You've Got a Friend In Me: A Qualitative Analysis of Children's Perception of Digital Media

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*"**Interviewer:** What do you think it means to be alive?*
***Participant:** Um…it means to feel good.*
***I:** To feel good? Okay. So pretty much all of the alive things feel good?*
***P:** Yeah, 'cause they're alive."*

(Interview with Charlie)

Abstract

This paper investigates children's perception of digital media with a particular focus on their interpretation of the delineation between living and non-living entities. Children are increasingly using digital devices in their daily lives, yet very little is known about how they perceive this aspect of their regular environment. This study is situated within the context of child development, new media studies, and Canadian Education History, and uses Interpretative Phenomenological Analysis (IPA) as the core of its conceptual framework. The methodology of this study involves triangulating ten semi-structured interviews with children between the ages of 7-9 (n=10), surveys given to their parents, and a document analysis of the Ontario science and technology curriculum. The key findings of this study are that children do not delineate between living and non-living entitles in the same way as adults, and the Ontario curriculum does not sufficiently address digital media in elementary school children's education.

Chapter One – Thesis Introduction

As of the early 2000s, research looking into children and digital media has revealed a trend that children's use of Internet, Internet-connected devices, and digital media is increasing substantially, with screens in the home being ubiquitous for many families (Holloway, Green, & Livingstone, 2013; Twenge, 2017a). This shift in behaviour occurred toward the end of the 2010s, which means that children born in the last ten years are growing up in an entirely post-Internet world. In other words, today's children have never experienced a time when the Internet was not available at their fingertips both inside and outside of their homes, schools, and daycares. As a result, academia has seen authors dive anew into the field of children and digital media, asking questions about whether this technology is influencing our youth's mental health, what risks children are being newly exposed to on the Internet and what role this new media is playing in identity and social development (Davis, 2013; Hinkley, et. al, 2017; Livingstone & Haddon, 2013). However, there is a distinct gap in the research as little has been done to understand children's own perception of the technology they are using. Regardless of whether digital media is beneficial for children's development or a hindrance to it, Canadian society has passed the point where the option to raise the next generation screen-free is a possibility. As such, it is important to understand as much as we can about the role of these devices in the lives of our youth, without being motivated by intrinsic value judgements.

Likewise, as the prevalence of screens has risen, so have worries about how to keep kids safe online. The Office of the Privacy Commissioner of Canada (OPC) has called attention to the vulnerability of children, stating that meaningful consent for disclosure of personal information cannot be given prior to thirteen years of age (2018), but guidelines for how to approach digital privacy education for children prior to this age are difficult to procure. The Canadian Radio-

television and Telecommunications Commission (CRTC) regulates advertisements directed towards children, compelling broadcasters to comply with the Broadcast Code for Advertising to Children (CRTC, 2008); however, the commission's jurisdiction does not extend towards children's online safety or privacy. In fact, there is very little regulation in Canada to protect children online (Charters, 2017; Campbell, 2014). The Office of the Privacy Commissioner has issued guidelines for children's online privacy, but this subject is not specifically addressed in our federal privacy law, the *Personal Information Protection and Electronic Documents Act* (2020), and we have no legislative equivalent of laws such as the *Children's Online Privacy Protection Act* (COPPA) in the United States.

Moreover, the most recent version of the Ontario Science and Technology curriculum for grades one to eight only briefly mentions educating children about Internet privacy without any specific guidelines for educators, stating simply "all students must be made aware of issues of privacy, safety, and responsible use," (Education, 2007, p.41). This curriculum itself is currently thirteen years old, the reason for which is vague at best. The Ontario Ministry of Education clearly explains on their website that as of 2003, curricula under their purview are in an ongoing cycle of review, with the goal being to maintain their relevance and currency (Education, 2018). The Ministry further elaborates that some curricula are entered into this review process each year; however, there is no clear information about how many curricula are reviewed at a time, how long this review process takes, or whether or not there is a limit at which point curricula of a certain age are mandated to be reviewed (Education, 2018). As a result, Ontario schools are currently operating a decrepit curriculum that derives from a history of education that does not prioritize the rights or needs of the child. In fact, the history of education in Canada is a sordid

tale of reform in response to political agendas and inseparable from the Canada's settler history of residential schooling (Wotherspoon, 2009).

The ramifications of the current research give rise to the question of how best to educate children about information communication technology (ICT), specifically digital devices, in ways that enable them to properly understand safety and privacy measures.

Despite the current popularity of this subject, there is a distinct gap in the research as little has been done to understand children's own perception of the technology they are using. As such, it is important to glean as much knowledge as possible about the role of these devices in the lives of youth. Exploring this phenomenon is critical for facilitating children's participation in society, as we are currently experiencing a screen-dominated world in which the majority of children will interact with digital media on a daily basis (The Campaign for a Commercial-Free Childhood and the Alliance of Childhood, 2012). In addition, this gap in research extends to parents' beliefs about how their children understand the digital devices they use. In order to effectively educate them about digital literacy, online safety and healthy screen habits, it is important to understand how children think about and interact with digital devices, and where discrepancies lie between children's perception and parental beliefs about this perception.

As a step towards filling this research gap, this study aims to glean an understanding of how children perceive their digital devices within a contemporary Canadian context, with the intention of triangulating these findings with parental beliefs about how children perceive their digital devices, and current Ontario science and technology curriculum for elementary schools. The objectives of this study are to achieve insight into children's thoughts and attitudes related to the "aliveness" of their digital devices. As illustrated by Yorek, Uguly and Aydin (2015), the concept of aliveness has been linked to motion, animation, anthropocentrism, and more, but has

yet to be defined as a concept with universal consensus. For the purpose of this study, *aliveness* refers to the distinction between living and non-living things (Topsakal, 2010). Living things are alive, non-living things are not alive, and the difference between a living and non-living thing is its aliveness. When a plant dies, it has lost its aliveness and transitioned from being a living thing to a non-living thing. Consistent with Topsakal's (2010) concept of liveness, aliveness can be looked at using the following seven basic characteristics: respiration, nutrition, excretion, motion, growth, excitation and reproduction (p. 574). Specifically, this study aims to observe the way that children understand the aliveness of the digital devices that they use based on the assumptions that understanding children's perception will enable adults to better communicate with children about these devices, and education policy to better serve children.

This study is grounded in a conceptual framework informed by Krämer's (2015) Messenger Model of communication, Livingstone and Bovill's (1999) work treating digital media as the child's environment, and Interpretative Phenomenological Analysis (IPA). Drawing upon the relevant research as well as the historical and theoretical education context, this study employs this conceptual framework to ask the question: *How do children ages seven to nine interpret the delineation between living and non-living entities in regard to their digital devices*? This thesis is driven by an interest in how the Ontario Curriculum addresses elementary school-aged children's learning about their digital worlds and how our increased understanding of children's perception can be used to inform curriculum development. To facilitate answering these questions, the current study also looks at parents' understanding of how their children interpret their digital devices with the aim of distinguishing whether or not parents and children experience a discord in their conceptualization of the child's digital world. To clarify, this study triangulates children's perception with how their parents believe they perceive digital devices

and how the curriculum approaches teaching them about technology with the aim of understanding this interplay and examining where the communication may or may not break down.

To meet these goals, this study uses a mixed methods approach. The methodology for this research involved two main data-collection processes: first, a set of semi-structured interviews with ten children between the ages of seven and nine; second, a questionnaire administered to each child's parent asking them to predict their child's answers. Following the collection of this data, I used a thematic analysis as a practical tool to identify key themes within and across the interviews (Braun & Clarke, 2006), and then analysed these themes informed by the conceptual framework I had built. Additionally, I conducted a document analysis of the *Grade 1 – Grade 8 Ontario Curriculum for Science and Technology* (OCST), aimed at assessing the level to which this document adequately addresses the digital media in children's environments (Bowen, 2009; Education, 2016).

The first chapter of this thesis addresses the issue at hand and provides an overview of the context for this study. As well, I use the current section of this chapter to establish the structure of this thesis.

In the second chapter, I critically review the relevant literature, establish a conceptual framework for the study, and address the problematic of conducting research about children within a child rights context. Key elements of the literature review include foundational concepts within child development that have contributed to our current understanding of how children learn about the world around them; discourse surrounding children's consumption of digital media and the major gaps in this literature particularly in the realm of children's understanding of digital devices; and the historical and theoretical education context which establish the

necessity of analysing curriculum documents when investigating areas of children's learning and understanding. Following the literature, I outline the conceptual framework that I use in this study, built primarily upon Krämer's (2015) Messenger Model of communication, Livingstone and Bovill's (1999) work treating digital media as the environment of the child, and IPA. Next, I conclude this chapter by undertaking children's rights within a research context, and familiarizing the reader with the research questions that this study seeks to answer.

In the third chapter, I begin by outlining the research purpose and goals of the current study. Next, I provide an overview of the methodological strategy employed and the justification for these choices, with particular focus on the *interviews, surveys*, and *document analysis.* Following this, I elaborate the most significant limitations of the current study, namely *researcher experience, lack of non-verbal data collection*, and *sample*. Finally, I conclude this chapter by elaborating they key procedures I followed, specifically in the areas of *ethics, recruitment, interviews, surveys* and *document analysis*.

In the fourth chapter, I present and discuss the results of my study. Beginning with the interviews, I address the eight key themes that arose from my analysis, and discuss how the interviews and surveys together contribute to our interpretation of these themes. Following this section, I address the OCST and discuss the two emergent themes from this analysis. Next, I recall Krämer's (2015) messenger model of communication and discuss the implications of this aspect of the conceptual framework upon the current study results. Finally, I conclude this chapter by denoting the key takeaways from this study in regard to the research questions being asked and the opportunities for future research that have risen from the current study.

In the fifth chapter I summarize the key findings from this study, and reiterate how they contribute to answering the research questions. I also discuss the methodological and theoretical

implications of this study, and note the future research that may well arise from these findings.

Chapter Two – The Research Problem

In this chapter I critically review the relevant literature, establish a conceptual framework for the study, and address the problematic of conducting research about children within a child rights context.

First, in the literature review, I cover the foundational concepts within child development that have led to our current understanding of how children develop an understanding of their environments. Next, I address the discourse surrounding children's consumption of digital media, noting the two major themes within this discourse of research into the effects of digital media on children, and research into the possible risks and opportunities that digital media may present for children. As well, I highlight the major gaps in this literature with particular focus on the lack of research into children's understanding of digital media and digital devices. Finally, I elaborate the historical and theoretical education context to provide an overview of the education system that this study deals with and to establish the necessity of analysing curriculum documents when investigating areas of children's learning and understanding.

Following the literature review, I establish a conceptual framework for this study. Drawing upon Krämer's (2015) Messenger Model of communication, and Livingstone and Bovill's (1999) work treating digital media as the environment of the child, I conceptually define communication, and the digital device for the current study. Further, I provide an overview of Interpretative Phenomenological Analysis and its theoretical underpinnings.

Next, I conclude this chapter by undertaking children's rights within a research context, and the prioritization of these rights that I applied throughout this study, and by defining the research questions at play.

Finally, I pull from the literature review and conceptual framework to situate the reader

going forward and identify the research questions that this study seeks to answer.

Child Development

Beginning largely with the work done by Jean Piaget and Lev Vygotsky in the mid 1900s, cognitive psychologists have been conducting research into the many aspects of children's minds for decades. These foundational psychologists brought white male legitimacy to knowledge that had long prior been a basic tenant of women's wisdom through mothering, and highlighted the fact that children are not simply little adults, but are indeed complex and rapidly developing beings (Piaget, 1951; Piaget, 1972; Vygotsky, 1962). Building off this transformative premise, three main waves in cognitive development emerged: first was Piaget's work itself that highlighted the egocentrism of infants; second came metacognition in which researchers were keenly looking into the way that children conceive of their own thoughts and perceptions; and third is the still expanding field of theory-of-mind (TOM) studies (Flavell, 1999).

Coined by Premack and Woodroff (1978), the term 'theory of mind' refers to the ability to understand consciousness. Specifically, cognitive psychology research has come to understand that it is not until around the age of four that children develop the capacity to understand the separation between themselves and others, or recognize that others have perceptions and consciousnesses separate to themselves (Flavell, 1999; Flavell, 2000; Gopnik, 1993; Slaughter & Gopnik, 1996).

Within TOM, multiple theories for how children develop a theory of mind exist (Flavell, 2000). Theory theorists believe that children have a foundational or framework theory, and that experience plays a critical role in helping this unscientific theory system develop (Gopnik & Meltzoff, 1997; Gopnik &Wellman, 1994; Perner, 1991; Wellman & Gelman, 1998). Modularity theorists such as Leslie (1994) and Baron-Cohen (1995) conversely assert that children have

different modular mechanisms responsible for helping them understand that agents are external to themselves, that they have intentionality and attitudes (Flavell, 1999). A third approach has been put forth by Harris (1992) that suggests children have the capacity to simulate others' mental states and that through practice they improve upon this. While these theories are all compelling in their own way, Flavell (2000) points to his own previous findings that children misunderstanding tasks may have played a role in a lot of the previous work in the field (Flavell & Miller, 1998), and posits that the best theory would be one that combines aspects of all these. To clarify, Flavell (2000) suggests that in circumstances where previous results have indicated flaws in each of these theories, there is instead a strong likelihood that each theory cannot stand alone, and that in reality children's development is so complex that it incorporates elements of all of the dominate TOM theories. Essentially, what this highlights is that despite the enormous body of work in the area of cognitive development and more specifically, TOM work, the fields' leading minds are currently unable to come to a consensus on how children develop their theory of mind. Flavell's (2000) suggestion that we would be best informed by incorporating all three main TOM arguments is useful for this study, as it establishes a foundation of open-minded inclusion in regard to the child participants and in regard to the things that they say. There is ever more research to be done into how children conceptualize their worlds, but using Flavell's (2000) concept allows researchers to approach understanding children's inner minds with recognition that these children may surprise us. In turn, this gives way to research that creates space for our current understanding to be challenged, rather than overlooking or ignoring results that do not fit into any single, more rigid, approach to TOM research. Meanwhile, still being informed of these foundational arguments is useful in that it allows us to question whether the current study reinforces any one of them over the others.

Focussing on another aspect of child development psychology, Piaget (1953) established the concept of schemas as the core building blocks of intelligence, elaborating upon schemas and schematas as a way of organizing knowledge and constructing a conceptualization of the world. Meade and Cubey (2008) outline the role of schemas in children's thinking, explaining, "schemas are a form of thought that relate to cognitive structures. They are like pieces of ideas or concepts" (p.3). For school-aged children, assimilating information into their existing schemas is a part of daily life. Derry (1996) states the existence of schemas to be agreed upon by virtually all experts in cognition and education; however, she takes the discussion a step further by noting the significance of cognitive schema theory in understanding how children change their minds (Derry, 1996). While sudden and radical changes to a child's schema can occur, Derry (1996) points out that it is far more common for children to undergo slow and gradual schema changes. This explains why even after children have acquired theory of mind, learning about one's own internal mental concepts is often a slow and gradual process. Forming a bridge between TOM research and cognitive schema theory, Piaget (1951) describes the concept of centration, which he uses to explain the way that children in this stage of development are capable of logic, but tend to focus only on one dimension of a phenomenon, ignoring other information even when it is contradictory. To elaborate, Piaget (1951) explains that sometimes according to their interests or the object that attracted their attention, the child "centres this or some other element and assimilates others to it," (p. 242)." In other words, the child tends to focus on one element as the defining factor in a schema and ignore when other elements contradict that schema. This is why we might hear a child say that something is alive if it moves, even if it doesn't breathe, for example. Building off these ideas, Flavell (1992) notes that children are not empty vessels to be filled with information; instead, they have existing cognitive structures that indicate to them

which pieces of their environment are salient. Children select input that is deemed meaningful and assimilate it to their existing cognitive structures [schemas], or accommodate these structures [schemas] to the new information (Flavell, 1992). Understanding this process is critical for understanding why two children, or one child and one adult, will often interpret different things from the same environment. What is salient to one individual may not be salient to another, and for children it stands to reason that their current stage of development would heavily dictate this.

Importantly, research is also being advanced to gain insight into children's extension of the self (Diesendruck & Perez, 2015; Harris, 2000; Vostrovsky, 1895). Children who have developed theory of mind have been found to perceive their favourite toys as extensions of themselves and to engage in personification by developing an attachment to a personified object (Diesendruck & Perez, 2015; Harris, 2000). To explain, children will attribute human traits to an inanimate object, and then form an attachment to this object as though these traits are really there (Harris, 2000). The age at which this behaviour tends to stop is difficult to ascertain largely because, as Clara Vostrovsky (1895) notes, "Children are apt to be more or less secretive in regard to these fancies, while older persons who have had them feel, often, a strange reluctant [sic] about bringing them to light" (p.394). Evidently, children readily extend themselves to their personal objects; however, there is a distinct gap in the research as to why this occurs. Diesendruck and Perez (2015) discuss methods for how this self-extension occurs as well as similarities and differences between child and adult self-extension, but the literature is lacking acumen in regards to why children make such mental leaps, and what their actual thoughts are about these items.

A final area of child psychology relevant to this discussion is the work being done to

understand children's conceptualization of life (Barrett & Behne, 2005; Kastenbaum & Fox, 2008). Importantly for the field and critical to the current thesis, are Piaget's foundational discoveries and ideas about the stages of development through which children progress (Piaget, 1953; Piaget, 1998), and how these stages of development inform the child's conceptualization of life. Specifically, in his 1998 work entitled *The Child's Conception of the World,* Piaget notes, "the spontaneous questions of children prove that the definition of life is a problem with which they are really concerned" (p. 201). Likewise, Piaget (1998) concludes that children within the 7 to 9 age range struggle to understand the delineation between living and non-living entities, often linking movement to life.

Interestingly, after Piaget's early works studying the child's concept of life, current research in this field consists almost entirely of work done studying how children understand and process death, rather than how they define or conceptualize life. Kastenbaum and Fox's (2008) work inquiring into whether imaginary companions die is particularly interesting conceptually; however, there are a few significant shortcomings. First of all, the authors question is premised on the notion that children believe their imaginary companions to be alive, and this is never addressed. It would be a fascinating and possibly very telling way to explore childhood conceptions of life. Moreover, by interviewing adults and asking them to recall their imaginary companions rather than interviewing older children or teenagers who more recently had imaginary companions, the authors missed a valuable opportunity to gain insight into some of the childhood mental concepts and attitudes that are more foreign to adults. Barrett and Behne (2005) similarly base their research on the premise that children have a difficult time understanding death because it is perceptually difficult to detect and conceptually impossible to experience, but this ignores the idea that children may not have an adult understanding of life to

build upon. Indeed, current research into children's understanding of life is centered upon studying death and allows us to glean very little about how children actually conceptualize these ideas.

The age of the children in this study has been selected based on broad developmental stages that divide children's abilities to respond to research and provide meaningful responses to questions (Platt, 2016). As Platt (2016) notes, age alone is not a sufficient marker of an individual's stage of development, but we can see broad age-related shifts in capabilities that indicate appropriate age groups for particular types of research. Generally, children under the age of 5 are better able to participate in research involving play and puppets, children ages 5 to 7 are able to engage in research, but are very literal in their responses, and children ages 7 to 10 typically take an enormous leap in their linguistic and conceptual capabilities (Platt, 2016). The goal of the age selection in this study is to optimize reliability of the information without risking that the children are too far along in their development to provide truly child-minded insight. Children under the age of six are not viable for interviews about complex subjects because generally they have not yet attended school and learned how to interpret and respond to questions in a traditional academic sense (Platt, 2016). Likewise, children between the ages of five and seven tend to be very literal in their interpretation of and response to questions (Platt, 2016), thus excluding them from being of use in this study due to the abstract line of questioning that takes place. Contrastingly, around the age of ten, children begin to demonstrate more adult-like responses to questions and may become at risk of falling into social desirability bias in which they respond based on what they think their peers would be likely to think and say, regardless of their own thoughts and opinions (Kumpal, 2013). This leaves ages seven to nine as optimal for a study of this nature, which places the children in the study in grades 2 – 4.

Children and Digital Media

In this section, I look at the dominant strains of discourse that are taking place surrounding children's consumption of digital media. Rideout, Foehr and Roberts' (2010) comprehensive study in to the media lives of American youth found that children and adolescents between the ages of eight and eighteen spend more time consuming media than any other activity. In fact, their study revealed that media consumption among this age group has risen to an average of 7 hours and 38 minutes per day, seven days a week (Rideout, Foehr & Roberts, 2010), which totals for an average of 10 hours and 45 minutes of media content that is being packed into those seven and a half hours as a result of the media multitasking taking place among youth (Rideout, Foehr & Roberts, 2010). Likewise, the Common Sense Census found that tweens between eight and twelve years of age typically consume an average of six hours of media daily. This prolific screen usage has given rise to two main areas of research into children and digital media, as well as a significant gap therein, all of which I address. Namely, this discourse is largely oriented around either the effects of this media consumption on children, or the risks and opportunities that new media provides for children, and contains a noticeable gap in terms of children's perception of digital media.

Research Into Effects on Children

One area that has been well researched but involves a high degree of opposing views and findings is the question of what effect media exposure is having on children. There are three main perspectives that authors in this field tend to fall into: first is a technological determinism approach, which argues that screens are having a measurable effect on our children's development and well-being and seeks to understand this effect (Campaign for a Commercial-Free Childhood, n.d.; Rideout, Foehr and Roberts, 2010); the second is a fear-based perspective

that takes robust studies from the technological determinists and extrapolates unfounded and frightening conclusions from them (Homayoun, 2018; Twenge, 2017a); the third is a non-prescriptive approach, which seeks to understand the role that digital devices play in children's lives without making sweeping value judgements (Davis, 2013; Johansen, 2018; Livingstone, 2018).

In the school of technological determinism, Rideout, Foehr and Roberts (2010) found a correlation between media consumption and children's grades and contentment levels that indicate high media consumers tend to have lower grades and lower contentment levels. Similarly, the Common Sense Census (2015) reported a negative correlation between children's social-emotional wellbeing and their media consumption, indicating a trend of high media consumers scoring lower in social-emotional wellbeing tests; however, this correlation is without causational evidence and thus hovers the boundary between a reputable technologically determinist perspective and a fear-based one. To expand, while research like this is well-founded and points toward correlational trends, there is a growing body of voices in the field extrapolating from these findings and contributing questionably sourced information to the discourse. As an example, the Campaign for a Commercial-Free Childhood (n.d.) published a brochure entitled *Healthy Kids in a Digital World* that is aimed at parents and possibly teachers, wherein claims are made that children need to unplug in order to connect with others, learn, play, and be healthy. Interestingly, the brochure indicates that readers can find sources for this information by going to their website; however, these sources are largely articles that also point to correlation rather than causation. This is significant as it demonstrates a wilful decision to mislead parents and draw on their fear of damaging their children rather than informing parents in an unbiased manner. The Campaign for a Commercial-Free Childhood appears at first glance

to be a friendly and child-focussed organization, lending itself to being viewed as trustworthy and reputable because their cause, giving children a real childhood, which they define as being commercial-free (Campaign for a Commercial-Free Childhood, n.d.), appears trustworthy and reputable. Unfortunately, the guidance that this organization issues is based on misinterpreted study results and fluff, which is not immediately clear, and necessitates a significant amount of time and research in order to discover.

Featured in the New York Times, an additional subject that causes worry among parents is digital device addiction and all of the side effects that come with this (Homayoun, 2018). This specific article is a useful representation of the way much of the media hype about children and screens operates. The short, catchy title, *Is Your Child a Phone 'Addict?'* is fear-inducing for parents, as are the first couple paragraphs that list the high rates of self-reported phone addiction among children and adolescents in America (Homayoun, 2018). Yet, what follows these first frightening lines is an article that largely quells the fears it first creates, and addresses the need to differentiate between different types of digital content that youth are consuming, and help youth establish healthy attitudes towards their digital devices rather than declare all technology as bad and ban the lot (Homayoun, 2018). Still, this article's headline and opening are playing on the fear that parents have and capitalizing on validating that fear. Indeed, this speaks to the moral panic surrounding digital media that Livingstone addresses and debunks in her prolific works on the subject (2018; Livingstone & Bovill, 1999; Livingstone & Blum-Ross, 2016; Livingstone, & Haddon, L 2008; Livingstone & Haddon, 2013; Livingstone, Ólafsson, Helsper, Lupiáñez-Villaneuva, Veltri, Folkvord, 2017; Livingstone, Stoilova, Yu, Byrne & Kardefelt-Winther, 2018).

In contrast to the technologically determinist dialogue asserting that media prevalence is drastically altering the next generation, are non-prescriptive researchers of children and media. For example, Davis' (2013) findings suggest that digital media can play either a positive or a negative role in teen's interpersonal and intra personal experiences, and that parents' and peers' behaviours actually have a significant impact upon these results. In addition, Johansen (2018) points out that much of the news hype surrounding the negative impacts of media consumption on children and adolescents is based on interpretations of survey results that are at best unclear in their empirical grounding. Similarly, the EU Kids 2020 Survey results demonstrate that children are generally reporting low levels of harm being done to them as a result of their being online (Smahel, Machackova, Mascheroni, Dedkova, Staksrud, Ólafsson, Livingstone, & Hasebrink, 2020), which indicates that much of the panic oriented around children experiencing harm from media, such as online bullying, may be overblown. Meanwhile, new media experts such as Sonia Livingstone firmly asserts that the moral panic surrounding digital media is not a new thing and that it is largely based on poorly done research (Livingstone, 2018).

To continue, academic research into mental health and digital device use reveals, as Warren-Smith (2020) explains, that these issues generally run deeper and involve more factors than the devices themselves. Corroborating this claim is the research done by Helsper and Smahel (2019) demonstrating that "a combination of digital literacy and psychological vulnerability frameworks is necessary to explain negative outcomes of intense [digital media] use" (p.13). This discovery reiterates the findings compiled by Livingstone and Blum-Ross (2016), which illustrate that the notion of screen time is a foolish one for adults to dwell on when dealing with children's consumption of digital media. Instead, arguing against the standard guidelines from American Academy of Paediatrics' suggesting that screen time be the main

measurement of digital media consumption, the authors put forth the suggestion that parents would be much better served by looking at factors such as whether or not their children are eating and sleeping properly, and whether or not their children are enjoying pursuing activities and hobbies (Livingstone & Blum-Ross, 2017).

Echoing the international academic debate that is taking place over whether or not digital media is harming children, there is also a lack of consensus among schools and child-care institutions in regard to effective digital media guidance that should be disseminated to parents. In an anecdotal blog post featured on *Parenting for a Digital Future*, Pavlick (2017) testifies that the school her children attend sent home a flyer admonishing tablets and any use of them at all; however, when she wrote to the school about the lack of evidence supporting these claims, they essentially agreed with her but informed her that parental need for guidance was overwhelming to the point where something had to be sent out regardless (Pavlick, 2017). This sort of logic appears to be behind a lot of different guidance from various voices in the field.

Indeed, the Canadian Paediatric Society published a Position Statement (2017) thoroughly outlining the risks and benefits associated with screen use among young children, and enumerated multiple ways that these risks can be minimized and benefits can be maximised, including a focus on mindful use of screen time instead of expunging it entirely. Despite this publication, the Public Health Agency of Canada continues promote emphasis on limiting screen time without providing readers with the nuanced understanding about the role that content plays over sheer hours of consumption (2019). Contradicting information at the level of reputable national not-for-profit organizations and federal government institutions exemplifies the complexity and lack of consensus among experts that informs the discourse surrounding the effects of digital media on children today.

Research Into Risks and Opportunities

Firstly, there is a lack of consensus between experts in the field as to the risks and rewards of children's screen consumption, which is a debate that needs to be dissected. The Common Sense Census found that most parents are more concerned with the content their children are consuming than the amount of time they are spending consuming media (2015), which is indicative of the widespread interest in children's safety in regard to media consumption that exists both within and outside of academia.

Fuelled largely by media articles, such as Jean Twenge's story in *the Atlantic* (2017b), a sort of digital media hysteria has surfaced in the discourse surrounding children's experiences online over the last few years, revealing a somewhat uncommon phenomenon wherein an academic narrative is being played out in large part on the public stage rather than in the confines of the ivory tower.

Empirically inquiring into some of the risks that Internet exposure provides to children, O'Neill, Grehan and Olafsson's (2011) work shows that while 67% of children report that they think there are things on the Internet that would bother someone their age, only 11% of children in the study say that they themselves have seen anything online that bothers them. This same study reveals that while about a quarter of the children involved report having seen obviously sexual images and having been bullied in the past twelve months, a much smaller percentage of both occurrences took place online (O'Neill, Grehan & Olafsson, 2011), which demonstrates that some of the primary concerns parents appear to have about their children's Internet safety are either taking place regardless of children's Internet use, or not taking place at all. In keeping with these findings, Ey & Cupit (2011) found that children between the ages of five and eight are

generally capable of recognizing the potential risks associated with Internet use, though they may not always respond in ways that mitigate these factors.

Despite the widespread interest in this subject matter, there is an underwhelming amount of reputable information about it to be found, especially publicly. There are a number of organizations that position themselves as being against children's over-exposure to screens and supportive of parental monitoring of mass media consumption (National PTA, 2003; AAP Council on Communications and Media, 2016). In contrast, these organizations' positions are most frequently framed in a very vague way that does not elaborate upon what research is behind these attitudes, or what the concrete implications are for children and parents. Similarly, there has been reputable research done looking into various statistics of children's media consumption without providing concrete suggestions or guidelines as to how parents and educators should proceed with this information (Rideout, Foehr & Roberts, 2010;). As well, there are popular works such as Twenge's pop psychology book *iGen* (2017a) that pulls misleading statistics and unfounded conclusions from small scope surveys and uses them to perpetuate misinformed fear-based narratives about the digital media-induced disintegration of society's younger generations.

As Finkelhor (2011) effectively points out, much of the dialogue on the matter implies that the Internet is a particularly risky environment that increases the children's opportunity to be exposed to risk compared to other environments they interact within. However, Finklehor also suggests "it is hard to cite any research that as yet supports that notion" (p.2). In indirect contrast to this argument, Media Awareness Network's (2012) publication aimed at helping children and adolescents manage and respond to online hate asserts that youth are at higher risk of receiving or being otherwise involved in online hate than any other population. These contradictory approaches highlight three of the main pillars forming the debate about the risks for children that

are associated with digital media and the Internet: First, there is a media-driven fear, or "*juvenoia*" as coined by Finkelhor (2011), that this generation is being ruined by the advancements in technology and that their over-exposure is putting them at high risk (Twenge, 2017a; Homayoun, 2018; Ehmke, 2020). Second, there is a body of work that vehemently opposes this idea, pointing to the debunking of technological determinism and the consistent history of each generation believing the next to be generally worse than their own, and calling for wider spread, reliable research into the matter (Livingstone & Haddon, 2008; Hicks, 2018; Livingstone, 2018; Resnick, 2019). Third, there is a growing group comprised mainly of not-for-profit youth support organizations taking the stance that regardless of whether or not screens are increasing risk for children, the risk online does exist and needs to be dealt with (Media Awareness Network, 2012; Canadian Centre for Child Protection, 2018; Protecting Kids Online, 2020)

Importantly, as Livingstone and Haddon (2008) denote, there are more gaps in this discussion than there are concrete answers. As the authors explain, this hole in the knowledge results from a few key issues: Research into the risks associated with children's Internet use is largely focussed on older children and adolescents despite the growing rates of use among toddlers and young children; research in this field quickly becomes obsolete as both children and the technology they use are constantly changing; research into parental mitigation and mediation is lacking in most countries; finally, this area of research is deeply involved and complex due partially to the necessity of including multiple perspectives across time (Livingstone & Haddon, 2008).

In contrast to this controversial area, the research into opportunities that digital devices provide for children does not seem to spark contention; however, it is not a widely covered topic

within academia. Kalmus, Runnel and Siibak (2012) have looked into trends related to children's online opportunities and generally found an increase of engagement in opportunities as children grow older and obtain more agency, but the authors also draw attention to the piecemeal nature of existing related data. Cabello-Hutt, Cabello & Claro (2018) outline the relationship between online risks and opportunities, highlighting the importance of further research into opportunities digital media provide for youth so that research looking into the risks contains a more complete picture of the situation. Their particular research has revealed that online risks and online opportunities appear to be related, but suggest potential that some of the variables previously found to be correlated to online risk may in fact be correlated to online opportunities instead, further establishing this need (Cabello-Hutt, Cabello & Claro). Similarly, Livingstone et. al (2017) point toward the history of media research as primarily protectionist and driven by inquiry into methods for mitigating harm caused to children. Their research opens up a new conversation about the role parents can play in their children's digital environments, as "enabling mediation enables not only children's Internet use but also children's agency within the parent–child interaction, as shown by the positive association with child-initiated requests for parental support" (Livingstone et. al, 2017, p.98). Livingstone et. al (2017) also address the need for support to help parents and children improve their coping strategies and resilience to risk, so they are well equipped to prevent actual harm from occurring.

Children's Perspective

As Holloway, Green, & Livingstone (2013) articulate, children are quickly becoming Internet users at rapidly growing rates and younger ages, making research in this area increasingly relevant. Due to the existing body of work aimed at studying children and new media (Livingstone & Bovill, 1999; Wallis, 2010; American Academy of Pediatrics, 2014), we

can confidently make statements about what children do not understand about these devices, and where some of their confusion lies, but aside from educated guesswork, we cannot make many assertions at all about what it is they do comprehend. Indeed, the lack of knowledge surrounding how children perceive their digital devices is congruent with the findings of Selwyn, Potter & Cranmer (2010), that adults often believe that they know how children use ICTs, but are frequently wrong. There is a void in place of children's perception of digital media that is beginning to be filled largely by the work of Livingstone and EU Kids Online, along with other key players on the global children's media scene (Kleine, Pearson & Povida, 2016; Livingstone et. al, 2018; Smahel et. al, 2020). However, while this research takes children's experiences into account and gives them central participatory roles, none of it asks questions specifically about how children interpret and understand their digital worlds.

The diversity of voices in this discussion substantiate the notion that there is much left to explore in relation to children's consumption of digital media. One particularly evident gap is the question of how children perceive their digital devices and how similarly or differently their understanding is to that of adults.

Historical and Theoretical Education Context

In this section I delineate the history of education in Canada in order to provide context for the analysis of the *Grade 1 to Grade 8 Ontario Curriculum for Science and Technology*. Next I discuss the school as a site where the child is defined, and address key theories surrounding curriculum study.

History of Education in Canada

The history of education in Canada is interesting to look at because of the complexity of the system(s) at play and what some would argue to be the uncommon way in which they were

developed. The structure of Canadian education is such that the majority of educational responsibility falls upon the provincial level of government, while federal government contributes a smaller portion of funding and deals mostly with matters concerning minority languages, designated groups and denominational schooling (Wotherspoon, 2009).

For the purpose of this study, the scope has been narrowed considerably to focus on the Ontario education system, but understanding the more holistic history of Canadian education is useful for understanding how and why the Ontario system functions as it does.

As Wotherspoon (2009) lays out in his work *The Sociology of Education in Canada*, education existed in what would become Canada far before European settlers arrived and imposed their own ideas of education upon the people and the land. Wotherspoon's account of this history is useful because it highlights concisely the pivotal moments in an elaborate story. Namely, Wotherspoon's account of this history reveals the way that Canadian education system(s) have been used primarily as political tools right from their genesis (2009). The first schools in Canada were developed at a time when the European population had very few children with them in Canada; European kids were homeschooled while religious figures and missionaries set up residential schools for indigenous children to attend (Wotherspoon, 2009). These schools were a tool for settlers to assimilate indigenous children, ideally stripping them of their culture so that a new "Canadian" culture could take root. While most people today seem to think that the residential schools have always been separate from our current education system(s), this is in fact a myth. As the European population in early Canada grew, the need for public schools seemed to develop overnight, which resulted in schools modeled almost exactly off the residential schools to be created for white children (Wotherspoon, 2009). These schools would form the foundation of our current public education system, meaning that the Canadian

schools of today were built upon the framework of early 1800s' residential schools (Wotherspoon, 2009), a fact that much of Canadian history chooses to overlook. Conveniently, there was a discourse at the time surrounding public education as a state apparatus, which has dominated the focus of education history in the country (Wotherspoon, 2009).

Over the years, Canada has seen two mass reforms to the schooling system, nationwide (Wotherspoon, 2009). The first took place in the 1910s to 1940s with the rise of industry influence in Canada (Wotherspoon, 2009). The public education system(s) in Canada served a larger purpose than simply to supply factory workers, but as industry continued to grow, education curricula underwent a large shift towards the industry model, with an emphasis on producing graduates equipped with "skills and knowledge that would contribute to their gainful employment" (Wotherspoon, 2009, p.66). Essentially, education transitioned from being primarily about shaping the culture of the country to creating a pool of human resources for employers.

The second large wave of reforms took place in the post World War II period (Wotherspoon, 2009). With the events of the Cold War and the Soviet launching of Sputnik, there was a sense of urgency among Canadian politicians to catch up with the mathematical and scientific advancements going on in other parts of the world. Again, the Canadian education system(s) were used as a mechanism for responding to this socio-political need, and curricula were developed to include a heavy maths and science component (Wotherspoon, 2009). In direct correspondence to these developments, Canada saw a rise in post secondary graduates and the education system(s) shifted once again to include a third priority: accreditation (Wotherspoon, 2009).

This history gives context for how our current education system(s) in Canada came about,

and why the Ontario education system produces its own provincial curriculum documents rather than Canada providing national curricula. I argue that this history is relevant to all studies related to education in Canada today, because it frames the mind to understand that our education system(s) historically serve to shape culture, provide skilled workers, and give graduates accreditation.

Specifically, I argue that it is necessary to establish this context in order to understand the salience of analysing education documents. The history of education in Canada is relevant to understanding the ethos of the *Grade 1 to Grade 8 Ontario Curriculum for Science and Technology* as it, along with its previous versions, derive directly from the national shift toward education as a means for providing accreditation and elevating Canada to join the global mathematical and scientific stage, for which the children subject to the curriculum were merely a tool.

School as a Site Where The Child Is Defined

Next, it is critical to understand how the curriculum can play a significant role in setting the tone for our approach to children, and why it needs to be looked at theoretically for more than just teaching content. To support me in this, I draw upon Sonu and Bensen's ideas of how the political underpinnings of education policies strip children of sovereignty.

Childhood both within social sciences and psychology thus far is largely looked at as a state of being into which adults can and should intervene in order to assist the child in becoming an adult (Sonu & Benson, 2016). This is problematic in the effects it has on our conceptualization of childhood and our consequent treatment of children. Using Foucault's concept of governmentality and its governing power, Sonu and Benson (2016) indicate the governing power that schools have as institutions and the ways that this governing power can

permeate our thoughts and actions in regard to the child. These authors make the case "that it is precisely our discursive constructions of childhood, as a natural, quasi-human, adult yet-to-come that lays the foundation for neoliberal educational policies and practices to work on the child, rather than with the child" (Sonu & Benson, p.231). This calls to the forefront the notion that the child is conceptualized neither as human, nor as un-human; instead, it is viewed as a human-to-be with the normative ideas of childhood acting as qualifiers for whether the child is still a child, or if it has shed its wild, un-socialized nature and entered into the realm of humanhood.

Using Foucault's concept of governmentality, Sonu and Bensen look specifically at Biesta's (2013) three domains of education: socialization, qualification, and subjectification (qtd. in Sonu & Bensen, 232).

For Sonu and Benson, the current neoliberal schooling system[1] does not allow space for children to have agency (2016). Instead, school is a site where the child is socialized into readiness for a career, which under capitalism inherently means being complacent with unequal social order and power imbalances between exploitative and exploited groups (Sonu & Bensen, 2016).

Perhaps most relevant to the current study, Sonu and Bensen also address the role of curricula, skills, and testing within education systems, highlighting the falsehood that they are designed as a tool to assist children and revealing instead the qualifying nature of these apparatuses (2016). Indeed, Sonu and Bensen argue that curricula, skills and testing are tools to assist qualification being conflated with socialization, as the child is urged to assimilate in order to meet requirements. To elaborate, our current education system(s) create curricula and testing tools that encourage children to perform all in the same way at the same level, with no variation

[1] For clarity, Sonu and Bensen's work is aimed at schools in New York, not Ontario. The theory transcends this geographical disparity.

in response to students' varying needs or diversity of experience. Significantly, these apparatuses are frequently both race- and class-blind, which perpetuates inequity masked as equality (Sonu & Bensen, 2016).

Finally, Sonu and Bensen look at subjectification within schools, showcasing the efficacy with which schools turn children into subjects, and borrowing Biesta's definition of subjectification as "[involving] the way in which an individual becomes a subject… as well as concerns about action, responsibility, freedom, and independence" (2016, p.241). The authors expatiate upon a process whereby the child attempts to master the requirements set forth by the school, while simultaneously allowing room for potential subversion or resistance (Sonu & Bensen, 2016). For Sonu and Bensen, the primary tool used in this process of subjectification is shame. To expand, the public visibility of the child's success or failure within the school context brings about shame for students that do not succeed in meeting the qualifications expected of them. "This shame, tied to the appearances of oneself in the presence of others, induces a subjecthood that is disassociated by the panopticism of schooling, one that is shaped both by how the subject perceives itself and also by the way in which others will judge, evaluate, and find the child either desirable or insufficient" (Sonu & Bensen, p.242).

In sum, Sonu and Bensen demonstrate the way that education policies, in tandem with apparatuses such as curricula, work to define the child within a schooling context as a quasi-human, which provides an appropriate context for analyzing curriculum documents, such as the *Grade 1 to Grade 8 Ontario Curriculum for Science and Technology,* which I do in chapter four. At no point in Canadian history[2] have children been the primary focus of education in Canada, as

[2] To specify, the term *Canadian history* is used purposely to refer to settler history in Canada, as this historical and theoretical context postdates the education that took place on Turtle Island prior to European arrival.

would be the case in a system that provides children with agency and treats them as currently valuable for their humanness, rather than solely valuable for their future potential.

Conceptual Framework

In this section, I establish the conceptual framework that this thesis is built upon. First, I discuss Krämer's Messenger Model for communication, which provides a foundation upon which we can view communication. Next, I explore the digital device as a component of the child's environment and how this can shape our attitude towards the responses in this study. Finally, I address Interpretative Phenomenological Analysis (IPA) and its theoretical underpinnings, which help us to understand the theoretical pillars of this thesis.

Krämer's Messenger Model

Necessary to this study is a conceptual framework for understanding communication in the life of a child. Sybille Krämer (2015) rejects the idea that one must adopt either a technical or interpersonal model of communication and posits instead a messenger model of communication that combines both the interpersonal and technical. Her messenger model "moves beyond the history of technology and the study of technical operations and focuses instead on the ways in which the phenomenon of mediality shapes our understanding of the world around us" (Enns, p.15). For Krämer, the role of media is to bridge the gap between two different agents of communication, and she notes as well that the medium generally becomes visible only when it is not functioning as it should (2015). This thinking provides a basis from which we can question the role of communication in the child's life, and challenge the application of adult concepts to children's experiences. These questions are elaborated upon in the discussion section of chapter four.

Digital Devices as the Child's Environment

One of the aims of the current study is to expand our definition of children's perception of digital devices. To meet these research goals, this study will follow the example of Livingstone and Bovill (1999) and treat digital devices primarily as the child's *environment* rather than studying it as either *a conduit* or *a language*. This emphasis allows the role of digital devices in children's lives to be examined from a non-prescriptive viewpoint (Livingstone & Bovill, 1999). Instead of comparing "old" and "new" media, or implying that digital devices are inherently "good" or "bad," the authors place emphasis on contextualizing children's media consumption (Livingstone & Bovill, 1999). In contrast, Selwyn, Potter & Cranmer (2010) focus on the necessity of a 'learner perspective' in child-centered ICT studies based on the notion that there is a lot wrong with ICT use in education. Their work values the child's perspective similarly to the work of Livingstone and Bovill (1999); however, Selwyn, Potter & Cranmer (2010) value this perspective as a tool for improvement within the educational implementation of ICTs, and not as a meaningful perspective in its own right. One significant issue with this latter approach is its implications for ensuring child rights-respecting research. While Selwyn, Potter & Cranmer (2010) focus on improving education for the benefit of children in the system, their perspective still positions children and their perspectives as worth incorporating for their use. Preferred would be to promote children's perspectives as necessary to include because they have the right to be heard rather than because it helps adults design education systems more easily. Moreover, the difference between these two approaches is significant in the way that it shapes our conceptualization of the technology that students are using. Sewyn, Potter & Cranmer (2010) operate upon the notion that children's use of technology can contain problems, which imposes the notion that technology use by children generally can be viewed on a spectrum of good to bad. In contrast, Livingstone and Bovill (1999) lay groundwork that positions the child as a user of

technology and the technology as part of the environment of the child, without these overlying prescriptive value-judgements. The current study aims to avoid such pitfalls as placing value judgements on children's technology use, and as such follows the example of Livingstone and Bovill (1999) by viewing children's digital devices as part of their environment worth exploring without judgment.

To elaborate, I have tried to set aside judgement about the child participants' media consumption and keep myself void of value judgements toward the participants in general, in order to "understand the perspectives of young people and their families and only then to link this understanding to public policy and academic agendas" (Livingstone & Bovill, 1999, p.1.2).

Interpretative Phenomenological Analysis

Interpretative Phenomenological Analysis (IPA) is a significant part of the conceptual framework of this study. Rooted in phenomenology and hermeneutics (Shinebourne, 2011), IPA allows the researcher to approach interview analysis with both subjectivity and academic rigour. IPA is particularly well suited to the current study because "[it] is concerned with trying to understand what it is like from the point of view of the participants. At the same time, a detailed IPA analysis can also involve asking critical questions of participants' accounts" (Shinebourne, p.21). IPA allows the researcher to shift between asking empathic and critical questions. The empathic questions are designed to draw out a participant's interpretation of their experience or of the phenomena being discussed, while the critical questions aim to challenge the participant and delve into the nuance of this same experience they have just elaborated.

By employing IPA as the foundational framework for my interviews, I was able to do just this: my approach elicited rich descriptions from children, as empathic questions intend, while providing an avenue for me to follow their explanations with questions that challenge their

statements or beliefs. This coupling of empathic and critical questions allowed me to effectively draw out the thought processes behind their perceptions of and conclusions about their digital worlds, rather than accessing only a superficial knowledge of their views.

IPA also focuses largely on the meaning of interpretation, as well as the interpretative process. Due to its grounding in Heidegger's hermeneutics, IPA places importance on the presence of preconceptions on behalf of the researcher, and addresses the need to set our preconceptions aside, enabling a focus on the newly defined phenomena (Shinebourne, 2011). Importantly, while guiding researchers to set preconceptions aside, IPA involves maintaining an understanding that sometimes these preconceptions present themselves only once interpretation is underway (Shinebourne, 2011). In essence, IPA both captures and informs the inherent complexity of trying to interpret another person's interpretation of the phenomena in study. Indeed, in Smith's 2004 work surrounding the development of IPA, he notes that for IPA involving human research there is an element of the double hermeneutic (Smith, 2004). He elaborates that "the participant is trying to make sense of their personal and social world; the researcher is trying to make sense of the participant trying to make sense of their personal and social world" (Smith, 2004, p.40). This quotation captures the fundamental core of what my study aims to accomplish. I needed to be informed by a conceptual framework that would not just allow, but also embrace the layered interpretative process that my research would involve, which IPA inherently does.

Imperative to using IPA, is an understanding of both the phenomenological and hermeneutic underpinnings, as well as their interplay together. IPA is located at the conjunction of these two philosophies and provides a framework that neither could accomplish on its own. Smith (2010) notes "the approach is phenomenological in being concerned with participants'

lived experience and hermeneutic because it considers that experience is only accessible through a process of interpretation on the part of both participant and researcher" (Smith, 2010, p.186). To elaborate, IPA seeks to understand participants' perception; it is built upon phenomenology in its interest in the participants' view and provides the researcher with the goal of approaching this perception as a phenomenon, as closely and accurately as possible. IPA is equally built upon hermeneutics, which gives the researcher a basis from which to access the interpretative process (Shinebourne, 2011). As Smith, Flowers & Larkin (2009) explain, "without the phenomenology, there would be nothing to interpret; without the hermeneutics, the phenomenon would not be seen" (qtd. in Shinebourne, 2011, p.22).

Child Rights in a Research Context

Critical to this study is the recognition and prioritization of children as rights bearing. The United Nations Convention on the Rights of the Child (UNCRC) signifies a global shift from philanthropic language and discourse in line with child-saving, to a more contemporary approach aimed at establishing the child as rights-holding (Wells, 2015). Effectively, the significance here is the shift away from viewing children as needing protection from adults and completely void of agency, to viewing them as beings with rights of their own. Proponents of children's rights argue that this is an important distinction to make, because while both concepts of the child operate on the premise that children are a vulnerable population, only the latter elevates them to a human status equal to adults (Pupavac, 2001). Viewing children as a vulnerable group needing protection from adults, namely parents, is indicative of a moral obligation of adults to behave in certain ways and thus places focus largely on the things that are and are not acceptable for adults to do. Establishing children as rights bearing, on the other hand, implies a state-level

responsibility for children that is more akin to other human rights enforcement, and thus elevates status of the child closer to human level.

Part of what the UNCRC affirmed is the right of the child to participate in research rather than be solely the subjects of research (Porter, Townsend, & Hampshire, 2012). While the current study is limited in its participatory capacity, it is informed by the principles of participatory research involving children, namely that children have the right to be consulted on issues that involve them (Kleine et. al, 2016).

Participatory research methods are arguably one of the most effective ways to respectfully approach research into childhood (Alderson, 2012); however, there are limitations to this study that prevented such methodologies. Specifically, bringing children into the conversation on how to create and proceed with this study and empowering them to be co-collaborators the entire way along would have required more time than possible as well as an adjustment to the existing ethics approval process at the University of Ottawa, which requires the researcher to determine all aspects of a thesis project prior to consulting any participants. Despite this limitation, the study has been informed also by Alderson's (2012) concept of rights-respecting research. To wit, research that respects children's rights needs more than just participation on behalf of the children. This type of research requires an effort on part of the researcher to understand the nature and history of children's rights; to know the ethical implications of research involving children; and to establish a "keen awareness of potential harms and limitations of their work and of how their views and values may differ from those of participants" (Alderson, p.238).

In keeping with this philosophy, I acknowledge the inherent contradictions within this study. I advocate for children to be treated as rights-bearers and be given agency and voice in areas that affect them; however, I was unable to find a way to pursue this subject that adequately

incorporated my participants into the planning of the project, or the conclusions drawn from it. To address this issue, I would like to overtly acknowledge it, and note that I have approached this study with an awareness of this problematic, and allowed that awareness to inform my research at every step. In line with this, it is important to note that the conclusions drawn from this study are my own, and do not reflect the conclusions or opinions that the child participants of this study may have.

There is a growing consensus among activists and policy-makers that children have the right to be heard and that their opinions should be used to inform both academic research involving them as well as policies concerning them; yet, there continues to be a lot less certainty in regard to "the potential for young people's knowledge to impact on adult agendas and policy arenas" (Porter, et. al, p.131). My aim is for the current study to contribute to the field of work advocating for such a shift and demonstrating the capacity of children to articulate their ideas and be seen as different from, but equal to adults.

Research Question

In this section, I denote the specific research question that this thesis aims to answer, as well as the interests and secondary questions that drive this thesis.

Drawing upon the concepts herein, the current study seeks to ask: *How do children ages seven to nine interpret the delineation between living and non-living entities in regard to their digital devices*? This thesis is driven by an interest in how the Ontario Curriculum addresses elementary school-aged children's learning about their digital worlds and how our increased understanding of children's perception can be used to inform curriculum development. As well, this study is interested in how parents understand their children's conceptualisation of their digital devices and their digital worlds. This study is based on the assumption that adults will be

better able to communicate with children about these devices if they have a shared meaning for the devices; if adults and children both had the same understanding of their digital devices then arguably communication would become easier. In keeping with this assumption, defining children's perception of digital devices will have implications for the way educators and parents teach their children about safe digital media consumption, privacy, and online security. Similarly, the results of this study could have an impact on education policy in Ontario, namely the process of developing curricula in a way that prioritizes the child as a rights-bearing human.

To briefly summarize the literature review, I would like to address how the three themes I have covered, child development; children and digital media; and historical and conceptual education context interplay together within this study and give rise to the research questions. Evident from reviewing the literature is the reality that children are incorporating digital devices into their every day lives at an age at which they are generally still struggling to understand the world around them (Piaget, 1998). This intersection is where child development theories can be used to inform the lens through which we read studies of children's media consumption. It is not sufficient to measure children's consumption patterns; we know enough from established child development theories to predict that children younger than ten likely perceive and conceptualize of their digital devices differently than adults, and equally likely have a challenging time understanding the more abstract aspects of their digital worlds. It is easy to extrapolate from this knowledge, and conclude that digital devices that can talk and sometimes appear capable of thinking or feelings would be a source of confusion for children in this age group. This gives rise to questions about what it is that children do understand, and how they perceive their digital devices.

In addition, I argue that in order to look more closely at any phenomenon concerning a

school-aged child's learning about and understanding of their environment, one must also look at the curriculum that covers the subject. This is necessary because of the volume of time that children spend at school, and our societal reliance on schooling systems to educate the children within them. In order to probe into why children may be understanding the world in a certain way, or how we can better serve them with our education system, one must first develop a basis of understanding how and what children are currently being taught.

Effectively, for the current study, IPA provides a firm foundation from which both aspects of the research question can be addressed: in seeking to understand children's perception of digital devices and delineation of aliveness in relation to these devices, one must acknowledge and think about the existence of this perception in the first place, and in tandem try to tease out an interpretation of how children interpret their own perception. Deciphering meaning within this context can easily send a researcher into a bit of a perception-of-aliveness inception, which is why it is critical to have a strong conceptual framework upon which to stand or, to continue the metaphor, upon which to harness oneself.

My aim is to triangulate children's perception of digital media with their parents' beliefs about their perception, and an analysis of the OCST. The goal of this triangulation is to use the main research question to help answer the secondary research questions. In other words, I hope to gain insight into children's perception of digital devices and use this insight to inform a critical review of the OCST, and attempt to draw conclusions about whether or not our education system is adequately serving children. My expectation is that I find that children struggle to interpret any delineation between living and non-living entities, that their parents do not realize this, and that the OCST does not sufficiently address digital devices in a way that assists children through these struggles. It is critically important that the education system be looked at as an

institution meant to serve children in a way that not only prepares them for the future, but assists them in navigating their daily lives currently, as valued members of society.

Chapter Three – Methodology

In this chapter, I begin by outlining the research purpose and goals of the current study. Next, I provide an overview of the methodological strategy employed and the justification for these choices, with particular focus on the *sample, interviews, surveys*, and *document analysis.* As well, I discuss the key procedures in regard to these same topics, *ethics,* and *recruitment.* Following this, I elaborate the most significant limitations of the current study, namely *researcher experience* and *lack of non-verbal data collection*.

Research Purpose and Goals

The purpose of this research is to explore how children perceive and interpret their digital worlds. Within this purpose, my goal is to establish a nuanced understanding of children's digital worlds, including what their parents believe them to understand and the role of education in digital media use and understanding. The research strategy used for this study is based upon collecting data via semi-structured interviews and surveys, and then using interpretative phenomenological analysis (IPA) to draw out prevalent themes from this data; simultaneously, the research strategy involves analysing Ontario's Science and Technology curriculum (OSTC) for elementary schools.

To accomplish these goals, I set about exploring three specific areas of inquiry: first looking at children's lived experiences with digital devices and the narratives they create surrounding these objects; second, establishing a sense of what parents believe about their children's digital worlds; and third, analysing the OSTC to identify potential areas where digital devices education could be more robust. My belief is that by acknowledging all three of these areas in conjunction rather than isolating any one of them, we can gain more meaningful insight

into some of the potential gaps and advantages of the current social structure that Ontario children are raised within.

Strategy, Justification, and Key Procedures

In order to effectively answer the research questions, I have chosen a mixed-methods approach to data-collection paired with an Interpretative Phenomenological Analysis (Livingstone et. al, 2018; Smith, Flowers & Larkin, 2009). The purpose of this pairing is to obtain as well-rounded and thorough an understanding of the phenomenon as possible. The goal of this research is to glean insight into an existing reality for children and obtain an experiential point of view. Thus, I have elected to gain insight from both children and parents in order to grasp the perspective of both the key players (children), as well as those who raise them (their parents) in order to analyse the responses.

A nuanced element of this thesis is the interplay between Thematic Analysis (TA) (Braun & Clarke, 2006), and Interpretative Phenomenological Analysis (IPA) (Smith, Flowers & Larkin, 2009; Smith, Jarman, & Osborn, 1999). While IPA is useful for informing the theory behind this study, Braun & Clarke's article on TA provides an overview of the actionable steps to take when conducting a theme-based analysis. Both TA and IPA are discussed more in depth presently.

The discourse analysis is informed by an Interpretative Phenomenological Analysis approach (Majors, 2013). The purpose of Interpretative Phenomenological Analysis (IPA) is to gain insight into "an individual's personal perception of an object or event" (Smith, Jarman, & Osborn, 1999, p.218). To elaborate, IPA does not aim to make an objective statement about the phenomenon being studied, instead it seeks to observe the individual's subjective perception and interpret meaning from this. Furthermore, IPA recognizes the complexity of the interview dynamic, acknowledging that while the researcher attempts to gain insight into the participant's

personal world, this experience such as the researcher's own conceptions and interpretations will influence this process. Likewise, these conceptions and interpretations are necessary for deriving meaning from the research and cannot be ignored even if it were possible to do so (Smith, Jarman, & Osborn, 1999). The nuance of IPA is what makes it useful for this study. IPA effectively addresses the barriers to empiricism that are innate to a qualitative study of this nature and posits a method of research interpretation that remains valid while maintaining a high standard of quality. Oppositions of IPA have been known to argue its theoretical underpinnings, stating that the entire epistemological framework is lacking in "sound theoretical basis" (Shinebourne, 2011, p.16); however, as Shinebourne (2011) points out, this is largely due to a lack of engagement with the theoretical underpinnings in phenomenology and hermeneutics. Analysed in conjunction with the OSTC, this approach allows us to interpret more than just the two subjective perspectives at play. By conducting a multi-faceted inquiry, we can assess the disparity between parent and child perspectives, as well as the level of adequacy with which the education system approaches new media in children's lives. From here, we can attempt to draw conclusions about where children are given access to learning and where dialogue may contain gaps. Without all three components of this study, the picture of children's digital worlds would be much less clear.

Ethics

The first step in my methodology involved getting ethics approval to work with children and their parents. To do this, I created an application that rigorously covered the topics of privacy, safety, anonymity, and real or potential risks to participants, and submitted that application to the University of Ottawa ethics department. Among the necessary information, I included an overview of my project, which included information about my selected

methodology, intended participants and recruitment method. I analysed the risks and benefits to participants that are associated with their participation in this study, and elaborated ways that I would minimize these risk factors and inconveniences. In addition, I submitted a copy of each document that participants would interact with in some way; I provided a copy of various consent and assent forms, as well as my interview guide and my parental survey.

Recruitment

Following ethics approval, I set about recruiting ten child participants and a parent participant for each child. I recruited my participants via snowball method, by creating an invitation letter and sending it to everyone in my personal community so that they could send it to people that they knew and thought might be interested in participating. The first few participants were easy to find, and I conducted the interviews with them on the University of Ottawa campus in a private room so that we could not be overheard. While these interviews were taking place, the parent participant would sit in the hallway outside and fill out the survey I had for them.

After my eighth interview, I discovered that my snowball method was running dry and it was proving to be a significant challenge finding families that could make the time to come to the University of Ottawa campus for the purpose of this study. I submitted a request to the ethics department to alter my study slightly, and allow me to enter into participants' homes in order to conduct interviews there. I was worried initially about the impact that this may have on a few elements: first, I was concerned that the children's level of distraction would interfere heavily with the required content of the interviews if they were surrounded by their toys and belongings. Secondly, I was concerned about my own safety entering into the homes of strangers as a solo

female researcher. Thirdly, I was concerned that being in participants' homes may diminish the level of privacy that I was committed to providing the child participants in my study.

The first of these three factors I was unable to mitigate, but decided that it was more important to have a full set of ten participants than it was to have short and concise interviews. Especially when factoring in that home visits would save families the time otherwise spent commuting to and from the university, I was willing to accept that interviews may indeed run long.

In regard to my own safety, I did a few things to mitigate this risk. First of all, I ensured that someone that I knew and trusted had vouched for the participants, whose homes I would be entering. In the case of these two participant groups in particular, my thesis supervisor knew the parents and was able to confirm that they were reliable and trustworthy people. Secondly, I made sure that someone I was personally close to knew where I was going and for what amount of time I expected to be there. I confirmed with them that I would communicate my status to them at certain times, as well as upon leaving, with the intent that they would follow-up and know my whereabouts should I not respond.

Finally, as an approach to ensuring that the child participants still maintained the required privacy, I communicated with the parent participants prior to my arrival to explain the necessity of a separate space where the interview could be conducted. In the home of one child participant, we were able to conduct the interview in their bedroom, on a separate floor from the rest of the family. For the other child participant, we conducted the interview in the family living room while their siblings were out of the house, and their parents remained in the basement filling out the parent survey.

Sample

The sample for this study consists of ten child participants (n=10) and eight parent participants (n=8); however, there are ten parent surveys because two parents each brought a set of two siblings to the study. The children come from a small variety of socio-economic backgrounds and represent a variety of different places in birth order. There were no children from only-child households in the study. There were four children with blended families, but all the children in this study live with their siblings at least part time. In the two instances wherein I had one parent bring two children to participate in my study, these parents filled out two separate surveys, which received different responses from one another and are counted as separate datasets. It must be noted that this contributes to having a significantly small sample size, especially within the group of parent participants.

The size and homogeny of my sample do not pose significant limitations, because this is an exploratory study not meant to offer generalizations to larger populations. The justification for my sample set was primarily the lack of time and resources needed to endeavour into a larger and more diverse study. This is a valid reason for maintaining a small, local sample and does not preclude my study from yielding meaningful results. Indeed, having only ten sets of interviews and surveys enabled me to conduct a detailed analysis of the data, which is useful for exploratory research.

Because I recruited my participants via snowball method, there is a distinct lack of diversity within my sample groups. My group is nearly entirely homogenous according to a variety of social factors. Among child participants, I have an equal gender distribution between the two most prevalent genders: five girls and five boys; however, this gender parity is not mirrored among my parent participants, which consist of five women and three men. This is perhaps reflective of a gender imbalance of child-related work among Canadian households,

deepening the complexity of this disparity. It is unclear whether or not this gender gap is reflective of Canadian society, or if it is an uncontrolled variable that has presented itself.

It is worth noting that neither the child participant nor parent participant groups included any openly non-binary gendered participants. Likewise, participants in both groups were entirely white, and all came from middle-class, hetero-normative families with cis-gendered, cis-sexual parents. Even if the sample set were larger, this study is limited in its capacity to extend findings to other groups due to the homogeneity of the participants. Under no circumstances can one assert that children belonging to different identity groups, facing different socio-economic challenges, or experiencing different forms of systemic and overt discrimination would yield the same findings as those found in this study.

Interviews

There are myriad benefits to conducting semi-structured interviews when working with children (Arkey & Knight, 2011; Clark, 2011). Semi-structured interviews are beneficial as they allow space for the participant to guide the conversation in a way that potentially reveals more than would be revealed in a more structured sort of setting (Oppenheim, 1992). Interviews of this nature allow for more clear and nuanced information to be collected. With children in particular, interviews are a useful tool for gaining insight into a person's experience and perception (Platt, 2016). Children in the age range that I am looking at are often unable to articulate themselves as well in writing, and struggle with attention for long periods of time (Platt, 2016). Many of the child participants appeared to have only low-level reading and writing competencies due to their young ages, which evidently meant that they needed to be interviewed in order to fully express themselves. Where a firmer interview structure may have minimised the effect of researcher bias (Forsey, 2012), being able to ask follow-up questions and clarify understanding was invaluable

in this study. Indeed, children often articulate themselves much better when given the space to explain their thoughts without time pressures or limitations (Clark, 2011). Likewise, being constrained by under-developed reading and writing skills would greatly hinder the depth and usefulness of children's perspectives (Clark, 2011). Interviewing them allowed me to give the participants the time they needed for distractions and following tangential trains of thought, while still circling back to the necessary questions.

The average length of time for the ten interviews is 16:58:06, with an average transcript length of 2,645 words, as presented in table 1. The names in this table have been changed, and gender has been left out in order to effectively protect the privacy of the children, whose parents might easily infer which child is theirs based on the gender and age combination.

Name	Interview Length in minutes	Transcript Word Count	Age
Avery	25:00	4,772	8
Jordan	18:48	3,589	8
Morgan	16:45	2,970	7
Blake	16:07	2,410	7
Riley	14:30	2,292	9
Charlie	15:27	2,491	8
Taylor	13:14	2,317	7
Jamie	11:38	2,021	8
Blair	19:17	3.085	9
Leslie	18:55	3,582	9

Table 1

In order to facilitate these interviews, I used an interview guide that I crafted based on theory-driven questions (Oppenheim 1992; Clark, 2011). I then asked these standardized questions across interviews to try and capture similar aspects of the children's experiences. This interview guide, along with the corresponding theories that drive it, can be found in Appendix A, and are discussed throughout the analysis and results section of this thesis in chapter 4.

These interviews enabled me to help the children feel safe and comfortable, and communicate clearly to them that this experience is about understanding them and gaining insight into their lives. This was effective (I think) at removing pressure from the children and creating an environment where they knew that they were not being tested, that there were no incorrect responses, and that they would not face consequences for the responses that they provided.

I think it was extremely important to be able to discuss these subjects with the children face-to-face. Part of what I argue in this thesis is that we need to give agency back to this population that we so quickly declare as vulnerable and work diligently to protect. I argue this more strongly now than ever, after working with these children and seeing the way that they really took the information in their assent letter to heart. To elaborate, before beginning the interviews, I read the assent letter to each child and discussed it with them while their parents were in the room. We talked about privacy, and how they had the right to decide what happens with their information and their opinions; included in this was discussion about them being allowed to keep the conversation private if they chose to do so, while also being allowed to tell their parents, family members, friends, teachers, and anyone else as much of it as they would like. We also talked a lot about their agency over the questions they would be asked, and I made

sure that they fully understood that there would be no consequences from myself or from their parents if they chose to skip questions, or end the interview entirely.

I found that multiple children did choose to skip questions and one of them ended the interview about two thirds of the way through my questions. This heartened me greatly. It is a sense of validation in itself to experience this empowerment and agency in action when one is trying to argue that children can be trusted to inform us of their own opinions and that they are great at communicating their needs and discomforts when we give them the space to do so.

I think using semi-structured interviews as my core data-collection method worked really well, as it ensured that I asked all the questions to which I had a strict academic necessity for answers, while leaving room for the conversations to flourish in ways that I had not expected or realized that this study needed. The semi-structured nature of these interviews is precisely what allowed me to make the discoveries that I did about children's perception of artificial intelligence applications like Siri and Alexa, which are discussed in more detail in chapter 4.

In terms of pragmatics, I recorded the interviews with the child participants so that I could focus on the conversation at hand without needed to take notes, and then transcribed them at a later date using the software ExpressScribe. From there I plugged the transcripts into Atlas.ti and used that software to code the interviews. This allowed me to quickly and easily see key themes and how they presented themselves across participants, as well as which themes repeated the most frequently. Children are only able to focus and attend to one task for a relatively short amount of time, so each interview was less than twenty-five minutes long. I used thematic analysis as an analytical tool for identifying key themes within the child participants' interviews. Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke, p.79). It is a tool that is useful largely because it is not tied to any single

epistemological framework, and thus has the flexibility to be applied across a number of different theoretical approaches (Braun & Clarke, 2006). Frequently in qualitative research, thematic analysis is applied without overt mention on the part of the researchers, which makes it difficult to understand the basis of the qualitative analysis that was conducted and how the emergent themes or patterns were identified (Braun & Clarke, 2006). To this end, I chose to identify thematic analysis as my key analytical tool, and to address the reasons that I have chosen to employ it in conjunction with IPA.

Specifically, I have drawn upon Braun & Clarke's (2006) suggested six steps for conducting thematic analysis in an academically sound, though flexible, manner. The authors suggest the following phases of thematic analysis: 1. Familiarizing yourself with your data. 2. Generating initial codes. 3. Searching for themes. 4. Reviewing themes. 5. Defining and naming the themes. 6. Producing the report. In practice, thematic analysis provides the guidance and structure to qualitative analysis that this study required. As a researcher conducting interviews and data collection for the first time, I relied upon this concept of thematic analysis to guide my process of identifying and solidifying the interview themes that I address through an IPA lens in chapter four.

Effectively, this interplay between TA and IPA is an important component of this thesis. While I used IPA as the theoretical framework for analysing my findings, I relied heavily on TA for concrete and pragmatic instruction. Accordingly, I read through my interview transcripts multiple times to become familiar with them. From there I used an open coding process (Corbin & Strauss, 2008), and generated codes for four overarching themes, and searched for these themes across each transcript. At this point, I realized that my themes were much too broad and that the concepts I was working with were quite difficult to discuss at such a macro level, so

before moving onto defining and naming the themes, I regressed back to the second of Braun & Clarke's (2006) six steps. Reworking my coding system, I generated distinct codes for over fifty different mini-themes, and coded all then interviews this way. During my second attempt at reviewing themes, I amalgamated codes that fit together well and disregarded codes that yielded no significant insights until I had distilled everything down to three main subjects that are broken down into eight core themes, which are discussed in the results and analysis section in chapter 4.

Surveys

Due to the nature of the information being sought in this study, surveys are an appropriate method of data-collection for the parent participants. Each parent answered one full survey per child, resulting in the two parents that brought siblings as child participants filling out two surveys each. Each survey consisted of fourteen open-answer questions (Appendix B), and they were given as much time as they needed to complete the surveys. This generally took approximately the same amount of time as their corresponding child's interview. The purpose of this section of the study is to assess the accuracy with which parents can predict their children's responses to relatively short and simple questions regarding their perception of digital devices. To that end, the necessity of a research methodology that will enable access to the parent participants' subjective thoughts and feelings is nil. Indeed, the implementation of surveys in this situation is useful, as surveys can still reveal a wide variation in responses and provide meaningful data when used in appropriate contexts (Lampard & Pole, 2002).

As noted by LaDonna, Taylor & Lingard (2018), open-text survey responses in themselves are generally not rigorous enough of a data-collection technique to yield satisfyingly rich results; however, I would argue that in the current context wherein survey results are used as a comparison to the more elaborate responses of the child participants, they are satisfyingly

meaningful and relevant. In line with Lampard and Pole's 2002 work that in part discusses the value of survey responses, the results from my parent participant surveys can "be used to answer theoretically interesting questions" (p.95), which makes surveys a sound choice of data collection for this section of the study.

The survey for this thesis is driven by an interest in exploring the similarities and discrepancies between children's perception of digital devices and what their parents believe them to perceive. A big tenant of my argument is that because we so infrequently ask children about their perception, we do not actually have an accurate idea of what that perception is. There is a significant body of work that points out the disparity between children's abilities and parental perception of these abilities (Sattler, Feldman & Bohannan, 1995; Miller, 1996; Miller, Manhal & Mee, 1991; Miller & Davis, 1992), which made me wonder if they are more accurate in estimating their children's worldviews, or not. Similarly, there is a gap in the education system in terms of teaching children about the digital devices they are using. All of this has led me to ask what parents think their children understand, how accurate they are, and how many conversations about this subject matter are taking place at home (Anderson & Jaafar, 2003; The Council of Ministers of Education, Canada, 2001; Selwyn, Potter & Cranmer, 2010). In order to gain some insight into this, I formulated the parent surveys to consist of all the same questions that I intended to ask the child participants, instead asking the parents how they think their child will respond, or what they think their child understands about these subjects. Because the theories that inform this survey are all oriented around discovering how parents predict their children will respond in their interviews, this survey closely mirrors the interview guide found in Appendix A.

Once all the surveys were complete, I compared each one to the corresponding interview, simply to look at the accuracy of each parent participant's predictions of their child's responses. I did not look for large patterns across parent's responses, as this is not within the scope of the current study.

Document Analysis

My analysis of the OSTC was informed by Bowen's 2009 work addressing document analysis as "a systemic procedure for reviewing or evaluating documents" (p.27). As Bowen elaborates, the use of document analysis is primarily beneficial when used in conjunction with other research methods, as a means of triangulation (2009). Precisely what I am aiming to do with this document analysis is to aggregate data from multiple sources and minimise the likelihood of bias in my results (Bowen, 2009). Document analysis is useful for this and can aid in providing an additional form of evidence to corroborate the interview results.

The final component of my thesis involved conducting a document analysis (Bowen, 2009) on the *Ontario Curriculum Grades 1-8 Science and Technology* (Education, 2007). I looked at the document with particular focus on the curriculum for grades 2 – 4, as these are the grades that my participants are in; however, I did include grades 1 and 5 in my analysis as well, to ensure that the relevant years are covered. This analysis was done paying particular attention to whether or not there was space created for children's voices to be heard when designing and guiding their education, as well as the key themes that I derived from the children's interviews.

Limitations

In this section, I discuss the most significant limitations to this study, namely *researcher experience*, and *lack of non-verbal data collection*. I identify these limitations, how they came to be, and what I learned about how to mitigate this factors in future research.

Researcher Experience

One of the most significant challenges I faced while establishing a methodology has been accommodating well-established methods of interviewing to suit children without compromising the integrity of the research. As noted by Forsey (2012), semi-structured interviews are ideally done in such a way that the interviewer has a general schedule of questions, but allows the interviewee the space to take the conversation where they feel appropriate; however, with children this poses quite a challenge. I had not fully anticipated the extent to which children are inclined to respond with simple "yes," "no," or "I don't know," responses to questions that I believed lent themselves to elaborate answers.

My style of interviewing thus evolved over time in a way that I abjure, and hope to circumvent in the future. While I was careful to avoid leading questions, I did find upon reviewing the transcripts that I hovered that line more closely than I deem desirable in a rigorous methodology. Specifically, there are many moments throughout the interviews wherein the participant notes a rather simple answer to a question and in response I follow up with interpreting their response and asking if I have understood correctly or not. Although this practice does not appear to be inherently flawed, and actually is useful at times to identify areas of misunderstanding, it is important to note that study participants are vulnerable to participant bias wherein their responses are influenced by their thoughts and feelings about being in the study (Stowell & Addison, 2017). Due to the potential of participant bias, there is a possibility that the child participants provided answers that they thought were 'correct,' and thus would make the interviewer happy or result in them being seen in a more positive light. For this reason, responding the way I did may not have been the most effective method of accurately retrieving the participants' beliefs and perceptions.

Lack of Non-verbal Data Collection

This study is limited by the exclusion of non-verbal communication. I made the decision to record only the audio component of the interviews I conducted based on the belief that it was not strictly necessary for the research to record video footage, and a desire to do the utmost to protect the children's privacy. The Office of the Privacy Commissioner of Canada's best practices guidelines note that personal information (such as video footage of individuals' faces and bodies) should only be collected when absolutely necessary for fulfilling a legitimate purpose (Office of the Privacy Commissioner of Canada, 2019), so I elected to only audio record the interviews rather than video recording them. Prior to completing the interviews, I did not fully appreciate the level to which children communicate non-verbally, especially when shy or confused. I still stand by my attitude to err on the side of caution when dealing with children's privacy, and recognize that an audio-visual recording is much more invasive and creates a larger risk to the privacy of participants than a solely audio recording does. Despite this, after evaluating the frequency and significance of information gaps present in my transcripts, I recognize the added value that video footage would have provided.

This limitation was especially distinct with one child participant, which demonstrates a possibility and even likelihood that a larger study would include a larger number of children with similar communication styles. What I mean by this is that the child participant in question articulated themself primarily through non-verbal communication, despite having no known learning disabilities or developmental delays linguistically or other. This brings to light the necessity of either including video footage of child participants in future research, or having a specified level of verbal communication as a requirement for eligibility. This second option would of course come with an entire host of related limitations and potential biases that cannot

be overlooked, and similarly poses quite a challenge in terms of implementation. For example, a child could easily pass an oral communication standard during a test and then change their behaviour during an interview based on mood, level of comfort, or myriad other reasons.

As a result of the quietness of this child participant, I currently recognize that my study did not anticipate the possibility of child participants that were orally challenged in any way. This means that had a child hard of hearing, developmentally delayed, with physical speech impairments, or other causes of near- or complete lack of speech presented themselves, I would have been at a complete loss for how to proceed.

Chapter Four – Results and Analysis

In this chapter, I present and discuss the results of my study. Analysis of the interviews revealed eight key themes, which are discussed in the following three sections: *Digital Worldview, Understanding of Aliveness as Applied to the Digital World,* and *Necessity of the Adult.* These themes are elaborated within the context of the interviews as well as the parent participant survey results. As discussed in the previous chapter on methodology, I identified these themes by repeating the six steps of Braun & Clarke's (2006) Thematic Analysis.

Following this discussion of key themes across interviews, I address the *Grade 1 – Grade 8 Ontario Curriculum for Science and Technology*, and discuss the two emergent themes from this analysis, which are *Existing Guidelines for Digital Device Education,* and *Agency of the Child.*

Finally, I conclude by denoting the key takeaways from this study in regard to the research questions being asked and the opportunities for future research that have risen from the current study, including recalling Krämer's (2015) messenger model of communication and the challenges to communication theory that this study poses.

Key Themes Across Interviews

Digital Worldview

The two themes in this section reflect the building blocks for our understanding of how children interpret their digital worlds. The first theme, conceptualization of the device, explores the way that children think about and view their devices generally, while the second theme, conceptualization of aliveness, explores the way that children think about and view aliveness in a broad manner, not specifically related to their digital worlds. This theme is useful for us to establish a framework of how children interpret their surroundings both in regard to digital

devices and life. These themes derive largely from question 7 in the interview guide (Appendix A), as well as the unexpected conversation that repeatedly came up surrounding clues for aliveness and examples of alive things.

Conceptualization of the device

The first interesting theme to reveal itself is also one that yielded some unexpected responses for me. Inspired by the findings of Diesendruck and Perez (2015) and Harris (2000) who discuss children's personification of comfort objects, I was interested first in finding out how children think about the devices that they use in a less abstract and more general way. There is a lack of knowledge surrounding the perception that children have towards many items in their environment, and digital devices are not an exception to that. My thinking was that while it is unlikely that children in the 7 to 9 age range would readily impute human character traits and abilities to inanimate comfort objects, they may be more uncertain about imputing such traits to objects that can speak aloud and, due to algorithms, appear capable of hearing and responding to our needs and desires regardless of whether or not we articulate them verbally.

To this end, I asked the children in my study whether they view their digital devices as toys, tools, friends, or as something else entirely (see Appendix A, question 7). The responses to this question varied from child to child, but did not reveal any overall trend related to age or gender. Of the nine children in the study that were asked this question, five of them said that they think of their digital devices as toys. Four of them added in that they also viewed them as tools or as technology, or explained that they were really advanced toys. Two children said that they did not think of the device as anything at all, that they view it simply as a means of entertainment. Interestingly, two children viewed and spoke about their devices in manner that greatly resembled the way they spoke about humans. Blake reported that they think of their digital

device as a brother. Similarly, Taylor referred to the device as their friend and expanded to inform me that it is, in fact, their best friend:

> Interviewer: Now, your tablet itself. Do you think of that as like, a toy, or do you think of it as a tool, or friend?
>
> Participant: Friend.
>
> I: A friend? Can you explain that to me a little bit?
>
> P: He's my best friend!
>
> I: He's your best friend? What do you mean?
>
> P: Um … I have Google on it.
>
> I: You have Google on it?
>
> P: Yeah.
>
> I: And that makes him your best friend?
>
> P: Mhm [yes].
>
> I: Aw, that's nice.
>
> P: He could talk to me.
>
> (Interview with Taylor)

The ease with which Taylor switches in and out of referring to the device as 'him' versus 'it,' really surprised me in this instance. Neither Taylor nor Blake were able to expand upon these notions in great detail, but I think that they point to a few interesting possibilities.

It is possible that the child participants that imputed human relationships to their digital devices do not truly feel this way, and instead were fabricating responses in keeping with the findings of Moriguchi, Okanda and Itakura (2008), which reveal that children seem to have a

tendency to want to give ‘yes’ answers in research studies; however, these studies almost exclusively involve children significantly younger that the child participants in the current study.

Another possibility that we need to consider is that some children truly identify with their digital devices, and feel a sense of kinship with them. Again, this is in line with findings about children and their comfort objects (Diesendruck and Perez, 2015; Harris, 2000), as well as findings about children’s relationship to and conceptualization of imaginary companions (Kastenbaum & Fox, 2008). The two child participants in this study that referred to their digital devices as either a friend or a brother indicate that it is possible and even likely that children of this age may be treating their digital devices much the same way that children have treated their stuffed animals and imaginary friends for years.

Essentially, this theme demonstrates the variety of perspectives that children have and provides us with some examples of real responses that adults rarely expect from children, as suggested by the parental responses to question 7 of the survey (Appendix B). In fact, the parent participants almost unanimously responded that they believed their child views digital devices as toys. One parent responded that they believed their child views digital devices in the context of their utility, often as a reward for accomplishing chores, which was in keeping with that child’s response. One other parent did not appear to realize the survey was double sided, and skipped that question. The corresponding child said that they viewed digital devices as toys. Aside from these two responses, all eight other survey responses predicted that their children view digital devices as toys, despite three of the corresponding children conceptualizing their digital devices as something else entirely, and most of the children responding with something additional to “toy,” such as “tool,” or “technology.” We can see here evidence that adults do not always have an accurate understanding of children’s thoughts, even if they are often in the right environs.

Likewise, this theme includes responses from children, such as those from Blake and Taylor, which refer to their digital devices as a friend and a brother, that are noticeably different from any that we would expect to hear from an adult being asked the same questions.

Conceptualization of Aliveness

The theme *conceptualization of aliveness* derives mainly from responses to question 11 (Appendix 1) and parts of the interviews that wandered away form the interview guide. This theme is largely explored through *clues for aliveness,* and *examples of alive things.* In keeping, this theme derives largely from an interest in exploring the depth of children's difficulty delineating a barrier between "alive" and "not alive" (Turkle, 1984). *Clues for aliveness* and *examples of alive things* are evidently two distinct concepts; however, I have included them under one heading because they are inextricably linked. The child participants spoke about clues for aliveness much more frequently than I had expected, and almost always in relation to different examples of things that may or may not be alive. These examples were sometimes items that I had named in order to help elaborate my own understanding of where the child in a given interview delineates aliveness:

> Interviewer: I'm gonna ask you about a few things now and you tell me if you think it's alive or not, okay? Does that make sense?
>
> Participant: Mhm [yes].
>
> I: So, uh, do you think that trees are alive?
>
> P: Mhm [yes].
>
> I: Yep, how do you know?
>
> P: Because um, there … wait…because…um…my teachers say they have feelings.
>
> I: Really? That's good. So you've learnt that in school?

P: Mhm [yes].

I: Okay. What about airplanes, do you think airplanes are alive?

P: No.

I: No? How come?

P: Because…well…maybe they're alive because they can move, like, yeah.

I: Hard to tell.

P: Mhm [yes].

I: Okay. Do you think that water is alive?

P: Yeah, 'cause it can move.

I: 'Cause it can move? All water?

P: Um…not all water, but some water.

I: Some water? That makes sense, like maybe the water in the river?

P: Yeah. And, maybe like, the water in the waterfall.

I: Right, but the water in like, your bathtub?

P: Nnn [no].

I: Not, probably not?

P: Mhm [yes].

I: That makes sense. Um, do you have pets at home?

P: Yeah.

I: Yeah, and do you think that they're alive?

P: Yes.

I: Yeah? How do you know that?

P: Because they are moving and sometimes they can talk.

(Interview with Charlie)

In other situations, the examples of alive or not alive things were items that the child participants came up with themselves while trying to articulate responses to other questions:

Interviewer: Okay. So, do you have any clues or rules for how you f- how you know if something's alive or not?

Participant: Not really, I just know.

I: Right.

P: I know a lot of stuff.

I: Yeah. But so for trees, you just, you just know. Like, even though it's difficult and confusing a little bit, you still just know.

(Interview with Leslie)

All ten of the child participants use clues to help them determine whether or not something is alive. One of them said that they do not use any clues, and that they can just tell if something is alive or not by spontaneously knowing it, but proceeded to use clues such as 'whether or not it can breathe' to help them figure out the aliveness of different examples I provided. The use of clues to try and help children understand the world around is in keeping with our understanding that that children develop schema and that new information then needs to either assimilate into those schema, or in instances where the information coming in contravenes an existing schema, the schema needs to be accommodated to fit the new information (Meade & Cubey, 2008). In this specific case for example, one child said that a big clue that they use to determine if something is alive or not is if it has a face. Then they learnt in school that plants are alive, and so they needed to accommodate their existing schema so that this new information – plants are alive – could fit into their concept of aliveness. The schema of *alive* shifted from "things with faces

are alive," to "things with faces are alive, but also some alive things do not have faces." This second schema is much more complex. There has been a shift from simple logic dictating that if a exists, then b is alive, to a more nuanced and tricky logic that still says the existence of a makes b alive, but there is also item c, which is alive, and does not have a. This forces the child to ask their self what it is that makes plants alive. This is often a difficult question for the learning child to answer, especially if they were told that plants are alive without being overtly taught how this alters their existing schema. For example, the child that has been told that plants are alive because they breathe may have an easier time adjusting their schema, because instead of questions they are given answers. This child has been told that yes, the presence of a makes b alive, but also the presence of d makes c alive, so alive things can have a or d. This schema still may not be complete and nuanced, but it is at least a fully formed schema that helps the child understand the world around them instead of leaving them with unanswered questions about why some things that seem distinctly not alive, in fact are.

The two most commonly used clues among my child participants were whether or not something breathes (n=3), and whether or not it can move (n=5), which is consistent with Piaget's 1998 findings that "the assimilation of life to movement has a genuine meaning in [the child's] eyes," (201). Generally, child participants responded that they know something is alive if it can breathe or if it moves, with 'or' being imperative here, like for Avery who explained that they know that water is not alive "'cause it doesn't breathe, but it but moves," and that plants are alive even if you can't see them moving, because "they breathe too" (Interview with Avery). Two children specified that a thing must be able to move by itself in order to be alive, while the other three that used motion as a clue for aliveness had a simple requirement of any movement at all, but none of the children required that something meet multiple criteria in order to determine

whether or not it was alive. Even Avery, who had a very good understanding of which items are alive and which are not, never used more than one criteria per item in their justification for how they knew whether or not it was alive. This single-criteria pattern is largely why some children reported that water in rivers and airplanes in the sky were alive; they both move, and while there may not be evidence of them doing any of the other clues that were mentioned, such as breathing, eating, drinking, or blinking, children in this age group are still in the process of developing nuanced and robust schema to help them process abstract concepts. Without these schemas being at a more advanced stage, the aliveness of an item proved very difficult for child participants to determine. This is a major finding for this thesis, as it is consistent with Piaget's (1998) findings that children do not delineate between alive and not alive things as easily as adults do, and that centration is a prominent feature of their thinking. Indeed, this study supports Piaget's conclusion that "the child's view of the physical world … confirms the reality of this confusion between the mechanical and the biological," (1998, p. 201).

Another interesting clue that came up in more than one way was the dichotomy of life and death. A few child participants spoke about knowing that something can be alive if it can also be dead. Interestingly, this was brought up in the context of electricity more than life. One child participant said that they knew their devices were alive because they turn on, which was also how they knew that cars and airplanes were alive too. Similarly, another child participant explained that they could tell if something is alive or not based on whether or not it needs to be charged:

> Interviewer: What makes you think that it's alive?
>
> Participant: How it works.
>
> I: How it works, what do you mean?

> P: Um, how it actually turns on, ‘cause sometimes phones can be dead when they don’t have energy.
>
> I: Oh, yeah that makes sense. Yeah, and then you charge them, right?
>
> P: Mhm [yes].
>
> I: So, charging them makes them alive?
>
> P: Mhm [yes].
>
> (Interview with Jordan)

This quotation illustrates well the challenge associated with discussing complex issues with children, and the difficulty that arises when asking children to explain concepts that they may not understand, but for which they have already been given a set of appropriate vocabulary. The grey area is the question of which section of communication involves two communicators using the same word with different meanings attributed. Evidently, the children are using the terms “alive,” and “dead,” in reference to batteries and electricity in a similar way that they have heard adults using these terms. What was unclear to me was whether they had heard their parents use these terms and understood from them that these objects are alive in the same sense that adults understand the term alive, or if they knew that there was a difference between the aliveness of a car and the aliveness of their pet cat. The children who responded that inanimate objects were alive did not make any distinction between the aliveness of these digital devices, vehicles, etc. and the aliveness of other things such as pets and plants. This suggests that the children in this study do not draw the same distinction between ‘alive,’ and ‘not alive,’ that adults generally do, the significance of which is returned to in the conclusion.

Understanding of Aliveness as Applied to the Digital World

The themes in this section exhibit different aspects of how children apply their understanding of aliveness to their digital worlds. The four themes in this section are as follows: *Aliveness of Characters, Aliveness of Devices, Virtual Assistants (Artificial Intelligence)* and *The Implications of Thinking and Feeling On Aliveness*. These themes derive from questions 8 – 11 in the interview guide (Appendix A), and explore the interplay between children's conceptualization of their digital worlds and their conceptualization of aliveness.

Aliveness of Characters

The aliveness of characters is a theme that came up in every interview. I had two outliers among my child participants that answered differently in this category than all the other children, despite having no discernable commonalities between the two of them. They were different ages, different genders, and came from very different family lives and somewhat different socio-economic statuses. My two outliers both knew quite concretely that characters in games and cartoon characters in shows are not alive; however, one of them noted that they have a very difficult time figuring out whether or not non-real characters on live-action shows are alive. For example, characters played by real humans but in costume or makeup like many of the aliens in various space shows. Aside from these two, all eight of my child participants reported that some or all of the characters in their games were alive. For a lot of the child participants, this is where the *clues for aliveness* presented themselves in action – the child participants would tell me that they knew the animals in their games were alive because they could move:

Interviewer: Okay, do you think that the characters in the games that you play are alive?

Participant: Yeah.

I: Yeah, what makes you think that?

P: Because they can move.

(Interview with Charlie)

This demonstrates very clearly that children conceptualize of and perceive the world very differently from the way that adults do. Dumontheil (2014) informs us that an ability to grasp abstract concepts is developed in late childhood and early teenage years as the prefrontal cortex continues to grow, which makes it unsurprising that the child participants in the current study have trouble grasping the boundaries of life, especially in cases like this where they are interacting with programs designed to simulate animate, living characters. There is also potential that emotional connection is tied into these children's responses. As previously discussed, research into children's relationships with inanimate comfort objects and imaginary companions shows that they develop strong emotional ties, even imbuing these characters with human capabilities (Diesendruck and Perez, 2015; Harris, 2000). It is no stretch to see that a similar process is possibly occurring here with some or all of the child participants, and that they are struggling to accommodate their existing schemas of 'alive' with their emotional attachment to the idea of these characters being alive, and thus being capable of knowing them and loving them in return. One child participant demonstrates this emotional relationship to aliveness well in their statement that they know if something is alive or not based on whether or not it loves you. In regard to figuring out if something is alive or not they told me: "I feel like just if you love them so much and they love you back [then you know] (Interview with Blair)." This poignant quotation demonstrates the way that children's emotions interact intimately with their view of the world (not to rule out the possibility that adults too experience this emotional interplay).

Interestingly, for a couple child participants the notion of "what is real" became salient during this discussion in a way that was entirely unanticipated in this study. One explained that characters that have a basis in reality are also alive in the games, whereas characters that are

imaginary are not alive. An example is that this child participant believes that the dinosaurs and fish in their games are alive (even though they know that dinosaurs are extinct and that the fish have powers that are different from fish in the real world) because they exist outside of the game, whereas other characters, like the monster characters, are not alive because they only exist inside the game.

The best illustration of this may be the case of Princess Peach. The child participant asserted that she is not alive because princesses are not real, but when I told them that the princess of England is a real princess they changed their mind and decided that Princess Peach is alive. This thought-process as best they were able to describe it is essentially that characters created by the game creator cannot be alive, whereas characters that exist elsewhere in some form are alive. I don't really understand why they think this way, but it effectively illustrates the point that kids have their own mechanism for deciphering the world around them, and that they absolutely do tend to implement a logic system in order to understand new and challenging concepts.

Aliveness of Devices

Unfortunately it was only with five of the ten child participants that the conversation produced a direct answer to whether or not they believed their digital devices to be alive, but these child participants did reveal some interesting perspectives. Three of these five children firmly asserted that their digital devices were not alive, and had no trouble deciding this. When prompted to explain why they felt this way; however, the child participants were unable to articulate much of a reason. This lack of support for their beliefs did not cause them to waver; instead they were firm and steadfast in their seemingly unfounded belief that the devices are not alive. This prompts us to think about whether or not they have a more concrete and adult

understanding of aliveness, or whether they have learnt somewhere along the way that these digital devices are not alive, and have remembered this fact without having necessarily internalized the rules that make it so. Within the context of their full interviews, I would posit that there is a strong likelihood the latter is true. None of the children in my study had a complete, complex understanding of aliveness as adults typically do, which lays the foundation for an argument that they have more likely memorized some of the outcomes they have been taught without knowing the philosophy behind them. It would be like memorizing one's timetables and knowing that 7 x 9 = 63, without understanding that seven times nine refers to seven groups of nine.

In contrast, two of these five children think that their digital devices are in fact alive; one of who had a difficult time deciding this at first, and only determined that their digital device was indeed alive once they applied their own internal logic to the problem:

> I: And do you think that your iPad is alive?
>
> P: No.
>
> I: No? [crosstalk: short laugh] How come?
>
> P: Hm, because … actually … I think it is.
>
> I: You think it is? How come?
>
> P: Because if it can think and it's [sic], it has feelings, then it has to be alive.
>
> (Interview with Morgan)

This excerpt provides insight into a few key aspects of this child participant's view of their digital world. Prior to diving into this discourse, it is important to understand that the logic system that the child uses was not provided to them by me, which is discussed further in the section on *the implications of thinking and feeling on aliveness*. In relation to the current theme,

this excerpt effectively demonstrates the uncertainty that children face when dealing with the concept of aliveness generally, as well as the limited criteria that children need in order to determine aliveness, as previously mentioned. Evidently, the child in this example was satisfied by the criteria for aliveness that seem to apply, and unconcerned about the evidence proving the contrary with which adults would likely be more preoccupied, such as the device's inability to breathe.

Additionally, this excerpt is sound evidence that it is possible for us as adults to be largely incorrect in regard to knowing what children think and understand about the world around them, or more specifically, about their digital devices. All ten of the parent participants in this study reported that they do not believe their child thinks that digital devices are alive, with a firmness to their responses varying from "not at all," to "I don't think so," which clearly does not correspond to the responses the children did elicit.

What we can glean form these children's responses as a whole, is that the base assumption many adults appear to have that digital devices are evidently not alive is not a healthy assumption to be making when interacting with children. We see here evidence, from the disparity between survey responses and interview content, that life is conceptualized of differently by the children in this study, and that it can be very confusing when deciphering the aliveness of aspects of their environment that are themselves inherently complex. This disparity between children and adults in conceptualizing aliveness is important to understand because as adults, our understanding of children's perception informs the way that we speak to them, and what we speak to them about. This issue is further addressed in the conclusion of this chapter.

Virtual Assistants (Artificial Intelligence)

Another element of this theme that came up logically, but unexpectedly for me is the aliveness of artificial intelligence applications (AIAs), and the connection between these applications and the digital devices themselves. Two of the child participants brought up either Siri[3] or Alexa[4] in relation to the aliveness of digital devices, and noted that they had a difficult time figuring the voices out. What struck me most about these interactions is that both children talked themselves through thinking about the AIAs without much prompting from me at all, and both referred to having tried previously to figure out whether or not they were alive, and how they worked, saying things like:

> Interviewer: And do you think Siri is alive?
>
> Participant: No … Sor- I … I never figured it out. Siri's a person, or Siri's just … a thing that tells you everything but is part of a phone.
>
> I: Mm. So you can't tell.
>
> P: Yeah. I, I've never figured it out.
>
> I: Yeah.
>
> P: I've tried to figure it out.

(Interview with Leslie)

The child participant that this quotation comes from does not believe that digital devices are alive, or that characters in games or TV programs are alive either. Due to their largely accurate understanding of the aliveness of digital devices, I found it surprising to discover that they were considering the possibility that Siri could be anything other than a recorded person. In fact, this child participant continued to explain their idea that they think there is an application

---

[3] Siri is the name of the virtual assistant available on Apple products, such as the iPhone and iPad.
[4] Alexa is the name of the virtual assistant available on Google products, such as the Google Home.

that searches for data, for which Siri is the voice, but specifically how the digital device creates that voice is what was stumping them. They could not figure out how it could possibly be that one person was able to record an answer to every possible question, and also could not understand how a digital device is able to create a human voice, alternatively. Essentially for this child participant, these two possibilities both seemed entirely impossible, so they went back to the drawing board and decided that they were unsure about Siri, whether or not she was alive, and how she worked. I do think that this child participant understands that there is no way for Siri to be a living thing inside of a digital device, but the level of confusion that she provides to even a child with a fairly advanced concept of aliveness was interesting as it points again to the complexity of this concept for children in this age group.

Perhaps most surprising about this confusion surrounding AIAs is that the child participant who did decide that Siri is just a person recording her voice also believes that digital devices are alive. I would have guessed that because this child participant views the digital device itself as being alive, they would have simply concluded that Siri is the voice of the device. I believe that this suggests a nuance that is inherent to the worldview of children at this age, in that they are approaching the world without many or possibly any of the assumptions and basic facts that adults so take for granted as to not even recognize them. This child participant conceptualizes digital devices in a way that allows space for them to be alive, as well as the characters found within them, but does not permit the aliveness of a talking, and seemingly thinking humanoid voice. The source of confusion surrounding AIA for this child participant was largely based on figuring out whether there was one Siri that recorded everything, or thousands of Siris that each record for one device. The child participant decided this was impractical and settled on there

being one Siri, but there was never any clarity provided as to why they believe the iPad and the characters in games are alive, yet Siri is not.

AIAs only came up in conversation with two other child participants, both of whom were confident that Siri and Alexa are alive within their digital devices. These child participants both referred to the AIAs' ability to talk and answer questions as reason to believe that they are alive. One child intermittently referred to the AIA virtual assistant as "it," rather than "her," which was interesting in and of itself, as it denotes awareness that this is an application or an object, rather than a human person. This child participant alternated back and forth between referring to the virtual assistant as an 'it,' for example, when explaining how they know it is alive: "'cause it can talk … and it can …like answer your questions" (Interview with Jamie), and referring to it as 'her,' for example when explaining how they know the virtual assistant has feelings: "sometimes if I offend her…or say a compliment to her, she says 'thank you' or says 'that's mean' or stuff" (Interview with Jamie) To note, when discussing AIAs with the child participants, I made sure to only ever refer to them as their name (either Alexa, or Siri) rather than 'her,' or 'it' myself until the child participant did so, to ensure that I was not planting those terms and the related connotations in the child participants' minds and speech. Additionally, the child participant that altered back and forth continued altering even while I mirrored this shift. In other words, after the child participant referred to the virtual assistant as 'her,' and had me essentially confirm the appropriateness of that word choice by then using the term myself, the child participant still shifted into the use of 'it,' and back to 'her' again. This was neat to observe, though altogether unsurprising due to the commonality with which virtual assistants are publicly referred to using both personal and objective pronouns.

Interestingly, AIAs almost never came up at all in the parent surveys. In response to question 11, which asks, “Does your child believe that the digital device(s) can think? Please explain” (Appendix B), one parent wrote: “if it was discussed with her I wouldn’t be surprised if she thought they could think for themselves (mostly because of Siri/Google home)” (Survey response from Laurie), but that was the only mention of AIA by any parent in response to any question, and Laurie’s child was not one of the ones that mentioned AIA at all themselves. I am not sure what conclusions to draw from this disparity, but it is worth noting that much like the parents, discussing Siri, Alexa, Google Homes, and other AIA did not occur to me at all before the children brought it up in their interviews. This suggests that these devices are much more salient components of children’s digital environments than I or their parents realized.

The Implications of Thinking and Feeling On Aliveness

One of the things that we talked about a lot in all ten interviews was the capacity of various characters and objects to think and feel. In eight of these then interviews, those conversations led directly into discussing the implications of thinking and feeling on aliveness. Two of the child participants viewed aliveness as inextricably linked to the ability to think and feel, believing that one could not exist without the other, as we see here:

> I: And do you think that your iPad is alive?
>
> P: No.
>
> I: No? [crosstalk: short laugh] How come?
>
> P: Hm, because … actually … I think it is.
>
> I: You think it is? How come?
>
> P: Because if it can think and it’s [sic], it has feelings, then it has to be alive.
>
> (Interview with Morgan)

This quotation is the same as the one provided earlier, in the section on *aliveness of devices,* at which point I briefly noted that it demonstrates the employment of a logic system that I did not provide for the child. What is unique about this quotation and made it relevant to include again, is that in conjunction with an earlier part of the conversation, this excerpt reveals the development of this child's logic system that tells them that thinking and feeling things must be alive. At an earlier stage in the interview, we discussed the thinking, feeling, and aliveness of pets:

> Interviewer: Oh, cool. And you have pets as well, right?
>
> Participant: Yes.
>
> I: At home? Yeah. And do you think your pets can think?
>
> P: Yeah.
>
> I: Yeah? And do you think that they have feelings?
>
> P: Mhm.
>
> I: Yeah? And how do you know that?
>
> P: Because they're alive just like us.

(Interview with Morgan)

This sort of logical thinking tells us a lot about how this child participant interprets their world. They first stated that they know that their pets can think and feel because they are alive, and then later on stated that they know their digital device is alive because it can think and feel. At no point did the child indicate recognition of having created this logic loop where thinking and feeling equals aliveness because aliveness equals thinking and feeling. What is not to be missed is the hesitation in deciding that this digital device is alive, because this is key evidence of the assimilation of new information into an existing schema. At first, the child confidently

responded that the digital device was not alive, but very quickly upon being prompted to think about that response, they switched and decided that it was alive, purely because of the strength of the schema they had already built to help them understand aliveness. Evidence of this process in action confirms for us that children are actively working to improve their understanding of their environments on an ongoing basis, and that the abstract concept of aliveness is a challenging one for them.

The other six children that spoke about the implications of thinking and feeling on aliveness found that there was no relation between these concepts at all. Things that can think may or may not be able to feel, and may or may not be alive; things that are alive may or may not be able to think, and may or may not be able to feel, and so on. As one child explained:

> Interviewer: Are the monsters in Minecraft alive?
>
> Participant: Mhm [yes].
>
> I: Do they think?
>
> P: Yes.
>
> I: And do they have feelings?
>
> P: I don't think so.
>
> I: You don't think so. So things can be alive without thinking or having feelings?
>
> P: Mhm [yes].
>
> (Interview with Jamie)

This result surprised me greatly. Because thinking and feeling seemed so much easier for children to grasp understand, I had not anticipated that they would still have trouble connecting them with alive things. On the contrary, I had guessed that they would have added thinking and feeling into their schemas of aliveness based on their own abilities to think and feel, and their

knowledge that they themselves were alive. Instead, what these responses demonstrate is that while the concepts of thinking and feeling themselves may be easier for a child that has experienced both to understand, this does not necessarily equate to that child knowing the limitations of what aside from them is able to think and feel. In fact, what became more and more apparent as the interviews went on is that the children in this study had an extremely difficult time figuring out what kinds of things can think and feel and what cannot. They had almost more trouble with this than they did with telling me which things were alive and which were not. As evidenced in the following quotation, many of the children responded in ways that included large amounts of uncertainty and never really settled on a final standpoint either way when asked about the ability of a given item to think or feel:

> Interviewer: And what about, like, the animals in Minecraft for example?
>
> Participant: I don't think they do, but I think they do?
>
> I: Yeah, what do you mean?
>
> P: Uh, there's crossbows and stuff when we could aim at them and kill them
>
> I: Oh right, so that means they have feelings?
>
> P: Mm [sound of uncertainty]
>
> I: Maybe? Okay.
>
> (Interview with Taylor)

My hypothesis surrounding this is that the difficulty for these children stems precisely from the experience with thinking and feeling that I believed would help clarify things for them. I think there is likelihood that because these children are so lost when it comes to the concept of aliveness, they feel a bit more comfortable taking a risk and guessing, or using their schemas and logic systems to help them decide. Whereas for thinking and feeling things, the children are

familiar enough with these experiences for it to give them pause – they know what strong emotions feel like and they know what it is to experience challenging thoughts, so they hesitate and question themselves a bit more. These concepts are familiar to them so they are able to formulate thorough, complex ideas about them, but their understanding of the world external to them is still in development, which prevents them from easily deciphering which aspects of the environment are able to share similar experiences and which aspects are not. We generally do not have the same conversations about the experience of being alive for these children to base their opinions on, so they are effectively starting from a cleaner slate that is less likely to cause them problems in their thought-processes.

The analysis of this theme reinforces the argument made by Turkle (1984) and advanced in the *Digital Worldview* section of this chapter, that *aliveness* as a concept is one that is just beyond the reach of children this age, while the concepts of thinking and feeling, which are more tangible because children have lots of experience with both of them by this age, are more easily grasped; however, even these concepts do bring with them challenges in regard to imputing the abilities to think and feel externally. The child participants may still have large elements of confusion in regard to which parts of their worlds can think and feel, and which cannot, but none of the children struggled to understand the concepts the way they struggled to understand aliveness, and its connection to thinking and feeling.

Necessity of the Adult

In this section, I discuss the final two key themes: *challenging nature of the questions*, and *lack of discussion with adults*. This section explores the very real struggle that the child participants in this study face when trying to understand their digital worlds and the delineation of alive and not alive things. This section looks at the role that adults currently play in this

struggle, and whether or not children and their parents are on the same page about the efficacy of that role.

Challenging Nature of the Questions

All ten child participants in this study gave clear indication that they found many of the questions in the interviews challenging. Children that were asked directly if they found the questions hard or easy responded that they found them hard. Other children expressed the difficulty they were having in response to specific questions, by responding that they do not know the answer, or would like to skip the question, such as in this instance:

> Interviewer: And so, um, of the characters in your games, the people and the animals, like in the pet one for example and stuff like that.
>
> Participant: Mhm [yes].
>
> I: Do you think that um, they can think?
>
> P: Um…I don't know [short laugh]
>
> I: Don't know, it's a hard question. That's fine, you're allowed to not know.
>
> P: I wanna skip it.
>
> (Interview with Morgan)

From this quotation we can see that the child was overwhelmed by the difficulty of the question and felt more comfortable moving on and skipping it. This happened a few times across the interviews, each time in situations where the child was taking quite a while trying to formulate their response. In other words, they did not give up easily; rather, they would think seriously about the question for a while, usually making concentrated facial expressions or 'thinking sounds' (like 'um,' or 'hmm'), and dropping eye contact. It is only after these long

pauses that some children would give up on a question, and for other children it was only after having explained their thought process, like in the following example:

> Interviewer: Um, do you think that the car that your parents drive is alive?
>
> Participant: [Long pause] Um…that's a hard question.
>
> I: That is a hard question.
>
> P: I wanna say no, but I also d- want to say yes, so [long pause] maybe.
>
> I: Maybe? Okay. What about airplanes?
>
> P: Um…[laughing sigh] maybe.
>
> (Interview with Morgan)

This quotation demonstrates the child's willingness to try and tackle the subject and general ease in the conversation (we had shared laughs and causal chatter for long enough that I feel sure they were not providing 'maybe' answers because of a general discomfort with the interview), which indicates that they truly found the question challenging in nature.

The prevalence of this theme directly relates to, and corroborates some of the premises that this research is built upon. As discussed in chapter two, Meade and Cubey (2008) demonstrate that children of this age group are likely still struggling with abstract concepts, arguably much more than many adults realize.

Unfortunately, I did not have the forethought to include a question about this in my parental survey to find out whether or not the parents predicted that their children would struggle with these questions. The parent participants' responses to the survey questions contain a lot of variation in confidence, from stating firm answers that contain a "yes," or a "no," to much less certain responses with phrasing such as "I don't believe so" or "I'm not sure about this." It is difficult to know for sure from these responses, but it appears likely that this hesitation stems

purely from parental uncertainty (parents realizing they may not know what their child is thinking), rather than demonstrating knowledge among parents that their children may struggle over the answers.

Lack of Discussion With Adults[5]

All ten children reported the use of some kind of digital device at school. Four child participants report having access to Chromebooks or computers that they use occasionally. For three others, the presence of digital devices in school is limited to the Smartboards that their teachers use. Despite all ten children reporting that there is some level of digital device presence at school, only one child reported having any discussions about the technology with their teachers:

> Interviewer: Do you talk to your teachers about the technology that you use?
>
> Participant: Mhm [yes].
>
> I: Yeah? What kind of things do you talk to your teachers about?
>
> P: Sometimes we have to get help, so we talk to them about what's happening with the computers so they can fix it.
>
> (Interview with Jordan)

As evident from this quotation, the discussions to which the child is referring do not appear to have any bearing on the child's perception of digital devices, and seem to address only the mechanics of how to operate the educational games that they are playing. This is consistent with the responses from all of the children in this study, as they repeatedly told me that they do not recall being spoken to at school about their understanding of technology or digital devices, nor the privacy or safety risks associated with using digital devices and technology. It is important to

[5] The issues in this theme are explored in the discrepancy between responses to question 13 in the interview guide (Appendix A), and questions 13 and 14 in the parental survey (Appendix B).

take into account the possibility that these discussions are taking place, and are simply not resonating with the children, as one child participant alluded to:

> Interviewer: Do your teachers or your parents ever talk to you about rules about technology?
>
> Participant: I can't really remember anything about that.
>
> I: No. Or do they talk to you about like, how to understand technology?
>
> P: Don't remember that either.
>
> I: No. Okay. So maybe they do, but you don't remember if they do?
>
> P: Yeah.
>
> (Interview with Riley)

The children's responses under this theme are both surprising, and revealing. Of the ten parental surveys that were filled out[6], six survey responses noted that the parent was unsure of whether or not discussion about digital devices was taking place in school, and four surveys reported that the parent definitely does believe there are discussions about safety in relation to technology. These responses are clearly in discord with each other, which can likely be accounted for in one of two ways. Firstly, it could be that these discussions are not taking place at all, and the parent participants have been misinformed. Secondly, it could be that these discussions are taking place, but they are not effectively resonating with the children enough for them to recall anything from them, or even recall them taking place at all.

Regardless of the reason behind these responses, what is evident is that the children in this study are not effectively being taught about digital devices at school. They do not report having learnt anything about safety or privacy, nor do they report having discussed any of the

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[6] As a reminder, there were eight parents in this study because two of them brought two children each. So, child participants n=10, but parent participants n=8 due to two sets of siblings.

philosophical questions surrounding digital devices that are proving to be deeply challenging for them. In brief, the formal digital device education that these children are receiving is either ineffective, or absent.

In regard to discussions with their parents about digital devices, I discovered that the child participants' favourite response to this line of questioning almost unanimously, "not really." Four of the ten child participants reported that they had talked to their parents about either the games they play, or the rules they have about digital device use, but even these four usually started out with telling me that they did not really talk about any of these things:

> Interviewer: What about your parents? [do you talk to them about digital devices?]
>
> P: Not really.
>
> I: Not really, do, you don't talk about like, rules or anything like that?
>
> P: We talk about some rules.
>
> I: Yeah? What kind of rules?
>
> P: Like how long we can play on it.
>
> (Interview with Blake)

Of the other six child participants, one gave me a flat "no," when asked if they had talked with their parents about digital devices or if their parents had ever asked them the sort of questions I was asking. The other five would not go much deeper than saying "not really," which I feel likely implies that they know their parents do talk to them about their digital device use sometimes, but they do not pay enough attention to those conversations to be able to recall much about them. I could be reading into that a little, but I think it is very likely, especially when factoring in the responses from the parent survey.

Eight of the ten parent participant responses reported that conversations about technology have taken place at home with their child. Some parents reported that they talk mostly about safety in regard to digital devices. Others reported that they talk mainly about the digital device in whichever context it is being used, i.e. they talk to their child about the game they are playing, or the program they are watching. Interestingly, three of the parent participants reported that they have had discussions with their child specifically about the difference between the digital device word, and the "real" world. One of these three corresponding children is the child that had a very advanced understanding of how game systems work, and the lack of aliveness in regard to technology generally. The other two are among the children that reported both characters and digital devices themselves as being alive. These two children both elaborated that they have talked to their parents about the games they play and the devices they use, and appear to have a very open line of communication with their parents. This corroborates the notion that abstract concepts like this are very challenging for children in this age group. Having discussions with their parents about the difference between games and real life was not enough for these children to understand or properly internalize the nature of digital devices, or distinguish in an abstract way between their aliveness and the aliveness of their pets or plants.

A key takeaway from this theme is not whether or not these discussions are taking place, but how effective they are. Parents report a higher amount of discussion taking place both at school (n = 4) and at home (n= 8) than their children do (n = 1 at school and n = 4 at home), which could be over-inflated due to participant bias, or not. Either way, what we can clearly see is that the children in this study are not learning about the digital devices they use from these discussions. This suggests that there is a gap between what adults, and specifically parents, believe their children know and understand, and what these children actually do know and

understand. This gap is neither the fault of the child, nor the parents. Instead, it points to the possibility that the system these children are operating within is not adequately approaching their technological education.

Science and Technology Curriculum

The *Ontario Curriculum, Grades 1–8: Science and Technology, 2007* (OCST) is the current curriculum document that public schools are using to structure science and technology education in Ontario. Curriculum documents in Ontario are developed and produced by the Ontario Ministry of Education (2020), and are used to set the guidelines within each subject for schools and school boards to follow when creating and carrying out education plans. The OCST specifically sets out the priority of ensuring that children acquire and maintain sufficient scientific and technological literacy as one of the requirements for graduation (Education, 2007). The OCST sets out three primary goals in order to accomplish this task, which are as follows:

1. To relate science and technology to society and the environment;
2. To develop the skills, strategies, and habits of mind required for scientific inquiry and technological problem solving;
3. To understand the basic concepts of science and technology (Education, p.3).

It is important to note that this curriculum was last updated in 2007, and as a result, the landscape of children's lives and environments has altered radically from the time in which this document was produced, as discussed in section on *children and digital media*, in chapter two. I argue that being able to understand the technology in one's daily life falls under all three goals outlined above, and as such, should be a present topic in the OCST. The results of the document analysis I conducted upon the OCST reveal two key themes to be discussed: *existing guidelines for digital device education,* and *agency of the child.*

Existing Guidance for Teaching Children About Digital Devices

Interestingly, the ethos of the OCST seems to acknowledge the importance of educating children about technology in a complete way, as it states that "[a]n understanding of the nature of technology includes knowing the following: what technology is, in its broadest terms (much more than the knowledge and skills related to computers and their applications) … how thinking about technology's benefits, costs, and risks can contribute to using it wisely" (Education, 2007, p.4). While this statement indicates to the reader that there is intent for children to be educated about the role that technology plays in their lives, and to develop a true understanding of what technology is and how it works, there is a distinct gap in this document in regard to digital device education.

Continuing on this vein, the OCST also specifically notes, "learning in science and technology cannot be viewed as merely the learning of facts" (Education, 2007, p.11), which indicates knowledge that memorization of facts and genuine understanding are distinct from one another, and that understanding is the goal of this curriculum. Quotations like this demonstrate the internal contradiction that this curriculum contains. Using broad statements, it sets out general goals that appear to be effective in addressing technology education, but the document contains a very limited amount of concrete information about how teachers are best able to approach these subjects, and which areas children are likely to struggle with.

The OCST includes a list of sixteen different topics that students will cover by the end of Grade 4 (this list actually continues to list topics all the way to Grade 12, but for the current age group, Grade 4 is the maximum relevant year). The topics addressed under the strand "understanding systems," such as "needs and characteristics of living things" (Education, 2007, p.19), do provide space wherein teachers could address some of the subjects discussed in this

study, namely aliveness and the delineation of alive and not alive things; however, the timing and order of these structures reveals one of the most significant flaws in the OCST (19). This document dictates that the needs and characteristics of living things be taught while students are in first grade (generally 6-7 years old), and in subsequent years the topics covered are all oriented around growth and change patterns in either plants or animals, or habitats and communities (Education, 2007). As evidenced from the current study, the concept of aliveness is challenging for children that are older and farther along in their development than children in Grade 1, which indicates that teaching these subjects at that time is both insufficient and inefficient.

The other strand that at first glance appears promising for digital device education is “understanding structures and mechanisms,” but this strand does not contain a single topic related to digital devices or electronic technology, or technology in the home (Education, 2007), nor do the last two strands, “understanding matter and energy,” and “understanding earth and space systems” (Education, 2007). This demonstrates a failure of this curriculum to address the subject of digital devices, despite the fact that they represent an ever-increasing presence in children’s lives and a source of major confusion for them.

In addition, there is a section in the OCST that specifically addresses the role of information and communication technologies (ICTs) in the classroom (Education, 2007). Unfortunately, this section represents a missed opportunity more than anything. It is under 250 words in length, and focuses almost exclusively on the use of ICTs as a resource for teachers and students when learning about other topics (Education, 2007). There is a brief statement addressing the need to discuss some aspects of ICT use with students: “Although the Internet is a powerful learning tool, all students must be made aware of issues of privacy, safety, and

responsible use, as well as of the ways in which the Internet can be used to promote hatred" (Education, 2007, p.41). This is certainly a positive thing to be teaching students, but the mention of it in fact highlights how brief and simplistic the OCST address of ICTs (and digital devices) truly is. There is nothing that undertakes the responsibility of educating children about the many aspects of digital devices or ICTs that may cause them confusion.

In regard to the lack of clear guidance within the curriculum, I am not arguing that it is impossible for teachers to approach technology education effectively because of this document, simply that this document is not sufficient in supporting them to do so. There are likely numerous teachers that have developed creative and thorough methods for teaching students about the digital devices in their lives; what they are, how they work, and what risks and benefits may be associated with their usage. This exploratory study suggests that the Ministry of Education should update its curriculum. Currently, with our digital device education being absent from the curriculum, we have a province wherein teachers must either develop entirely from scratch their own approaches to this educational feat and create content without guidance or standards, or leave the subject to be untouched and allow their students to accrue these Ministry of Education-mandated gaps in knowledge. Based on the responses from the child participants in this study, they have not been given access to the education that they require in order to understand a portion of their lives that is extremely prevalent, and their parents appear unaware that this topic has fallen through the cracks. However, the blame for this cannot be fairly placed on the parents either, as parents should be able to rely on their government to ensure that children are receiving the education that their curriculum would easily lead parents to believe children are receiving.

Agency of the Child

The OCST addresses the agency of the child in a problematic way. Throughout the document, students are discussed in conjunction with either their responsibilities or with the expectations that are placed upon them (Education, 2007). At no point does this document address or provide agency for children in a positive way that is geared toward their inclusion in the development of a learning plan, or anything similar. In the context of this document, students are discussed largely as a potential, rather than as individuals with agency. In the section that addresses the responsibilities of the students, the document says that “[s]tudents who develop mental attitudes and ways of behaving that contribute to success in life will benefit as learners” (Education, 2007, p.7). This sort of statement may seem innocuous, but it is one of many times that the document refers to students’ future capacities, with no mention anywhere of the students’ existing value. The nature of this document is that it is written with the intended outcome of creating objective guidelines for educating students about science and technology. In line with this, it is understandable that some might expect it to be void of the more human elements of education, but I argue firstly that that would be an inappropriate exclusion to make, and secondly that it is not currently void of those elements, it simply has not addressed them sufficiently.

To continue, while the goal of this document may well be to create an objective set of guidelines, the settings within which these guidelines are to be implemented are schools, which means that the diversity of students’ experiences and requirements must be taken into consideration in the development of such a document. To this end, the OCST does in fact include a section on antidiscriminatory [sic] education, which indicates agreement with the notion that elements of the student experience need to be addressed within this document (Education, 2007). Accepting the premise that curriculum documents are an appropriate place to address the

treatment of children during their education, I find there to be a glaring gap in this particular curriculum concerning the lack of agency for the children. There is nothing within this curriculum that creates space for students to provide feedback about their own education. This curriculum and the overarching policy document, the *Ontario Schools Policy and Program Requirements 2016*, are heavy on testing and assessment as a form of feedback about whether or not education plans are working, but this does not allow for a complete picture of students' successes and needs. A system that tests students' ability to produce correct answers against a standard is not one that showcases what children actually believe about the topics they are trying to learn.

This curriculum provides no suggestions or guidelines for how teachers, schools, or school boards may go about finding out where their students view gaps in their education or how they feel they could be better served by their education. Without this agency, it is clear that students in Ontario are products being groomed by the system, rather than members of society that the system is devised to serve.

In regard to the agency of children, I cannot help but wonder how different the landscape of Canadian education might be if our system had children's agency built into its foundation. We cannot know, but I find it easy to imagine that a system wherein the main actors are able to provide feedback about how the system is serving them and where they see room for improvement would be vastly different to the production system that education in Ontario currently is. One of my key recommendations from this research is an overhaul of Ontario curricula in order to assist its alignment with Sonu & Bensen's (2016) ideas that education should approach children with "an invitation to the child, not as a child, but as a human being with rights and concerns worthy of recognition" (p.232). This would involve first a more

intensive analysis of the OCST, as well as the other Ontario curricula. Following these analyses, new curricula should be developed primarily to update the content of what should be taught and when, but also to update the deeply problematic address of gender and race within this document, and to include an ongoing mechanism for students to provide feedback about their education throughout their academic careers.

Conclusion

Analysis of the child participants' interviews and comparison between their responses and those that their parents predicted demonstrates that children do not perceive their digital devices the same way that adults do. These results inform us that children's perception of their digital devices varies greatly, but that difficulty understanding the delineation between alive things and not alive things poses a challenge in some way for all of the children in this study. As exemplified by the theme *examples of alive and clues for aliveness*, the findings of this study suggest that the aliveness of an item is extremely difficult for children in this age group to understand. This study also suggests that the answer to the specific research question, *how do children ages seven to nine interpret the delineation between living and non-living entities in regard to their digital devices* is that children do not share one view. In fact, there is a multitude of different ways that children view aliveness, and some do not draw much delineation between alive and not alive things at all. It is in this complexity and varied nature of the children's responses that we find the most significant takeaway from this study: children view their digital worlds very differently from adults, who generally find consensus that their digital devices are not alive. Indeed, it is clear that the children in this study interpret that delineation with fluidity, and largely perceive it as less of a concrete delineation than adults typically do. This gives rise to questions for future research that may ask whether children interpret life as a binary that needs a

delineation between living and non-living entities to be drawn, or if perhaps life in the eyes of the child is more of a continuum, or even a large question mark to be filled in later on in their development.

This study also reveals much more about the OCST than I had anticipated. Evident is the lack of attention within the curriculum to students' need for education and learning space oriented around the technology in their daily lives. Moreover, this study revealed glaring issues with the existing science and technology curriculum in Ontario, which highlights the need to assess all of the Ontario curriculum documents for similar such issues. There is a need to revise the OCST in an overhaul manner aimed primarily at shifting the ethos of the document to be in line with child rights and realign Ontario education with the needs of the child as an existing human as well as a future human.

Finally, this study suggests that we need to reconsider our theories of communication as they apply to the communication of the developing child. Recalling Krämer's (2015) messenger model for communication from chapter two, she focuses on the medium as that which bridges two languages, or two agents of communication. This is a useful understanding of media to bring into the current study, for it at once highlights the significance of the digital devices' visibility for children, and provides a basis from which we can question whether the medium is highly visible to children because it is not functioning correctly, or if adults and children simply do not experience digital devices in the same way.

To clarify, in part this study addresses the way that children conceptualize their digital devices, and suggests that defining their conceptualization of these devices is something they actively work on and struggle with. Within Krämer's messenger model for communication; however, one would expect the digital device itself to be invisible and the focus of the child to be

solely on the content, or the message (2015). Instead, the preoccupation that children aged seven to nine have with their digital devices reveals that either the medium is not functioning and has become salient to them as such; or, we need to re-evaluate our theories of communication for the child. Explicitly, working within Krämer's messenger model for communication, we accept the notion that a medium only becomes visible to us when that medium is not functioning – we only think about our phone when it malfunctions, otherwise we happily text away without considering the phone itself. What this study causes us to question, is whether or not this theory can appropriately be applied to children's communication, or if perhaps we need to develop all new theories of communication for the developing child. One wonders if the children in this study are really preoccupied with the struggle to understand their digital devices because the intended communicative process of these devices has broken down, or if it would be more appropriate to accept that communication for children serves a different function than it does for adults; a more exploratory, learning-focussed function, maybe. This study throws into question whether we can look at the developing child's communication using the same theories that we apply to adult models of communication, or not. Possibly for the developing child learning to communicate, the medium is always a salient and attention-grabbing aspect of communication, regardless of whether we are referring to the conceptualization of digital devices as in this study, or the process of learning the feel of particular mouth-shapes for new speakers. The current study being of an exploratory nature, I feel that more research is needed in order to take a firm standpoint, but argue that applying adult theories to child communication reinforces Pupavac's (2001) notion of the child as a quasi-human. Rather than impose adult perspectives upon children and deem their modes of communication to be broken, or ineffective because they have not yet imbibed an adult understanding of the world, I think that we need to ask ourselves what communication

looks like for the child and consider the idea that communication for the child may serve a different purpose. Ideal, perfect communication for the child may in fact be a process that empowers them to question and challenge their environments, regardless of the adult-deemed accuracy of this communication.

Chapter Five - Conclusion

A qualitative analysis of children's perception of digital media has revealed that children between the ages of seven and nine do not interpret the delineation between living and non-living entities in the same way as adults. Indeed, this study demonstrates that children interpret their environment, specifically including their digital devices, differently from the way adults do, and differently from the way their parents believe they do. In addition, a document analysis of the OCST reveals that the Ontario curriculum does not sufficiently address children's digital environments, or provide adequate guidance for teachers to approach teaching such subjects to elementary school students.

The literature discussed in chapter two suggests that children's experience with digital media is nuanced and complex (Holloway, Green & Livingstone, 2013; Livingstone et. al, 2018). As well, a review of child development literature revealed that children in this age group are in the process of developing a solid conceptualization of the world around them (Piaget, 1951; Piaget, 1953; Piaget, 1998; Flavell, 2000; Meade & Cubey, 2008). Together, this review of relevant literature established the expectation that this study would suggest that children do not interpret their digital environments the same way that adults do, or that adults expect them to.

In keeping with this expectation, this study found that it is challenging for children to answer questions about aliveness, particularly pertaining to their digital devices and the characters within these devices. I found that eight key themes emerged from the interviews with children, namely *conceptualization of the device, clues for aliveness and examples of alive things, aliveness of characters, aliveness of devices, virtual assistants (artificial intelligence), the implications of thinking and feeling on aliveness, the challenging nature of the questions,* and *the lack of discussion with adults.* These themes show us that there are many different facets of

digital devices and interacting with digital media that are confusing for children of this age. We can also see from these results that children in the process of learning how to conceptualize abstract thoughts typically tend to try and make sense of the world around them by assimilating new information into their existing schemas, or adjusting their schemas to accommodate for new, contradictory information. To elaborate, it is important to recognize that while the children in this study do not yet interpret their digital environments in a way that matches adults' typical perception, these challenges the child participants face in this regard are likely a typical part of development, and not an indication of problematic development. Instead, what is to be gleaned from the general confusion and lack of clarity among the child participants is that there is a distinct need for adults to adjust their teaching so that it can newly incorporate, or improve upon, overt education about digital devices and related matters.

Building off of this established need, the current study also demonstrates some glaring issues with the science and technology curriculum currently being used in Ontario elementary schools. It is evident that the curriculum does not sufficiently address digital devices or digital media more generally. There is a gap in Ontario children's education when it comes to their digital environments, as many parents are not overtly addressing these subjects with their children (at least not in ways that resonate and linger with the children), and the education system at large does not broach the subject at all. This gap points to a larger curriculum issue that this study enabled me to discover, which is that the Ontario science and technology curriculum is not written from a child-rights perspective, and treats the child as a quasi-human potential rather than a valuable member of society and rights-bearing citizen.

These findings are significant for four main reasons: they further our psychological understanding of the child, and reinforce Flavell's (2000) argument that open-minded research

with children creates space for them to surprise us; they contribute to the existing body of work surrounding children and media (Livingstone & Bovill, 1999; Kleine, Pearson & Povida, 2016; Livingstone et. al, 2018; Smahel et. al, 2020); they highlight critical flaws with our current elementary school education; and they indicate a need for child-focussed theory development in addition to child-focussed empirical research.

First, this study contributes to the literature in child development by demonstrating that children between the ages seven and nine have very different worldviews from adults, and struggle to make sense of their surroundings. This is in keeping with the work of Meade and Cubey (2008), and Flavell (1992), both of whom address children's conceptualization of their environment, and the learning process.

Next, this study aids in filling the children's perception gap in literature about children and media (Livingstone & Haddon, 2008; Livingstone et. al, 2017). Understanding children's perspective is a valuable aspect of children and media, because it can help academic authors and policy-makers ensure they are recognizing children's agency and the need to prioritize their voices and experiences. This study asserts firmly that children and adults have distinctly different interpretations of digital devices, and as such illuminates the need to bring children's perspectives to the forefront when attempting to facilitate their participation in society.

Third, the evidence of curricular deficit brought to light by this study is useful as it provides a concrete demonstration that curricular reform is needed in Ontario. From this study, we can see plainly that the Ontario science and technology curriculum is out-dated, and the time for revision is now. Already, children are encountering digital devices in their regular environment that they struggle to interpret and understand. With the constant advancement of AI

and the related discourse among adults surrounding where life begins and ends, it is imperative that children be explicitly taught about the technology in their lives.

Lastly, this study challenges our existing theories of communication insofar as their application to children. Specifically, drawing upon Krämer's (2015) messenger model for communication as a useful lens for viewing adult communication, this study highlights our lack of ability to apply the same notions of broken or perfect communication to children that communication scholars apply to adults.

The findings that derive directly from posing the research question, *how do children ages seven to nine interpret the delineation between living and non-living entities in regard to their digital devices*? are in line with my hypothesis that they do not draw much of delineation at all, and in fact struggle to grasp the abstract concept of aliveness. Likewise, I was not surprised to find that the OCST inadequately covers technology insofar as children's digital device education; however, the depth of the problems with the curriculum that became apparent were not part of the hypothesis or predicted results for this study. I was shocked to find the exclusionary, racist, and gender-binary undertones that exist in the OCST, and dismayed to discover that the document completely omits the concept of the child as a rights-bearing citizen that an education system is meant to serve.

I think it is important to reiterate one of the most significant limitations of this study, which is my own lack of child participation. As noted in chapter two, I was unable to incorporate the child participants into the planning and analysis of this study, which in many ways contradicts the child-rights, participatory approaches for which I am advocating. While I worked diligently to keep Alderson's (2012) concept of rights-respecting research in mind throughout this study, this remains an area to be addressed in further research.

In addition, the results of this study give rise to multiple avenues of further research. Most pressingly, I urge the need for child participatory education policy research. After uncovering the massive issues with the OCST, I see even more clearly now a need for children's voices to be given space and priority in education policy that affects their daily lives. I think a rights-focussed critical analysis of all of Ontario's curricula, as well as the *Ontario Schools Policy and Program Requirements* document is needed, and that children should be involved in this critical analysis from genesis to conclusion.

As well, I see potential for much more research investigating children's perception of digital media, such as a similar study to this one with a representative sample that can be used to extrapolate findings, and research that explores children's perception of their digital environments in a more participatory manner. This study was fruitful and enabled me to glean interesting insight, but now that the iceberg's tip has become apparent, it is time to go below the waters and see how large it really is. In plainer terms, we can see now that children view their digital environments differently from adults, and that their delineation between living and non-living entities is not so stark. What is left to uncover is how vast children's alternative conception of reality is, so that we can try to approximate, as best we can, the child's experience. I think that all people want desperately to be understood, and I do not imagine children to be exempt from this. With continued research in this particular field where cognitive development, media studies, and education policy converge, I envision a world in which we understand our children properly, and continually create spaces designed expressly to help them thrive.

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Appendix A

Theory-Driven Interview Guide

1. Do you have siblings? a. Are they older or younger?	Birth order can influence children's learning / development. Possibly only within the family context, but this still has a lot of uncertainty. (Harris, 2000; Bonesronning & Massih, 2011; Carette, Anseel & Yperen, 2011). Seems worth collecting this data even if I don't end up needing/using it/
2. What kind of screens or electronics do you use at home? a. Which one is your favourite to use? Why? 3. What do you use (the digital device(s) the child has named) for? 4. What games do you play on your (digital device(s) the child has named)?	These are simply questions that provide me with the information I need in order to proceed with the meat of the interview.
5. Do you play these games alone? a. Do you play them with friends? b. Do you play them with siblings? c. Do you play them with your parent(s)?	Even children under the age of nine often have strong social influence in their digital device use. The main push here is pressure from peers at school to fit in and not be excluded. I'm curious to see if a lot of kids answer that their peers all play the same games/play the games with them. This prompt could develop into questions about whether or not friends give them new ideas for games, etc. (Holloway, Green & Livingstone, 2013; Pea et. Al., 2012) Capture the sibling-digital device interaction is important because it could potentially influence the child's thinking surrounding the devices. Birth order effects, as noted already (Harris, 2000; Bonesronning & Massih, 2011; Carette, Anseel & Yperen, 2011). Capturing whether or not children play on their digital devices with their parents is relevant to the accuracy of parental survey – part of what I'm looking at is whether or not parents understand what their children think about DDs, and research shows that parents tend to estimate their children's abilities more accurately when they spend more time interacting with their children in relation to the abilities in question (Sattler, Feldman &

	Bohannan 1985) Accuracy may also correlate with the child's level of ability, which would be interesting to see here perhaps in parents who do not play with their child, but are still accurate in their survey (Miller & Davis, 1992; Miller, Manhal & Mee, 1991)
6. Do you use (the digital device(s) the child has named) at school?	Needed mainly for relevance of the education analysis portion of this. If they are using their devices at school this should show in education policy (i.e. it should be present in curriculum documents etc.). If they are not using these devices at school, then it opens up a whole other discussion about whether or not school is adequately equipping kids with digital literacy skills.
7. Can you tell me if you think of your (digital device(s) the child has named) as a toy or a friend or something else? a. Why do you feel this way?	These questions links to the notion of digital devices being conceived of as personified objects Diesendruck & Perez, 2015; Harris, 2000).
8. Do you think the people/animals in the games you play have feelings? a. Can you tell me about this/how you know this? 9. Do you think that the people/animals in (the digital device(s) the child has named) are alive? a. Can you tell me about this/how you know this?	This question links to children's difficulty delineating a barrier between "alive" and "not alive" (Turkle, 1984).
10. Do you think (the digital device(s) the child has named) can think? a. Can you tell me about this/how you know this?	Theoretically, children of this age understand theory of mind (they finally know that other people have thoughts that are different from their own), but we don't really know where this ends - they seem to extend this to some inanimate objects, but not others. At some age they stop, but we're not really sure exactly when, etc. (Flavell, 1992; Vostrovsky, 1895; Kastenbaum & Fox, 2008)
11. Do you think (the digital device(s) the child has named) is/are alive? a. Can you tell me about this/how you know this?	Like question 9 – children's concept of "aliveness" is something I'm really exploring here, so more than one chance to probe their thoughts on the subject is useful. This also connects to

12. How do you know if something is alive or not?	This connects to children's alternative perception of the world / ways of classifying things (Meade & Cubey, 2008).
13. Have your parents or teachers asked you any of these questions before?	This question may reveal a pattern related to parental understanding (Potter & Cranmer, 2010). Similarly, it may corroborate, from the point of view of the child, the major gap in Ontario's education approach to teaching kids *about* digital media instead of solely how to use it (Anderson & Jaafar, 2003; The Council of Ministers of Education, Canada, 2001).

Clarify any remaining questions about responses.

Additional prompts and follow-ups pertaining to these questions may be asked depending on the nature of the responses.

Appendix B

Parental Survey

Please be reminded that you are not obligated to answer any questions you prefer to skip. Please also note that you will be provided with blank paper in case you need extra space. All sheets of paper provided will be collected, and all information written down is to be considered part of this survey.

1. What is the birth order of your child? E.g. only child, oldest child, middle child, youngest child.
2. What kind of digital device(s) (e.g. iPad, tablet, computer, video gaming console, smartphone, etc.) does you child use at home most often? Is this your child's favourite one to use? If not, what is?
3. What does your child use the digital device(s) for? Please include as much information as you can.
4. What game(s) does your child play on the digital device(s)?
5. Does your child play this/these game(s) alone?
   a. Does your child play this/these game(s) with friends?
   b. Does your child play this/these game(s) with siblings?
   c. Does your child play this/these game(s) with you or another caregiver?
6. Does your child use the digital device(s) at school? If yes, what for?
7. Does your child consider the digital device to be a friend, a toy, or something else? Please explain.
8. Does your child believe that the characters and/or animals in their digital device(s) have feelings? Please explain.

9. Does your child believe that the characters and/or animals in their digital device(s) are alive? Please explain.
10. Does your child believe that the digital device(s) are alive? Please explain.
11. Does your child believe that the digital device(s) can think? Please explain.
12. How does your child figure out if something is alive or not? Please explain.
13. Do you and your child discuss their understanding of this digital device(s)? If yes, what do you talk about?
14. Does your child talk about digital devices at school? If yes, what do they talk about?