharing
2. ToM storybook task battery
3. Demonstration of *Chatterpix Kid* app by researcher to participants
4. *Chatterpix Kid* with limited iPad to children ratio

These activities were used in the next phase: the definitive test.

3.7.5 Phase 5: The Definitive Test

Phase 5 consisted of the definitive test. Once a 'successful' intervention was reached in Phase 4, the field study, the intervention was tested at another site with other participants to ensure the validity of the product.

3.7.5.1 Participants

The participants in Phase 5 were preschool-aged children aged three to four (n=5), different participants from Phase 4, and were located within the Southwest of BC. The participants attended a full-day program of a 12-month registered ECE preschool program. Again, demographic information was not explicitly captured because the research was about inviting a diverse group of participants without segmenting by demographics; the participants represented cultural and socio-economic diversities. There were three girls and two boys. Convenience sampling was used. The children were underage; therefore, consent and image/video release forms were signed by their parent(s)/guardian(s). However, verbal and visual assent checks were used throughout the study to confirm the child's assent.

3.7.5.2 Procedures

The definitive test consisted of one scenario, based on the most 'successful' parts of the intervention during the previous phase. The scenario had four activities: reading digital story *Mine,* ToM storybook task battery, researcher demonstration of *Chatterpix Kid*, and limited iPad to children ratio using *Chatterpix Kid* to animate pictures taken.

In the first activity, similar to the activity in the field study, the researcher read the digital picture book *Mine.* Participants were asked simple questions (i.e., is this good or bad?) as

discussion prompts during the reading. The scenario helped facilitate the interview process and a semi-structured interview was conducted after the story was completed.

In the second activity, children participated in the ToM storybook task battery, read by the researcher to the children using an iPad, of 15 test questions with nine tasks that ascend in difficulty presented in a storybook format. Participants had a set of stick puppet faces emotions to hold up the different 'feelings' that the story asked (*Figure 8*). The process allowed for group answers, as well as facilitated children who preferred non-verbal answers and stick puppets allowed for interactive group participation. Children also raised their hands to answer questions.

In the final activity the children used the *Chatterpix Kid* app for animating pictures they took. First the app was demonstrated to the children by the researcher. Once there was a basic understanding of the app, the participants worked with each other to take pictures around the room and animate a mouth to talk. Participants worked independently and in groups of two and three. The definitive test ended with children watching their animations.

3.8 Data Analysis

Qualitative and quantitative data analyses were used for the research in this dissertation. By highlighting and displaying findings, reporting fieldwork procedures, identifying patterned regularities and irregularities in data, current results were linked to other findings (Creswell, 2013; Hammersley & Atkinson, 2007; Wolcott, 1994). The results to known cases were compared to the results in my study and were contextualized to broader frameworks, while connecting with larger theoretical frameworks (Creswell, 2013; Fetterman, 1989).

NVivo software was used for the qualitative analysis of video recorded data (QSR International, 2016). The primary source for video analysis was collected using two researcher

cameras set up in two areas of the preschool classroom. A supplementary video was captured using the individual blue *Snapcam Ion* cameras. All cameras were used to ensure that the data analysis was accurate. Data from the personal cameras were not used from the field study as the researcher cameras captured all actions. In the definitive test, two of the participants moved out of the researcher camera view, therefore the individual blue *Snapcam Ion* cameras were used to supplement the researcher camera for data analysis.

The collection of material goods, objects, and artifacts, and how people interact with them is analyzed to support the interviews and observations (Hammersley & Atkinson, 2007). An Observational Measure of Prosocial Incidents (OMPI), from (Ramaswamy & Bergin, 2009), to specifically focus on sharing, was used for observations of the social behaviours of the children. The social behaviours of the children were initially divided into the following categories: offering, showing, allowing another child to use an object, and turn taking (Ramaswamy & Bergin, 2009). Analysis of video and audio data (i.e., with NVivo software) facilitated coding for the OMPI to prepare for running descriptive statistics using SPSS (IBM Corp, 2016; QSR International, 2016). In particular, the multiple levels of coding were analyzed using video software as video can be coded directly using the NVivo software (QSR International, 2016). The codes were re-analyzed several times, as prescribed by DBR methods and methods of grounded theory, based on thematic results of the data. Trends and themes were identified through NVivo software. For ToM, there were several measures (Corbin & Strauss, 1990, 2008; Glaser & Strauss, 1967). The individual child's ToM ability measured through the ToM storybook task battery checked "the level of ToM ability [and] it also allows investigators to compare different relevant ToM components" in the same child (Hutchins et al., 2008; Hutchins et al., 2011; Lerner, Hutchins, & Prelock, 2011). As described earlier, the task battery

storybook consisted of 15 test questions with nine tasks that related to ToM domains. The children had one correct response and three distractors. Overall the children received scores out of 15 (Appendix H). ToM was also measured for each observed prosocial or antisocial event based on observable domains, which will be described in more detail in the next chapter.

For the quantitative results, SPSS software was used (IBM Corp, 2016) to calculate ToM domains, prosocial, antisocial, and nonsocial behaviours. The data were measured based on statistical frequencies, Chi-squares, and Cohen's Kappa agreement for inter-rater reliability. Qualitative data were triangulated with quantitative data. Data were included in an analysis and sub-analysis. The next section will describe the specific thematic coding that was identified and used for both the qualitative and quantitative analysis.

3.8.1 Coding and Repeated Measures

Using the iterative process of DBR, video ethnography supported the coding and analysis. The initial coding was based on the sharing and non-sharing behaviours as identified by Ramaswamy and Bergin (2009). In particular, the initial round of coding focused on the OMPI: showing, allowing use, offering, and taking turns. Repeated measures refers to the same participants participating in all conditions of the experiment and the resulting data are related (Field, 2013). As the data continued to be analyzed, the initial four codes were insufficient because they did not address behaviours repeated by the children across the activities and observed by the researcher that included both nonsocial and antisocial behaviours (e.g., non-sharing). Additionally the four codes did not address shared behaviours using M&T. At this moment of analysis, open-thematic coding was used.

The repeated measures coding was divided into three main coding events: prosocial (individual and group events), nonsocial, and antisocial. Prosocial behaviours included all of the positive sharing events in which the children would share. Nonsocial behaviours were when the children would work independently. Antisocial behaviours were when the children would behave in ways that would oppose sharing behaviours. Nonsocial was established as different from antisocial. Typically antisocial behaviours have a negative connotation and sometimes the children would work alone not to be antisocial or isolated, rather they were working positively but independently. Through the video data analysis, I identified and counted, or quantified, antisocial, nonsocial, and prosocial behaviours repeated by the children across the activities in the final two phases. For finer grained qualitative data coding analysis, these three main event codes were divided into subcodes (*Table 6*).

Table 6. Codes and subcodes for children using iPads.

Event code	Event subcode
Nonsocial behaviour	Work independently
Antisocial behaviour	Pull item away
	Push hand away
Prosocial individual behaviour	Allowing use
	Offering
	Showing
Prosocial group behaviour	Taking turns
	Watch together, researcher controls
	Watch together, participant controls
	Multiple hands holding device
	One participant holds, another participant touches the screen
	Touch screen together
	Speak together

The antisocial codes were identified based on behaviours described by Bierhoff (2002). For the other iPad related codes, the thematic codes evolved from open coding because previous studies that were observing sharing behaviours did not use iPad devices.

For ToM, the codes that were used were based on the 11 domains identified in the task battery test. ToM domains were either observed or not observed during event actions (prosocial or antisocial).[5] Three domains were chosen:

- Emotion recognition
- Desire-based emotion recognition
- Seeing leads to knowing[6]

These three domains were chosen, as they were the most overtly observable external processes, while the other 8 domains are primarily internal processes. Emotion recognition is the ability of a child to recognize the emotional states of others (Hutchins et al., 2014; Hutchins et al., 2011). For example, in my research a child sees another child laughing and laughs alongside of them. Desire-based emotion recognition is the ability to understand another child's desires (Hadwin et al., 1996; Wellman, 1990). For example, in my research one child would say "Can I play now?" and the other child responded by saying, "You're that guy" and pointed to the character they can be on the screen. The third domain, seeing leads to knowing is on the border of an internal or external process. It is about the child's ability to see something (or hear something) and get knowledge (Hadwin et al., 1996). For example a child sees another child using the iPad and sees that they can touch the screen in a certain way as well.

---

[5] Nonsocial events were not coded for ToM, as ToM required at least two participants.
[6] For more detailed description of each domain, please refer to Appendix E.

A Chi-square test was used to test two categorical variables, sharing and ToM, to see if these two categorical variables were associated (Field, 2013). Other Chi-square tests tested categorical variables of sharing and ToM when using M&T, sharing and ToM when not using M&T, sharing and M&T, ToM and M&T. These tests are discussed in detail in Chapter 4.

3.8.1.1 Reliability Coding

The scenarios were recorded and all events were identified and analyzed by the first researcher. The second coder, with a Master's in Education, was chosen based on his expertise in educational research and technology studies education. The second coder viewed the video and coded 10% of the events from a random set of events. The events were randomly and represented multiple activities from Phase 4 and 5, including activities with and without M&T. Cohen's Kappa was calculated to determine the inter-rater reliability. Cohen's Kappa represents moderate agreement value at .5, good agreement value at .7, and very good agreement above .8 (Pallant, 2010). Values of Cohen's Kappa were very good agreement for nonsocial behaviours (Cohen's Kappa =.85, $p < .0005$), moderate agreement for antisocial behaviours (Cohen's Kappa =.55, $p < .0005$), very good agreement for prosocial behaviours (Cohen's Kappa =.82, $p < .0005$), and moderate agreement for ToM observable domains (Cohen's Kappa =.58, $p < .0005$). Even though there is only moderate agreement for antisocial behaviours and for ToM observable domains, this is statistically significant.

3.9 Research Methodologies Summary

My research employed a mixed-methods approach, which includes DBR and video ethnography, and descriptive and inferential statistics for quantitative analysis. The multiple

iterations as designed by the researcher and participants informed practice, research, and theory at the ECE level. Moreover, the amount of time spent in the field allowed for a collection of abundant data that lead to rich descriptions and multiple narratives and the ability to identify a large number of behaviour events. Working with the preschool-aged children and teachers in close relation also provided opportunities for refinement of the research problem and study throughout data collection phases. The DBR iterative approach, enhanced by video ethnography, allowed for multiple viewings of captured data that were analyzed and re-analyzed throughout the iterations. As M&T continues to be ubiquitous in classrooms, observations of various behaviours through creative research methodologies can be insightful to future theory and practice. This chapter described DBR and video ethnography by their emphasizing characteristics, challenges, similarities and complementary features. Ethical considerations, specific to research children, were also addressed. This chapter described the phases of DBR in detail including the participants and procedures used in this research study, as well as the data analysis used. The next chapter expands on these details and look more closely at the research findings.

Chapter 4: Research Findings

4.1 Introduction

The previous chapter focused on the research methodologies that were used in this study. As described earlier, Phases 1 and 2 of the DBR process are presented in Chapters 1, 2 and 3. In this chapter the results of Phases 3, 4, and 5 in relation to the research questions are presented. The research tested the designed intervention over several scenarios and activities to create a 'successful' intervention that can be used at other sites. This chapter describes the results of the research and discusses the possible answers to the research questions.

4.2 Phase 3: Feasibility Study and Prototype Analysis

During Phase 3, 18 teacher-participants performed a mock scenario, a simulation of the scenario to test the designed intervention intended for the field study, testing *Chatterpix Kid*, followed by a group interview. In the mock scenario, participants were asked to draw a robot, use stickers and filters in the app, and animate the robot's mouth to talk (*Figure 10*).

After the *Chatterpix Kid* creations were completed, the animations were projected onto a classroom projector. Once all of the animations had been viewed, a group interview was conducted. The majority of the feedback was positive, in which the participants agreed that this app and scenario would facilitate sharing. In particular some participants said that: "there was only one [iPad] so we had to share" and this facilitated a "sharing environment." In regards to making changes, some teacher participants said that: "the more people you have per group then it's less sharing but if everyone has an iPad and they take one picture then they are doing the

activity individually" and "have them use the stickers and filters to let more [children] participate". The sharing intervention used in the field study reflected suggestions for change.

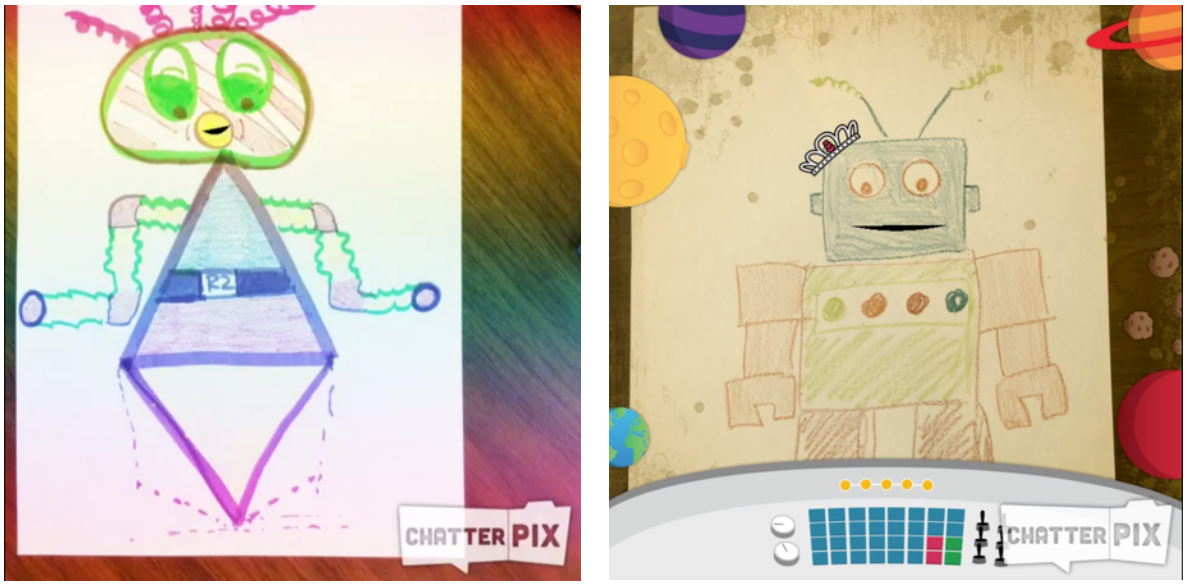


Figure 10. *Chatterpix Kid* creation during feasibility study (prototype test).

The second form of feedback from the feasibility study (prototype test) test included an optional questionnaire about *Mine,* a digital storybook. Five of the 18 participants completed the questionnaire (*Figure 11*) and a short answer section.

The overall mean score was 3.9 out of 5, which indicates that most of the questionnaire respondents thought the story was good. Most participants (n=4; 80%) indicated that they agreed or strongly agreed that story was suitable for preschool aged children and only one person indicated that they disagreed with the statement that the pictures matched the text. None of the respondents responded 'strongly disagree' for any of the questions.

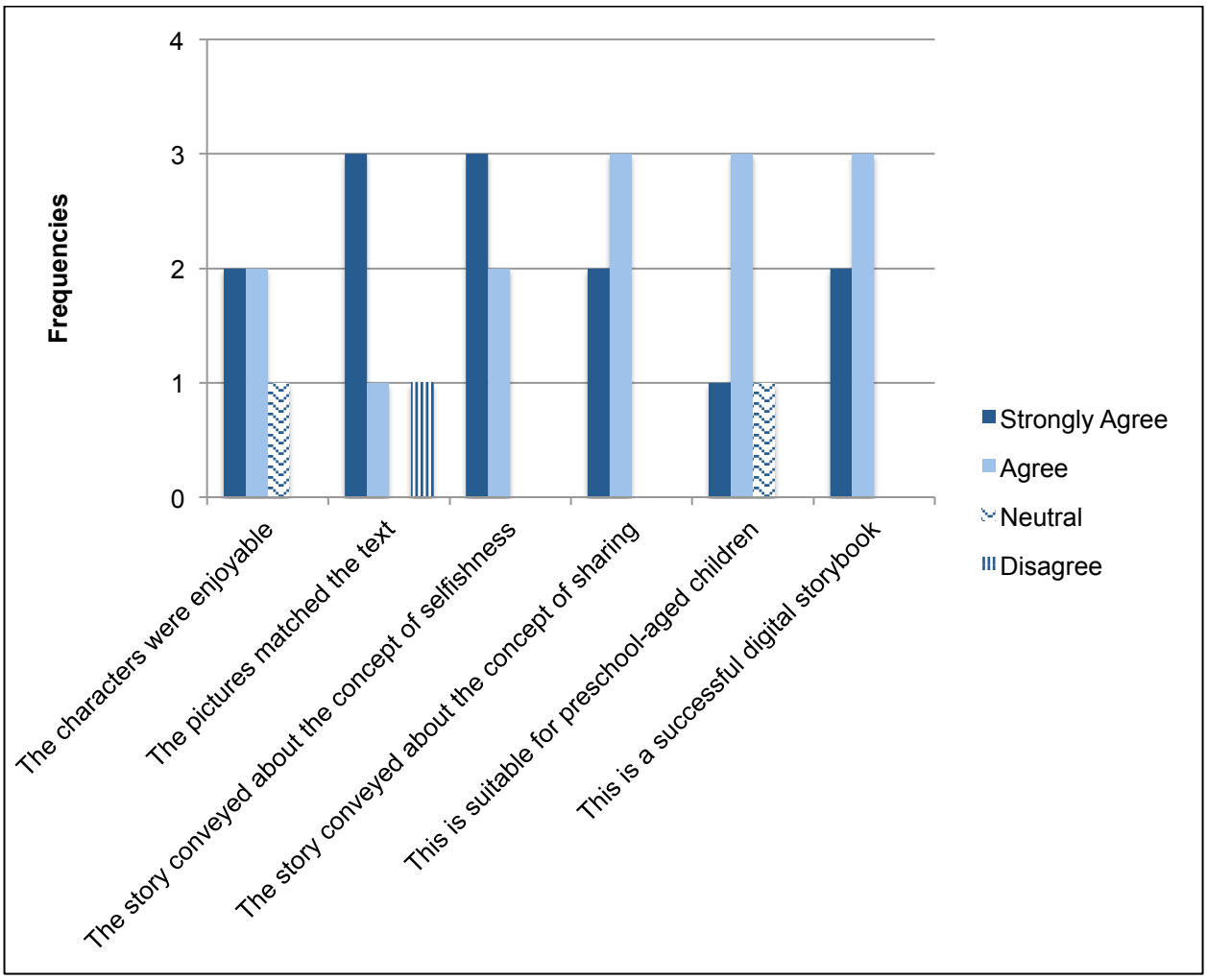


Figure 11. *Mine* storybook survey feedback scores.

The short answer portion of the questionnaire asked about the favourite and the least favourite pages in the storybook. These responses were used to adjust images and text for the field study. In particular, the majority of the participants said that the caterpillar page was confusing, so this image was redrawn. The final question, "Is there anything you would add/change to make this a successful book teaching preschool-aged children about sharing?" provided the most compelling feedback because the majority of participants stated that the vocabulary was too difficult, (i.e., the words lichens, brushwood, and squabbling were not words

that preschool aged children would know). The vocabulary was changed for use in the field study to reflect language more age-appropriate language for 3-5 year olds. The prototype test was used in the design of the intervention and as part of the analysis for the iterations.

Once all of the feedback was integrated, the changes were made and the designed research intervention was ready to move to the next phases: working with preschool-aged children. The next section of this chapter will describe the results of Phase 4 and 5: the field study and the definitive test with preschool-aged children.

4.3 Participants in Field Study and Definitive Test

Three children participated in the field study (Phase 4), and five children participated in the definitive test (*Table 7*). The children would work individually, in partner groups, or in groups of three or more.

Table 7. Demographics of children participants.

Phase of DBR	Participant	Gender	Age
Field study	1	Female	4
	2	Male	4
	3	Female	4
Definitive test	4	Female	4
	5	Male	4
	6	Female	4
	7	Female	3
	8	Male	4

4.4 Results: Phase 4 - Field Study

The field study began with an interview with the practicing teacher (Appendix B). The main themes identified from the interview were sharing lessons, expressing feelings, and

integrating technology. When asked about the types of sharing lessons that the teachers in this program typically create, the teacher said:

> I wouldn't say like a lesson. Everything in the room is shared. When the children come in and they're playing, [and the children know] if I have my toys here and someone else wants them [I share]. We try to encourage the sharing. But we don't have like lesson plans.

The teacher is stating that the ECE program has no specific lesson plans or activities designed specifically around sharing. Instead, the teachers allow children to interact organically while using verbal cues to encourage the culture of sharing. Organic encouragement is reflective of the High/Scope program in which the teacher creates activities based on the interests of the children (Edwards, 2002; Morrison, 2006). Also, verbal encouragement is consistent with social learning theory and other research that encourage sharing through verbal cues (Bandura, 1977; Brownell, Iesue, et al., 2013; Brownell, Svetlova, et al., 2013)

The next question asked the teacher about feelings. In particular, without specifically asking about ToM, the researcher asked: “When they are sharing, do you think they have that emotional response? They understand what happens when I share and when I don't share, how people feel?” The teacher said:

> We'll talk with them and say "Oh look at her face, she really wants a turn, how is she feeling, what does her heart feel like right now?", "Is her heart happy that you have all the toys and she has none? How can we make her heart happy?" I just kind of relate heart to heart. And we used to always talk about faces, but I know for me when I'm really angry sometimes I'll smile. So it's incongruent – or whatever the word is. They couldn’t tell by my face. So we use heart. How does your heart feel?

In this statement the teacher is trying to explain how, in the past, they would refer to facial expressions as a way to understand feelings, but it was inaccurate because some facial

expressions did not always express real emotions. The culture of the current ECE program includes teachers asking children to think about how a “heart feels”.

The next part of the interview with the teacher focused on the use of M&T in the classroom. At first the teacher was asked to explain the program’s technology use. The teacher stated that:

> I think for children, who have technology at home, and I'm guessing or if I'm being realistic they all have it. They tell me they have iPads and stuff at home. I think it would be hard. I don't know that the interactions would be the same, child to child. When you're trying to share a toy, you have to speak. But with technology I'm afraid that it would shut that down around, like a mom said, a bomb could go off beside her and she's on [the iPad] and it wouldn't phase her.

This first statement was the teacher’s understanding that the majority of her students have access to technology devices (i.e., iPads) at home. However, she is still hesitant to introduce the devices in her classroom. The story she tells about the mom describing her daughter playing on the home iPad and not noticing or interacting with anyone or anything around her is a common concern that is expressed in research discussing screen time (American Academy of Pediatrics (AAP), 2014; Gentile, Li, et al., 2014; Gentile, Reimer, et al., 2014). The teacher is worried that the children would not interact with each other and would be focused on their devices. Finally, the researcher asked what the teacher thought about the designed intervention and integration of technology into the classroom. The teacher said:

> I think they know sharing with toys. With our materials. With our natural materials. They know that's sharing. So I think what you're doing with the iPad and sharing is taking that to another level. Which is good. So they are learning. When they go to kindergarten, they are going to have technology more in their programs or there's a classroom for that. Great that they are getting that concept of sharing. That it goes right across the board. That we need to share everything in life. Not just the plastic toys or the blocks or whatever. So I think it's a good thing. Hopefully it will carry over.

The teacher expressed that the children are used to sharing and they should also learn to share with technology, especially as they get closer to kindergarten in which M&T is more ubiquitous (Karsenti, 2013). Also, she appeared to believe that learning to share with M&T is an important life lesson and that children should learn how to share everything and she is hopeful that it will work.

During the field study, there were three scenarios, each with specific sub-activities. The activities were used to measure sharing behaviours and ToM. As described in the previous chapter, scenario one consisted of two activities: 1) Reading digital story *Mine* and 2) drawing using crayons and stickers. Scenario two consisted of four activities: 1) ToM storybook task battery, 2) creating a pirate story (3:1 children to iPad), 3) drawing a picture using crayons and animating it with the *Chatterpix Kid* app (1:1 children to iPad), and 4) free time on the iPad (1:1 children to iPad). The third and final scenario during the field study involved seven activities: 1) watching and discussing past recorded sessions, 2) colouring puppets with crayons, 3) video recording a puppet show using an iPad, 4) watching the recorded puppet show, 5) two participants using *Chatterpix Kid* (2:1 children to iPad), 6) three participants using *Chatterpix Kid* (3:1 children to iPad), and 7) free time on the iPad (1:1 children to iPad).

4.4.1 Field Study Scenario One

In the first scenario, activity one, the researcher read a digital story to the children. During this activity, the children and the researcher shared one iPad device. The researcher controlled this device and the three participants watched together (*Figure 12*).

Figure 12. Field study participants reading the digital story on the iPad with the researcher.

The researcher asked the children questions (Appendix A) while the researcher read the digital storybook *Mine* to the children and while showing the story via the iPad. The participants shared their answers with the group and often answered in unison. For example:

> Researcher: During lunch, Willow would shout mine! And she chomped the largest and crunchiest beetle. During dinner, Basil would shout mine! And he gobbled up the juiciest slug.
>
> All participants: Eww! *[said expressively]*

Given that the children answered in unison, the researcher was able to identify that all children were engaged in the activity. After reading the book, the researcher and children discussed main themes together, including: sharing, feelings, and iPads. The first theme, sharing, was discussed:

> Researcher: So they learned how to share. Do you know what sharing is?
>
> Participant 3: Yah, share your toys.
>
> Researcher: Sharing a toy, what else can you share?
>
> Participant 2: You can share like a robot?

Researcher: Yes? What else can you share?

Participant 2: Colours.

The children did not define sharing; rather they gave examples of things they share. Once the children stopped providing examples of sharing, the researcher moved on to the ToM question. The researcher asked how the children feel when people share with them. They said:

Participant 3: Nice.

Participant 2: Nice! *[said with enthusiasm]*

Researcher: Yes? When people don't share with you how do you feel?

Participant 2: Sad and mad.

Researcher: Sad? Grumpy? Mad?

[all participants nodded after each word was stated]

In this discussion the children were able to express the difference between feeling nice and feeling sad. The children also expressed a simple understanding of how they feel when sharing occurs or does not occur. Finally, the researcher asked a few questions about the children's experiences with iPads:

Researcher: Do you know what this is?

Participant 3: iPad.

Participant 2: iPad.

Researcher: Have you seen an iPad before?

All participants: Yes.

Researcher: Yes, have you used an iPad before?

Participant 1: I have a black one.

Participant 2: But I don't have one because that got lost so we have a tablet.

Researcher: A tablet, okay.

Participant 3: I kind of broke my tablet.

Researcher: You broke your tablet? Do you play games or watch shows?

Participant 3: I broke 3.

Participant 2: I watch cartoons.

Researcher: You watch cartoons?

Participant 3: I don't have one. I do but it's my mom's.

The children all seemed to know what a tablet or an iPad was and they each had experience using them, including watching cartoons. The researcher noticed that the children were getting restless, as they were not answering questions anymore and some were shifting in their seats; they were ready to move onto the second activity. The second activity focused on sharing behaviours using crayons, markers, paper, and stickers. Children were either nonsocial or prosocial. Throughout this activity, the children exhibited a number of prosocial sharing behaviours. The sharing behaviours included: showing, offering, allowing use, and taking turns. In particular, the children showed many items, including the stickers and their drawings to each other and to the researcher.

Figure 13 illustrates all participants drawing images while sharing crayons and stickers. Images A and B show all participants working independently on their drawings. Images C and D display a participant exhibiting the most frequently observed prosocial behaviour: showing. He is enthusiastically showing his sticker and his drawing to another participant.

Image A

Image B

Image C

Image D

Figure 13. Participants 1-3 drawing images and sharing crayons and stickers.

The majority of the social sharing interaction was showing, occurring when children held up an item or pointed at something they were drawing or noticed. Also, children frequently said, "look". For example, Participant 2 said, "Look at this. Look at this" a number of times. "Look at this" was a common phrase expressed amongst all participants.

Sharing was a known action in the culture of this preschool classroom. Sharing was demonstrated when the items were handed out and sharing vocabulary was expressed:

Researcher: And we got some crayons.

Participant 2: And let's share dem!

At times, the researcher gave verbal cues to assist children in sharing items and expressing ideas. For example:

Researcher: What do you think if you need to borrow purple? What should you do?

Participant 3: Ask them.

The participant knew what to do, but needed a reminder to facilitate sharing. However, after this statement, he decided to use blue instead and did not need to ask to borrow purple. Sometimes participants would ask for items, but other participants did not answer. For example, Participant 1 found a snake sticker in the container and showed it to the group. At this moment Participant 2 expressed that he wanted the snake. He said, “Uh can I have a snake? I want snake.” However, Participant 1 had already affixed the snake to her paper and no one responded to his request. Other times, a child would ask for an item and another child would give it to them. For example:

Participant 1: I need a purple crayon.

Participant 2: Do you want purple?

Participant 1: Ya.

Participant 2: Okay here's purple.

Quite often the children would be looking for a particular colour and once they said that colour out loud, other children would find that colour and offer it to the requester.

There was only one occurrence of antisocial behaviour during this scenario and activity in which Participant 1 pulled the sticker container away from Participant 3. Observed ToM domains were 20 events throughout this first scenario. Participant 1 exhibited ToM three events (15%), Participant 2 exhibited ToM 11 events (55%), and Participant 3 exhibited ToM six events (30%). There was no iPad use during this scenario; rather the first scenario was used to measure the sharing behaviours and ToM when M&T was *not* involved.

When the first scenario was completed, a re-analysis of the intervention occurred. The re-analysis prompted refinement of the designed intervention for the second scenario. In particular, the children did not want to focus on interview questions, and the researcher modified the activity by planning to integrate questions into other activities. Also, based on the first scenario each activity needed to be shortened to 15-20 minute sections. After this re-analysis, the research study proceeded to scenario two.

4.4.2 Field Study Scenario Two

During the second scenario, there were four activities: 1) ToM storybook task battery, 2) 3:1 participants to iPad story creator *Toontastic Jr*., 3) drawing and 1:1 participants to iPad using *Chatterpix Kid*, and 4) 1:1 participants to iPad free time.

The ToM storybook task battery was used to measure the ToM of each child. The researcher read the ToM storybook (Hutchins et al., 2014), while the participants answered the questions. Some questions required the children to hold up stick puppet emotion faces, while

other questions required them to answer verbally or point at the screen (*Figure 14*). The children received a score out of 15 measuring their ToM abilities, based on 11 domains (*Table 8*).

Figure 14. Participants 1-3 answering ToM storybook task battery questions.

Table 8. ToM storybook task battery scores for the field study.

Participant	Score n/15 (%)	ToM Knowledge Level (0-5 low, 6-10 medium, 11-15 high)
1	11(73.3%)	High
2	11(73.3%)	High
3	11(73.3%)	High

For the second activity, the three children were restricted to one iPad total, to observe facilitated sharing. During scenario one, the children explained that they had prior experience to using an iPad and they did not need direction on how to use the iPads and could independently interact with the devices. During the activity, there were many manifestations of shared behaviours, facilitated individually and in groups. The shared behaviours included: offering, allowing use, watching together when one participant controls the device, speaking together and touching the screen together (*Figure 15*). Also there were four incidents of observed ToM, two for Participant 3, and one for both Participants 1 and 2 during antisocial or prosocial events.

Image A

Image B

Image C

Image D

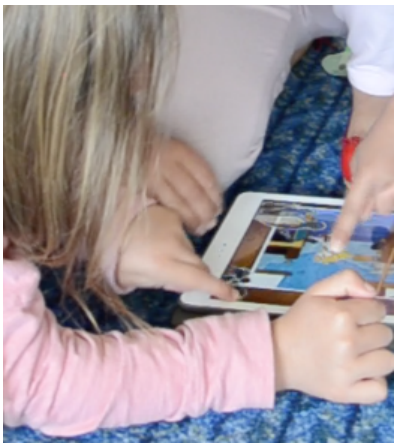


Figure 15. Participants 1-3 creating a *Toontastic Jr.* together.

Images A and B show the children all touching the screen together or taking turns touching the screen. Image C shows the children watch their created animation together. Image D is a close up of Participant 1 hand after she pushed Participant 3's hand away from the device and off the screen. During the *Toontastic Jr.* activity, the children also communicated verbally. In particular, Participant 1 said, "Can I try now? Can I try now?" and Participant 3 replied, "You're, you're, you're him." She then showed Participant 1 which character she could be. Participant 2 also requested a turn and said, "Can I try now? Can I play now?" After hearing this request, Participant 1 removed her hand from the screen to give Participant 2 a turn.

The next activity was 1:1 participants to iPad drawing and using *Chatterpix Kid*. Each child drew an image and then used *Chatterpix Kid* to animate and give voice to their drawing (*Figure 16*).

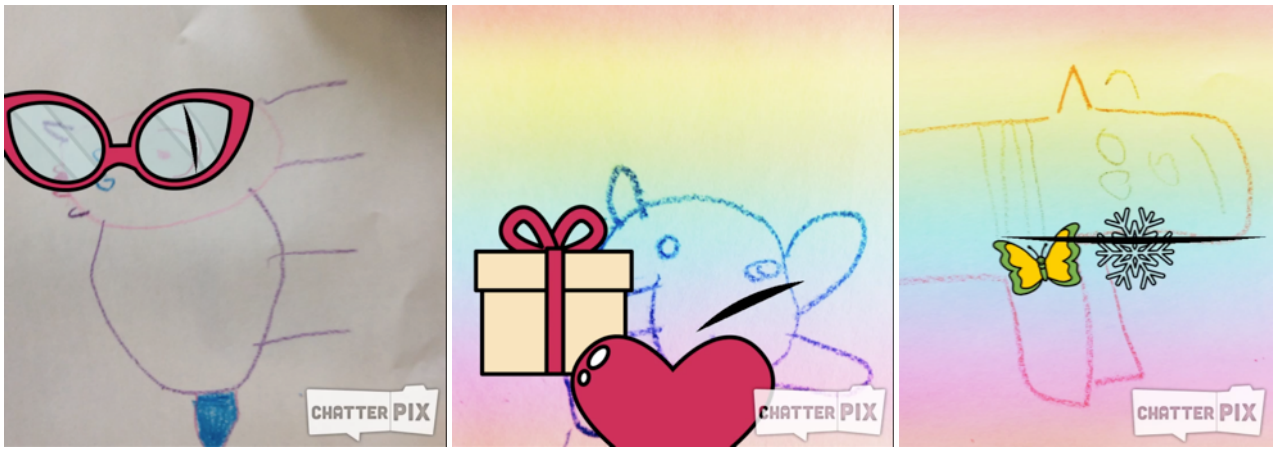


Figure 16. Field study *Chatterpix Kid* animation.

There were minimal shared behaviours during the *Chatterpix Kid* activity, including showing, watching together when one participant controls, and touching screen together. There were a few occasions of antisocial behaviours in which Participants 1 and 3 pulled an item, the

crayon box, away. However, they each replaced the box once they had made their selections. While the children completed their drawings and *Chatterpix Kid* animations, prosocial and nonsocial events occurred (*Figure 17*).

Figure 17. Field study individual iPad use with *Chatterpix Kid.*

When the children would participate in activities with no M&T or blended with M&T, the most common behaviour was nonsocial in which the children worked independently. Their heads were down and focused on their own work. Most of the time the independent work resulted in silences, only broken when they would show their work to the researcher and to each other. Occasionally, the children would look at each other's screens or drawings, but not explicitly as a sharing behaviour, rather observing the work and creation of others. Observed ToM only occurred once in this activity from Participant 2 when he responded to a request from Participant 1.

In the final activity for scenario two, the children had free time to explore apps. Participant 1 played: *My Talking Angela, LEGO®DUPLO® Trains, Cookie Maker, and Chatterpix Kid.* Participant 2 played: *LEGO® Juniors Quest, LEGO® City my City, and*

Chatterpix Kid. Participant 3 played: *Cookie Maker, My Talking Angela, My Story, PuppetPals2, Book Creator, and LEGO® City my City*. During this time the children did not display any shared behaviours (*Figure 18*).

Figure 18. Participants 1-3 playing individually on iPads.

For the majority of the five minutes of free time, the participants' heads were down and they were each focused on their own device. One moment, in the five minutes of free time, Participant 1 looked over at Participant 2's screen, but did not say anything. Another time Participant 2 reacted to a sound from Participant 1's iPad, but quickly went back to not talking and looking at his own iPad screen.

The individual iPad activity concluded the second scenario and another re-analysis occurred. It was noted that the children were engaged when the researcher controlled the iPad. Even though the *Toontastic Jr.* app allowed multiple user interaction, the app was too advanced for this group of children. The *Chatterpix Kid* app was successful; however, the activity did not facilitate sharing when the iPads were used 1:1. Based on the analysis, adjustments were made which are reflected in the third scenario.

4.4.3 Field Study Scenario Three

In the third scenario, there were seven activities:

1. Watching and reflecting on previously recorded sessions
2. Making puppets using crayons and paper
3. Video recording a puppet show with an iPad
4. Watching the puppet show on the iPad
5. Two participants use *Chatterpix Kid* on an iPad (2:1 children to iPad) and take photos
6. Three participants use *Chatterpix Kid* on iPad together (3:1 children to iPad)
7. 1:1 children to iPad free time

The first activity consisted of the children watching recorded sections from scenario one and two from the personal cameras and the researcher's camera. The researcher facilitated discussion and asked questions to the participants. During the discussion, the children identified themselves. For example, the researcher said, "So that's your hand, you see? This is what the camera gets" and Participant 1 realized that she was on the screen and said, "and that's the heart shirt that I wear." Other participants also realized they were on the screen. For example, Participant 3 said, "and that was me." After the children identified themselves the researcher asked questions about what was happening in the recording to clarify what the children said or did. For example:

Researcher: What were you saying?

Participant 3: That she has three colours.

Researcher: So that's you. Do you remember drawing that?

Participant 2: Ya.

Researcher: You're doing the kitty game?

Participant 2: I want to do this like...

Participant 1: I did the kitty game too.

After the children watched a few clips, they moved onto activity two: creating puppets. Creating puppets was similar to an activity in the first scenario in which crayons were shared. The prosocial sharing behaviours included: showing, offering, allowing use, and taking turns. Within the second activity, most of the discussion and sharing behaviours were focused around colour selection. Children would express desires of colours and other children responded. For example:

Participant 3: I want purple.

Participant 2: Here you go.

There were more incidents of nonsocial behaviours of working independently than prosocial behaviours. There was only one incident of antisocial behaviour in which Participant 1 pulled a crayon away. There were only a few moments of observed ToM during the prosocial incidents. Once the puppets were completed, the children went to the next activity and created a puppet show, recording it on one iPad (*Figure 19*).

The three children shared one puppet theatre and one iPad. They were not touching the screen but watching their recording and interacting with each other and the iPad screen while the iPad recorded their actions. The children recorded a puppet show and watched their recorded video together.

Figure 19. Participants 1-3 using puppet theatre to record puppet show.

After the puppet show recording, two of the participants worked on the fifth activity, creating an animation using *Chatterpix Kid*, while Participant 1 wanted to make a second puppet and worked independently colouring at the table.

Participants 2 and 3 went to a couch and used an iPad together (*Figure 20*).

Figure 20. Participants 2 and 3 sharing one iPad.

The sharing behaviours that manifested in this activity were: allowing use, multiple hands on the device, touching the screen together, showing, watch together and one participant controls, and speaking together. There was only one incident of ToM when the two participants participated in a prosocial event, i.e., holding the device together and took a picture of the couch. They then sat on the couch, drew a mouth on their picture, and recorded their voices together to animate the couch. They made 2 recordings together: one of the couch and one of the window.

After completing two animations, Participants 2 and 3 moved back to the table and Participant 1 joined in. At this time three children shared one iPad and took turns giving a voice to the animation in the sixth activity (*Figure 21*). During the sixth activity ToM was observed several times during prosocial events.

Figure 21. Participants 1-3 taking turns.

The sharing behaviours included: watching together and a participant controls, touching the screen together, speaking together, and taking turns. The children were speaking together and touching the screen together to create their animations. After a few times of the children creating animations together, they wanted to record their own voice and decided to take turns. The

children also exhibited antisocial behaviours when they were animating their pictures (*Figure 22*).

Figure 22. Antisocial behaviours with Participants 2 and 3.

When the children were taking turns, Participant 3 wanted to stop Participant 2 from interrupting when it wasn't his turn by covering his mouth to stop him talking. She also pushed his hand out of the way and held it off of the screen so he wouldn't touch the screen when it was someone else's turn.

Once the children had each taken a turn recording their voice into *Chatterpix Kid*, and watched their creations, they each wanted to play on their own device, which lead to activity seven: 1:1 free time. During the free time, nonsocial behaviours of working independently manifested. The quiet independent work was similar to scenario two's free time activity; however, there was an increase in shared behaviours over time. The shared behaviours included: showing, allowing use, watching together and a participant controls, and touching the screen together. Instead of only lifting their heads and looking at each other's devices, they were asking

questions and talking to each other. Participant 3 also went over to the devices of the other participants and they touched the screens together (*Figure 23*).

Figure 23. Participant 3 showing Participant 1 something in the same app.

4.4.3.1 Quantitative Results for the Field Study

The qualitative results of the field study scenarios are supported by quantitative results. The quantitative results include: descriptive frequencies and Chi-square analysis. The controlled variables include: age of children (4), one location for the three scenarios, one type of device (i.e., iPads), and the same three children for all scenarios. The dependent variables were social behaviours and ToM events. The independent variables were the interactive activities and the designed intervention. The first quantitative results include descriptive frequencies.

Figure 24 shows the social behaviours per participant with M&T. All three participants exhibited prosocial and nonsocial behaviours. Prosocial group behaviour was the most common for all participants at 168 (73.0% of total behaviours). Antisocial behaviours were the least common for all participants at 6 (2.6% of total behaviours). Overall, prosocial behaviours outnumbered antisocial or nonsocial behaviours at about 186 (80% of total behaviours) to 42

(20% of total behaviours). Participant 3 displayed the most prosocial behaviours with 76 events (33% of total behaviours) and displayed the most antisocial behaviours at 5 (2.2% of total behaviours). She also exhibited the most nonsocial behaviours at 15 (6.5% of total behaviours). Participant 2 did not exhibit any antisocial behaviour.

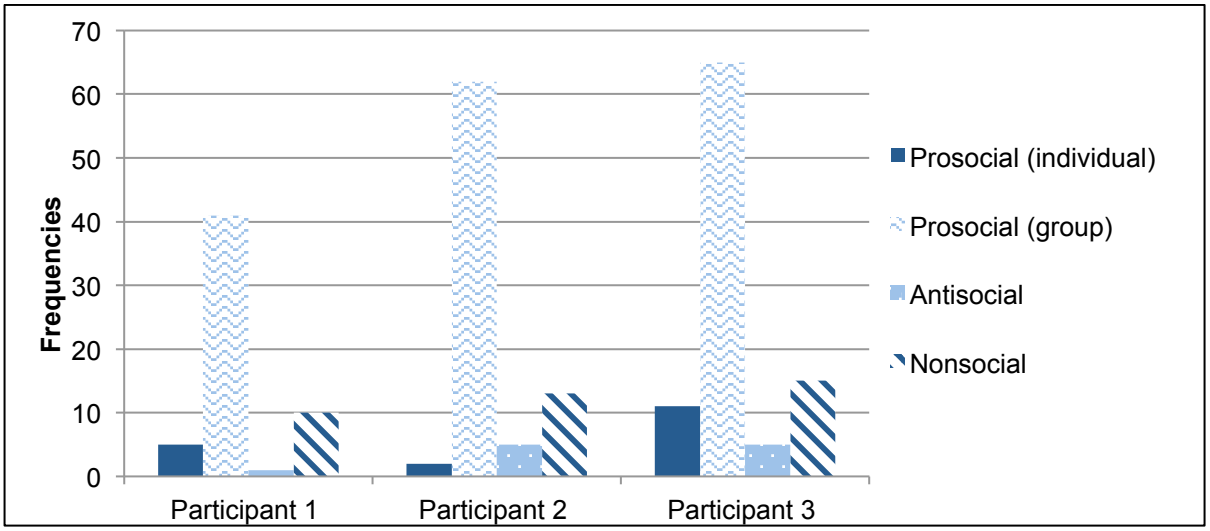


Figure 24. Frequencies of social behaviours *with* M&T for field study participants 1-3.

Figure 25 describes the social behaviours per participant without M&T. All three participants exhibited prosocial and nonsocial behaviours. Nonsocial behaviours were the most prevalent at 96 (50.3% of total behaviours), with prosocial behaviours closely behind at 90 (47.1% of total behaviours). The least exhibited behaviours for all participants were antisocial at 5 (2.6% of total behaviours). Participant 2 displayed the most prosocial behaviours at 52 (27.2% of total behaviours); Participant 1 displayed the most antisocial behaviours, 4 (2.1% of total behaviours), and the most nonsocial behaviours, 36 (19.9% of total behaviours).

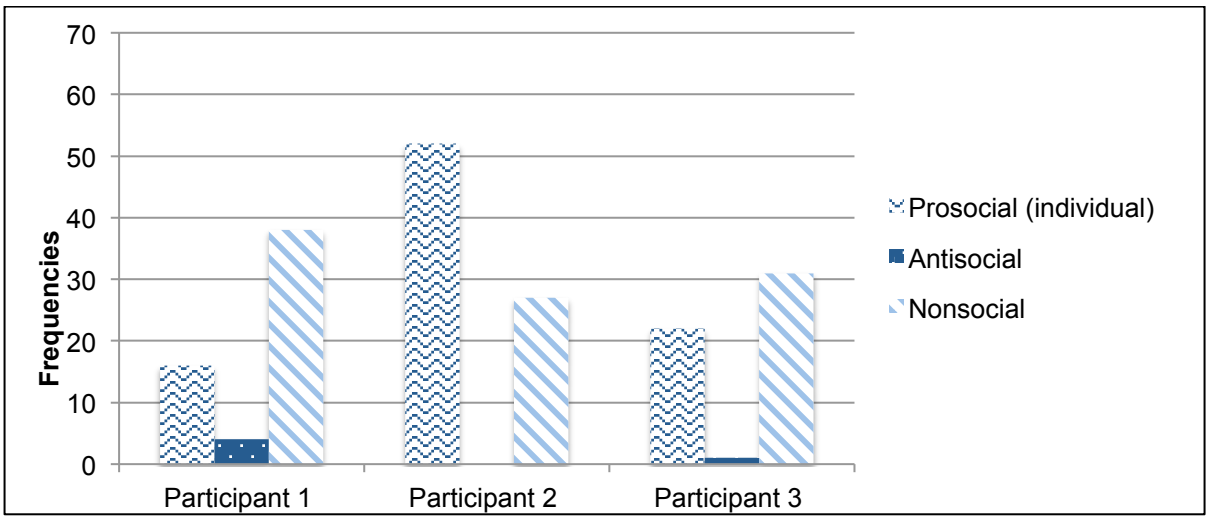


Figure 25. Frequencies of social behaviours *without* M&T for field study participants 1-3.

The boy participant displayed more individual prosocial behaviours compared to both girls in the field study. He also was second overall for prosocial behaviours, 64 (27.9% of total behaviours) and the least antisocial, displaying no antisocial behaviours.

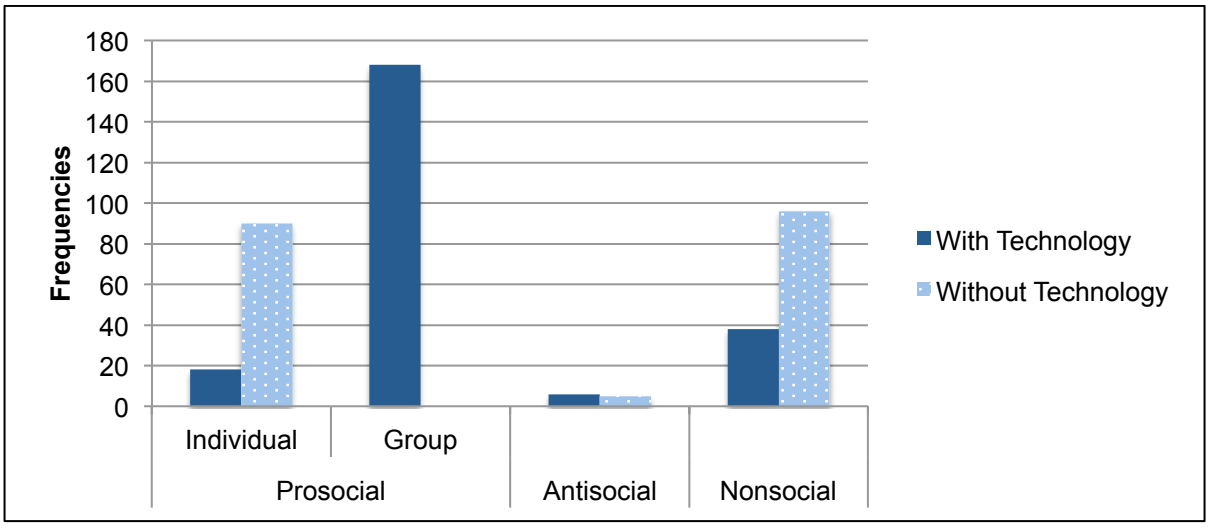


Figure 26. Frequencies of social behaviours with and without M&T during field study.

Figure 26 displays the social behaviours comparing M&T to no M&T. Overall, prosocial behaviours with M&T was the most common with 276 events (65.9% of total behaviours). The next most commonly observed behaviours were nonsocial behaviours 134 (32.0%). Comparing M&T to no M&T, prosocial behaviours with M&T were the most commonly displayed 186 (44.4% of total behaviours) compared to 90 (21.5% of total behaviours) without M&T. There were more individual prosocial behaviours without M&T, but there were also more nonsocial behaviours, 96 (27.9% of total behaviours). Antisocial behaviours were the least common with and without M&T, 11 (2.6% of total behaviours).

Figure 27 displays the individual prosocial sharing behaviours of showing, allowing use, and offering comparing activities with and without M&T. Overall, showing was the most prevalent sharing behaviour displayed with and without M&T, 90 (84.1% of total behaviours). Showing was also observed more frequently with M&T, 14 (13.1% of total behaviours), and without M&T, 76 (70.1% of total behaviours). The least displayed individual behaviour with M&T was offering, 1 (0.9% of total behaviours) and without M&T was allowing use 2 (1.9% of total behaviours).

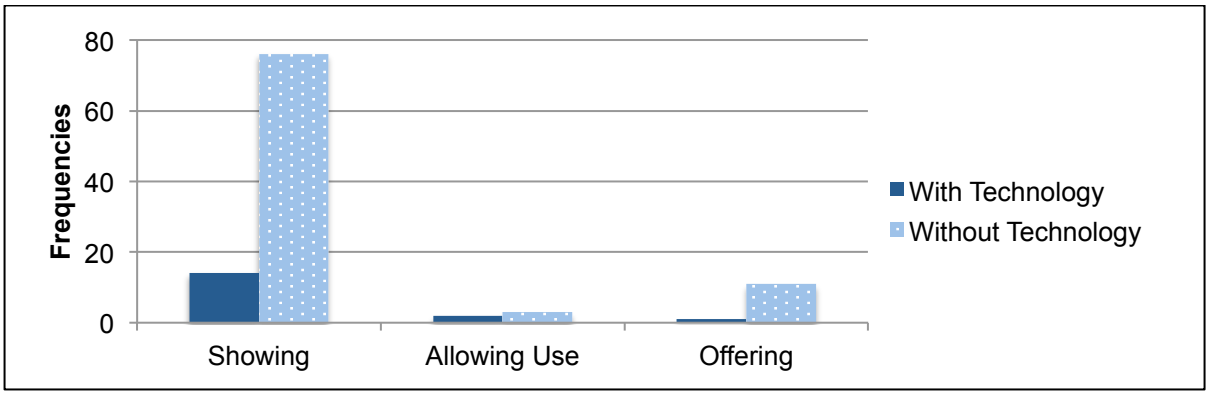


Figure 27. Frequencies of individual prosocial behaviours with and without M&T during the field study.

Chi-square, as a way to compare categorical items, was used to explore the association between M&T, sharing, and ToM. Four different Chi-square analyses were conducted: 1) comparing ToM and sharing with M&T, 2) comparing ToM and sharing without M&T, 3) comparing ToM to M&T or no M&T, and 4) comparing sharing to M&T or no M&T.

A Chi-square test for independence (with Yates Continuity Correction) and a Fischer's Exact test on the field study participants using M&T indicated no significant association between ToM and sharing behaviours, x^2 (1,n=131)=2.459, p=0.090, phi=0.158 (*Table 9*). The proportion of participants displaying sharing behaviours and ToM was not significantly different from the participants who did not display sharing behaviours and ToM. There appears to be no association between sharing and ToM when M&T is involved. In other words, when M&T is involved, if ToM is observed as present then sharing is not present. There is no increased presence of sharing if ToM is present when M&T is used.

Table 9. Proportion of sharing events with and without ToM with M&T for the field study.

	ToM observed n(% of total)	**ToM not observed n(% of total)**	**Totals n(% of total)**
Sharing present n(% of total)	19 (14.5%)	68 (51.9%)	87 (66.4%)
Sharing absent n(% of total)	4 (9.1%)	40 (30.5%)	44 (33.6%)
Totals n(% of total)	23 (14.8%)	108 (85.2%)	131 (100%)

A Fischer's Exact test on the field study participants without using M&T indicated a significant association between ToM and sharing behaviours, x^2 (1,n=193)=30.61, p<0.000, phi=0.451 (*Table 10*). The proportion of participants displaying individual sharing behaviours

and ToM was significantly different from the participants who did not display individual sharing behaviours and ToM. There appears to be a significant association between sharing and ToM when M&T is not involved. In other words, when M&T is not involved, ToM is observed as present then sharing is also present. There is increased presence of sharing when ToM is present when M&T is not used.

Table 10. Proportions of sharing events observing ToM without M&T for the field study.

	ToM observed n(% of total)	**ToM not observed n(% of total)**	**Totals n(% of total)**
Sharing present n(% of total)	26 (13.5%)	66 (34.2%)	92 (47.7%)
Sharing absent n(% of total)	0 (0%)	101 (52.3%)	101(52.3%)
Totals n(% of total)	26 (13.5%)	167 (86.5%)	193 (100%)

A Chi-square test for independence (with Yates Continuity Correction) on the field study participants indicated no significant association between ToM and M&T use, x^2 (1,n=324)=.721, p=0.396, phi=0.056 (*Table 11*). The proportion of participants displaying ToM and M&T use is not significantly different from the participants who did not display ToM nor M&T use. There appears to be no association between ToM and M&T. In other words, M&T use is not a factor when ToM is present.

Table 11. Proportions of ToM events with and without M&T for the field study.

	ToM observed n(% of total)	ToM not observed n(% of total)	Totals n(% of total)
M&T used n(% of total)	23 (7.1%)	108 (33.3%)	131 (40.4%)
No M&T used n(% of total)	26 (8.0%)	167 (51.5%)	193 (59.6%)
Totals n(% of total)	49 (15.1%)	275 (84.9%)	324 (100%)

A Chi-square test for independence (with Yates Continuity Correction) on the field study participants indicated significant association between M&T use and sharing behaviours, x^2 (1,n=324)=10.343, p=0.001, phi=0.185 (*Table 12*). The proportion of participants displaying sharing behaviours and M&T use is significantly different from the participants who did not display sharing behaviours and M&T use. There appears to be a significant association between sharing and M&T use. In other words, the use of M&T is a significant factor when sharing is present.

Table 12. Proportions of sharing events with and without M&T for the field study.

	M&T used n(% of total)	No M&T used n(% of total)	Totals n(% of total)
Sharing present n(% of total)	87 (26.9%)	92 (28.4%)	179 (55.2%)
Sharing absent n(% of total)	44 (13.6%)	101 (32.2%)	145 (44.8%)
Totals n(% of total)	131 (40.4%)	193 (59.6%)	324 (100%)

After the third scenario and a series of successful activities, the results indicated that the following activities should be used for a definitive test:

1. Read *Mine* digital storybook to facilitate discussion regarding sharing
2. ToM storybook task battery
3. Demonstration of *Chatterpix Kid* app by researcher to participants
4. *Chatterpix Kid* with limited iPad to children ratio

4.5 Results: Definitive Test (Phase 5)

The definitive test consisted of new participants and a new location separate from the field study. The definitive test phase only had one scenario, based on the iterations from the field study. The definitive test scenario had four activities: 1) Reading digital story *Mine,* 2) ToM storybook task battery, 3) Researcher demonstration of *Chatterpix Kid*, and 4) Five children to three iPads using *Chatterpix Kid* to animate pictures taken.

In the first activity, the researcher read a digital story to the children. During the activity, the children and the researcher shared one iPad device. The sharing behaviours that were displayed were showing and watch together while the researcher controls. The researcher controlled the iPad and the five participants watched together (*Figure 28*).

Figure 28. Participants 4-8 reading an iPad story with the researcher.

The researcher used the story as a facilitator of pre-interview questions and asked questions about feelings, kindness, and iPads. The first question the researcher asked was related to ToM, asking if the characters look happy, sad, or mad. The question was asked to know if the children understood basic emotions that would arise in the ToM storybook task battery. Participants 5 and 6 identified the characters as mad and the other children nodded their heads in agreement with Participants 5 and 6. Next, the researcher asked about the characters and their behaviours. A few of the participants were able to identify that the characters were not nice in the beginning because they were "fighting", but they turned nice at the end of the story. The final question the researcher asked was to gauge if the children had previous experience with iPad devices. Several of the participants identified that they knew what an iPad was. In particular, Participant 5 said, "My mom and Dad have a iPad." Several other participants stated, "I have one." Once the story was completed and the questions were answered, the second activity was initiated. The ToM storybook task battery was used to measure the children's ToM. During this activity, the researcher read the ToM storybook task battery (Hutchins et al., 2014), while the participants answered the questions (*Figure 29*).

Figure 29. Definitive test ToM storybook task battery.

Some questions required the children to hold up the stick puppet emotion faces, while other questions required them to answer verbally, or raise their hands. One participant was distracted by the stick puppet items and did not fully participate in the task battery. The children received a score out of 15 measuring their ToM abilities (*Table 13*).

Table 13. ToM storybook task battery scores for the definitive test.

Participant	Score n/15 (%)	ToM Knowledge Level (0-5 low, 6-10 medium, 11-15 high)
4	13 (86.7%)	High
5	13 (86.7%)	High
6	13 (86.7%)	High
7	8 (53.3%)	Medium
8	4 (26.7%)	Low

The third activity had the children watch the screen while the researcher demonstrated the use of the *Chatterpix Kid* app. Participant 5 spoke to record a voice. There were no explicit sharing activities, as this activity was primarily for app demonstration.

The fourth activity involved the children working together taking photos and animating the photos using *Chatterpix Kid*. The children worked in groups of two or three or worked independently. Initially, the children played with a device and other children based on their prior peer affiliations. For example, Participant 6 and Participant 7 both wanted to work with Participant 4 because they were friends prior to participating in this study. Shortly after the initial group make-ups, the children shifted into other groups and constantly switched partners based on who was holding the device.

The sharing behaviours that were observed included: offering, allowing use, showing, watch together and participant controls, one participant holds while the other touches the screen, taking turns, multiple hands on the device, speaking together, and touching the screen together (*Figure 30*). There were several incidents of observed ToM throughout this activity during prosocial events.

Figure 30. Participants 4-8 sharing iPads.

The children would gather around devices and watch the screen together after an animation was created. They would also sit on the floor together and touch the screen and speak into the device to record their voices together. Similar to the field study participants, the children would express the need to share and show their creations. Several times children said "look" and hold up their device or point to the screen. Showing occurred more frequently when the children discovered the ability to add stickers to their screens. For example, Participant 4 said, "Look I got 2 butterflies."

The nonsocial behaviours occurred throughout the activity and were exhibited when the children worked independently (*Figure 31*).

Figure 31. Participants 4 and 5 work independently while other participants work together.

Sometimes children did not work with an iPad or with any other participants. They were distracted from the designed research activity and played with another toy (i.e., a chick) (*Figure 32*).

Figure 32. Participant 8 playing with other toys.

The antisocial behaviours that were observed were: pushing another's hand aside and pulling an item away (*Figure 33*). The children also displayed antisocial behaviours verbally. For example, Participant 6 pushed Participant 7's hand off the screen and said, "No, no, no. I want to do it. You do this!" Participant 7 said, "No!" in response. This lead to Participant 6 saying "No, no, no, no. No! I want to do it."

Figure 33. Participant 6 exhibiting antisocial behaviours.

Other antisocial behaviours were also verbally expressed using "I want." For example, Participants 4,6, and 7 said, "I want to do it." When antisocial behaviours persisted, the researcher used verbal cues to encourage sharing. For example, the researcher initiated prosocial behaviours for Participants 6 and 7 by reminding them to "take turns". Verbal cues initiated other prosocial sharing behaviours, such as touching the screen together.

In another event of antisocial behaviours, (*Figure 34*), Participant 5 took a picture of Participant 7 and proceeded to animate her photo in the app. He made her photo talk and say noises, such as, "Hootoo! Hootoo! Hootoo!" As the other children gathered around the iPad to

laugh at Participant 5's funny animation, Participant 7 was becoming visually upset and began to cover her face and tears welled up in her eyes.

Figure 34. All participants laughing while Participant 7 covers her face.

The researcher noticed this right away and intervened by saying, "Wow you are a good model. Good picture," to Participant 7. The encouraging words from the researcher stopped the laughing and caused Participant 7 to smile. Overall, prosocial behaviours were more prevalent than nonsocial and antisocial behaviours. The next section will describe the specific frequencies of the observed behaviours.

4.5.1 Quantitative Results for the Definitive Test (Phase 5)

Quantitative analyses included descriptive statistics and one Chi-square test. The controlled variables include: age of children (between three and four), one location for one

scenario, and one type of device (i.e., iPads). The dependent variables were social behaviours and ToM. The independent variables were the interactive activities and the designed intervention. The first quantitative results include descriptive frequencies.

Figure 35 shows the social behaviours per participant with M&T. All five participants exhibited prosocial group behaviours 146 (70.9% of total behaviours). Participants 7 and 8 did not exhibit individual prosocial behaviours. Participant 7 did not display nonsocial behaviours. Overall prosocial behaviours were the most common with 177 events (86% of total behaviours). The least frequently observed behaviour was antisocial behaviour with only 9 events (4.4%). Individually Participant 4 exhibited the most prosocial behaviours, 14 (6.8% of total behaviours). Overall, Participant 6 exhibited the most prosocial behaviours, 47 (22.8% of total behaviours). Participant 5 exhibited the most nonsocial behaviours, 8 (3.9% of total behaviours). Participants 5 and 6 exhibited the most antisocial behaviours, 3 (1.5% of total behaviours). On average, the boys exhibited slightly less prosocial behaviours than the girls with 30-37 events (15% to 17% of total behaviours). The boys were two times (1% of total behaviours) more antisocial and nonsocial than the girls.

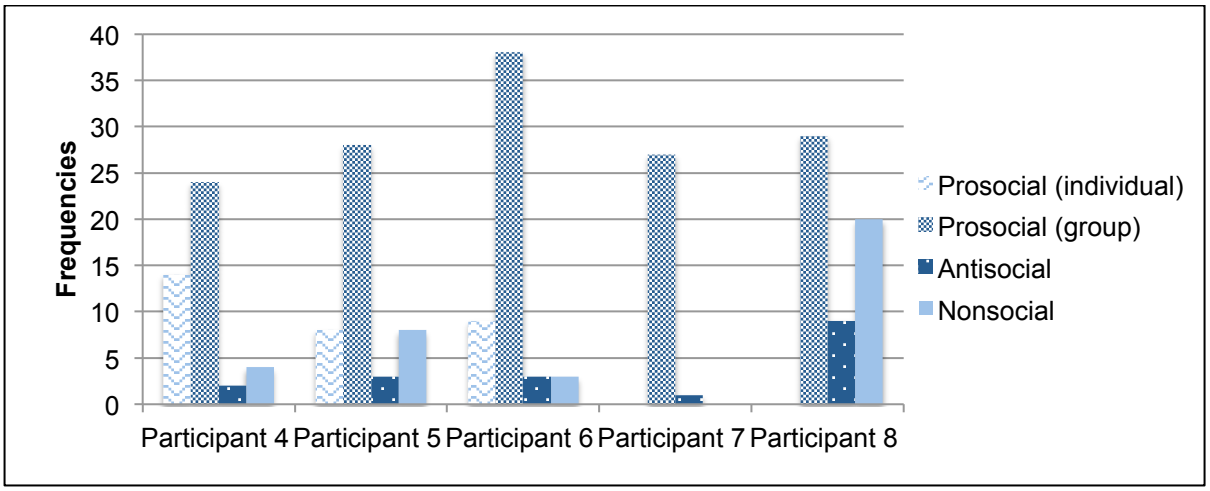


Figure 35. Participant (4-8) social behaviour counts with M&T.

Figure 36 displays the individual prosocial sharing behaviours of showing, allowing use, and offering. Overall, showing was the most common sharing behaviour displayed, 20 (64.5% of total behaviours). The least common individual behaviour was allowing use, 3 (9.7% of total behaviours).

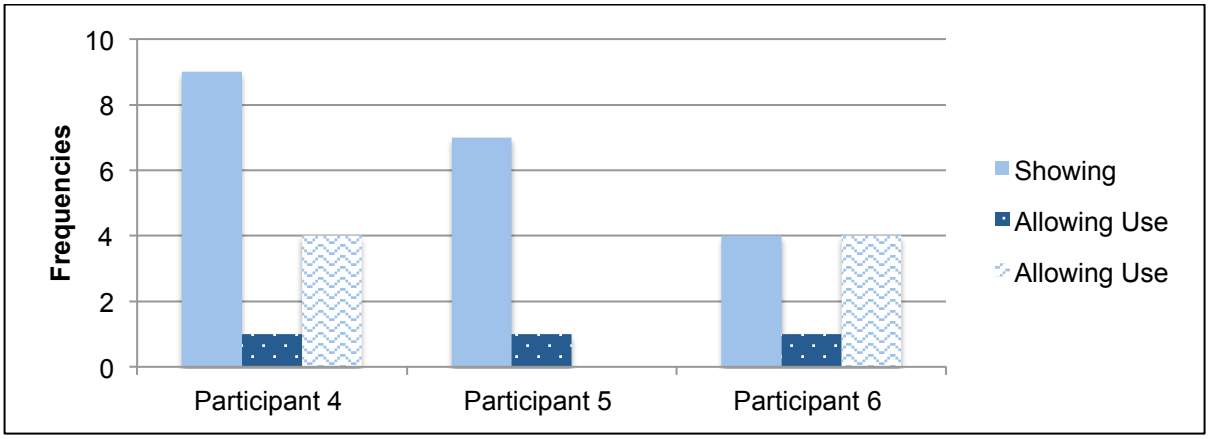


Figure 36. Individual prosocial behaviours per participant (4-6) [7].

A Fischer's Exact test on the field study participants indicated significant association between ToM and sharing behaviours, x^2 (1,n=119)=5.586, p=0.006, phi=0.243 (*Table 14*). The proportion of participants displaying sharing behaviours and ToM was significantly different from the participants who did not display sharing behaviours and ToM. In other words, when ToM is observed as present then sharing was also present.

[7] Note: Participants 7 and 8 are removed from the figure as they did not display any individual sharing behaviours

Table 14. Proportion of sharing events observing ToM with M&T for the definitive test.

	ToM observed n(% of total)	ToM not observed n(% of total)	Totals n(% of total)
Sharing present n(% of total)	20 (21.7%)	72 (72.7%)	92 (77.3%)
Sharing absent n(% of total)	0 (0%)	27 (22.7%)	27 (22.7%)
Totals n(% of total)	20 (16.8%)	99 (83.2%)	119 (100%)

Final conclusions were drawn based on the field study and the definitive test. Validation occurred through triangulation between the qualitative and quantitative data, video recording observations, and interviews.

This section of Chapter 4 described the qualitative and quantitative results of scenarios for the field study and the definitive test. The next section addresses the research questions based on conclusions drawn from these results.

4.6 Discussion

Throughout the research in this dissertation, social behaviours, ToM, and their relations to M&T were explored, specifically focusing on sharing behaviours and ToM, and their interplay, when iPads are introduced into an ECE setting. The main task was testing a teaching intervention using the DBR method and video ethnographic techniques. The designed intervention focused on using iPads in sharing scenarios. Mixed methods, qualitative and quantitative, tested and evaluated the designed intervention. The following sections explore the results of my research, reflecting on the theoretical underpinnings and research of others, through each research question.

4.6.1 Question 1

This section discusses results in relation to question one: *In what ways do theory of mind and the prosocial behaviour of sharing manifest among preschool-aged children interacting with iPads?* This section is divided into key themes of: manifestations of ToM, peers influencing on sharing, cost of sharing, using video, and motivation.

4.6.1.1 Manifestations of ToM

ToM was measured in two ways: the storybook task battery and *in situ* observations. The results of the ToM storybook task battery indicated that all children had some ToM. Participants 1-6 all had high levels of ToM, which supports other research stating that by the age of four children have ToM (Blijd-Hoogewys et al., 2008; Lane et al., 2010; Song et al., 2012; Weimer et al., 2012) and contradicts the dissertation of Kohlberg (1958) and the work of Piaget (Piaget, 1951) stating that only adolescents and adults can have internal moral reasoning and young children are egocentric. The ToM results for two of the children in this dissertation do not completely agree with other research findings. Participant 8 was four years old, but had a low level ToM. The video analysis suggested that he was not interested in participating and was distracted by the four stick puppets rather than accurately measuring his ToM. He was captured playing with the stick puppets instead of answering questions. Distractions and short attention spans are some of the many challenges of working with preschool-aged children. Participant 7's results were also inconsistent with other research. This is possibly due to her age (she was three years old) and displayed a medium level of ToM through the task battery. Her results suggest that children under four years old are capable of having a ToM, but may not be as advanced as a four year old. The ToM storybook task battery was used as a baseline indicator measuring each

child's capabilities. After that test, the manifestations of ToM in preschool-aged children were measured through observations in each scenario.

As previously described, manifestations of ToM were observed or not observed in preschool-aged children based on the three domains: emotion recognition, desire recognition, and seeing leads to knowing. Most ToM domains (8 of the 11) are internalized factors; therefore only three observable domains were chosen. My research extends the traditional task tests of other research and attempts to measure ToM *in situ* based on the observable task domains. Even though the manifestations of ToM were not frequently observed, it does not mean ToM does not exist. ToM, often based on a test in other research and this current study, suggest that children who pass the test use ToM all the time, but my current study suggests that this may not be true. ToM may not be the motivator of actions all the time. If the task battery was the only measure for ToM, it could be said that all behaviours were indicative of ToM. However, when measuring ToM *in situ*, ToM seems to be less common than other research suggests. Social behaviours were not always indicative of ToM, rather based on social learning practices, which will be discussed more in latter sections of this chapter. The next section explores peer influences on sharing.

4.6.1.2 Peer Influences on Sharing

Peers can have some of the strongest social influences during development and can sometimes determine actions and feelings. At early ages, peers can include parents, teachers, and siblings, but as children enter school peers become children of similar ages. In each phase of my study with preschool-aged children, peer social behaviours were measured. As described, the children in each study displayed nonsocial, antisocial, and prosocial behaviours. The two peer influences that emerged were prior peer affiliations and gender.

The first potential influence of the actions of the children in the study of this dissertation was prior peer affiliations. The prosocial behaviours of sharing were reflected in the peer relationships. Other researchers have described how children demonstrating prosocial behaviours would associate with other children who demonstrated similar prosocial behaviours, and the same association relationship for antisocial behaviours (Eivers et al., 2012; Fabes et al., 2012; Fujisawa et al., 2008; Liao et al., 2014). My research supported some of these findings, as peers associated within certain peer groups. In the definitive test, the children initially chose their groups based on prior relationships; however, in a subsequent phase of the scenario children were seen to share with other children based on the resource availability. There were three iPads and five children. The children shifted to different groups based on who was in possession of the iPad and did not choose partners based on prior peer affiliations. The children would cluster around certain children who were in initial control of that device, not because they were friends with that child. In the field study, Participants 1 and 2 were friends prior to the research, which did not indicate whether Participant 3 would, or would not be included in prosocial sharing behaviours. In fact, Participants 2 and 3 would share together more often that Participants 1 and 2. All three participants interacted with each other in partners or in a group of three, with prior peer affiliations having limited to no influence.

Antisocial behaviours were not influenced by prior peer affiliations, rather antisocial behaviours were reflective of reactive aggression as described by Eisenberg-Berg et al. (1979) and Eisenberg-Berg (1981). Prior research studies describe antisocial behaviour for preschool-aged children as external behaviours of pushing, hitting, or verbal aggression. My research supported the findings as the antisocial behaviours focused around the defense of play area or item. In particular, the children in the field study and definitive test demonstrated antisocial

aggression by pulling an item away or pushing a hand away or saying “no” or “I want.” Antisocial behaviours were not predicated by peer affiliations, rather the behaviours were manifested when a child tried to maintain or obtain control of the device. Despite some antisocial moments, overall, there were more manifestations of prosocial behaviours than antisocial behaviours.

The nonsocial behaviours were also not indicative of peer affiliations because the children who would not participate with other children either positively or negatively, rather they were neutral in their social behaviours. When the children were nonsocial, no ToM manifestations were observed, because ToM is dependent upon the interactions between people. Prior peer affiliations were not predictors of social behaviours.

The second possible influence on social behaviours with peers was gender. Other research states that groupings are often determined by gender and that children will share more frequently with other children of the same gender (Hay et al., 1999; White et al., 2014). Other research further states that boys exhibit more antisocial behaviours, whereas girls exhibit more prosocial behaviours (Bouchard et al., 2015; Eisenberg-Berg, 1981; Eivers et al., 2012; Hartas, 2011; Hay et al., 1999; Radke-Yarrow et al., 1976; Warneken & Tomasello, 2013). The gender predictors are often based on preconceived notions of normative behaviours. As described in Chapter 2, teachers associate empathy and prosocial behaviours to girls and not to boys (Belacchi & Farina, 2012; Bouchard et al., 2015; Fabes et al., 2012). My research contradicts others research studies, as gender did not determine predict prosocial sharing behaviours. In particular, Participant 2, who was a boy in the field study, was more prosocial than Participants 1 and 3, who were both girls. In both the field study and the definitive test, boys and girls shared the iPads together (*Figure 37*).

Figure 37. Boys and girls sharing with each other.

My research results agree with researchers stating that gender did not significantly impact behaviour (Alper (2013); Bouchard et al. (2015); Fabes et al. (2012). The children in both phases of the research in this dissertation did not display a specific choice of prosocial sharing behaviours towards one gender group over another. They would change groups and partners frequently as their decisions were probably based upon who was in control of the iPad. If only one child was using an iPad they would move to that person to increase their chances of

interacting with the device. Sharing may not be determined by prior peer affiliations or gender, rather sharing might be determined by cost and object properties, which will be discussed in the next section.

4.6.1.3 Cost of Sharing iPads

To reiterate, the cost of sharing is a loss by giving something away or an action that is not reciprocated. Some research describes goods that are distributed equally to all (Dunfield, 2014; Sommerville et al., 2013). My research contradicts other findings in the first scenario of my field study phase, as the children did not care about the distribution of the stickers or any other item. They did not divide them up equally or in any way, rather they used the resource as needed. At one point, Participant 2 attempted to ask the other participants if they wanted a particular sticker, but neither child seemed interested. The children were not concerned with equal distribution of goods.

Some research has found that selfish or antisocial behaviours were more frequent once the cost of sharing was calculated or that sharing was more frequent when it was non-costly (Brownell et al., 2009; Paulus et al., 2013; Paulus & Moore, 2014; Warneken & Tomasello, 2013); however, my research contradicts these studies. The perceived cost of an iPad is quite high, as neither location had any mobile devices in the classroom. Some researchers, educators, and parents may think that no devices in the classroom would increase the value of the iPad as many children only used the item at home and with their parent's permission or control, but that was not the situation in this research. Despite the perceived value, 'cost' did not detract from prosocial sharing behaviours, as the children shared these devices frequently. Additionally, reciprocity was not a factor as indicated by social exchange theory. In other research, reciprocity

was central to the manifestation of sharing behaviours (Feldman et al., 2013; Fujisawa et al., 2008; Hay et al., 1999; Warneken & Tomasello, 2013); however, in my research, the children more frequently shared the iPad with each other without the presumption of reciprocity.

Overall, the introduction of iPads was not impeded by perceived value and the cost of sharing. The next section will explore how video cameras were key components to capturing sharing behaviours and ToM.

4.6.1.4 Using Video to Capture Sharing and ToM

As described in Chapter 3, this research study used video ethnographic methods to capture behaviours and ToM manifestations. The video recorded preschool-aged children interacting with each other using iPads in classroom settings. Multiple cameras captured different points of view. The videos assisted in capturing accurate counts of behaviours and ToM manifestations and in understanding what the children were saying and doing. To reiterate, my research used two researcher cameras and several personal point of view blue *Snapcam Ion* cameras for the children to wear. The cameras were high-definition and captured 60 frames per second, which obviously is more than a human could capture with a still image camera. The different sets of cameras were used to reduce the partial representation that a video ethnographer captures (Hammersley & Atkinson, 2007). At times, the children would move out of shot and the researcher camera would not capture the behaviours (*Figure 38*).

Figure 38. Participants 5 and 8 move out of researcher camera shot.

When the children would move out of the shot of the researcher camera, the *Snapcam Ion* continued to capture what the children were doing and was essential to the data analysis part of the research (*Figure 39*).

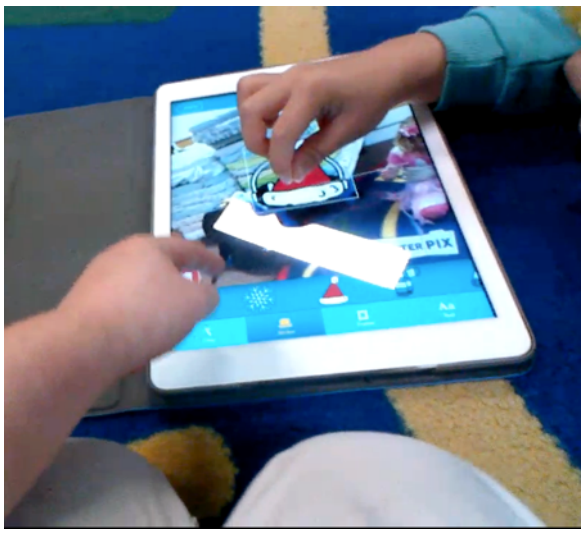


Figure 39. Participant 5's point of view camera.

At times, the point of view footage was dark or black when the children would lie down on the carpet or their shirt would cover the camera lens and some footage was lost. However, a significant amount of video footage was captured and supported the research camera. Even though there were times when the image was lost, the cameras continuously captured the audio and the cameras acted as individual microphones. NVivo was used to organize all of the footage and allowed the researcher to view, analyze, re-view and re-analyze the footage captured by the researcher and cameras (Heath et al., 2010; QSR International, 2016). Some research recommends that children can capture their own footage in participatory research (Kullman, 2012); however, typical participatory research in which children use their own cameras are for children over six years old. My research extends other research to include children under five years old. The use of wearable cameras with preschool-aged children is something fairly unique in educational research and should be tested in other ECE research. More research is needed to explore the impact of personal point of view cameras or participatory research cameras in ECE.

At times, the video footage would capture the silences that Shrum et al. (2007) suggests are as important as the sounds captured. When the children would work 1:1 with the iPads, the focus was on their one device and there were minimal interactions with other children. During these moments, the video footage captured almost over five minutes of silence. Five minutes of silence from preschool-aged children can be pretty astounding, especially as the researcher observed limited attention spans in earlier activities, i.e., the pre-interview. Some researchers could challenge that the silences could just as easily be captured in audio recordings as much as video recordings and therefore video cameras are not needed. This is true; however, the body language alongside of the silence was important to observe. The children's focus and heads were down and they barely moved. This would not be captured in audio recordings. The captured moments were essential to the analysis of the data.

The video captured assisted in the analysis portion of the research. With audio recordings alone or hand-written field notes, the researcher would not be able to get accurate counts of behaviours and ToM manifestations. The video footage was viewed and re-viewed and coded over several sessions using NVivo software (QSR International, 2016). Being able to re-view the video and having several passes at the footage also refined the thematic coding. Initially, the coding was based on the Observational Measure of Prosocial Incidents (OMPI) of Ramaswamy and Bergin (2009) including: offering, showing, allowing use, and taking turns; however, the use of the iPads and the complex sharing behaviours that emerged needed to be addressed. The captured video allowed for this complexity to be addressed.

Finally, the cameras were essential to this research that audio recordings or still images alone would not be. In particular, the children's voices had a similar tone, making it difficult to decipher what child was saying what. Additionally, some of the children had speech difficulties,

making it even more difficult to decipher what some children were saying. When transcribing and coding the footage, NVivo and video footage were central to understand what was being said. Also, the children would often speak at the same time, as is often the situation in preschool classrooms. If the voices were similar or unclear, watching the video footage allowed the researcher to look at the children's mouth and vocal gestures to see what words they were trying to say.

The video footage was central to this research and needs to be encouraged in future research in ECE or when working with young children. Even though some parents or research ethics boards may be hesitant about children being recorded, researchers need to continue to exert and emphasize the importance of capturing children's authentic behaviours on camera for continued research. This section discussed the importance of using video ethnography with researcher and wearable point of view cameras in ECE research. The next section explores how motivation could influence the manifestations of sharing behaviours.

4.6.1.5 Motivations behind the Manifestation of Sharing Behaviours and ToM

There were several motivators that triggered sharing behaviours, which were initiated by the children themselves, by their peers, and also by the researcher. In particular, each child could choose when to share or not. The motivations included: ToM, altruism and egoism, and decision-making.

The first motivator, ToM was measured in every child. Every child had ToM and every child in both phases displayed some sort of shared behaviour, individually or within small groups, and some level of ToM. As other critiques suggest, measuring ToM only using a false-belief or task measure, we may not have completely accurate measures of ToM (Hutchins et al.,

2008; Leudar & Costall, 2009). My research agrees with Eisenberg (1982) where ToM can be connected to a prosocial act, including recognizing the other person's needs and empathy. For example, in my research when participants would express a desire, or asking, "can I have a turn?" other participants would respond. The response and act of sharing is reflective of desire-recognition domain of ToM. Several participants demonstrated ToM by recognizing other's needs and feelings through empathy; however, there were also several times that the children shared when ToM might not have been a factor. Eisenberg (1982) identified skills for helping behaviours that can be also adapted and applied to sharing behaviours. In order for a child to demonstrate a sharing ability they need the ability to:

- Consider a variety of alternative acts
- Predict the outcome of one's own behaviour
- Understand the importance of intention to act
- Recognize the other person's needs
- Empathize
- Reason morally according to postconventional principles
- Self-regulate one's behaviour (p. 200)

A child would have the ability to use all of these skills to perform the highest level of prosocial behaviours, but a low level of prosocial behaviours only requires some of these skills. The ability to achieving the six skills is dependent upon cognitive skills, perspective taking, and morality and the ability for altruistic or possible self-sacrificing (Eisenberg, 1982). Young children may reason morally according to postconventional principles or they may need a reason at a preconventional level related to social learning or they share because they recognize another person's needs. For example, a child asked, "Can I play now?" and the other child gave them

access to the iPad. My research findings agree with other research on levels of high moral reasoning, in which general principles are guidelines for ethical rules (Bierhoff, 2002; Kohlberg, 1958, 1984). The list from Eisenberg (1982) focuses on prosocial behaviours, but the list does not indicated ToM as a motivator for every action. Not all of these are indicative of ToM, as ToM is about understanding another's feelings or desires, which is only understood for some of these skills.

Table 15. Prosocial behaviour skill motivated by ToM.

Prosocial behaviour skill	ToM (yes or no)
Consider a variety of alternative acts	Yes
Predict the outcome of one's own behaviour	No
Understand the importance of intention to act	No
Recognize the other person's needs	Yes
Empathize	Yes
Reason morally according to postconventional principles	Yes
Self-regulate one's behaviour	No

Table 15 identifies which of the prosocial skills uses ToM as a motivator. ToM is commonly associated to a few skills, which suggests that ToM is not the only motivator of prosocial behaviours. For example, Participant 2 exhibited over 64 (27% of total behaviours) prosocial behaviours with M&T and zero antisocial behaviours. If the observed social behaviours of Participant 2 were combined with the results of the ToM storybook task battery, then ToM motivated every action; however, his sharing was not only based on ToM but also on social rules and his own understanding of respect and equality.

A second motivator of sharing behaviours is altruism and egoism and my research reflects the basic assumptions about human nature, motivations, and processes. My research, as

described in Chapter 1, is focused on the three theories of empathy-altruism, social exchange, and social learning. These three theories represent a part of Bierhoff's (2002) six theories of prosocial behaviour (*Figure 40* – used with permission).

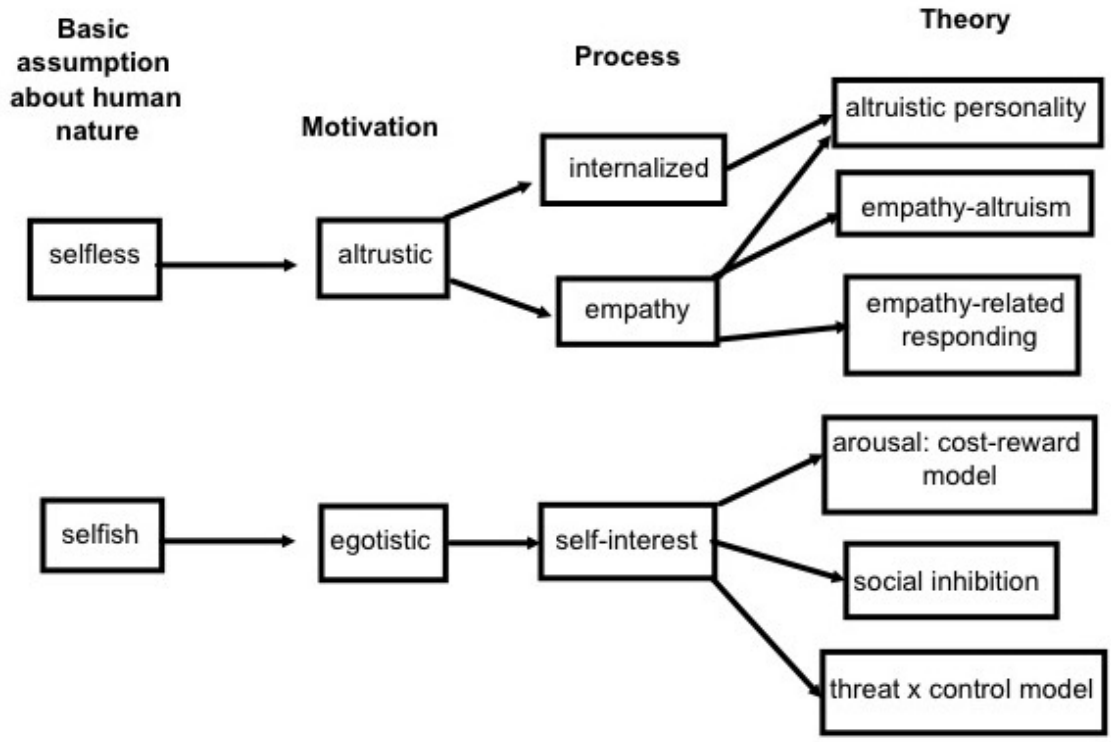


Figure 40. Six theories of prosocial behaviour adapted from Bierhoff (2002, p. 177).

In both ECE groups in my study, the children displayed altruistic acts that were internally motivated and not completely predicated on external reminders from the researchers. The selfless act could be based on altruistic tendencies and empathetic responses. For example, in the definitive study Participant 4 offered the iPad to Participant 6 when the latter seemed upset about not having her own device. There were limited antisocial behaviours observed in my research study that related to selfish or egotistic acts. Looking closely at the observed antisocial

behaviours, the children were often defending their play area. It is possible that the antisocial, egotistic, selfish acts were not very common because of the designed intervention as the purpose was to facilitate prosocial sharing behaviours reducing antisocial behaviours. Social or relational aggression of children with a high ToM was limited to one incident in which Participant 5 might have been participating in a type of social bullying against Participant 7, but was subsided with researcher intervention and the short attention spans of the preschool-aged children moving on to another image in their iPad.

The altruistic or egotistic motivators are internal motivation processes of children; however, based on social learning theory, I believe that before a selfish or selfless act takes place, a decision can occur, which can be externally motivated from the social norms of the classroom. Children sometimes use social learning or cognitive development before making the selfish or selfless decision (*Figure 41*). And sometimes children unconsciously behave in a selfish or selfless way.

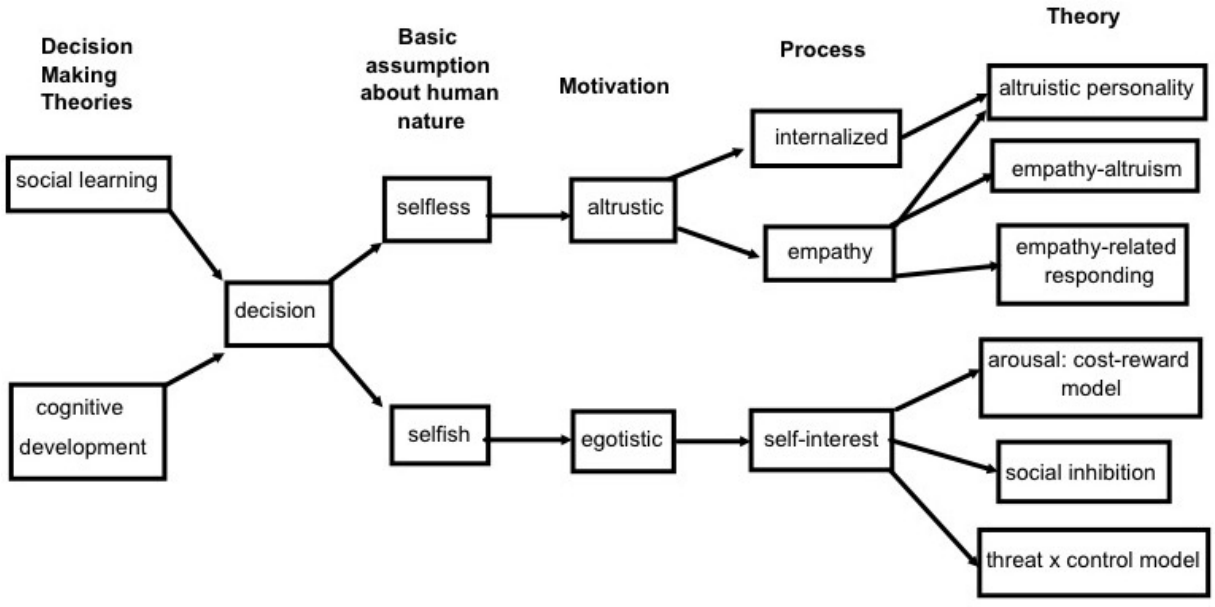


Figure 41. Adding decision making to Bierhoff's six theories of prosocial behaviour.

By extending the theories beyond the initial six suggested by Bierhoff (2002), to include social learning and cognitive development there can be a greater understanding of the motivations for prosocial behaviours. Also, social learning or cognitive development could be a place when a child uses or does not use ToM. For example, Participant 2 had the iPad and was deciding to share with another child; his decision was based upon the social conventions of his ECE classroom where he had learned to take turns, as facilitated by the teacher or researcher. The researcher or teacher would have an influence on the motivation through verbal cues and links social learning and classroom expectations to taking turns. Children are also motivated by their own cognitive development in which they understand the importance of sharing or sociocultural theory. *Table 16* identifies other motivators for prosocial sharing skills that are grounded in the theories of prosocial behaviours and decision-making.

Table 16. Theoretical motivators for prosocial sharing skills.

Prosocial behaviour skill	**Motivators from theories of prosocial behaviours**
Consider a variety of alternative acts	• ToM • Social exchange • Reciprocity
Predict the outcome of one's own behaviour	• Socially learned • Altruistic or egotistic personality
Understand the importance of intention to act	• Socially learned • Altruistic or egotistic personality
Recognize the other person's needs	• ToM
Empathize	• ToM
Reason morally according to postconventional principles	• ToM
Self-regulate one's behaviour	• Socially learned • Altruistic or egotistic personality

In the research in this dissertation, sharing, in relation to social learning theory, was most commonly displayed by *showing*. The children wanted to show their created drawings or animations to hear praise/feedback from their classmates or teacher.

In order for children to exhibit the highest level of moral reasoning, they would need to combine several of the above prosocial behaviour skills. Some children did exhibit some of these attributes and were motivated by internal processing and empathy, as well as recognizing the needs of others and they were also motivated by the social conventions of the classroom and the desire to hear praise from a teacher or classmate. The motivations of sharing can be indicative of preconventional principles and social learning rather than complete altruism or sharing can be motivated by altruism; it is child dependent.

This section explores the answer question one in terms of motivations behind the prosocial or antisocial actions. This section described how children were motivated internally and externally and the connection to deeper learning theories. The next section discusses question two.

4.6.2 Question 2

This section discusses research question two: *What are the effects of iPad use on the manifestation of theory of mind and prosocial behaviours of sharing among preschool-aged children?* The key themes discussed are: negative effects of iPad use, positive effects of iPad use, and discussion of M&T versus no M&T.

4.6.2.1 Negative Effects of iPad Use on Sharing and ToM

Throughout this research study, and based on other research, effects of iPads were observed. The possible negative effects reported in the literature include bullying and theory of nasty minds, antisocial behaviour, and distractions from learning.

The first negative effects identified are related to bullying and theory of nasty minds. When research is conducted with digital devices, negative effects are commonly associated to cyberbullying, which has increase in tandem with increased screen time (Gentile, Li, et al., 2014; Jordan & Robinson, 2008; Uhls et al., 2014; van Geel et al., 2014). Cyberbullying is typically associated with online behaviour and electronic communication, but these were not a part of the designed intervention for my research. In my research, the children were not online, but used the devices in the classroom. Since the design of the intervention had the artifacts remain offline, cyberbullying did not occur. However, traditional face-to-face antisocial behaviours occurred. As described previously, Participant 5 took a photo and made a funny voice for Participant 7, which seemed to upset her, and could be a form of a 'nasty' theory of minds. The relational antisocial behaviour was also described in other research where the child had a ToM and understood he was making fun of her to intentionally upset her (Liao et al., 2014; Renouf et al., 2010; Ronald et al., 2005; Sutton et al., 1999; Yagmurlu, 2014). Participant 5 may have understood what he was doing because he only targeted Participant 7, the smallest and youngest, and no other child in the room. More research is needed to identify a 'nasty' theory of mind. In this type of designed intervention research, targeted relational antisocial behaviour, bullying, or cyberbullying is likely reduced because researchers and teachers are present and likely intervene in problematic negative behaviours in the classroom.

The second potential negative effect when using iPads is related to antisocial behaviour. Albeit not longitudinal, my research does not concur with others' findings associating increased screen time to antisocial behaviours (Edwards & Pye, 2011; Gentile, Reimer, et al., 2014; Hatakeyama & Hatakeyama, 2012; Persson, 2005; Piaget, 1951; Piaget & Inhelder, 1969; Renouf et al., 2010; van Geel et al., 2014). My research also contradicts findings that children are more egocentric and selfish at young ages (Piaget, 1951; Piaget & Inhelder, 1969). As described in the results section, there were a small number of antisocial events associated with iPad use, less than 6 events (2% of total behaviours) during the field study and less than 9 events (5% of total behaviours) during the definitive test. Negative social behaviours were not associated with iPad use in this research. Negative social behaviours were also not associated with an egocentric age group because antisocial behaviours without M&T in the field study were also less than 5 events (2% of total behaviours).

A third possible negative effect from increased screen time is the concern that iPads are over-stimulating, distracting, and too fast paced (Flewitt et al., 2014; Karsenti, 2013). Participants did not demonstrate over-stimulation, distraction using devices, or falling behind in tasks. The children were quite motivated, excited, and yet calm while using the devices for the first time in their classrooms. The times the children were distracted was with the non-M&T items in the room (i.e., Participant 8 playing with the ToM stick puppets and the toy chick rather than the iPads). Finally, the activity was not too fast-paced as the app and activity were designed for interaction at a preschool-age pace and adjusted appropriately through iterative re-designs. The *Chatterkid Pix* app was chosen for its ease of use and how the app demonstrates its use with verbal and visual directions, important for preschool-aged children with limited literacy skills. Also, the pace was constantly adjusted in the moment. For example, as I described in the results,

when the children began to lose their attention span during the pre-interview in the first scenario, the question period was cut short and integrated into the drawing activity. The scenarios were re-designed after the first one into shorter and more focused activities. Also, the ToM storybook was chosen for this method of measuring ToM in preschool-aged children was age appropriate with simple stories. The language was simple and clear and written for to preschool-aged children and the images were colourful and clearly illustrated. I also designed an interactive element of reading the ToM storybook with the children by creating the simple emotion faces stick puppets. The stick puppets were not only helpful in capturing the answers from the children, but allowed them to have fun when interacting with the task battery and keep their attention that may be lost by reading two stories in a row.

Negative effects that are often associated with the use of digital devices did not overtly emerge in my research study. The children were largely prosocial. The children were not over-stimulated, distracted or left behind, rather they were engaged, participated, and accelerated appropriately. These results were based on the short-term impacts of this study and long-term impacts still need to be explored. The designed intervention elicited mostly prosocial behaviours, described in the next section.

4.6.2.2 Positive Effects of iPad Use on Sharing and ToM

A large number of positive effects from iPad use with the designed intervention occurred, including: increased opportunities for prosocial learning interactions with devices, increased opportunities for ToM, and increased interest and motivation.

The first positive effect of the designed intervention was increased opportunities for prosocial learning interactions with iPad devices. Typically, as described in earlier chapters, ECE

lacks M&T. This research introduced ways to incorporate M&T into classrooms and displayed positive results of significant shared behaviours manifestations. As described in the results section, prosocial sharing behaviours using M&T were observed much more than anti- or non-sharing behaviours. In the field study, when the iPads were used, prosocial behaviours were observed nearly four times more frequently than antisocial and nonsocial behaviours. In the definitive test, the prosocial behaviours were observed nearly five times more frequently than antisocial and nonsocial behaviours. My findings are supported by other research stating that preschool-aged children share toys (Brownell, Iesue, et al., 2013; Chernyak & Kushnir, 2013; Eisenberg-Berg et al., 1979; Garon, Johnson, & Steeves, 2011; Hay et al., 1999; Lane et al., 2010; Paulus et al., 2013; Paulus & Moore, 2014; Ramaswamy & Bergin, 2009; Sommerville et al., 2013; Wu & Su, 2014).

iPad use allowed opportunities for participants to use ToM. The majority of the observed domains with iPads were *desire recognition* and *seeing leads to knowing*. The children often expressed the desire to use the iPad or "have a turn", and the other child would respond accordingly. Also, when some children observed that the researcher praised one child for sharing and the other child would share as well, this was a demonstration of social learning. The children acted based on the observation of social norms and the preconventional moral reasoning of being praised for doing something 'good'. They would also use their own ToM, conventional or postconventional, moral reasoning to share because of their internal morality. For example, Participant 2 shared the iPad device with Participant 3 on repeated occasions, even when Participant 3 became aggressive and covered his mouth or pushed his hand away from the iPad. Participant 2 did not express any frustration towards Participant 3, but continuously shared with

her. As the dataset was limited, this intervention needs to be continuously tested in various ECE settings for this to be generalized to all preschool-aged populations.

The third positive effect of my study was increased interest and motivation. My research supported other researchers' findings that describe increased interest and motivation for children when they use an iPad (Flewitt et al., 2014; Lynch & Redpath, 2014; McPake et al., 2013). The children were actively involved in the designed activities. Their eyes were often focused on the devices or each other rather than other distractors in the room. They also verbally expressed interest in using the iPads.

Children in ECE are often taught the importance of sharing, especially when there is a limited resource. The *Mine* digital storybook introduced the concept of sharing and reminded the participants of the importance of sharing. Also, when the researcher introduced the iPads, the children were encouraged to share through verbal cues. The verbal cues from the researcher are similar in the introduction of any new 'toy' in an ECE setting where the teacher reminds students to share. For example, the teacher said that the children shared everything with their classmates and were often reminded to do so by the teacher. Sharing, ToM, interest, and motivation all increased with the introduction of iPads to an ECE classroom. This section described the positive effects of iPad use on prosocial sharing behaviours and ToM, and the next section addresses the use of M&T versus not using M&T.

4.6.2.3 M&T or No M&T

Using M&T in education has been controversial, especially in ECE; however, not using M&T is also becoming quite controversial. Research with M&T will always beg to question if the same data would result from no M&T. What happens when there is no M&T? Do we need

M&T in education? If so, why do we need M&T integration? How can we incorporate research into future ECE programming? This section discusses the purpose of M&T, extending the concepts that arose in Chapter 2 and the results of my research study, and focus on the integration of M&T into ECE classrooms.

As discussed in Chapter 2, the integration of M&T in ECE classrooms is a conversation that has arisen especially around the need to develop digital literacy and programs that are reflective of children's lives in affluent cultures. ToM and sharing behaviours with preschool-aged children have been studied several times indicating that children from ages 2-5 are emerging with ToM and prosocial sharing behaviours (Moore et al., 2011; Moore & Macgillivray, 2004; Renouf et al., 2010; Slaughter et al., 2002; Wu & Su, 2014; Yagmurlu, 2014). iPad use in ECE classrooms have also been studied (Flewitt et al., 2014; Karsenti, 2013; Lynch & Redpath, 2014; McPake et al., 2013; Roskos et al., 2012; Rowsell & Harwood, 2015). My research findings are in agreement with research exploring the manifestations of prosocial sharing behaviours.

In this study, there were activities with M&T, and there were activities with no M&T. Prosocial behaviours were dominant across all activities, regardless of M&T. Antisocial behaviours were quite infrequent across all activities, regardless of M&T. In my research, M&T did not encourage or impede ToM manifestations. However, the results indicated that there was a significant association between sharing and M&T. In other words, when M&T was used sharing behaviours increased. The purpose of the designed intervention was to examine prosocial behaviours in the presence of M&T. The participant teacher acknowledged that the children needed to extend the sharing they learn with other toys to the use of M&T. Children need to learn how to share with iPads as much as any toy. As teachers are instructing young children on

how to share crayons and other toys, they should also be teaching children how to share digital devices. When M&T is thoughtfully integrated into ECE settings it may be possible to encourage positive shared social interactions with devices like iPads.

Other research typically suggests that children with a high ToM often exhibit prosocial behaviours (Moore et al., 2011; Wu & Su, 2014; Yagmurlu, 2014). My research supports these findings. The children with the higher prosocial scores displayed prosocial behaviours more frequently resulting from the designed intervention. The children were encouraged to exhibit ToM and prosocial behaviours through each M&T activity.

The results of my study can contribute to future ECE programs. The intervention designed of 1) Reading digital story *Mine,* 2) ToM storybook task battery, 3) Researcher demonstration of *Chatterpix Kid*, and 4) Limited iPad to children ratio using *Chatterpix Kid* to animate pictures taken was created for preschool-aged children and was successfully used with preschool-aged children. The successful designed intervention should be continuously tested in other preschool programs, influencing ECE programs. In particular, the Early Learning Framework of BC (2008), in need of an update, can reflect on the results of this research to see possible ways of integrating M&T into their programming or conducting more research extending the understanding of the influence of M&T in ECE. To reiterate, to be digitally literate is to have "the ability to make and share meaning in different modes and formats, to create, collaborate and communicate effectively and to understand how and when digital technologies can best be used to support these processes" (Kang, 2012, p. 1067). The intervention designed by my research specially addresses some of these attributes, allowing children to create, collaborate, communicate, and share meaning through prosocial sharing behaviours via ToM. Moreover, my research contributes to the growing literature on young children's use of M&T. Based on the

NAEYC and the Fred Rogers Center, this research promotes the use of interactive M&T to support the development of children and assist early childhood educators to support learning goals. The positive results of this research can inform the AAP's policies for young children and support the importance for M&T to "allow children opportunities to discover make choices…to explore, imagine and problem-solve" (Beschorner & Hutchison, 2013, p. 17). Since the qualitative aspects of this research included limited participants, it can only begin to inform policies. However, it does recommend the need for continuous research using M&T with young children. Social learning is also a significant part of ECE, as preschool-aged children are not only learning their academic skills in these classrooms, but also their social skills, including sharing.

Computers or other stationary devices would place limitations in this type of study. Stationary devices could limit interaction as these machines would be set up in a particular area that may not allow all children access physically. Additionally, iPads' ease of use, based on the weight, and mobility were central to active participation. iPad devices were also technically simple and the children could simply troubleshoot their own problems. Finally, the choice of apps was structured on the four pillars of Hirsh-Pasek et al. (2015): active learning, engaged learning, meaningful learning, and socially interactive learning. Perhaps other tablet devices could be used, as they have similar features. However, as I have described earlier, iPads have better touch features than other devices currently on the market (Crescenzi et al., 2014; Rowsell & Harwood, 2015) and multi-touch features were important, as there were many times in which children would touch the screen at the same time.

Overall, the use of M&T was an important contributor to positive sharing results. Also, the results help contribute to the evolving research to understand the effects of M&T. This section explored the effects of M&T vs. no M&T.

4.6.3 Question 3

This section discusses research question 3: *What are the possible connections between a child's theory of mind and their prosocial behaviour of sharing?*

4.6.3.1 ToM and Sharing Behaviours Affiliations for Preschool-aged Children

The connections between ToM and sharing behaviours are centralized around the theoretical themes of: social exchange theory, empathy-altruism theory, and social learning theory. Social exchange theory is determined on the perceptions of balance between what we have, what we put in, and what we take out (Cook & Rice, 2006; Emerson, 1976; Homans, 1961; Thibaut & Kelley, 1959). As discussed earlier, in this study sharing was not impeded by social exchange theory. The children in this study did not acknowledge an exact balance between what they had and what they put in and what they took out. They were more concerned with playing with the iPads and sharing them with each other regardless of what others had, gave, or took. Social exchange theory did not appear to be related to sharing behaviours.

My research results and the manifestations of ToM and sharing agree with empathy-altruism theory. Children manifested sharing in an individual or group capacity and they also had ToM. As children become four years old, they typically develop a ToM and their emotional understanding matures into empathy (Doherty, 2008; Hadwin et al., 1996; Lane et al., 2010). My research findings on empathy and ToM are supported by the larger study of the *Sesame*

Workshop described in Chapter 2. Overall, parents and teachers believe that it is important for children to accept others, be polite and kind, and they "prioritize kindness over academic achievement" (Durand, 2016). As described by this research study, there needs to be opportunities for children to practice these behaviours as educated by parents and teachers. My research encourages empathy and ToM through the designed shared activities. As the parents and teachers of the *Sesame Workshop* request for their children to learn kindness, my designed intervention could be used to create a program for *Sesame Workshop*: K is for kindness, E is for empathy, S is for sharing, and I is for interactive.

My research findings also agree with social learning and the prominent vicarious, symbolic, and self-regulatory processes (Bandura, 1977). The vicarious process of observing the behaviours and consequences of other children was commonly seen through *showing*. The children watched other children show things and hear praise and would *show* as well. The symbolic process was through the iPad use in which the children used the iPad and created funny animations that caused each other to laugh and encouraged other creations. Self-regulatory capacities included the ability for children to control their behaviours based on environmental factors. The children were commonly exposed to sharing other toys in their program and also encouraged to think about how someone else's heart felt and they exhibited these behaviours, extending traditional classroom practices into the research study with M&T.

Social interactions allow children to express and understand ToM when sharing items and responding to 'how the heart feels' (Hay et al., 1999; Moore et al., 2011; Sutton et al., 1999; Weimer et al., 2012; Wu & Su, 2014; Yagmurlu, 2014). My research findings agree that the children who were more socially engaged displayed more ToM actions. Some of the actions

were identified based on facial expressions (Lane et al., 2010; Weimer et al., 2012), while others were based on internal understandings of how the heart feels, or emotion recognition.

In the field study there were no significant associations between sharing and ToM when M&T was used. In the definitive test there was a significant association between sharing and ToM when M&T was used. The field study and definitive test results contradict each other. Other researchers have suggested that children with ToM will share more than those with no or limited ToM (Moore et al., 2011; Moore & Macgillivray, 2004; Renouf et al., 2010; Slaughter et al., 2002; Wu & Su, 2014; Yagmurlu, 2014). In my study, if sharing was solely based on the ToM storybook task battery then ToM would predict all sharing behaviours; however my research extends the task battery and attempts to measure ToM *in situ* based on the task domains. Even though the field study did not have significant associations between ToM and sharing, this was only based on observable domains. Most ToM domains (8 of the 11) are internalized factors. ToM may have been a factor in predicting sharing behaviours in other research. Accurate *in situ* ToM measures need to be created to measure beyond a task test. Future research needs to explore the possible measurements and other factors as well, which will be discussed in the next chapter.

4.7 Research Findings and Discussion Summary

In this chapter the results of my research study were presented. Based on my research the following nonsocial behaviours occurred: work independently; the antisocial behaviours that occurred included: pull item away and push hand aside; the independent prosocial behaviours included: allowing use, offering, and showing; the group prosocial behaviours include: taking turns, multiple participants hands on the device, participant holds and one touches, watch together while one participant controls, watch together while the researcher controls, speak

together an touch screen together. Overall, there were a larger number of prosocial behaviours (individual and group) compared to nonsocial and antisocial behaviours. Also, sharing was more commonly present when M&T was used, whereas ToM was not observed as present when M&T was used. Every child had ToM as tested in the task battery, but ToM *in situ* was more difficult to measure, likely because the majority of these manifestations are internal processes.

In relation to M&T there are negative effects of iPad use including cyberbullying, antisocial behaviour, and distractions from learning; however the negative effects were not frequent and therefore were hard to detect using statistical methods in this research. The positive effects from iPad use with this intervention included increased opportunities for prosocial learning interactions with devices, increased opportunities for ToM, and increased interest and motivation. It is possible that the overall positive effects exceed the negative effects. This study suggested the influence of M&T integration into ECE programs and the development of digital literacies. More research is needed to understand the influence of M&T integration into ECE programs.

The next chapter summarizes the research presented in this dissertation, strengths and limitations of the study, and implications for the future.

Chapter 5: Conclusions and Implications

This study explored prosocial behaviours of preschool-aged children in their interaction with M&T. Chapter 2 identified a major gap in the literature regarding the manifestations of preschool-aged children's prosocial sharing behaviours and ToM when using iPad devices. Specifically, this current research attempted to address the gap of literature regarding the manifestation of sharing behaviours had how they interplayed with a child's ToM when iPad devices are used as one of the first empirical investigations exploring these interactions. The research conducted in this dissertation has important implications for theory and practice for researchers, parents, teachers, and policy makers. The research results of this study open more questions about the short- and long-term impacts of M&T on ECE as well as demonstrating the combination of methodologies of DBR and video ethnography.

Grounded in the theoretical foundations of social exchange, altruism, empathy, and social learning, three questions shaped my research:

1. In what ways do ToM and the prosocial behaviour of sharing manifest among preschool-aged children interacting with iPads?
2. What are the effects of iPad use on the manifestation of ToM and prosocial behaviours of sharing among preschool-aged children?
3. What are the possible connections between a child's ToM and their prosocial behaviour of sharing?

Firstly, this chapter describes the summary of findings for each participant phase of research, including a brief summary and discussion of the above research questions. Secondly, the strengths and limitations of my research study are addressed. Finally, the possible

implications for future research, policy, and practice are discussed for this research area to progress.

5.1 Summary of Findings

During this empirical study, the research used mixed methods to test a designed intervention for preschool-aged children. The initial designed intervention included testing M&T and non M&T activities over several scenarios. Before the designed intervention was used with preschool-aged children, a pilot study was conducted with practicing teachers.

5.1.1 Feasibility Study (Prototype Test)

The feasibility study (prototype test) refined the designed intervention by testing a simulated scenario, intended for preschool-aged children, with participants (n=18) who were practicing teachers. Suggestions by the practicing teacher participants influenced essential changes to the designed teaching intervention that were initiated prior to field study implementation. The participants partook in a simulated scenario, group interview, and optional questionnaire. The feedback provided assisted in the re-design of the intervention. In particular, suggestions were made to reflect age appropriate activities, structure, and pacing of the scenarios that were used in the field study.

5.1.2 Field Study

The field study tested the designed intervention from the prototype test. Using a mixed methods approach, data was collected through two video cameras set up by the researcher and personal wearable blue *Snapcam Ion* cameras worn by each participant (n=3). A semi-structured

interview with the classroom teacher (n=1) facilitated the iterative process and refined the design intervention, as the teacher stated that sharing was incorporated into their daily activities. She also emphasized the importance of this type of research, as children need to understand the sharing of all things, including toys and digital devices. Over three scenarios, the children participated in several M&T and non M&T activities in which the designed intervention was tested. The activities included: reading a digital storybook about sharing, drawing pictures with crayons and markers, playing apps on the iPad together and individually, and participating in a ToM storybook task battery. After each scenario, the results were analyzed and re-designed for the next iteration. For example, after the first scenario, activities were adjusted to include several shorter activities to reflect the temperamental attention spans of preschool-aged children. Once all three scenarios were complete, a detailed analysis was conducted. The results indicated that all children had a ToM from the storybook task battery, but manifestations of ToM *in situ* were difficult to measure as no measurement tool has been created and it can be difficult to measure as it consists of many internal processes. Additionally, using NVivo software for video analysis (QSR International, 2016) allowed the researcher to view and re-view and analyze and re-analyze the captured video. Additionally observing physical behaviours with captured audio supported understanding, especially as the tone of voice for many of the children along with some speech difficulties made it difficult to understand what the children were saying. The researcher cameras were influential in capturing this data, but as was the individual cameras worn by the participants. If the participants went out of the shot of the researcher, their actions and especially their voices were still captured. The video footage allowed the researcher to identify themes that emerged fit into three main categories of prosocial (individual and group), nonsocial, and antisocial behaviours. Using SPSS, event codes were counted to substantiate the

findings of the qualitative results (IBM Corp, 2016). Overall, prosocial behaviours were observed more significantly than nonsocial and antisocial behaviours. Moreover, M&T had significant influences on sharing behaviours. In other words, children would share more frequently when iPad devices were used.

Each scenario was analyzed and re-designed to reflect the classroom culture. With thorough analysis, the data were synthesized from the three sharing scenarios with multiple activities into one 'successful' scenario with four activities: 1) Reading digital story *Mine,* 2) ToM storybook task battery, 3) Researcher demonstration of *Chatterpix Kid*, and 4) Limited iPad to children ratio using *Chatterpix Kid* to animate pictures taken. The 'successful' scenario became the final intervention to investigate with the definitive test.

5.1.3 Definitive Test

The definitive test finalized the 'successful' designed intervention of four activities from the field study, also using qualitative and quantitative approaches as captured by the researchers two cameras and the personable wearable *Snapcam Ion* cameras worn by each participant (n=5). Through extensive data analysis a number of conclusions were drawn. Similar to the field study, as captured by the ToM storybook task battery, all children had a ToM, but again ToM was difficult to capture *in situ.* Also, the themes identified in the field study were used to count behaviours in the definitive test using NVivo software for video analysis (QSR International, 2016). Similar to the field study, the cameras worn by the participants supported footage captured by the researcher as several times the children would move out of shot. Using SPSS, event codes were counted to substantiate the findings of the qualitative results (IBM Corp, 2016). Overall prosocial behaviours outnumbered nonsocial and antisocial behaviours. The facilitation

of small groups allowed more opportunities for sharing behaviours to manifest. In the definitive test there was a significant association between ToM and sharing when M&T devices were used. In other words, when ToM was observed, sharing was also present.

Overall, the definitive test confirmed conclusions drawn from the field study, indicating the significant influence M&T devices can have on prosocial sharing behaviours. The results of this study suggest the need for more research in this area to inform teaching practices and policy changes in ECE.

5.2 Strengths and Limitations

The research in this dissertation is one of the first empirical investigations exploring the interactions between ToM, prosocial sharing behaviours, and M&T. Strengths of this study, as described throughout the dissertation, include: mixed-methods, empirical research in naturalistic setting, extensions of OMPI to include digital device interactions, developing a way to code ToM from observations or video data, in-depth and detailed exploration, individual coder rating inter-reliability, and multiple measures of analysis (i.e., quantitative and qualitative). The research methods and intervention were revised and adapted throughout the study to reflect the needs and abilities of the preschool-aged participants. Additionally, my research informs ToM, empathy-altruism, and social learning theories, and informs ECE practice and program planning by linking sharing and ToM with M&T. The research raises new questions about the purposes or role of M&T in ECE. The research in this dissertation also contributes to the growing literature on DBR and video ethnography methodologies. The use of the two stationary research cameras was supported by several blue *Snapcam Ion* cameras worn by the participants as described in Chapter 3. These facilitated the collection of mobile, point of view data. The blue *Snapcam Ion*

cameras were relatively inexpensive and captured up to 2 hours of HD quality video every session. The extra cameras were integrated to ensure that data analysis was accurate by capturing individual point of views that would not be captured by the researcher cameras alone. Notwithstanding the number of strengths, this research also has some limitations.

Despite best efforts, research has biases. My bias, as a teacher and researcher, was reduced through the triangulation of the qualitative and quantitative data. Also, to reduce bias, another coder contributed to inter-rater reliability. To reduce bias in the future, the researcher could invite the second coder to do the initial coding with the researcher as the second coder, or apply a formal training process until inter-rater agreement achieves at least .8. Another limitation was the small sample sizes that reduce generalizability or transferability. One reason for the small sample size was the use of video recordings. Some parents were not comfortable with their child being recorded and did not participate in the study. However, qualitative approaches tend to have smaller sample sizes, which allows for rich data. Also, sample size issues were reduced through the detailed coding which identified high frequencies of observed behaviours/events and multiple iterations until the intervention was deemed successful. Small sample size concerns may not be an issue for those considering transferring the design or research findings to other settings.

Another limitation was the limited time frame, as the results measured more short-term effects of the intervention. Due the limited scope of the school year, we do not know the long-term effects. For future research, ideally the intervention would be initiated at the beginning of the school year and continue throughout the year. ToM was measured using storybook task batteries that have been validated; however since this was the first study to use observation data to count of ToM, validation of this method should be carried out to establish more reliable results.

5.3 Implications for Future Research, Theory, and Policy and Practice

The research study in this dissertation explored the manifestations of prosocial sharing behaviours and ToM when M&T are introduced into ECE settings. Grounded in theories of social exchange, empathy-altruism, and social learning, the research continues to develop and provide empirical evidence for this work. As my study was primarily qualitative with some quantitative approaches, the need for more research is strongly suggested. Research needs to continue in order to have significant impact on future policy and practice in ECE. This section uses Brown et al.'s (2006) model of addressing clinical medical treatments and recommend using the EPICOT + model that could assist in developing recommendations for future research (*Table 17*).

Table 17. Recommendations using Brown et al. (2006, p. 805) EPICOT+.

Core Element		Issues to consider	Recommendation
E	**Evidence**	What is the current evidence?	This research used DBR and video ethnography through qualitative case studies and quantitative measures conducted in ECE classroom settings.
P	**Population**	What is the population of interest? (age, gender, inclusion/exclusion criteria?)	Preschool-aged children (mean age 4 years, females and males, in ECE classroom)
I	**Intervention**	What are the interventions of interest? (type, frequency)	Weekly M&T teaching intervention
C	**Comparison**	What are the comparisons of interest? (routines, alternative treatments)	No active treatment or control group
O	**Outcome**	What are the outcomes of interest? (to measure, improve, influence, or accomplish; what methods for measurement should be used?)	Major sharing events (with iPads); DBR iteration was significant as was video ethnographic methods
T	**Time stamp**	Date of literature search or recommendation	Future research can commence September 2017

Optional elements			
d	**'Disease' burden or relevance**	What are the issues of the 'disease' that could impact the research?	The literature review suggests that children share and have ToM by the age of four. Additionally, as children age they are exposed to digital devices more frequently (i.e., in kindergarten).
t	**Timeliness**	Time aspect of core elements of EPICOT:	
		Mean age of population	3-4
		Duration of intervention	September – June (minimum 3 months)
		Length of follow-up	Any length
s	**Study Type**	What is the most appropriate study type according to local need to address the proposed question?	Qualitative case study

The next part of this section goes into more details of specific research recommendations and the need for ECE programs to make adjustments to include M&T in their policy and practice.

Implications for future research include an extension to diverse ranges of ECE centres and a variety of new apps, as well as exploring other variables, creating a new measurement tool for ToM, and innovating with video ethnographic methods. Firstly, the 'successful' intervention should be carried out in other ECE centres in other settings, including rural settings in a range of different countries. In terms of other apps, research can explore the impact of apps chosen based on Hirsh-Pasek et al. (2015) four pillar model. Additionally, more research needs to be conducted in the development of digital literacy using tablet devices, especially as new and more interactive apps are developed. Secondly, this dissertation focused on one prosocial variable, sharing. Future research could look at comforting, helping, or cooperating alongside of iPad use and creating accurate measures for observing these behaviours in classroom settings. Thirdly, testing the current 'successful' intervention using other apps on the iPad can help explore what types of apps can contribute to prosocial behaviours and ToM using digital devices. Fourthly,

creating a measurement, like the OMPI for sharing behaviours, for ToM observable behaviours would help us better understand the manifestations of ToM in authentic settings. This would also allow an opportunity for a critique of using ToM as the one measure for prosocial behaviours. The measurement tool could increase opportunities for children to be active participants in the intervention. Fifthly, the use of video ethnographic methods was imperative towards data collection and analysis. Although some Research Ethics Board representatives and parents may disprove of the use of wearable, point of view video with young children, the use of researcher and wearable cameras in this setting to capture moment-to-moment behaviours and interactions was imperative to interpreting the cultural and social situations. As described in previous chapters, the use of the researcher cameras was essential to the data analysis. The voices of young children have similar tones and can have speech difficulties, which are difficult to transcribe or understand without supporting audio and video and the ability to look at a child's mouth and vocal gestures. Also, the individual blue *Snapcam Ion* cameras were essential for the data analysis as they captured individual perspectives, with close-up microphones and footage that may not be captured in a researcher camera's angle. What does interaction with digital technologies mean to the children, from their point of view?

Implications for future theory include the influence of this study on social exchange theory, empathy-altruism theory, and social learning theory. This study extends these theories to explore the influences of M&T, alternative measures using storybooks, and research with young children. This study extended the understanding of social exchange theory addressing the give-and-take relationships and social learning theory addressing social processes of how to learn and learn how to act. In particular, this exploration of social behaviours was influenced strongly by the use of M&T, which should be continuously studied to further understand potential

influences. For empathy-altruism theory, or how empathy towards a person leads to an unselfish act towards that same person, was extended through the shared activities in this study. In particular, using the ToM storybook task battery allowed for an understanding of how ToM can be a measured using an age appropriate measurement tool.

Finally, given the review of literature, many ECE programs have limited or no specific learning goals towards incorporating M&T into their classroom settings. In particular, the BC Early Learning Framework was updated in 2008, nearly 2 years before iPads were even on the market. My research can begin to inform changes to authoritative agencies, such as the American Academy of Pediatrics and the BC Early Learning Framework. The designed intervention in my study could inform ECE curriculum and programming as well as debates regarding the purposes and role of M&T integration.

I am taking steps to investigate long-term influences of M&T and hope to recruit a cohort for longitudinal study. How can we develop accurate *in situ* measures for ToM? How do wearable technologies influence children's active participation and point of view in research? As a researcher, I have had the opportunity to research and analyze diverse theories, explore and understand meaningful literature, and large quantities of data. This learning process has allowed me to explore and contribute to the growing knowledge of the continued influence of media and technology in education. As M&T continue to evolve, research questions will continue to change, and I will continue to explore short and long-term implications of M&T on children.

References

Adams, C. (2012). Technology as teacher: Digital media and the re-schooling of everyday life. *Existential Analysis, 23*(2), 262-273.

Adams, C., & Thompson, T. L. (2016). *Researching a posthuman world: Interviews with digital objects*. London, UK: Palgrave Macmillan.

Alper, M. (2013). Developmentally appropriate new media literacies: Supporting cultural competencies and social skills in early childhood education. *Journal of Early Childhood Literacy, 13*(2), 175-196.

American Academy of Pediatrics (AAP). (2014). The benefits of limiting TV. Retrieved October 15, 2014 from http://www.healthychildren.org/English/family-life/Media/Pages/The-Benefits-of-Limiting-TV.aspx.

American Academy of Pediatrics (AAP). (2016). American Academy of Pediatrics announces new recommendations for children's media use. Retrieved October 30, 2016 from https://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/American-Academy-of-Pediatrics-Announces-New-Recommendations-for-Childrens-Media-Use.aspx.

Amiel, T., & Reeves, T. C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Journal of Educational Technology & Society, 11*(4), 29-40.

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher, 41*(1), 16-25.

Apple. (2015). Retrieved September 8, 2014 from http://www.apple.ca.

Apple. (2016). Retrieved March 23, 2017 from http://www.apple.com.

Apple. (2017). App Store shatters records on New Year's Day. Retrieved March 23, 2017 from http://www.apple.com/newsroom/2017/01/app-store-shatters-records-on-new-years-day.html.

Arnott, L., Grogan, D., & Duncan, P. (2016). Lessons from using iPads to understand young children's creativity. *Contemporary Issues in Early Childhood, 17*(2), 157-173. doi:10.1177/1463949116633347

Aronin, S., & Floyd, K. K. (2013). Using an iPad in inclusive preschool classrooms to introduce STEM concepts. *Teaching Exceptional Children, 45*(4), 34-39.

Astington, J. (1993). *The child's discovery of the mind*. Cambridge, MA: Harvard University Press.

Axelsson, A., Andersson, R., & Gulz, A. (2016). Scaffolding executive function capabilities via play-&-learn software for preschoolers. *Journal of Educational Psychology, 108*(7), 969-981. doi:10.1037/edu0000099

Bains, M. (2014). iPads, tablets required for West Van high school students. *CBC News*. Retrieved September 4, 2014 from http://www.cbc.ca/news/canada/british-columbia/ipads-tablets-required-for-west-van-high-school-students-1.2607006

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, N.J.: Prentice Hall.

Bannan-Ritland, B. (2003). The role of design in research: The integrative learning design framework. *Educational Researcher, 32*(1), 21-24.

Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *Journal of the Learning Sciences, 13*(1), 1-14.

Batson, C. D. (1991). *The altruism question: Toward a social-psychological answer*. NJ: Lawrence Erlbaum Associates.
Batson, C. D. (2009). These things called empathy: Eight related but distinct phenomena. In J. Decety & W. Ickes (Eds.), *The social neuroscience of empathy* (pp. 3-15). Cambridge, MA: MIT Press.
Bawden, D. (2008). Origins and concepts of digital literacy. In C. Lanshear & M. Knobel (Eds.), *Digital literacies: Concepts, policies and practices* (pp. 17-32). New York, NY: Peter Lang.
Belacchi, C., & Farina, E. (2012). Feeling and thinking of others: Affective and cognitive empathy and emotion comprehension in prosocial/hostile preschoolers. *Aggressive Behavior, 38*(2), 150-165. doi:10.1002/ab.21415
Bergin, C., Bergin, D., & French, E. (1995). Preschoolers' prosocial repertoires: Parent perspectives. *Early Childhood Research Quarterly, 10*, 81-103.
Berkowitz, A. D. (2004). The social norms approach: Theory, research, and annotated bibliography. Retrieved September 14, 2016 from http://www.edc.org/hec/socialnorms/theory.html.
Beschorner, B., & Hutchison, A. (2013). iPads as a literacy teaching tool in early childhood. *Online Submission*.
Bierhoff, H.-W. (2002). *Prosocial behaviour*. New York, NY: Psychology Press.
Blau, P. M. (1964). *Exchange and power in social life*. New York, NY: John Wiley & Sons.
Blazek, M., & Hranová, P. (2012). Emerging relationships and diverse motivations and benefits in participatory video with young people. *Children's Geographies, 10*(2), 151-158.
Blijd-Hoogewys, E. M. A., van Geert, P. L. C., Serra, M., & Minderaa, R. B. (2008). Measuring theory of mind in children. Psychometric properties of the ToM storybooks. *Journal of Autism and Developmental Disorders, 38*(10), 1907-1930. doi:10.1007/s10803-008-0585-3
Bouchard, C., Coutu, S., Bigras, N., Lemay, L., Cantin, G., Bouchard, M.-C., & Duval, S. (2015). Perceived, expressed and observed prosociality among four-year-old girls and boys in childcare centres. *Early Child Development and Care, 185*(1), 44-65.
Bragger, J. D., Rodriguez-Srednicki, O., Kutcher, E. J., Indovino, L., & Rosner, E. (2005). Work-family conflict, work-family culture, and organizational citizenship behavior among teachers. *Journal of Business and Psychology, 20*(2), 303-324.
Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences, 2*(22), 141-178.
Brown, P., Brunnhuber, K., Chalkidou, K., Chalmers, I., Clarke, M., Fenton, M., . . . Moody, J. (2006). How to formulate research recommendations. *Bmj, 333*(7572), 804-806.
Brownell, C. A., Iesue, S. S., Nichols, S. R., & Svetlova, M. (2013). Mine or yours? Development of sharing in toddlers in relation to ownership understanding. *Child Development, 84*(3), 906-920. doi:10.1111/cdev.12009
Brownell, C. A., Svetlova, M., Anderson, R., Nichols, S. R., & Drummond, J. (2013). Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy, 18*(1), 91-119.
Brownell, C. A., Svetlova, M., & Nichols, S. R. (2009). To share or not to share: When do toddlers respond to another's needs? *Infancy, 14*(1), 117-130.

Bruner, J. (1967). *On knowing: Essays for the left hand*. Boston, MA: Harvard University Press.
Chavarro, J. E., Peterson, K. E., Sobol, A. M., Wiecha, J. L., & Gortmaker, S. L. (2005). Effects of a school-based obesity-prevention intervention on Menarche. *Cancer Causes & Control, 16*(10), 1245-1252. doi:10.1007/s10552-005-0404-5
Chernyak, N., & Kushnir, T. (2013). Giving preschoolers choice increases sharing behavior. *Psychological Science, 24*(10), 1971-1979. doi:10.1177/0956797613482335
Chernyak, N., & Sobel, D. M. (2015). Equal but not always fair: Value-laden sharing in preschool-aged children. *Social Development*.
Childwise. (2016). *The monitor pre-school report: Key behaviour patterns among 0-4 year olds*. Retrieved from http://www.childwise.co.uk/
Clarke, D. (2003). *Descartes's theory of mind*. Oxford, UK: Oxford University Press. .
Clayton, R. B., Osborne, R. E., Miller, B. K., & Oberle, C. D. (2013). Loneliness, anxiousness, and substance use as predictors of Facebook use. *Computers in Human Behavior, 29*(3), 687-693.
Cobb, P. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9-13.
Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology* (pp. 15-22). New York, NY: Springer-Verlag.
Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. *Journal of the Learning Sciences, 13*(1), 15-42.
Common Sense Media. (2013). Zero to eight: Children's media use in America: A Common Sense research study. Retrieved May 4, 2015 from https://www.commonsensemedia.org/research/zeroto-eight-childrens-media-use-in-america-2013.
Cook, K. S., & Rice, E. (2006). Social exchange theory. In J. DeLamater (Ed.), *The handbook of social psychology*. US: Springer Science & Business Media.
Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative sociology, 13*(1), 3-21.
Corbin, J., & Strauss, A. (2008). *Basics of qualitative research (3rd ed.): Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: SAGE Publications Ltd.
Crescenzi, L., Jewitt, C., & Price, S. (2014). The role of touch in preschool children's learning using iPad versus paper interaction. *Australian Journal of Language & Literacy, 37*(2), 86-95.
Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Los Angeles, CA: SAGE Publications.
Dahl, A., Schuck, R. K., & Campos, J. J. (2013). Do young toddlers act on their social preferences? *Developmental Psychology, 49*(10), 1964-1970.
De Simone, J. J. (2013). What is good can also be bad: The prosocial and antisocial in-game behaviors of young video game players. *Atlantic Journal of Communication, 21*(3), 149-163.
de Waal, F. B. M. (2007). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology, 59*(1), 279-300. doi:10.1146/annurev.psych.59.103006.093625

Decety, J. (2011). The neuroevolution of empathy. *Annals of the New York Academy of Sciences, 1231*(1), 35-45. doi:10.1111/j.1749-6632.2011.06027
Dede, C. (2004). If design-based research is the answer, what is the question? A commentary on Collins, Joseph, and Bielaczyc; diSessa and Cobb; and Fishman, Marx, Blumenthal, Krajcik, and Soloway in the JLS special issue on design-based research. *The Journal of the Learning Sciences, 13*(1), 105-114.
Dede, C. (2005). Why design-based research is both important and difficult. *Educational Technology, 45*(1), 13-17.
Dennis, L. R. (2016). The effects of a multi-component intervention on preschool children's literacy skills. *Topics in Early Childhood Special Education, 36*(1), 15-29. doi:10.1177/0271121415577399
Design-Based Research Collective. (2003). Design based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32*(1), 5-8.
Dewey, J. (1916). *Democracy and education*. New York, NY: Simon and Schuster.
Dewey, J. (1929). *My pedagogic creed*. Washington, DC: Progressive Education Association.
Dockett, S., Einarsdottir, J., & Perry, B. (2009). Researching with children: Ethical tensions. *Journal of Early Childhood Research, 7*(3), 283-298.
Doherty, M. J. (2008). *Theory of mind : How children understand others' thoughts and feelings*. New York, NY: Psychology Press.
Dunfield, K. A. (2014). A construct divided: prosocial behavior as helping, sharing, and comforting subtypes. *Frontiers in Psychology, 5*.
Dunfield, K. A., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy, 16*(3), 227-247.
Dunn, S. E. (2000). Technology: Where is it taking us? A "writing" perspective. *Montessori Life, 12*(1), 34-35.
Durand, A. (2016). U.S. parents & teachers see an unkind world for their children, new sesame survey shows [Press release]. Retrieved October 15, 2016 from http://www.sesameworkshop.org/press-releases/u-s-parents-teachers-see-an-unkind-world-for-their-children-new-sesame-survey-shows-2/
Early Learning Advisory Group. (2008). *British Columbia early learning framework*. British Columbia: Ministry of Health and Ministry of Children and Family Development.
Edelson, D. C. (2002). Design research: What we learn when we engage in design. *Journal of the Learning Sciences, 11*(1), 105-121.
Edwards, C. (2002). Three approaches from Europe: Waldorf, Montessori, and Reggio Emilia. *Early Childhood Research & Practice, 4*(1).
Edwards, C., & Pye, A. (2011). For and against social networking technology. *Engineering & Technology, 6*(9), 28-29.
Eisenberg, N. (1982). *The development of prosocial behavior*. New York, NY: Academic Press.
Eisenberg, N., Hofer, C., Sulik, M. J., & Liew, J. (2014). The development of prosocial moral reasoning and a prosocial orientation in young adulthood: Concurrent and longitudinal correlates. *Developmental Psychology, 50*(1), 58-70. doi:10.1037/a0032990
Eisenberg-Berg, N. (1981). Relationship of preschool children's habitual use of space to prosocial, antisocial, and social behaviors. *Journal of Genetic Psychology, 138*, 111-121.

Eisenberg-Berg, N., Haake, R., Hand, M., & Sadalla, E. (1979). Effects of instructions concerning ownership of a toy on preschoolers' sharing and defensive behaviors. *Developmental Psychology*.

Eivers, A. R., Brendgen, M., Vitaro, F. f., & Borge, A. I. H. (2012). Concurrent and longitudinal links between children's and their friends' antisocial and prosocial behavior in preschool. *Early Childhood Research Quarterly, 27*(1), 137-146.

Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology, 2*, 335-362. doi:10.1146/annurev.so.02.080176.002003

empathy. (n.). (Ed.) (2016) Oxford English Dictionary, OED online.

Erickson, F. (2011). Uses of video in social research: A brief history. *International Journal of Social Research Methodology, 14*(3), 179-189.

Erickson, F., & Wilson, J. (1982). *Sights and sounds of life in schools: A resource guide to film and videotape for research and education*. East Lansing, MI: Michigan State University, Institute for Research on Teaching of the College of Education.

Etherington, D. (2013). Apple has sold over 8M iPads direct to education worldwide, with more than 1B iTunes U downloads. Retrieved September 8, 2014 from http://techcrunch.com/2013/02/28/apple-has-sold-oce-8m-ipads-direct-to-education-worldwide-with-more-than-1b-itunes-u-downloads/.

Fabes, R. A., Hanish, L. D., Martin, C. L., Moss, A., & Reesing, A. (2012). The effects of young children's affiliations with prosocial peers on subsequent emotionality in peer interactions. *British Journal of Developmental Psychology, 30*(4), 569-585. doi:10.1111/j.2044-835X.2011.02073.x

Feldman, R., Bamberger, E., & Kanat-Maymon, Y. (2013). Parent-specific reciprocity from infancy to adolescence shapes children's social competence and dialogical skills. *Attachment & Human Development, 15*(4), 407-423. doi:10.1080/14616734.2013.782650

Fetterman, D. M. (1989). *Ethnography: Step by step*. Newbury Park, CA: Sage.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Los Angeles, CA: Sage.

Flavell, J. H. (1992). Perspectives on perspective-taking. In H. Beilin & P. B. Pufall (Eds.), *Piaget's theory: Prospects and possibilities* (pp. 107-139). Hillsdale, NJ: Lawrence Erlbaum.

Flewitt, R., Messer, D., & Kucirkova, N. (2014). New directions for early literacy in a digital age: The iPad. *Journal of Early Childhood Literacy*, 1-22.

Fodor, J. A. (1992). A theory of the child's theory of mind. *Cognition, 44*(3), 283-296. doi:10.1016/0010-0277(92)90004-2

Fred Rogers Center. (2014). Retrieved October 15, 2014 from http://www.fredrogerscenter.org/.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*, 59-109.

Fujisawa, K. K., Kutsukake, N., & Hasegawa, T. (2008). Reciprocity of prosocial behavior in Japanese preschool children. *International Journal of Behavioral Development, 32*(2), 89-97.

Garon, N., Johnson, B., & Steeves, A. (2011). Sharing with others and delaying for the future in preschoolers. *Cognitive Development, 26*(4), 383-396.

Gentile, D. A., Li, D., Khoo, A., Prot, S., & Anderson, C. A. (2014). Mediators and moderators of long-term effects of violent video games on aggressive behavior: practice, thinking,

and action. *Journal of the American Medical Association Pediatrics, 168*(5), 450-457. doi:10.1001/jamapediatrics.2014.63
Gentile, D. A., Reimer, R. A., Nathanson, A. I., Walsh, D. A., & Eisenmann, J. C. (2014). Protective effects of parental monitoring of children's media use: A prospective study. *Journal of the American Medical Association Pediatrics, 168*(5), 479-484. doi:10.1001/jamapediatrics.2014.146
Gerace, A., Day, A., Casey, S., & Mohr, P. (2013). An exploratory investigation of the process of perspective taking in interpersonal situations. *Journal of Relationships Research, 4*. doi:10.1017/jrr.2013.6
Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press.
Gilster, P. (1997). *Digital literacy*. New York, NY: John Wiley & Sons Inc.
Glantz, L. H. (1998). Research with children. *American Journal of Law and Medicine, 24*(2&3), 213-244.
Glaser, B., & Strauss, A. (1967). *Discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.
Graham, A., Powell, M., Taylor, N., Anderson, D., & Fitzgerald, R. (2013). *Ethical research involving children*. Florence, Italy: UNICEF Office of Research – Innocenti.
Hadwin, J., Baron-Cohen, S., Hawlin, P., & Hill, K. (1996). Can we teach children with autism to understand emotions, beliefs, or pretence? *Development and Psychopathology, 8*, 345-365.
Ham, O. K., Sung, K. M., & Kim, H. K. (2013). Factors associated with screen time among school-age children in Korea. *Journal of School Nursing, 29*(6), 425-434.
Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice (3rd ed.)*. New York: Routledge.
Happé, F., & Frith, U. (1996). Theory of mind and social impairment in children with conduct disorder. *British Journal of Developmental Psychology, 14*, 385-398.
Hartas, D. D. (2011). Children's language and behavioural, social and emotional difficulties and prosocial behaviour during the toddler years and at school entry. *British Journal of Special Education, 38*(2), 83-91.
Hatakeyama, M., & Hatakeyama, H. (2012). Developmental study of empathy, moral judgment, and social information processing in preschooler's with relational aggression. *Japanese Journal of Developmental Psychology, 23*(1), 1-11.
Hay, D. F., Caplan, M., Castle, J., & Stimson, C. A. (1991). Does sharing become increasingly "rational" in the second year of life? *Developmental Psychology, 27*(6), 987-993.
Hay, D. F., Castle, J., Davies, L., Demetriou, H., & Stimson, C. A. (1999). Prosocial action in very early childhood. *Journal of Child Psychology and Psychiatry, 40*(6), 905-916.
Hayashi, A., & Tobin, J. (2012). Reframing a visual ethnography of a Japanese preschool classroom. *Visual Anthropology Review, 28*(1), 13-31.
Healy, J. (1998). *Failure to connect*. New York, NY: Touchstone.
Heath, C., Hindmarsh, J., & Luff, P. (2010). *Video in qualitative research: Analysing social interaction in everyday life*. London, UK: Sage Publications.
Hendela, T. (2014). App Store Sales Top $10 Billion in 2013. *Apple Press Info*. Retrieved November 4, 2014 from http://www.apple.com/ca/pr/library/2014/01/07App-Store-Sales-Top-10-Billion-in-2013.html

Hinkley, T., Verbestel, V., Ahrens, W., Lissner, L., Molnar, D., Moreno, L. A., . . . Consortium, I. (2014). Early childhood electronic media use as a predictor of poorer well-being: a prospective cohort study. *Journal of the American Medical Association Pediatrics, 168*(5), 485-492. doi:10.1001/jamapediatrics.2014.94

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps lessons from the science of learning. *Psychological Science in the Public Interest, 16*(1), 3-34.

Hoadley, C. (2004). Methodological alignment in design-based research. *Educational Psychologist, 39*(4), 203-212.

Hobson, R. P. (1991). Against the theory of theory of mind. *British Journal of Developmental Psychology, 9*, 33-51.

Homans, G. (1961). *Social behavior: Its elementary forms*. New York, NY: Harcourt Brace Jovanovich.

Houssa, M., & Nader-Grosbois, N. (2016). Could social cognition training reduce externalizing behaviors and social maladjustment in preschoolers? *Journal of Psychological Abnormalities, S1*. doi:10.4172/jpab.S1-005

Hunleth, J. (2011). Beyond on or with: Questioning power dynamics and knowledge production in 'child-oriented' research methodology. *Childhood, 18*(1), 81-89.

Hutchins, T. L., Bonazinga, L. A., Prelock, P. A., & Taylor, R. S. (2008). Beyond false beliefs: The development and psychometric evaluation of the perceptions of children's theory of mind measure – experimental version (PCToMM-E). *Journal of Autism and Developmental Disorders, 38*, 142-155. doi:10.1007/s10803-007-0377-1

Hutchins, T. L., Bouyea, L. B., & Prelock, P. A. (2014). *Technical manual for the Theory of mind inventory and theory of mind task battery*: University of Vermont, Department of Communication Sciences et Disorders.

Hutchins, T. L., Prelock, P. A., & Bonazinga, L. A. (2011). Psychometric evaluation of the theory of mind inventory (ToMI): A study of typically developing children and children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*.

Hutto, D. D. (2008). *Folk psychological narratives: The sociocultural basis of understanding reasons*. Cambridge, MA: MIT Press.

IBM Corp. (2016). IBM SPSS Statistics for Mac, Version 24. Armonk, NY: IBM Corp.

ipad. (n.d.). (Ed.) (2016) Collins English Dictionary - Complete & Unabridged 10th Edition.

Jacobson, M. (2014). Design-based research: Sponsoring innovation in education. *Education Canada*, 22-24.

Jenkins, H. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*. Chicago, IL: The John D. and Catherine T. MacArthur Foundation.

Johnson, C. N., & Wellman, H. M. (1982). Children's developing conceptions of the mind and brain. *Child Development, 53*(1), 222-234.

Jordan, A. B., & Robinson, T. N. (2008). Children, television viewing, and weight status: Summary and recommendations from an expert panel meeting. *The ANNALS of the American Academy of Political and Social Science, 615*(1), 119-132.

Joseph, D. (2004). The practice of design-based research: Uncovering the interplay between design, research, and the real-world context. *Educational Psychologist, 39*(4), 235-242.

Kang, H. Y. (2012). *Large group meetings in the preschool classroom: Co-constructing meaning making through group interaction.* (72), ProQuest Information & Learning, US.

Karsenti, T. F., Aurélien. (2013). *The iPad in education: uses, benefits, and challenges - A survey of 6,057 students and 302 teachers in Quebec, Canada*. Montreal, QC: CRIFPE.
Kelly, A. E. (2004). Design research in education: Yes, but is it methodological? *Journal of the Learning Sciences, 13*(1), 115-128.
Kohlberg, L. (1958). *The development of modes of thinking and choices in years 10 to 16.* (Dissertation), University of Chicago.
Kohlberg, L. (1984). *The psychology of moral development*. San Francisco, CA: Harper.
Kohlberg, L., Levine, C., & Hewer, A. (1981). *Moral stages: A current formulation and a response to critics*. Basel, Switzerland: Karger.
Kuhlmeier, V. A., Dunfield, K. A., & O'Neill, A. C. (2014). Selectivity in early prosocial behavior. *Frontiers in Psychology, 5*. doi:10.3389/fpsyg.2014.00836
Kullman, K. (2012). Experiments with moving children and digital cameras. *Children's Geographies, 10*(1), 1-16. doi:10.1080/14733285.2011.638174
Lacy, K. E., Allender, S. E., Kremer, P. J., de Silva-Sanigorski, A. M., Millar, L. M., Moodie, M. L., . . . Swinburn, B. A. (2012). Screen time and physical activity behaviours are associated with health-related quality of life in Australian adolescents. *Quality of Life Research, 21*(6), 1085-1099. doi:10.1007/s11136-011-0014-5
Lane, J. D., Wellman, H. M., Olson, S. L., LaBounty, J., & Kerr, D. C. R. (2010). Theory of mind and emotion understanding predict moral development in early childhood. *British Journal of Developmental Psychology, 28*(4), 871-889.
Lankshear, C., & Knobel, M. (2008). *Digital literacies: Concepts, policies and practices*. New York, NY: Peter Lang.
Learmonth, M. (2010). How the iPad became child's play - and learning tool. *Advertising Age, 81*(23), 4-4.
Lerner, M. D., Hutchins, T. L., & Prelock, P. A. (2011). Brief report: Preliminary evaluation of the theory of mind inventory and its relationship to measures of social skills. *Journal of Autism and Developmental Disorders, 41*, 512-517. doi:10.1007/s10803-010-1066-z
Leudar, I., & Costall, A. (2009). *Against theory of mind*. New York, New York: Palgrave Macmillan.
Liao, Z., Li, Y., & Su, Y. (2014). Emotion understanding and reconciliation in overt and relational conflict scenarios among preschoolers. *International Journal of Behavioral Development, 38*(2), 111-117.
Luzón, M. J. (2011). 'Interesting post, but I disagree': Social presence and antisocial behaviour in academic weblogs. *Applied Linguistics, 32*(5), 517-540.
Lynch, J., & Redpath, T. (2014). 'Smart' technologies in early years literacy education: A metanarrative of paradigmatic tensions in iPad use in an Australian preparatory classroom. *Journal of Early Childhood Literacy, 14*(2), 147-174.
Magee, C. A., Lee, J. K., & Vella, S. A. (2014). Bidirectional relationships between sleep duration and screen time in early childhood. *Journal of the American Medical Association Pediatrics, 168*(5), 465-470. doi:10.1001/jamapediatrics.2013.4183
Malinowski, B. (1922). *Argonauts of the western pacific*. London, UK: Routledge & Kegan Paul.
Mangen, A. (2010). Point and click: Theoretical and phenomenological reflections on the digitization of early childhood education. *Contemporary Issues in Early Childhood, 11*(4), 415-431.

Masek, M., Murcia, K., & Morrison, J. (2012). Getting serious with iPads: The intersection of game design and teaching principals. *Australian Educational Computing, 27*(2), 34-38.
McCabe, R., Leudar, I., & Anataki, C. (2004). Do people with schizophrenia display theory of mind deficits in clinical interactions? *Psychological Medicine, 34*, 401-410.
McPake, J., Plowman, L., & Stephen, C. (2013). Pre-school children creating and communicating with digital technologies in the home. *British Journal of Educational Technology, 44*(3), 421-431.
MediaSmarts. (2013). Digital literacy fundamentals. *MediaSmarts.* Retrieved May 5, 2015 from http://mediasmarts.ca/.
Medvin, M. B., Spargo, B., & Falcocchio, A. (2000). *Using computers to facilitate social problem solving in head start classrooms*. Paper presented at the Paper presented at the Head Start National Research Conference, Washington, DC.
Middleton, J., Gorard, S., Taylor, C., & Ritland, B. (2006). The "compleat" design experiment: From soup to nuts. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching*. New York, NY: Routledge.
Mitchell, R., Saltmarsh, R., & Russel, H. (1997). Overly literal interpretations of speech in autism: Undrstanding that messags arise from minds. *Journal of Child Psychology and Psychiatry, 38*, 658-691.
Moore, C., Bosacki, S. L., & Macgillivray, S. (2011). Theory of mind and social interest in zero-acquaintance play situations. *Child Development, 82*(4), 1163-1172. doi:10.1111/j.1467-8624.2011.01602.x
Moore, C., & Macgillivray, S. (2004). Altruism, prudence, and theory of mind in preschoolers. *New Directions for Child and Adolescent Development, 2004*(103), 51-62. doi:10.1002/cd.97
Morgado, L. (2008). TEL practices in preschool and kindergarten education: Integrating computer use and computer programming in off-computer activities. In M. D. Lytras, D. Gasevic, P. Ordonez de Pablos, & W. Huang (Eds.), *Technology enhanced learning: Best practices*. New York, NY: IGI Publishing.
Morrison, G. S. (2006). *Fundamentals of early childhood education*. Upper Saddle River, NJ: Pearson Prentice Hall.
Moyer-Packenham, P. S., Shumway, J. F., Bullock, E., Tucker, S. I., Anderson-Pence, K. L., Westenskow, A., . . . Jordan, K. (2015). Young children's learning performance and efficiency when using virtual manipulative mathematics iPad apps. *Journal of Computers in Mathematics and Science Teaching, 34*(1), 41-69.
Muller, A. A., & Perlmutter, M. (1984). Preschool children's problem-solving interactions at computers and jigsaw puzzles. *Journal of Applied Developmental Psychology, 6*, 173-186.
Muller, U., Liebermann-Finestone, D. P., Carpendale, J. I. M., Hammond, S. I., & Bibok, M. B. (2012). Knowing minds, controlling actions: The developmental relations between Theory of mind and executive function from 2 to 4 years of age. *Journal of Experimental Child Psychology, 111*(2), 331-348.
Musante, K. (2014). Participant observation. In H. R. Bernard & C. C. Gravlee (Eds.), *Handbook of methods in cultural anthropology*. USA: Rowman & Littlefield Publishers.

NAEYC. (2012). *Technology and Young Children – Ages 3 through 8. A Position Statement of the National Association for the Education of Young Children*. Washington, DC: National Association for the Education of Young Children.
Neuman, M., & Neuman, D. (2014). Touch screen tablets and emergent literacy. *Early Childhood Education Journal, 42*(4), 231-239.
O'Hara, M. (2011). Young children's ICT experiences in the home: Some parental perspectives. *Journal of Early Childhood Research, 9*(3), 222-231.
Olds, T., Ferrar, K. E., Gomersall, S. R., Maher, C., & Walters, J. L. (2012). The elasticity of time: Associations between physical activity and use of time in adolescents. *Health Education & Behavior, 39*(6), 732-736.
Pallant, J. (2010). *SPSS survivial manual: A step by step guide to data analysis using SPSS* (4th ed.). New York, NY: Allen & Unwin Book Publishers.
ParticipACTION. (2016). *Are Canadian kids too tired to move? The 2016 ParticipACTION report card on physical activity for children and youth.* Retrieved from Toronto, ON:
Paulus, M., Gillis, S., Li, J., & Moore, C. (2013). Preschool children involve a third party in a dyadic sharing situation based on fairness. *Journal of Experimental Child Psychology, 116*(1), 78-85. doi:10.1016/j.jecp.2012.12.014
Paulus, M., & Moore, C. (2014). The development of recipient-dependent sharing behavior and sharing expectations in preschool children. *Developmental Psychology, 50*(3), 914-921. doi:10.1037/a0034169
Paulus, M., & Moore, C. (2015). Preschool children's anticipation of recipients' emotions affects their resource allocation. *Social Development*.
Pearce, C., Arnold, M., Phillips, C., & Dwan, K. (2010). Methodological considerations of digital video observation: Beyond conversation analysis. *International Journal of Multiple Research Approaches, 4*(2), 90-99.
Persson, G. E. B. (2005). Developmental perspectives on prosocial and aggressive motives in preschoolers' peer interactions. *International Journal of Behavioral Development, 29*(1), 80-91.
Petrina, S. (2014). Postliterate machineries. In J. Dakers (Ed.), *New frontiers in technological literacy: Breaking with the past* (pp. 29-43). New York, NY: Palgrave Macmillan.
Petrina, S., Feng, F., & Kim, J. (2008). Researching cognition and technology: How we learn across the lifespan. *International Journal of Technology & Design Education, 18*(4), 375-396. doi:10.1007/s10798-007-9033-5
Piaget, J. (1951). *The child's conception of the world*. London: Routledge & Kegan Paul.
Piaget, J., & Inhelder, B. (1969). *The psychology of the child*. Paris, France: Presses Universitaires de France.
Pink, S. (2001). More visualising, more methodologies: On video, reflexivity and qualitative research. *The Sociological Review, 49*(4), 586-599.
Pitman, S. (2008). The impact of media technologies on child development and wellbeing. Retrieved October 17, 2014 from http://www.ozchild.org.au/userfiles/docs/ozchild/research-papers/ImpactOfElectronicMedia.pdf
Plante, J., & Beattie, D. (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*.
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., & Stephen, C. (2007). Guided interaction in pre-school settings. *Journal of Computer Assisted Learning, 23*(1), 14-26.
Plowman, L., Stephen, C., & McPake, J. (2010). *Growing up with technology: Young children learning in a digital world*. New York: Routledge.
Plowman, L., Stevenson, O., Stephen, C., & McPake, J. (2012). Preschool children's learning with technology at home. *Computers & Education, 59*(1), 30-37.
Powell, K. (2014). How can parents enforce limits on screen time? *The Washington Post*. Retrieved November 2, 2014 from http://www.thestar.com/life/2014/04/21/how_can_parents_enforce_limits_on_screen_time.html
Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*, 515-526.
Punch, S. (2002). Research with children: The same or different from research with adults? *Childhood, 9*(3), 321-341.
QSR International. (2016). NVivo qualitative data analysis Software, Version 11: QSR International Pty Ltd.
Radke-Yarrow, M., Zahn-Waxler, C., Barrett, D., Darby, J., King, R., Pickett, M., & Smith, J. (1976). Dimensions and correlates of prosocial behavior in young children. *Child Development, 47*(1), 118-125.
Ramaswamy, V., & Bergin, C. (2009). Do reinforcement and induction increase prosocial behavior? Results of a teacher-based intervention in preschools. *Journal of Research in Childhood Education, 23*(4), 527-538.
Reddy, V. (1991). Playing with others' expectations: Teasing and mucking about in the first year. In A. Whiten (Ed.), *Natural theories of mind*. Oxford, England: Blackwell.
Reddy, V., & Morris, P. (2004). Participants don't need theories: Knowing mind in engagement. *Theory and Psychology, 14*, 647-665.
Reimann, P. (2011). Chapter 3 design-based research. In M. L., P. Freebody, & J. Irwin (Eds.), *Methodological choice and design*. New York, NY: Springer Science and Business Media.
Renouf, A., Brendgen, M., Parent, S., Vitaro, F., Zelazo, P. D., Boivin, M., . . . Seguin, J. R. (2010). Relations between theory of mind and indirect and physical aggression in kindergarten: Evidence of the moderating role of prosocial behaviors. *Social Development, 19*(3), 535-555.
Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). Generation M2: Media in the lives of 8- to 18-year-olds *Henry J. Kaiser Family Foundation*. Retrieved from January 16, 2017 https://kaiserfamilyfoundation.files.wordpress.com/2013/04/8010.pdf
Rogers, K., Dziobek, I., Hassenstab, J., Wolf, O. T., & Convit, A. (2007). Who cares? Revisiting empathy in Asperger syndrome. *Journal of Autism and Developmental Disorders, 37*(4), 709-715. doi:10.1007/s10803-006-0197-8

Romero, D., & Walker, D. (2010). Ethical dilemmas in representation: Engaging participative youth. *Ethnography and Education, 5*(2), 209-227.
Ronald, A., Happé, F., Hughes, C., & Plomin, R. (2005). Nice and nasty theory of mind in preschool children: Nature and nurture. *Social Development, 14*(4), 664-684.
Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior, 29*(3), 1243-1254.
Roskos, K., Burstein, K., & You, B.-K. (2012). A typology for observing children's engagement with eBooks at preschool. *Journal of Interactive Online Learning, 11*(2), 47-66.
Rowsell, J., & Harwood, D. (2015). "Let It Go": Exploring the image of the child as a producer, consumer, and inventor. *Theory Into Practice, 54*(2), 136-146.
Sandoval, W. A., & Bell, P. (2004). Design-based research methods for studying learning in context: Introduction. *Educational Psychologist, 39*(4), 199-201.
Schwartz, W. (2002). From passivity to competence: A conceptualization of knowledge, skill, tolerance, and empathy. *Psychiatry, 65*(4), 338-345. doi:10.1521/psyc.65.4.338.20239
Schwartz, W. (2013). The parameters of empathy: Core considerations for psychotherapy and supervision. *Advances in Descriptive Psychology, 10*. doi:10.2139/ssrn.2393689
Shamay-Tsoory, S. G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain, 132*(3), 617-627. doi:10.1093/brain/awn279
Sharp, M. (2015). What is Socialization? *The Socjourn*.
Shavelson, R. J., Phillips, D. C., Towne, L., & Feuer, M. J. (2004). On the science of education design studies. *Educational Researcher, 32*(1), 25-28.
Shrum, W., Duque, R., & Ynalvez, M. (2007). Lessons of the lower ninth: Methodology and epistemology of video ethnography. *Technology in Society, 29*(2), 215-225.
Shuler, C., Levine, Z., & Ree, J. (2012). iLearn II An analysis of the education category of Apple's app store. *The Joan Ganz Cooney Center at Sesame Workshop, New York, NY*.
Silliman, E. R., Diehl, S. F., Bahr, R. H., Hnath-Chisolm, T., Zenko, C. B., & Friedman, S. A. (2003). A new look at performance on theory-of-mind tasks by adolescents with autism spectrum disorder. *Language, Speech, and Hearing Services in Schools, 34*, 236-252.
Slaughter, V., Dennis, M. J., & Pritchard, M. (2002). Theory of mind and peer acceptance in preschool children. *British Journal of Developmental Psychology, 20*(4), 545-564.
Snyder, C. R., Lopez, S. J., & Pedrotti, J. T. (2011). *Positive psychology: The scientific and practical explorations of human strength*. Los Angeles, CA: SAGE.
Sommerville, J. A., Schmidt, M. F. H., Yun, J.-e., & Burns, M. (2013). The development of fairness expectations and prosocial behavior in the second year of life. *Infancy, 18*(1), 40-66.
Song, J.-H., Volling, B. L., & Lane, J. (2012). *Young children's behavioral characteristics differentially predict their theory-of-mind abilities.* Paper presented at the American Psychological Association 2012 Convention Presentation.
Spindler, G., & Spindler, L. (1987). Teaching and learning how to do the ethnography of education. In G. Spindler & L. Spindler (Eds.), *Interpretive ethnography of education: At home and abroad* (pp. 17-33). Hillsdale, NJ: Lawrence Erlbaum.

Stafford, B. M., & Terpak, F. (2001). *Devices of wonder: From the world in a box to images on a screen*. Los Angeles, CA: Getty Publications.
Strand, P. S., Pula, K., & Downs, A. (2015). Social values and preschool behavioral adjustment: A comparative investigation of Latino and European American preschool children. *Cultural Diversity and Ethnic Minority Psychology, 21*(3), 400-408. doi:10.1037/cdp0000017
Sullivan, K., Zaitchik, D., & Fager-Flusberg, H. (1994). Preschoolers can attribute second-order beliefs. *Developmental Psychology, 30*(3), 395-402.
Sutton, J., Smith, P. K., & Swettenham, J. (1999). Bullying and 'theory of mind': A critique of the 'social skills deficit' view of anti-social behaviour. *Social Development, 8*(1), 117-127.
Tandon, P. S., Zhou, C., Lozano, P., & Christakis, D. (2010). Preschoolers' Total Daily Screen Time at Home and by Type of Child Care. *Journal of Pediatrics, 158*(2), 297-300. doi:10.1016/j.jpeds.2010.08.005
Tappan, M. B. (1997). Language, culture, and moral development: A Vygotskian perspective. *Developmental Review, 17*(1), 78-100. doi:10.1006/drev.1996.0422
The United Nations. (1989). *Convention on the Rights of the Child*. Treaty Series, 1577, 3.
Thibaut, J. W., & Kelley, H. H. (1959). *The social psychology of groups*. New York, NY: John Wiley & Sons, Inc.
Toi, M., & Batson, C. D. (1982). More evidence that empathy is a source of altruistic motivation. *Journal of Personality and Social Psychology, 43*(2), 281-292. doi:10.1037/0022-3514.43.2.281
Tosco, J. E. (2015). *The effects of technology on engagement and retention among upper elementary Montessori students.* (Masters of Arts in Education Thesis), St. Catherine University, (Unpublished).
Turkle, S. (2015). *Reclaiming conversation : The power of talk in a digital age*. New York, NY: Penguin Press.
Uhls, Y. T., Michikyan, M., Morris, J., Garcia, D., Small, G. W., Zgourou, E., & Greenfield, P. M. (2014). Five days at outdoor education camp without screens improves preteen skills with nonverbal emotion cues. *Computers in Human Behavior, 39*, 387-392.
US Code of Federal Regulations. (2009). *Part 46 Protection of Human Subjects*.
Van Berkel, S. R., Van der Pol, L. D., Groeneveld, M. G., Hallers-Haalboom, E. T., Endendijk, J. J., Mesman, J., & Bakermans-Kranenburg, M. J. (2015). To share or not to share: Parental, sibling, and situational influences on sharing with a younger sibling. *International Journal of Behavioral Development, 39*(3), 235-241.
Van den Akker, J., Gravemeijer, K., McKenney, S., Nieveen, N. (2006). *Educational design research*. New York, NY: Routledge.
van Geel, M., Vedder, P., & Tanilon, J. (2014). Relationship between peer victimization, cyberbullying, and suicide in children and adolescents: a meta-analysis. *Journal of the American Medical Association Pediatrics, 168*(5), 435-442. doi:10.1001/jamapediatrics.2013.4143
Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Stiener, S. Scribner, & E. Souberman Eds.). Cambridge, MA: Harvard University Press.

Walker, R. (2010). Design-based research: Reflections on some epistemological issues and practices. In L. Markauskaite, P. Freebody, & J. Irwin (Eds.), *Methodological choice and design: Scholarship, policy and practice in social and educational research* (pp. 51-56). Netherlands: Springer Science and Business Media.

Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development, 53*(4), 5-23.

Wang, S.-K., Hsu, H.-Y., Campbell, T., Coster, D., & Longhurst, M. (2014). An investigation of middle school science teachers and students use of technology inside and outside of classrooms: Considering whether digital natives are more technology savvy than their teachers. *Educational Technology Research & Development, 62*(6), 637-662.

Wang, Y. (2012). *Designing immersive language learning environments in virtual worlds.* (Ph.D Dissertation), University of British Columbia.

Warneken, F., & Tomasello, M. (2013). The emergence of contingent reciprocity in young children. *Journal of Experimental Child Psychology, 116*(2), 338-350. doi:10.1016/j.jecp.2013.06.002

Weimer, A. A., Sallquist, J., & Bolnick, R. R. (2012). Young children's emotion comprehension and Theory of mind understanding. *Early Education and Development, 23*(3), 280-301.

Wellman, H. (1990). *The child's theory of mind*. Cambridge, MA: MIT Press.

White House Task Force on Childhood Obesity. (2010). White House Task Force on childhood obesity Report to the President. Retrieved November 4, 2014 from http://www.letsmove.gov/white-house-task-force-childhood-obesity-report-president.

White, N., Ensor, R., Marks, A., Jacobs, L., & Hughes, C. (2014). "It's mine!" Does sharing with siblings at age 3 predict sharing with siblings, friends, and unfamiliar peers at age 6? *Early Education and Development, 25*(2), 185-201.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition, 13*, 103-128.

Winch, R. F. (1952). *The modern family*. New York, NY: Holt.

Wispé, L. (1986). The distinction between sympathy and empathy: To call forth a concept, a word is needed. *Journal of Personality and Social Psychology, 50*, 329-338.

Wolcott, H. F. (1994). *Transforming qualitative data: Description, analysis, and interpretation*. Thousand Oaks, CA: Sage.

Wu, Z., & Su, Y. (2014). How do preschoolers' sharing behaviors relate to their theory of mind understanding? *Journal of Experimental Child Psychology, 120*, 73-86.

Yagmurlu, B. (2014). Relations among sociocognitive abilities and prosocial behavior. *Journal of Child and Family Studies, 23*(3), 591-603.

Zahavi, D. (2002). Beyond empathy *Between ourselves: Second-person issues in the study of consciousness*. Charlottesville, VA: Imprint Academic.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64-70.

Appendices

Appendix A: Interviews with children

- semi-structured
- designed to provide information to respond to the research questions

Pre-interview

1) What is sharing?
2) How do you share?
3) What can you share?
4) Why do you share? Why don't you share? How does that make you feel?
5) How does it make other people feel when you share? When you don't share?
6) Have you used an iPad before?
7) What did you use the iPad for?

Post-interview

1) What is sharing?
2) How do you share?
3) What can you share?
4) Why do you share? Why don't you share? How does that make you feel?
5) How does it make other people feel when you share? When you don't share?
6) How did you feel when you used the iPad?
7) Did you share with the iPad? How?
8) Did you like sharing with the iPad?
9) Was the activity today fun?
10) Would you like to do it again?

Appendix B: Interviews with preschool instructors

- semi-structured
- designed to provide information to respond to the research questions

1. Do you have specific lessons you have to teach the kids how to share? Or is it a day-to-day encouragement?
2. Do you notice that certain age groups are less sharing or just individual kids, depending on circumstances?
3. Do you use technology in the preschool programs?
4. What do you think would happen if you introduced, I'm introducing iPads, what do you expect? Or predict? What would happen?
5. When they are sharing, do you think they have that emotional response? They understand what happens when I share and when I don't share, how people feel?
6. Do you think that with this intervention of iPads and the approach I'm taking, will that change how the kids interact or do you think they already know sharing and interacted that way anyways?

Appendix C: Mine Questionnaire

1) How would you rate this story? (Check one per question)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The characters were enjoyable					
The pictures matched the text					
The story conveyed about the concept of selfishness					
The story conveyed about the concept of sharing					
This is suitable for preschool-aged children					
This is a successful digital storybook					

2) What was your favourite page?

3) Why was that your favourite page?

4) What was your least favourite page?

5) Why was that your least favourite page?

6) Is there anything you would add/change to make this a successful book teaching preschool-aged children about sharing?

Appendix D: NAEYC Guiding Principles to Technology Tools and Interactive Media

NAEYC principles to guide the appropriate use of technology tools and interactive media in early childhood programs:

- Above all, the use of technology tools and interactive media should not harm children
- Developmentally appropriate practices must guide decisions about whether and when to integrate technology and interactive media into early childhood programs
- Professional judgment is required to determine if and when a specific use of technology or media is age appropriate, individually appropriate, and culturally, and linguistically appropriate
- Developmentally appropriate teaching practices must always guide the selection of any classroom materials, including technology and interactive media
- Appropriate use of technology and media are active, hands-on, engaging, and empowering; give the child control; provide adaptive scaffolds to ease the accomplishment of tasks; and are used as one of many options to support children's learning
- When used appropriately, technology and media can enhance children's cognitive and social abilities
- Interactions with technology and media should be playful and support creativity, exploration, pretend play, active play, and outdoor activities
- Technology tools can help educators make and strengthen home-school connections
- Technology and media can enhance early childhood practice when integrated into the environment, curriculum, and daily routines
- Assistive technology must be available as needed to provide equitable access for children with special needs
- Technology tools can be effective for dual language learners by providing access to a family's home language and culture while supporting English language learning
- Digital literacy is essential to guiding early childhood educators and parents in the selection, use, integration, and evaluation of technology and interactive media
- Digital citizenship (understanding use, abuse, and misuse of technology and norms of appropriate, responsible, and ethical behaviours) is an important part of digital literacy for young children
- Early childhood educators need training, professional development opportunities, and examples of successful practice to develop the technology and media knowledge, skills and experience needed to meet the expectations set forth in this statement

Appendix E: ToM Task Battery Questions and Prompts

TASK A:
Page 2: Test Question 1: *What face is happy?*
Test Question 2: *What face is sad?*
Page 3: Test Question 3: *What face is mad?*
Test Question 4: *What face is scared?*

TASK B:
Page 4: *This is Brynn. Brynn wants a cookie to eat.*
Page 5: *What does Brynn want? cake, a cookie, a lollipop, or a candy bar?*

IF INCORRECT, SKIP TO TASK C
Page 6: *How will Brynn feel if she gets a cookie? Will she feel happy, sad, mad or scared*?
Justification (verbal children with correct answer only): *Why will Brynn be happy?*

TASK C:
Page 7: *This is Patty. This morning Patty saw her glasses on the table. Now she wants her glasses.*
Page 8: *Where does Patty think her glasses are? In the drawer? The desk? The Table? The Chair?*
Justification (verbal children with correct answer only): *Why will Patty think they are on the table?*

TASK D:
Page 9: *Jasmine is at the park. Vince is also at the park. Jasmine and Vince are looking at a statue.*
Page 10: *When Jasmine looks at the statue, what does she see? The front? The Back? The side?*

When Vince looks at the statue, what does she see? The front? The Back? The side?

TASK E:
Page 11: *This is Franklin. Franklin wants his keys.*
Page 12: *Franklin has two sets of keys that are exactly the same. One set is on the couch and the other set is on the bed.*
Page 13: *Today Franklin saw the keys on the couch. Franklin did not see the keys on the bed.*
Page 14: *Where will Franklin go to get the keys? Will he go to the couch? To the Desk? To the Drawer? To The Bed?*
Justification (verbal children with correct answer only): *Why will Franklin to go the couch?*

TASK F:
Page 15: *This is Anthony. Anthony is reading a book. When he is done, Anthony puts the book on the table. Anthony leaves to get something to eat in the kitchen.*
Page 16: *Look, Sonya comes in and moves the book from the table to a drawer.*

Page 17: *Then Sonya leaves.*
Page 18: *Look, Anthony comes back to read some more.*
Page 19: *Where did Anthony put the book? Did Anthony put the book on the table? In the Drawer? On the Shelf? On the Chair?*

IF INCORRECT, SKIP TO TASK G
Control question: *Where is the book now? Is the book now on the table, in the drawer, on the shelf or on the chair?*

IF INCORRECT, SKIP TO TASK G
Where will Anthony look for the book first? In the drawer, on the desk, on the table, or on the chair?

Justification (verbal children with correct answer only): *Why will Anthony look for the book on the table?*

TASK G:
Page 20: *This is Lee. It is Lee's birthday. Lee wants a toy airplane for his birthday.*
Page 21: *Dad thinks Lee wants a train for his birthday. Dad got a train for Lee. Lee doesn't know about the train. Lee thinks his Dad got him an airplane.*
Page 22: *What does Lee want? A truck? A Train? A Wage? An Airplane?*

IF INCORRECT, SKIP TO TASK H

What does Lee think his Dad got him? Does Lee think his Dad got him a truck, a train, a wagon, or an airplane?

IF INCORRECT, SKIP TO TASK H
Page 23: *If Lee thinks his Dad got him an airplane, how will Lee feel? How will Lee feel if he thinks dad got him an airplane? Will Lee feel happy, sad, mad or scared?*
Justification (verbal children with correct answer only): *Why will Lee feel happy?*
Page 24: *Look, Dad gives Lee the train.*
Page 25: *What does Dad think Lee wants? A truck, a train, a wagon, or an airplane?*

IF INCORRECT, SKIP TO TASK H
Page 26: *How will Lee feel when his Dad gives him the train? Will Lee feel happy, sad, mad or scared?* Justification (verbal children with correct answer only): *Why will Lee feel sad?*

IF INCORRECT, SKIP TO TASK H
When Dad gives Lee the train, how does Dad think Lee will feel? Will Dad think Lee will feel happy, sad, mad or scared?
Justification (verbal children with correct answer only): *Why does dad think Lee will be happy?*

TASK H:

Page 27: *This is Russ. Russ is cooking dinner.*
Page 28 *He has made spaghetti and a salad. He puts the spaghetti in one bowl and the salad in another bowl.*
Page 29: *Russ puts the bowl of spaghetti on the counter and the bowl of salad on the dinner table.*
Page 30: *Look, Russ leaves the kitchen. He goes into the living room to read the paper.*
Page 31: *Which bowl did Russ put on the counter? Did Russ put a bowl of salad, a bowl of spaghetti, a bowl of bread, or a bowl of soup on the counter?*

IF INCORRECT, SKIP TO TASK I
Which bowl did Russ put on the dinner table? Did Russ put a bowl of salad, a bowl of spaghetti, a bowl of bread, or a bowl of soup on the dinner table?

IF INCORRECT, SKIP TO TASK I
Page 32: *This is Mariam. Mariam came into the kitchen. She takes the bowl from the counter and the bowl from the table and has something to eat.*
Page 33: *When Mariam is finished, she puts the bowls back but she gets the bowls mixed up. She puts the bowl of salad on the counter and the bowl of spaghetti on the dinner table.*
Page 34: *Which bowl did Mariam put on the counter? Did Mariam put bowl of salad, a bowl of spaghetti, a bowl of bread, or a bowl of soup on the counter?*

IF INCORRECT, SKIP TO TASK I
Which bowl did Mariam put on the dinner table: a bowl of salad, a bowl of spaghetti, a bowl of bread, or a bowl of soup on the dinner table?

IF INCORRECT, SKIP TO TASK I
Page 35: *Later, Russ decides to have something to eat. He asks Mariam to bring him the bowl that is on the counter.*
Page 36: *Which bowl does Russ really want? Does he want a bowl of salad, a bowl of spaghetti, a bowl of bread, or a bowl of soup?*

TASK I:
Page 37:
This is Enrique and his Mom. It is Enrique's birthday. He is having a big party tonight.
Page 38: *Enrique's Mom is surprising him with a new bike. Mom has hidden the bike in the closet.*
Page 39: *Enrique and his Mom are talking in the kitchen. Enrique says, "Mom, I really want a new bike for my birthday." Now remember, Mom wants the bike to be a surprise so she says "Sorry, I didn't get you that. I got you roller blades instead."*
Page 40: *Enrique thinks his Mom got him roller blades.*
Page 41: *Then Enrique waves goodbye to his Mom. Enrique says, "Ok. I am going to my friend's house. I'll be home later."*
Page 42: *On his way out, Enrique opens the closet to get a jacket and sees the new bike. Enrique is happy. He thinks to himself "Yes! Mom did not get me roller blades. She really got me a bike!" Mom does not see Enrique open the closet. Mom doesn't know that Enrique found the*

bike.
Page 43: *What does Enrique think he is getting for his birthday? Does he think he is getting rollerblades, a bike, a basketball, or a baseball glove?*

IF INCORRECT, END HERE
Page 44: *Later, Enrique's Grandfather comes over for his birthday. Grandfather asks Mom, "Does Enrique know what he is getting for his birthday?"*
Page 45: *What does Mom tell Grandfather? Does she tell him that Enrique thinks he is getting roller blades, a bike, a basketball, or a baseball glove? Will Mom say that Enrique thinks he is getting roller blades, a bike, a basketball, or a baseball glove?*
Justification (verbal children with correct answer only): *Why will Mom say Enrique thinks he is getting roller blades?*

Appendix F: ToM Domains

ToM domains from Hutchins et al. (2014) Technical manual for the Theory of mind inventory and theory of mind task battery (p.90-92).

TASK A: The *Emotion Recognition Task* is intended to assess children's recognition of emotional states. Specifically, children are asked to identify a happy, sad, mad, and scared face. Two panels consisting of four illustrations each (two correct and two distracters) were presented in order to reduce response bias due to a process of elimination. *Four points (one for each emotion) are possible for this task.*

TASK B: The *Desire-Based Emotion Task* was developed from several research paradigms (Hadwin et al., 1996; Wellman, 1990) and it is intended to assess children's understanding of desires. More specifically, this task is designed to tap the understanding that people are happy when desires are satisfied. *One point is possible for this task.*

TASK C: The *Seeing Leads to Knowing Task* was developed from several research and experimental paradigms (Hadwin et al., 1996) and it is intended to assess children's knowledge that perceptions influence beliefs. The specific content of this understanding is the notion that seeing something (and more generally hearing about something) provides access to knowledge. Children who acquire this understanding should be able to attribute knowledge or ignorance to an observer on the basis of whether the observer was able to access information via seeing (or hearing). *One point is possible for this task.*

TASK D*:* The *Line of Sight Task (Flavell, 1992)*is intended to assess the understanding that people may not see the same thing depending on positioning. *A total of two points (one for each characters' perspective) is possible for this task.*

TASK E: The *Perception-Based Action Task (Hadwin et al., 1996)* was adapted to assess the understanding that perceptions influence behavior. Thus, this task has one additional layer of understanding compared to the Seeing Leads to Knowing Task. For Perception-Based Action, the child must understand that 1) knowledge can be gained through visual perception (e.g., seeing keys on a couch leads to knowledge that keys are on the couch) and, 2) that knowledge drives behavior (e.g., knowing the keys are on the couch will result in seeking behavior such that the person will now look for the keys on the couch). *One point is possible for this task.*

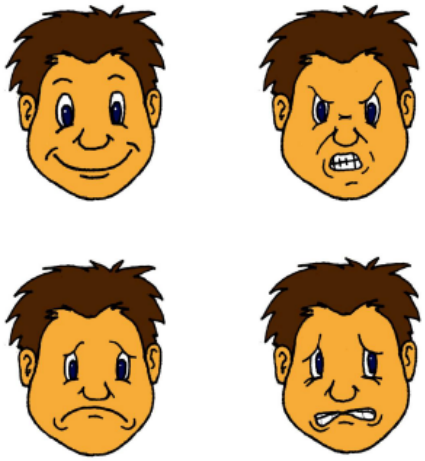
TASK F: A *Standard False Belief Task (Wimmer & Perner, 1983)*is intended to assess children's ability to infer belief in the context of an unexpected location change. The test question for the item modeled after the classic false belief task was modified to include the word *first* (i.e., "Where will Anthony look for the book first?") to limit the potential that this question would be misinterpreted. That is, this question should not be interpreted as "Where will someone need to look in order to be successful in finding the object?" Like the Perception-Based Action Task, this task also includes an understanding of the knowing-looking connection; however, the Standard False Belief Task adds yet another layer of complexity because it must also include the understanding that people can have a belief that contradicts reality. *One point is possible for this task.*

TASK G: The *Belief- and Reality-Based Emotion and Second Order Emotion Task* was adapted (Hadwin et al., 1996) to assess the understanding that beliefs, as well as events contrary to beliefs, can cause emotion. This task also incorporated a second-order emotion task to assess children's understanding that an observer will incorrectly infer a protagonist's emotion based on a false belief about the protagonist's desire. This adds another degree of complexity and requires recursive thinking (i.e., thinking about what someone thinks about someone else's emotions/desires). *A total of three points is possible for this task.*

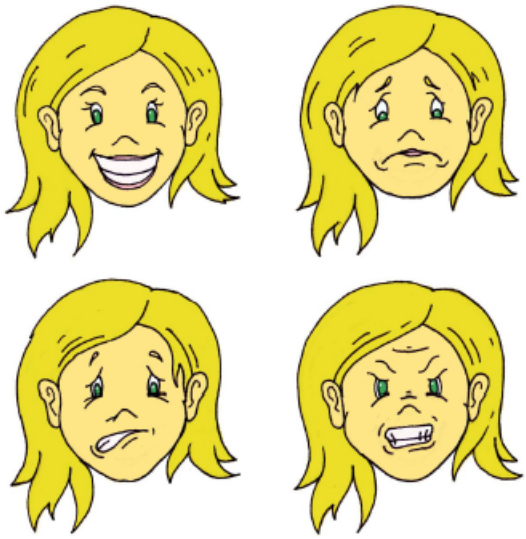
TASK H: The *Message-Desire Discrepant Task* was adapted (Mitchell et al., 1997) to assess the ability to infer the belief of another when interpreting a statement of desire in the context of a change location (i.e., false belief). This task was chosen because it represents a distinct facet of ToM while conferring advantages over other tasks (e.g., the more traditional Smarties, false-contents task) by avoiding response errors due to an overly literal interpretation of the test question ((Fodor, 1992; Mitchell et al., 1997)). *A total of one point is possible for this task.*

TASK I: A *Second-Order False Belief Task* was adapted (Silliman et al. (2003); originally adapted from Sullivan et al. (1994)) to tap knowledge of second-order false beliefs. This task is believed to be the most challenging test of ToM in the battery. Not only is complex recursion involved (thinking about what someone else thinks about what someone else thinks) but it also includes the element of a false belief. As described more fully below, it is not uncommon for some older typically developing children to fail Tasks G and H but pass Task I. We suggest that, with regard to ToM knowledge, Task I may be the most challenging but that patterns of performance like that just noted are possible due to the item construction of G and H and their larger number of associated control questions for which a pass is required for credit on the test questions. *One point is possible for this task.*

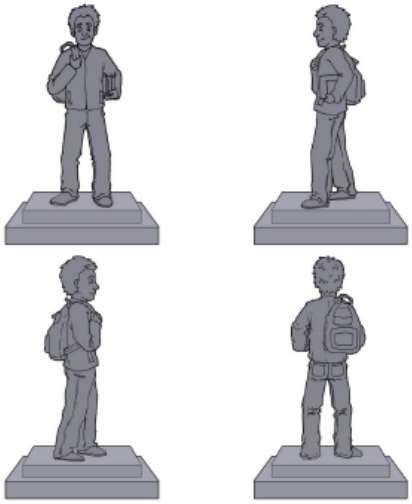
Appendix G: ToM storybook task battery Storybook Examples



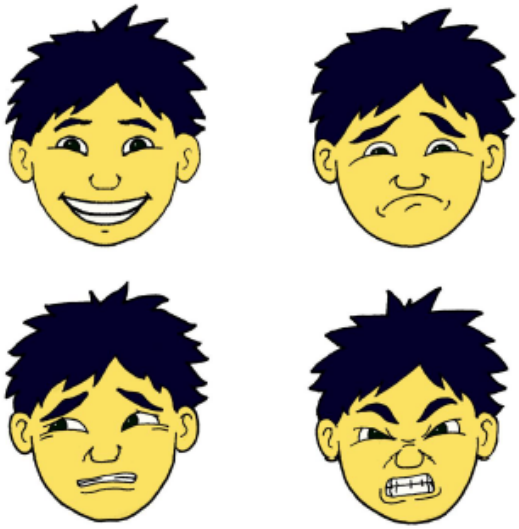
Point to the face that is happy.
Point to the face that is sad.



How will Brynn feel if she gets a cookie?



When Jasmine looks at the statue, what does she see?
When Vince looks at the statue, what does he see?



If Lee thinks his Dad got him an airplane, how will Lee feel?

Appendix H: ToM storybook task battery Scoring Sample

Task/Test Question (TQ)	Domain Intended to be Tapped	Result (Pass/Fail)
Task A TQ1	Recognition of facial expression: happy	**Pass Fail**
Task A TQ 2	Recognition of facial expression: sad	**Pass Fail**
Task A TQ 3	Recognition of facial expression: mad	**Pass Fail**
Task A TQ4	Recognition of facial expression: scared	**Pass Fail**
Task B TQ5	Desire-based emotion (understanding that people will be happy when they get what they want)	**Pass Fail**
Task C TQ6	Seeing-leads-to-knowing (understanding that what someone sees influences what they know)	**Pass Fail**
Task D TQ7	Line of sight (inferring that people will have different visual perspectives based on physical positioning)	**Pass Fail**
Task D TQ8	Line of sight (inferring that people will have different visual perspectives based on physical positioning)	**Pass Fail**
Task E TQ9	Perception-based action (inferring that people will act in accordance with their perception-based beliefs)	**Pass Fail**
Task F TQ10	False-beliefs (inferring a belief in the context of an unexpected location change)	**Pass Fail**
Task G TQ 11	Belief-based emotion (inferring that beliefs can cause emotions)	**Pass Fail**
Task G TQ 12	Reality-based emotion (inferring emotions in the context of actual events)	**Pass Fail**
Task G TQ 13	Second-order emotion (inferring that people will have thoughts about others' emotions)	**Pass Fail**
Task H TQ 14	Message-Desire discrepant task (inferring the beliefs of others when interpreting a statement of desire)	**Pass Fail**
Task I TQ 15	Second-order emotion (inferring that people will have thoughts about others' emotions)	**Pass Fail**
	Total Correct_____	

Appendix I: Example of Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA | VANCOUVER

Community | Vision | Distinction
Department of Curriculum & Pedagogy

Consent Form
How We Learn (Media & Technology Across the Lifespan)

Investigators
The principal investigators for this study are Drs. Stephen Petrina and Franc Feng, members of the Faculty of Education and who may be reached at [redacted]. This research will be used for the PhD dissertation Rachel Ralph, a graduate student in the Faculty of Education, who may be reached at [redacted].

Study Purpose and Procedures
Building on research literature of prosocial behaviours, researchers explore the impact of sharing during the preschool age. Our research intends to explore the ideas of the use of mobile touchpads, in particular iPads, in preschool classrooms and examining the impact on prosocial behaviours (i.e., sharing). We are interested in the cognitive demands of these technologies. This study addresses learning over time. The total time necessary to participate in the study is approximately 4 to 8 hours divided into 2 to 4 sessions.

Confidentiality
Your child's identity will be kept strictly confidential. Physical hard copies will be kept in a locked filing cabinet. Electronic copies will be encrypted and protected by password. This data will be kept in the research office in the Neville-Scarfe building on the UBC campus and will be accessed only by research team members.

Contact Information
If you have any questions or desire further information with respect to this study, you may contact Dr. Stephen Petrina at [redacted]. If you have any concerns or complaints about your child's rights as a research participant and/or their experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at [redacted] or if long distance e-mail [redacted] or call toll free [redacted].

Consent
Your child's participation in this study is entirely voluntary and you may refuse your child to participate or withdraw your child from the study at any time. Your signature below indicates that you have received a copy of this consent form for your own records. Your signature indicates that you consent your child to participate in this study.

Participant Parent(s)/Guardian(s) Signature	Date
Printed Name of the Parent(s)/Guardian(s)Participant	Printed Name of Child Participant