EFFECTIVE TECHNOLOGY INTEGRATION

Let's Get Digital: Teachers' Perspectives and Practices of Effective Technology Integration

By

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Abstract
The goal of this research study was to explore the assessment and implementation of meaningful and effective technology use in different classrooms, as well as the factors and resources supporting and/or challenging these efforts. The main research question guiding this study was: How does a sample of teachers define “effective technology integration” and how do they enact this in practice? Data was collected through semi-structured interviews with two Ontario Certified Teachers working in the Greater Toronto Area who have demonstrated a dedication to effectively integrating technology into the classroom. Findings suggest teachers mainly integrated technology within the classroom for curricular, communicative, and assistive needs. Also, student-directed learning was a key success criterion for the effective integration of educational technology. Additionally, motivation to effectively integrate technology and access to resources supports the quality of technology use within the classroom. Findings identify obtaining resources and finding effective strategies to use those resources as challenges to effective integration. As well, findings suggest that effective technology integration produced positive intrapersonal and interpersonal student outcomes in academic and non-academic domains. The implications of these findings suggest positive outcomes are observed through effective technology practices, specifically relating to student achievement, and social-emotional development.

Key Words: Educational technology, technology integration, perspectives, practices
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Chapter 1: Introduction

1.0 Research Context

As a society, we are constantly being immersed into a “digital world”. We are typically engaged with “digital media,” which may include films, video games, songs, magazines, websites, etc. (Ontario Ministry of Education, 2006). Generally, individuals born after 1980 are considered to be “digital natives” as they have grown up with digital media and have been interacting with new digital devices and the online world more than any other generation (Prensky, 2001). Meanwhile, generations born before 1980 are referred to as “digital immigrants” as they have had to assimilate and work towards an understanding of most technological advances (Prensky, 2001). While a significant number of teachers can be classified as “digital natives”, there is a portion of teachers that fall within the “digital immigrant” category. With consideration to this digital fluency that students will assumedly possess, it is important to review the ways in which media and technology will have an effect on children, in and outside of the classroom.

There have been several observable cognitive advantages seen among high frequency video game players, including greater attention, visual short-term memory, and executive control (i.e. shifting attention and multitasking) (Bavelier, Green, Pouget & Schrater, 2012; Boot, Kramer, Simons, Fabiani, & Gratton, 2008; Núñez Castellar, All, de Marez, & Van Looy, 2015). Arithmetic performance enhancement induced by video game play was demonstrated in one study, with Working Memory improvements also being observed with video game play when compared to paper exercises (Núñez Castellar, All, de Marez, & Van Looy, 2015). Apps for iPads (and tablets) have been, and continue to be used as an intervention method to help individuals who have deficits and/or limitations in communication, handwriting, motor skills,
coordination, visual perception, cognition, activities of daily living, and to improve participation in academics (Amerih, 2013). As technology becomes more ubiquitous, we are beginning to fully integrate technology and depend on technology as a cognitive tool (Jonassen & Reeves, 1996).

As technology has become so engrained in our everyday lives, educational ministries have reflected the significance of technology use for meaningful learning as evident in the curriculum documents (Ontario Ministry of Education, 2006). Media literacy is an identified strand of literacy within the Ontario Ministry of Education’s Revised Literacy curriculum document (2006). It is with digital media adoption and technology integration that the overall and specific curriculum expectations will be appropriately met (Ministry of Education, 2006). When teachers have self-motivation, as well as the support from colleagues, head of the school, administration and funding support, digital media adoption is more likely to be successful in that school (Petko, Egger, Cantieni, & Wespi, 2015).

On a more micro level, an individual teacher has great influence on how technology will be integrated into the classroom. Research supports that perceived usefulness of technology, perceived ease of use of technology, perceived subjective norms regarding use of technology, and facilitating conditions to use technology, affected pre-service teacher’s computer attitudes (Teo, Lee & Chai, 2008). It is these attitudes that can provide the self-motivation for a teacher to strive for a greater amount of technology training (Petko, Egger, Cantieni, & Wespi, 2015). This technology training combined with a teacher’s general disposition, time spent beyond contractual work week, and openness to change, are the factors that best predicted classroom technology use (Fordham & Vannatta, 2004).

While teachers’ computer skills and attitudes will impact effective classroom use of
computers, a teacher’s educational beliefs and pedagogical perspectives are additional influencing factors towards technology integration (Hermans, Tondeur, van Braak, & Valke, 2008). In the traditional perspective, the assumption is that students learn from technology or teachers. In the constructivist perspective, learning with technology supports thinking in meaningful ways (Jonassen, 2000). Constructivist Learning Theory is a student-centered approach that focuses on students making their own discoveries to facilitate learning (Yager, 1991). Whereas Traditionalist Learning Theory follows a lecture-based teaching style, this approach relies on the teacher providing students will the tools and guidance to actively solve presented tasks (VAST, 1998). Research has supported the benefits of approaching technology integration through the Constructivist Learning Theory, which include greater student enthusiasm and more meaningful connections to the knowledge discovered (Zoller, 2000).

However, the current research shows that many teachers are not integrating technology consistently as a teaching and learning tool (Bauer & Kenton, 2005) and are also not effectively integrating technology to support meaningful student outcomes (Keengwe, Onchwari, & Wachira, 2008).

1.1 Research Problem

Research has found that many teachers are not effectively integrating technology to support meaningful student outcomes (Davies & West, 2014; Keengwe, Onchwari, & Wachira, 2008; National Education Association, 2008; Snoeyink & Ertmer, 2001). Teachers that either lack extensive computer skills or take on traditional teaching approaches with technology may be creating barriers for optimal learning (Hermans, et al., 2008; Jonassen, 2000). One commonly identified barrier involves the use of ineffective pedagogical approaches that do not follow the emerging shift towards Constructivist Learning Theory (Ertmer & Ottenbreit-Leftwich, 2013;
Despite teachers’ computer skills and pedagogical perspective being congruent with the literature with regards to effective technology integration (Hermans, et al., 2008), schools that lack access and funding for various technological applications will face great difficulty in adopting digital media into the classrooms (Petko, et al., 2015). Without the financial support for technological devices and without administrative support for teacher training, technology integration is very limited (Petko, et al., 2015).

While the evidence shows there are academic and cognitive benefits, as well as more enjoyment for students using technological applications in their learning (Núñez Castellar et al., 2015), there may be adverse mental health and physical effects from this regular technology use (Smahel, Wright, & Cernikova, 2015). More specifically, children have voluntarily reported experiencing several physical and mental health problems from typical technology use. Some indicated physical problems reported included headaches, sore eyes, and fatigue, whereas mental health problems included aggression, frustration, and sleep disturbances (Smahel, Wright, & Cernikova, 2015).

1.2 Research Purpose

With consideration to the factors promoting or hindering technology integration in the classroom, I am interested in discovering different teacher perspectives on what “effective” technology integration can look like. I am interested in exploring how meaningful and effective technology use is being assessed and implemented in different classrooms. In particular, the goal of my research is to learn how a sample of teachers define “effective technology integration” and to learn from them how they enact this in practice. Further goals include learning what factors and resources support them in this work, and learning what outcomes they have observed from
1.3 Research Questions

The main research question guiding this study is: How does a sample of teachers define “effective technology integration” and how do they enact this in practice?

Subsidiary questions that will also be addressed include:

1. What range of success criteria are these teachers using for determining that the technology use has been effective?
2. What factors and resources support these teachers in their effort to integrate technology?
3. What challenges do these teachers face and how do they respond to the challenges they confront?
4. What are the observable outcomes and student feedback from technology integration?
5. How do these teachers integrate technology across a range of subject areas?

1.4 Reflexive Positioning Statement

When considering my own experiences as a student, I would categorize most of my elementary school teachers to have followed a more traditionalist approach to learning. I can recall the barriers (such as lack of student motivation, lack of student involvement, and lack of meaningful connections with the subject material) a traditionalist approach can impose on meaningful learning. Additionally, my experience of using technology as an elementary student in the classroom was quite limited (which may be attributed to the novelty and availability of technology during the time I was a student). Today, technology is a part of everyday life. With the abundance of applications and resources that are becoming quite ubiquitous through this generation, I am excited to consider the possible impact to student learning these tools can
facilitate when used in the most effective ways. It is important to acknowledge that my excitement towards technology implementation in the classroom may not be a common attitude shared by other teachers. I must also acknowledge my privilege in being able to access many of these tools and resources, a factor that must be taken into consideration when exploring how technology is being used in classrooms in various neighbourhoods of varying social economic statuses.

1.5 Preview of the Whole MTRP

To respond to the research questions, I will be conducting a qualitative research study using purposeful sampling to interview two teachers about their strategies for effectively integrating technology use in the classroom. In Chapter 2 I review the literature in the areas of technology use, pedagogical approaches to learning, and factors influencing technology integration. Next, in Chapter 3 I elaborate on the research design. In Chapter 4 I report my research findings and discuss their significance in light of the existing research literature, and in Chapter 5 I identify the implications of the research findings for my own teacher identity and practice, and for the educational research community more broadly. I also articulate a series of questions raised by the research findings, and point to areas for future research.
Chapter 2: Literature Review

2.0 Introduction

In this chapter I review the literature in the areas of technology and the classroom. More specifically I review the potential impact of technology use, the significance of technology in schools, and teacher perspectives and experiences with technology. I start by reviewing the literature in the area of technology use and its potential impact for school-aged children in and outside of the classroom. Next, I review research on the significance of technology use in schools and consider the ways schools may respond to rising technology needs. Next I look at themes related to the pedagogical perspectives pertaining to technology, by reviewing the literature in the area of traditionalist and constructivist learning theory. I will also contemplate the implications each perspective demonstrates with regards to technology integration. Finally, I consider teacher skills and attitudes towards technology and their implications for technology integration.

2.1 Impact of Technology Use

According to Presnky (2001), all students within the elementary and secondary school systems can be classified as “Digital Natives”. This reflects the fact that these students were born into a society where technology and digital media is the expected norm. Digital Natives from developed countries have had the exposure and opportunity to explore diverse devices of technology such as computer games, emails, the Internet, cell phones, instant messaging, etc. (Presnky, 2001). One study found that regardless of income status, most students report Internet use at least once daily, with students from higher-income families reporting Internet use several times a day (Greenhow, Walker & Kim, 2009). With consideration to this digital exposure, it is important to consider the potential impact that such a frequency of use may have on children, in
and outside of the classroom.

2.1.1 Cognitive processes.

Prensky (2001b) argues that the heavy technology exposure Digital Natives receive growing up has physically altered their brains and therefore their abilities of cognition. In particular, research in neuroplasticity (the concept that brains are to an extent plastic and can be reorganized), demonstrates that stimulation of various kinds actually changes brain structures and the ways people think (Prensky, 2001b). Therefore, stimulation resulting from technology exposure would also affect brain structures. Additionally, evidence supports the idea that people who undergo different inputs from the culture that surrounds them think differently (Prensky, 2001b). This would mean that today’s students, as Digital Natives, would be having different input experiences than other generations, specifically active exposure to technology, which in turn would uniquely shape their thought processes. Therefore, it logically would follow to make the statement that children that were raised with digital devices think differently from Digital Immigrants (Prensky, 2001b).

Due to the frequency of technology use among Digital Natives, young individuals are assumed to be adept in parallel processing (simultaneously processing different incoming stimuli) and multitasking (completing different tasks simultaneously) (Prensky, 2001). Research studies concerned with video game technology argue that video game players demonstrate greater cognitive abilities, such as attention, visual short-term memory, and executive control (i.e. shifting attention and multitasking) (Bavelier, Green, Pouget & Schrater, 2012; Boot, Kramer, Simons, Fabiani, & Gratton, 2008; Núñez Castellar, All, de Marez, & Van Looy, 2015). However, these improved cognitive functions may not translate for users of technological devices other than video games.
As consumers of digital media, we are often engaged with several “applications” and devices at one time. One particular study compared heavy media multitaskers with light media multitaskers (determined by the number of media forms being engaged with in a single period of time), and found cognitive deficits for heavy media multitaskers, as they are more susceptible to interference from irrelevant environmental stimuli and from irrelevant representations in memory (Ophir, Nass & Wagner, 2009). Therefore, while cognitive advantages may occur in relation to the use of a particular technological device, switching between many devices at once could become a hindrance to cognitive performance (Ophir, Nass & Wagner, 2009).

2.1.2 Psychological, emotional, and social aspects of technology use.

With such excessive exposure to digital media, and specifically within the last decade, social media, we must explore the potential impact technology use and overuse will have on children’s psychological, emotional, and social well-being. Technology overuse and Internet addiction has been linked to emotional instability, depression, loneliness, anxiety, and impulsivity (Augner and Hacker 2012; Ha, Yoo, Cho, Chin, Shin, & Kim, 2006; Lee et al, 2008). With regards to social skills, Internet over usage is associated positively with poorer interpersonal skills, poorer family interactions, poorer quality of life, and a greater tolerance for violence (Koo, Wati, & Jung, 2009; Wei, 2007).

While high Internet use and technology overuse in general have negative associations, we must also take a look at the impact average technology use may have on children. Smahel, Wright, & Cernikova (2015) found that without indicating Internet addiction or overuse, children reported cognitive salience experiences (such as sexual or gory images remaining in their head), experiencing aggressive behaviours (including the use of aggressive language), and sleeping problems, such as nightmares after playing violent games or watching bad movies. Therefore it is
important to consider the online content explored by children, as not only technology over usage may have negative impacts on mental health (Smahel, Wright, & Cernikova, 2015).

Additionally, exposure to the social networking aspects of digital media (through average technology use and overuse) may put children at risk of cyberspace bullying. Cyber bullying describes repeated acts of aggression carried out over digital devices, typically through platforms such as social media, blogs and text messages (Teng, 2015). Students that are cyber bullied may seem more anxious, insecure and may lack social skills or have no support network (Waddell, 2007).

In contrast, research studies have also found technology use to be associated with feeling increased social support, social affinity, positive emotions, and positive attitudes toward school (Lee et al, 2008; Koo et al, 2011). Specifically, the literature indicates that effective use of technology in classrooms can lead to greater student intellectual and social engagement (Gebre, Saroyan, & Bracewell, 2014). Sawang, O’Connor, & Ali (2017) found that the use of an interactive student response software was directly related to the level of student engagement, especially with introverted students experiencing more engagement in class. Therefore, the use of technology can be linked to both positive and negative impacts for students using digital devices in and outside of the classroom.

2.2 The Significance of Technology in Schools

With the many pros and cons associated with technology use, it is clear that technology has become a part of everyday life in this digital age. As advancements in technology have been made, the intent for digital adoption into schools has noticeably increased. The means schools and school boards have taken for digital adoption will be discussed below.
2.2.1 21st century learning.

Digital literacies, which include information literacy (the ability to assess and evaluate information), media literacy (the ability to analyze and create media products), and information and communication technology literacy (the ability to apply technology effectively), are playing an increasingly important role in learning (Chen, Gallagher-Mackay & Kidder, 2014). There is a current movement to incorporate new technologies, such as mobile applications and educational games, with effective teaching methods to generate positive outcomes for student learning (Chen, Gallagher-Mackay & Kidder, 2014).

The range of available technology and digital programs is quite extensive. Use of computers are implemented, although computers may take the form of desktops, laptops, notebooks, or tablets (Ramey, 2012). Through these computers, word processing and internet browsers are accessible (Ramey, 2012). Furthermore, various applications can be accessed through these devices. Applications may include educational games, online quiz generators, anonymous student participation platforms, design programs, and subject-specific software (Ramey, 2012). Mobile phones, as well as student’s own devices, may be utilized in the classroom (Chen, Gallagher-Mackay & Kidder, 2014; Ramey, 2012) as additional channels to the above mentioned applications. Additionally, smart interactive white boards are typically used in classrooms. Using a projector, the interactive whiteboard displays visual images that would otherwise be viewed on a computer screen, and allows users to draw, write, or manipulate images on the screen (Ramey, 2012).

With the many programs and technologies available for use in the 21st century classroom, the extent to which these technologies can be used can vary greatly. Puentedura (2012) has devised the “SAMR Model” (Figure 1) as a hierarchy to demonstrate the scope of technology
use in the classroom and how it might impact teaching and learning (SMART Model, n.d.). The foundation of the SAMR Model is the “Substitution” Level. At this level, technology is only being used as a substitution for traditional classroom tasks (Puentedura, 2012). For example, any task with technology that does not offer significant functional change in teaching and learning, such as students printing out a worksheet to complete and hand in (SAMR Model, n.d.) is consider substitution. Above substitution is the “Augmentation” level, where technology offers some functional benefit over traditional tasks (SMART Model, n.d.). With the example of the paper quiz, an augmentation would involve using an application (e.g. Google Form) to complete an online version of the quiz (SMART Model). Moving up the model, “Modification” is the next level, which includes significant functional change and enhancement of traditional classroom tasks (SAMR Model, n.d.). For example, students may be able to integrate word documents with visual images and videos, as well as audio recordings and background music (SAMR Model, n.d.). Finally, at the top of the model is the “Redefinition” Level (SAMR Model, n.d.). In this level, the technology allows for new tasks that were previously inconceivable (SAMR Model, n.d.). This model demonstrates a hierarchy of change that 21st century learning has made possible. It poses a challenge for educators to consider the purpose of technology use in the classroom, as well as the desired direction for effective technology integration in the classroom.
The 21st century classroom also includes the use of assistive technology. Students with exceptionalities, including motor limitations, visual impairments, limited verbal speech, or extreme cognitive delays, legally have the right to access the general curriculum (Pugach & Warger, 2001). For many students with exceptionalities, adaptations using technology devices and services to support learning are exercised to provide access to the general curriculum (Coleman, Cramer, Park, & Bell, 2015). Assistive technology can range from simple, inexpensive, non-electronic devices, to battery-operated tools, to computerized software (Coleman et al, 2015). Cloud and Web-based software, mobile devices, and apps are increasingly being utilized in classrooms (Schaffhauser, 2013). For example, schools using Google Apps for Education, Read&Write for Google Docs is a free tool embedded in the Google Chrome browser that reads documents aloud and provides access to a text or picture dictionary (Schaffhauser, 2013). This can support students struggling with reading and comprehension difficulties, as well as with visual impairments (e.g., text is read aloud). In particular, Conway & Amberson (2011) found laptop-enhanced literacy learning that allowed for independent and flexible support for...
individualized needs provided significant agency and learning opportunities for students with literacy difficulties. Assistive technology also exists to support students with visual impairments and motor difficulties in accessing the music curriculum and visual arts curriculum (Coleman et al, 2015; Rush, 2015). This range of existing assistive technologies provides support for students of all levels and abilities in reaching their learning goals.

### 2.2.2 Curriculum expectations.

On a curriculum level, the need to incorporate technology into lessons and evaluations is very much reflected. The Ontario Ministry of Education’s revised Language Curriculum document (2006), specifically identifies “Media Literacy” as one of the strands of expectations for each grade. The Ministry document (2006) further explains the concept of “Media Literacy” as:

…the result of study of the art and messaging of various forms of media texts. Media texts can be understood to include any work, object, or event that communicates meaning to an audience. Most media texts use words, graphics, sounds, and/or images, in print, oral, visual, or electronic form, to communicate information and ideas to their audience.

Whereas traditional literacy may be seen to focus primarily on the understanding of the word, media literacy focuses on the construction of meaning through the combination of several media “languages” – images, sounds, graphics, and words (p. 13).

Media literacy promotes the exploration of films, video games, songs, magazines, websites, etc. (Ontario Ministry of Education, 2006). The curriculum document acknowledges that digital media is ubiquitous, and the messages they convey, both overt and implied, can have a significant influence on students’ lives (Ontario Ministry of Education, 2006). The curriculum therefore not only expects schools to provide exposure to digital media, but also expects students
to develop critical thinking skills as it applies to media products and messages (Ontario Ministry of Education, 2006). The curriculum also reflects that it is ultimately the responsibility of the schools to have the necessary technology readily available for student use so that they may meet these curriculum expectations (Ontario Ministry of Education, 2006).

2.2.3 Funding and support.

In order to provide the access to digital media, as per the curriculum requires, schools will need to provide students with the opportunity to use the school’s available technology. However, if a school does not possess the necessary technology, then technology integration cannot take place in the classroom. Funding support has been identified as one of the main crucial factors affecting successful digital media adoption in the classrooms (Petko, Egger, Cantieni, & Wespi, 2015). Petko et al. (2015) found that although teachers’ self-motivation and support of colleagues were predictive factors of successful media adoption, the effect of technology integration was negated with a lack of funding to support the acquisition of technology into the classroom.

Additional supportive factors to successful digital media adoption identified in this particular study (Petko et al, 2015) were support from the head of the school and from the administration. Essentially, having the head of the school support teachers in participating in Professional Development courses and workshops related to technology integration positively impacted teachers’ self-motivation. Additionally, having administrative support to advocate and organize the need for school board funding positively impacted digital media adoption in the classrooms (Petko, Egger, Cantieni, & Wespi, 2015). Therefore there is a need for teachers to be involved in continuous Professional Development with regards to technology throughout their career to provide the best opportunity for students to engage with digital media within the
classroom. While this need must be strongly supported by school boards and the head of a
school, there is an important consideration of the teacher’s self-motivation with regards to digital
media use and how the teacher will choose to approach technology integration on an individual
level.

2.3 Teacher Influence on Integration of Technology Into the Classroom

After considering the significant need for technology in the schools and the factors that
support its availability to students, arguably the most influential consideration to how available
technology will be integrated into the classroom environment is determined by the individual
teacher of a classroom. An individual teacher’s specific pedagogical perspective, skill level with
technology, and attitudes towards technology are important factors that influence effective
technology integration within the classroom.

2.3.1 Pedagogical perspectives (traditionalist learning theory vs. constructivist learning
theory).

The traditional approach to learning (which will also be referred to as the Traditionalist
Learning Theory) possesses a focus on a teacher-centred learning experience. The teacher is
essentially considered to be the provider of all necessary knowledge, leaving little motivation for
student inquiry (or much involvement on the student’s part at all (Stofflett, 1998). The
Traditionalist Learning Theory approach also assumes that all students will receive the
information in the same way at a similar pace (Lord, 1999).

A teacher that possesses a traditional perspective towards learning believes that students
can only learn from the teacher. Therefore when technology becomes a part of the equation, the
assumption under Traditionalist Learning Theory is that students will learn from technology
(Jonassen, 2000). To further articulate this concept, consider a traditionalist teacher that would
have lectured the class using a chalkboard to provide notes. With new technology available in the classroom, this teacher would lecture the class in the same way, but would now use a smart board in place of a chalkboard. This teacher is still the provider of knowledge and the students are essentially uninvolved with the content of the lesson.

In contrast to the Traditionalist Learning Theory is the emerging shift towards a Constructivist Learning Theory. This pedagogical approach is student-centred and focuses on student discoveries to facilitate learning (Yager, 1991). This approach relies on the teacher providing students with the tools and guidance so that students may discover one or more solutions for a given task/activity. Students of varying skill levels work together as the teacher provides assistance in developing new ideas and connecting these discoveries with previous knowledge (VAST, 1998).

A teacher that possess a pedagogical perspective adhering to the Constructivist Learning Theory will believe that learning with technology supports thinking in meaningful ways (Jonassen, 2000). For instance, a teacher with a constructivist approach will have students use the technology as a tool to solve complex problems. As a traditionalist teacher would use the Smart Board TM as a static screen, the constructivist teacher would invite students to interact with the smart board themselves and physically engage with the contents on the screen.

Jonassen (1996) created three categories in which students interact with technology: learning about technology (technology as a subject), learning from technology (technology as a delivery tool) and learning with technology (technology as a cognitive partner). Therefore, Traditionalist Learning Theory views technology as a delivery tool, whereas Constructivist Learning Theory views technology as a cognitive partner.

While both teaching perspectives can lead to successful learning, the constructivist
approach has shown more enthusiasm and interest in subject material from students, whereas teacher-centered lessons can be less productive and sometimes ineffective in the learning process (Zoller, 2000). Consistent with these findings, Jonassen and Reeves (1996), argue that technology is best used when approached under the Constructivist Learning Theory when students use it as a cognitive partner to make their own interpretations of information and represent the new knowledge to others.

Therefore, the research supports the idea that a traditionalist approach to technology is not the most effective approach to learning. Teachers that possess a traditional pedagogical perspective are not integrating technology consistently as a teaching and learning tool (Bauer & Kenton, 2005). Research has supported the finding that many teachers are not implementing digital media in a way that supports meaningful student outcomes (Keengwe, Onchwari, & Wachira, 2008). It will be important to explore the ways in which teachers are supporting the Constructivist Learning Theory as it applies to technology.

2.3.2 Skills in technology.

In addition to a teacher’s pedagogical perspective, a teacher’s actual skill level in technology will be a great influencing factor in how digital media will be adopted into the classroom (Hermans, Tondeur, van Braak, & Valke, 2008). Teachers will need to acquire a certain level of technological knowledge in order to effectively integrate such technology into the classroom (Chai, Koh, & Tsai, 2013). Extensive professional development and additional workshops (Lawless & Pellegrino, 2007) may be required for teachers to be better prepared to use digital media in meaningful ways to promote successful learning for students. A teacher’s motivation for acquiring new computer skills will be reflected by the teacher’s personal attitudes towards technology (Aldunate & Nussbaum, 2013).
2.3.3 Attitudes towards technology.

Along with pedagogical perspectives towards technology and skill level in technology, a powerful indicator of effective technology implementation is a teacher’s personal attitude towards technology (Hermans, Tondeur, van Braak, & Valke, 2008). For instance, perceived usefulness of technology, perceived ease of use of technology, perceived subjective norms regarding use of technology, and facilitating conditions to use technology, affected pre-service teacher’s computer attitudes (Teo, Lee & Chai, 2008). As mentioned in 2.3.2 Skills in Technology, this attitude may fuel a teacher’s willingness for future technology training and professional development sessions concerned with digital media adoption (Aldunate & Nussbaum, 2013). Additional variables in attitude such as teachers’ general dispositions and openness to change also predicted classroom technology use (Fordham & Vannatta, 2004). While skills in technology can be actively improved, internal factors, such as personality and personal attitudes, can become difficult to overcome during the acquisition of greater technology skills. It will be important to consider teacher motivation as well as skill level to better understand the specific approaches and methods practiced in a classroom.

2.4 Conclusion

In this literature review I looked at research the potential impact of technology use, the significance of technology in schools, and teacher perspectives and experiences with technology. This review elucidates the extent that attention has been paid to the influencing factors surrounding meaningful integration of technology into the classrooms. It also raises questions about the disconnect between the research supported theories regarding technology integration and the actual practice of these theories. While research has shown over time that more and more teachers are successfully integrating technology in a way congruent to the literature, there are still many teachers ineffectively engaging with digital media. This review points to the need for
further research in obtaining detailed classroom practices with regards to technology integration and the need for further understanding of teacher reasoning behind chosen methods of integration. In light of this, the purpose of my research is to learn how a sample of teachers define “effective technology integration” and to learn from them how they enact this in practice so that a better understanding of the specific factors and resources that support meaningful learning with digital media can be achieved.
Chapter 3: Research Methodology

3.0 Introduction

In this chapter I describe the research methodology for this study. I begin by reviewing the general approach, procedures, and data collection instruments, before elaborating more specifically on participant sampling and recruitment. I explain the data analysis procedures and review the ethical considerations relevant to my study. Furthermore, I identify a range of methodological limitations, but also speak to the strengths of the methodology. Finally, I conclude the chapter with a brief summary of the key methodological decisions and provide my rationale for these decisions given the research purpose and questions.

3.1 Research Approach and Procedures

This research study will be conducted using a qualitative research approach involving an in-depth examination of the existing literature relevant to the study, as well as semi-structured interviews with three elementary school teachers. Qualitative research provides a different perspective towards study findings than the findings typically associated with quantitative research (Creswell & Miller, 2000). In quantitative research, the main concern is with the specific inferences that can be made from concrete and observable data collected through experimental design (Creswell & Miller, 2000). In contrast, qualitative research is mainly concerned with the views and experiences of the people involved in the specific research study (Creswell & Miller, 2000). There is great value in the qualitative approach, as it not only provides the answers to the researcher’s questions, but also expresses the participants’ feelings, perceptions, experiences, and thoughts about the question (Ivey, 2012). Essentially, qualitative research obtains this insight through from the lived experiences of participants. Ivey (2012) argues that this approach preserves the context for the data, while a quantitative approach would
not provide such insight.

In addition to the great insight provided through the perspectives of participants involved in the study, a qualitative study also considers the perspective of the researcher via researcher reflexivity. Researcher reflexivity is a factor unique to qualitative studies in that it allows the researcher to self-disclose their own assumptions and biases that may pertain to the interpretation of the research study (Creswell & Miller, 2000). An inclusion of researcher reflexivity provides readers the opportunity to reflect on the social, cultural, and historical forces that shape the findings of the study (Creswell & Miller, 2000). My perspective as a Digital Native personally invested in the general exploration of technology will be considered when assessing my findings. My personal lens also provides a reflection on society’s growing dependence on technology as a cognitive tool (Jonassen & Reeves, 1996).

Qualitative approaches have been effectively applied in many practice-based fields, including education, psychology, and medicine (Creswell, Hanson, Clark Plano, & Morales, 2007; Ivey, 2012). Leeman and Sandelowski (2012) suggest that to successfully implement best practices, the social context and interactions of the participants must be understood to facilitate appropriate adaptations. I am mainly interested in the lived experiences of teachers using technology effectively in the classroom, as well as the specific factors that support or challenge the success of technology integration. It is my hope that by interviewing elementary school teachers with a demonstrated interest in technology, I can discover the best practices that support successful technology use in the classroom, so that successful methods may be adapted and/or replicated in future classrooms.
3.2 Instruments of Data Collection

The primary instrument for data collection used in this study is the semi-structured interview protocol. It is a qualitative approach using particular and descriptive questions to develop an in-depth understanding about how different cases can provide insight into a unique case (Creswell, Hanson, Clark Plano, & Morales, 2007; Yin, 2003). Given the identified research questions of the presented study, it is evident that I am curious about the specific case of effective technology and digital media integration. I wish to obtain the insight behind successful integration methods being currently used in classrooms. I want to learn from different individual teacher experiences to learn what specific factors can support successful integration. Therefore, the use of a semi-structured interview conducted with two different elementary school teachers is an effective instrument to obtain the desired data.

A semi-structured format allows for the interviewer to design and plan an interview relevant to their research focus and questions, while leaving room for participants to elaborate and even re-direct attention to areas previously unanticipated or unaccounted by the interviewer (DiCicco-Bloom & Crabtree, 2006). I have organized my protocol (located in Appendix B) into four sections, beginning with the teacher’s background information, the teacher’s beliefs regarding effective technology, the teacher’s demonstrated practices involving technology use within the classroom, and concluding with the teacher’s self-identified support and challenges concerning the successful integration of technology and digital media into the classroom environment. Examples of questions include:

- What does ‘technology integration’ mean to you? What are some key characteristics of technology integration in teaching?
- What subject areas have you used technology to teach a lesson?
What factors support you in your capacity to effectively integrate technology into teaching?

3.3 Participants

Here I review the sampling criteria I established for participant recruitment, and I review a range of possible avenues for teacher recruitment. I also include a section wherein I introduce each of the participants partaking in the presented study.

3.3.1 Sampling criteria.

The following criteria will be applied to teacher participants:

- Teachers will have at least three years of teaching experience.
- Teachers will have demonstrated some degree of expertise in the area of technology/an area related to technology.
- Each teacher will have some level of access to technology and/or digital devices to be used in the classroom.
- Participating teachers will teach in schools across a range of student demographics (e.g. ethno-cultural identities, socio-economic status).

In order to address my research questions, it is important that teacher participants have at least three years of experience. This indicates a degree of dedication to their career, as well as enough time and lived experiences to shape their present methodology. Teachers with some level of expertise in an area relevant to technology, whether through an academic focus within their educational background, a professional development course, workshop, etc, demonstrate a degree of motivation to be better skilled in technology, and according to the literature, are more
likely to effectively integrate technology into the classroom (Hermans, Tondeur, van Braak, & Valke, 2008; Chai, Koh, & Tsai, 2013). Additionally, teachers need some level of access to technology and digital devices in order to use it in the classroom, effectively or not. Therefore, it is important to only consider teachers with access to technology to obtain their lived experiences from incorporating the resources available to them.

Finally, it is interesting to consider teacher experiences reflective of differing schools and neighbourhoods in terms of socio-economic status. Lower-income schools have less funding for digital devices. Similarly, lower-income families may also have less access to digital devices. The factors of novelty and lack of familiarity with technology and certain digital devices may pose challenges to the effective technology integration. It is valuable to explore how such factors might inhibit or support learning experiences for students, as well as how teachers may be able to override these challenges, should they exist.

3.3.2 Sampling procedures.

Whereas quantitative approaches rely on random sampling and large participant numbers, this method would not provide the deep understanding of individual human experiences desired for a qualitative study (Marshall, 1996). A small sample size is effective under a qualitative approach, as generalizability is not the goal of the research study (Marshall, 1996). Furthermore, the qualitative approach recognizes that some individuals will have richer and more relevant experiences than others (Marshall, 1996). It is important to acquire these “richer” informants in order to obtain the richer insight related to the interview question.

There are different sampling strategies to consider when conducting a qualitative study: theoretical sampling, purposeful sampling, and convenience sampling (Marshall, 1996).
Theoretical sampling relies on the creation of theories from the existing literature to drive sample selection, as a means to further elaborate on the created theories (Marshall, 1996). This strategy does not apply to my main research purposes and is not utilized for the presented study.

Purposeful sampling requires the researcher to seek out the most beneficial sample relevant to the main research question (Marshall, 1996). This strategy provides the opportunity for the researcher to consider influencing variables (e.g., age, gender, social class) that may provide more interesting and dynamic insights within the context of the research study (Marshall, 1996). It is ideal to recruit all of my participants through the use of purposeful sampling, as I will be able to assure better responses to provide greater insight into my research questions.

I have made good use of the network of teachers I have built over the years through volunteer and paid positions within different school boards, as well as professional connections made this year through practicum placements, to consider which teachers would be best suited as participants for my study. I have reached out to my desired participants, provided them with an overview of my research study, and asked if they would be willing to participate in my study. When introducing my study to prospective participants, I ensured that teachers did not feel obligated or pressured to participate, but volunteered willingly. As I am relying on my already existing (but growing) professional network of teachers, I am in a way relying on convenience sampling, which involves the selection of the most accessible participants (Marshall, 1996). However, I feel that my network is extensive enough that I am reaching out purposefully to those best suited for my study.

3.3.3 Participant biographies.

Both participants of the present study are currently working teachers in the Greater Toronto Area, Canada. They are both certified teachers at publicly funded Ontario schools, each
with at least three years of experience in the classroom, and working with a dedicated focus in effective technology integration. The participants will remain anonymous through pseudonyms.

Amelia

Amelia is currently an intermediate/senior teacher fulfilling a Long-Term Occasional position for a school board. She has been teaching for over 3 years and has primarily filled Long-Term Occasional positions. She has experience teaching students from kindergarten to Grade 8, but is particularly interested in teaching Grades 7 and 8. Due to the nature of taking on Long-Term Occasional Positions, she has experienced a range of demographics with regards to school communities. She had attended a specialized STEM: Science, Technology, Engineering, and Mathematics teacher’s college, and from that tech-based training, she has developed a passion for integrating technology into the classroom. Following teacher’s college, she has taken various professional development courses and in-services related to technology in the classroom.

Harley

Harley currently runs a tech-based cross-curricular classroom for a variety of grades and subjects for different periods of each day of the week. The grades and subjects he teaches include Kindergarten, a group of Grade 4/5 students, as well as STEAM (Science, Technology, Engineering, Art, and Math) classes. He has been teaching full-time with his board for over ten years. At his school, Harley is the allocated person of responsibility with regards to technology integration in the school. Harley teaches at a model school that receives a fair amount of funding and high allocation of resources, due to the low income of families in the school community. This funding has provided Harley’s school, and his classroom specifically, with a large range of technological devices and available platforms.
3.4 Data Analysis

The overall intent of qualitative data collection is to develop an in-depth understanding of each participant in the context of his or her individual experiences (Creswell, Hanson, Clark Plano, & Morales, 2007). The interviews of my semi-structured interviews (the data) with each participant have been transcribed for a more efficient method of analysis. I have examined the data using my research questions as an interpretive tool. After looking at each transcript individually, I have identified a few key categories or themes. These themes are not used for generalizing the data, but to better understand the over-arching complexity of the data (Creswell, Hanson, Clark Plano, & Morales, 2007; Yin, 2003). I have further looked for themes within identified categories and continued to synthesize themes where appropriate.

After categories and themes have been identified, the interpretation of the data was the next stage of analysis. This is where I had applied the meaning to the findings within the context of the existing literature pertaining to the main research questions. As I analyzed identified categories of frequent themes and discrepancies in the findings, I also recognized the null data of what participating teachers did not speak to, as I explored the significance of all findings. At this stage of analysis, it is necessary to consider how the study’s findings build upon or contest the existing theories, which offers a degree of theoretical significance of the research study (Tracy, 2010).

3.5 Ethical Review Procedures

Tracy (2010) states that a variety of practices will contribute to ethics in qualitative research, including procedural, situational, relational, and exiting ethics. Procedural ethics refers to ethical actions dictated as universally necessary, including mandates such as do no harm,
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avoid deception, negotiate informed consent, and ensure privacy and confidentiality (Sales & Folkman, 2000). Situational ethics refers to the inclusion of ethical practices and actions that arise through reason and context and suggests that ethical decisions should be based on particularities of a situation (Tracy, 2012). Relational ethics refers to a mindfulness of a researcher’s characters, actions, and consequences on others, while recognizing and valuing mutual respect and dignity of participating parties (Tracy, 2012). Finally, exiting ethics refers to the considerations beyond data collection and to how researchers conclude a study and share the results (Tracy, 2012).

To account for the above and necessary ethical actions, participants were provided with informed consent and asked to sign a consent letter (Appendix A) giving their consent to be interviewed as well as audio-recorded. This consent letter provided an overview of the study, addressed ethical implications, and specified expectations of participation (one 45-60 minute semi-structured interview). Additionally, privacy and confidentiality was ensured as all participants were assigned a pseudonym and participants’ identities remained confidential (i.e., any identifying markers related to their schools or students were excluded). Also, all data (audio recordings) was stored on my password-protected computer and phone and will be destroyed after 5 years.

There are no known risks (mental or physical health risks) associated with participating in my research study. However, participants may experience fatigue from participating in an hour-long interview. Participants were notified that breaks may be taken as needed. Additionally, there was a chance that questions asked during the interview may trigger uncomfortable or unpleasant memories for the participating teacher. Participants were then re-assured throughout the interview, as well as in the consent letter, that they had the right to refrain from answering
any question that they did not feel comfortable with. Furthermore, participants were notified and reminded of their right to withdraw from participation in the study at any stage of the research study before commencing the semi-structured interview. In case of any lingering feelings of discomfort or uncertainty regarding a participant’s specific response, participants were given the opportunity to review the transcripts and to clarify or retract any statements before I conducted data analysis.

3.6 Methodological Limitations and Strengths

Given the ethical parameters this study is approved for, the MTRP can only involve interviews with teachers, and consequently it is not possible to interview students or parents, or to conduct surveys or classroom observations. This can limit the scope of the research findings, as I was only able to consider one type of source material. Yin (2003) recommends the use of multiple information sources/types of information (e.g., interviews, direct observations, physical artefacts). Unfortunately, I was only able to partake in one type of information (interviews). Fortunately, I was able to consider more than one source of information (multiple teachers), which allowed for different personal experiences and perspectives at the very least.

An additional limitation to this study remains the inability to generalize findings to the general public, due to a small sample size (Marshall, 1996). However, this inversely relates to a fundamental strength of this study: the ability to develop an in-depth understanding of a complex issue. This study has the strength of transferability, as the findings speak to other contexts and settings through the extension or disconfirmation of existing theories in the literature (Marshall, 1996). The study design allows for the exploration of rich content, and the small sample size allows more time for attention to detail during the coding stage of analysis. Quantitative studies typically use fixed response surveys as instruments for data collection (Marshall, 1996), which
would not provide the high level of detail obtained from semi-structured interviews.

Another strength of the semi-structured interview is that it also creates a space for teachers to speak about subjects they are dedicated and passionate about, in a safe and relatively risk-free method (Tracy, 2012). In this way, interviews can validate the teacher experience and become an opportunity to make meaning from lived experiences. Interviews also provide a channel and opportunity for teachers to reflect on their perspectives and practices. The interview may aide teachers in conceptualizing particular topics with regards to both theory and practice.

3.7 Conclusion

In this chapter I explained the research methodology. I began with a discussion of the research approach and procedure, exploring the meaning and significance of qualitative research and attending to its major differences from quantitative research. I then described the instruments of data collection, identifying semi-structured interviews as the primary source of data, due to their flexible nature of incorporating both planned interview questions and opportunities for open discussion relevant to the research topic. I also spoke to some of the benefits of semi-structured interviews. I then identified the participant criteria desired for the study, listing the applied criteria during interviewee selection. I also described different recruitment procedures, including purposeful sampling, which was utilized, in order to maximize the richness and depth of data obtained, as well as convenience sampling, which was also implemented due to the overall extent and scope of the research study. I also provided a small biography of the participating interviewees. I proceeded to describe that the analysis of the data would include examining individual interviews before looking for common patterns and themes across the data. Ethical issues such as consent, risks of participation, right to withdraw, and data storage were also considered, and ways to address these potential issues were recognized. Lastly, I discussed the
methodological limitations (such as limited scope of the study due to restricted ethical
parameters) and strengths of the study (such as the rich details obtained from teachers will
provide great insight within the context of the existing research literature). In the next chapter, I
report on the findings of the research.
Chapter 4: Research Findings

4.0 Introduction

In this chapter, I explore the data I collected through two face-to-face semi-structured interviews with educators that have demonstrated a commitment to effective technology integration in the classroom. The purpose for conducting these interviews was to gain the insight of teacher perspectives on effective technology integration and to learn from how they enact those perspectives in their own teaching practices. Specifically, the main research question guiding these interview questions was: How does a sample of teachers define “effective technology integration” and how do they enact this in practice?

In the discussion connections are made between participants’ experiences and the research findings explored the Chapter 2 literature review. Findings are organized in the following five main themes:

1. Teachers mainly integrated technology within the classroom for curricular, communicative, and assistive needs.

2. Teachers indicated that student-directed learning was a key success criterion for the effective integration of educational technology.

3. Teachers indicated that motivation to effectively integrate technology and access resources within a school supports the quality of technology use within the classroom.

4. Teachers who integrate technology in the classroom face challenges obtaining resources and finding effective strategies to use those resources.

5. Teachers indicated effective technology integration produced positive intrapersonal and
interpersonal student outcomes in academic and non-academic domains.

Each theme consists of sub-themes that further clarify how each theme is applied in the classroom setting according to participants’ experiences. For each theme, I will first describe it, then report on the data, and finally discuss the significance of each theme within the context of the existing literature. Finally, I summarize my findings and make recommendations for next steps.

4.1 Teachers Mainly Integrated Technology Within the Classroom for Curricular, Communicative, and Assistive Needs

Both Amelia and Harley used various digital devices and applications to integrate technology across a range of subjects. This theme explores some of the current teacher practices of technology integration in the classroom. This section mainly explores popular devices and applications being used, as well as the core purposes of the technology being implemented. This will provide some insight when later exploring participants’ perspectives on what makes technology integration particularly effective in a classroom. Participants explained subject specific needs and general assistive needs of technology, as well as how technology is used to apply 21st century learning in the classroom.

4.1.1 Subject-specific software is accessed to produce interactive learning experiences, which make content knowledge more accessible to students.

Amelia described using specific websites and programs in the classroom to bring lessons to life. She explained that her students find learning from a textbook to be quite challenging, so the use of subject-specific programs can help to bring focus to the necessary content knowledge in more interesting (and therefore more attainable) ways for the students. SpongeLab is one of
the websites she has used for this purpose. She explained, “Students can come to the board and actually put, you know, organs in the body and there’s like links to explain the organs, so things are very interactive.” Amelia stressed that the interactivity and explorative nature of SpongeLab are the main qualities she looks for when selecting programs to use in the classroom, as those qualities are the most conducive for meaningful learning. Amelia’s experiences using interactive websites and programs in the classroom fall in line with Constructivist Learning Theory, which promotes the belief that having students interact with technology and engage directly with content knowledge will support students’ thinking in meaningful ways (Jonassen, 2000).

Constructivist Learning Theory perceives technology as a cognitive partner, where students learn with the technology (Jonassen, 1996). Amelia’s use of SpongeLab demonstrates how students can obtain greater meaning from lessons where they are learning with technology.

4.1.2 General technology applications and specific assistive tech tools are accessed as needed across subjects to assist students in meeting their learning goals.

Both participants strongly believe in the use of assistive technology to support students in overcoming learning obstacles. Amelia recognized the value of using technology as a tool to meet learning goals. She expressed how even the basic tool of spell check can really make a difference for students with reading and writing difficulties. She explains that these tools allow the struggling students the opportunity to express their thoughts and meet the task demands of assignments.

Harley also acknowledged his fondness for using technology for assistive purposes across all subjects. He described how general classroom task demands can be interpreted through the lens of technology to make the learning objectives more accessible to students with exceptionalities. For example, instead of having a student use pencil and paper to write what they
know about life in Ancient Egypt, students can cut together a video where they demonstrate this knowledge. Harley explains,

And they might not able to even perform a tripod pencil grasp on a pencil, but they can do that [cut together a video on iMovie], because poking with one finger on a keyboard as a gross motor movement is a heck of a lot easier to do than the fine motor movement you need to hold a pencil.

Amelia and Harley’s experiences of utilizing assistive components of technology reflects the research focused on assistive technology. Research findings have demonstrated the benefits of assistive technology when used by students with exceptionalities (Coleman et al, 2015; Conway & Amberson, 2011; Rush, 2015; Schaffhauser, 2013). Amelia specifically spoke to the support for literacy accommodations with the available spelling and grammar software. The use of technology to support literacy demands is a widely accepted accommodation for students with literacy difficulties (Schaffhauser, 2013). Harley’s encounters with students experiencing motor difficulties reflects the needs for tools and software to provide physical accommodations to access the curriculum (Rush, 2015). Both Amelia and Harley’s experiences highlight the ability for assistive technology to make the general curriculum more accessible for all students (Coleman et al, 2015).

4.1.3 General technology applications and software are utilized across subjects to apply learning objectives and experiences into the 21st century.

Both participants recognized an open-use of technology within the classroom which reflects learning in the 21st century. Amelia frequently mentioned the use of Google applications within the classroom and the constant use of the Google search engine to discover answers to
student inquiries. Amelia also mentioned the use of Desire2Learn, an e-learning portfolio that is currently being used throughout the school board. Desire2Learn can also be used for communicating classroom messages (e.g. important dates coming up, homework for the day) to parents. Amelia described using Desire2Learn as a literacy blog with her students. She explained, “Whatever you read and that’s interesting to you, you can talk about it, post it on D2L, get other people to talk about it.” Here, she is able to create and utilize an online network for students to engage in thoughtful discussion about topics of interest amongst each other electronically.

Harley also gave many details regarding the available technologies frequently being used in his classroom. Use of Google applications, as well as video filming and editing, were quite popular for many classroom tasks. In particular, Harley mentioned one project where his classroom collaborated with another classroom across the globe. The two groups met via Skype, where the students had the opportunity to see and speak with students from another country. Harley also noted the use of the application “Seesaw”, which is an online learning portfolio that is used to document student progress, while also creating a platform for communication between students. He explained,

They’re able to really actively reflect on their stuff that they’re doing. They also post video reflections, kind of like on Survivor. And because we got these online learning portfolios, they’re also able to communicate with their parents. And because my learning portfolios traverse years, they’re able to look back at stuff they did four years ago in my class.

Here, Harley has created a digital space that extends learning experiences outside of the classroom. This electronic access allows monumental learning moments to become documented
and available for students and parents to look back upon as desired. Students may communicate online with each other to extend discussions and/or post reflections of these learning experiences through this digital space.

Both participants have created a classroom environment where technology has seamlessly become integrated with most learning experiences with online portfolios and digital documentation of student learning. The skills required to access and participate in these online activities reflect levels of comprehension in digital literacy, media literacy, and information and communication technology literacy (Chen, Gallagher-Mackay & Kidder, 2014). These classroom tasks developed by Amelia and Harley tap into these tech-based/digital learning skills that students will need to develop as Digital Natives in the 21st century.

Additionally, both Amelia and Harley have redefined classroom activities through their online portfolios. Without the use of the technology to document and broadcast moments of learning, these experiences may have gone under the radar for teachers and parents. Both participants have reached the “Redefinition” level of the SAMR Model (Puentedura, 2012) as they were able to create tasks dependent on the technology that allows for more connected deeper learning opportunities. While Harley and Amelia have been integrating technology through such effective practices, the literature finds that many teachers are not implanting technology in a way that supports meaningful outcomes (Keengwe, Onchwari, & Wachira, 2008).

4.2 Teachers Indicated That Student-Directed Learning Was a Key Success Criterion for the Effective Integration of Educational Technology

Both participants expressed student-directed (or student-centred) learning as a key
indicator of effective technology integration in the classroom. This theme explored the different ways student-directed learning had produced positive learning experiences for students. This section examines how participants conceptualized effective technology integration in the classroom and how they were able to determine the success of their practices. Participants explained how student-directed use of educational technology promoted meaningful engagement, assisted students in overcoming difficulties to reach learning goals, and promoted autonomy and interest in achieving learning goals.

4.2.1 Student-directed use of educational technology promoted more meaningful engagement with learning material.

Both participants stressed the importance of students independently engaging with the learning material (through the lens of technology) for more meaningful outcomes. In particular, Amelia reinforced the idea of using a student’s interests to guide their learning experience through the use of technology. One of her lessons that exemplified this method had students explore an interactive website about the human body. Students were required to explore an organ system of their choosing, to later present using the appropriate scientific language. She stated,

It’s okay, you’re interested in the digestive system because you watched Ms. Frizzle go down that kid’s mouth in, like, grade one, and you still remember it a little bit, that’s fine. You can go research on that, but come back to me and become an expert in that one thing that interests you.

Amelia explained that the level of engagement with the interactive website and the opportunity to become an expert in an area of interest allowed students to really retain the learning material. This interactivity of the lesson exemplifies a constructivist approach to
learning that is student-centred and focuses on students’ discoveries to guide their learning (Yager, 1991).

Harley specified that independent problem-solving is intensified when students direct their learning into areas of interest. He provided the example, “Right now we've got frogs that we're going to try to induce hibernation in them, so the kids are looking forward to researching how to freeze them without killing them.” When students are responsible for discovering the solutions to their own inquiries, they are more willing to independently find what they need to support their questions.

Both participants’ experiences replicate research findings that state students learning with technology supports thinking in meaningful ways (Jonassen, 2000). Teachers that focus on student discoveries to facilitate learning will allow students to use technology as a tool to solve complex problems, which elevates the learning experience. The effectiveness of this teaching approach is reflected by research findings indicating that student-directed use of technology is associated with greater intellectual and social engagement with the lesson (Gebre, Saroyan, & Bracewell, 2014). Additionally, both participants allowed students the independent use of technology to solve inquires, which increased student interest and engagement. This is reflected in the literature, as research supports individual student use of technology to increase personal engagement with classroom learning (Sawang et al, 2017).

### 4.2.2 Student-directed technology use assisted students in overcoming learning roadblocks so students could obtain learning goals.

Both participants gave several examples of the ways in which technology could be used to support students with overcoming learning difficulties to meet task demands. Both stated the
use of spell check tools to support students with reading and writing challenges to produce quality documents. Specifically, Harley mentioned the power of allowing students to explore a task through the lens of technology so that they are able to demonstrate their knowledge and perspective, without being hindered by individual challenges. He provided the example,

If you’re a little dude and you’re finding gross motor control sucks, the things that you are envisioning in your head and the things that your body is capable of producing are vastly different. It can stop them from wanting to take risks because they are so frustrated.

Harley expressed that when students were given the freedom to explore a task using technology, they are able to meet specific learning goals that might have been inconceivable without the available technology. This is reflected in the literature findings that identify a range of technologies that can be used to bridge gaps between individual student learning difficulties and the curriculum expectations (Coleman, Cramer, Park, & Bell, 2015). Furthermore, by allowing students the independence and flexibility to use available technology to support learning as needed, learning opportunities are made accessible for students with learning difficulties (Conway & Amberson, 2011).

4.3 Teachers Indicated That Motivation to Effectively Integrate Technology and Access to Resources Within a School Supports the Quality of Technology Use Within the Classroom

Both participants identified various support mechanisms within schools that facilitated effective technology integration within the classroom. This theme explored how personal experiences with technology can shape future intentions to integrate technology into classrooms. Specifically, both participants acknowledged the importance of self-motivation for teachers to approach technology integration in the most meaningful ways within the classroom.
Additionally, both participants agreed that working with colleagues that were also motivated to integrate technology effectively in the classroom were an asset to any teacher’s individual desires for quality technology use. Finally, both participants alluded to access to technology as a necessary support for effective technology integration, specifically the necessity of having technology available to classrooms within the school.

4.3.1 Teacher self-motivation to integrate technology fostered a greater quality of technology use in the classroom.

Amelia identified the importance of having a tech-focus in teacher’s college as a driving force in her own motivation to consistently integrate technology effectively. Amelia relied on having the knowledge and familiarity with various software applications and technology to support the delivery of her lessons. She explained that during her time in teacher’s college, “I worked very closely with this professor [Professor’s name], and she’s very much into STEM education with a focus in technology. Everything had to be tech-based. So they really enforced the use of technology in my teaching.” Amelia explained that having this foundation of technology integration deeply rooted into her teacher training influenced her passion to use technology effectively in the classroom. Amelia’s background in technology supports literature findings that a teacher’s actual skill level in technology will influence how the technology is integrated into the classroom (Hermans, Tondeur, van Braak, & Valke, 2008). Amelia’s skill in various software applications and devices allowed her to utilize them frequently and meaningfully within her lessons.

In contrast, Harley admitted to not having an extensive background in technology upon receiving his first teaching job. However, because it was a clear mission of the school upon his hiring to implement new technologies into the classroom, Harley was motivated to learn how to
use these technologies. Harley shared his self-taught experience, “I'd say maybe about a month after she hired me, I've been spending until nine-thirty, ten o'clock at night at school. So I stayed really late and I learned how to use it.” Harley added that this dedication was necessary as he was immediately immersing his students with tech and delivering lessons involving computers, SMART boards, and video editing. Although Harley did not initially have the skills to support technology integration, he was driven to acquire these skills as soon as possible.

This further supports Hermans, Tondeur, van Braak, & Valke’s (2008) findings, that a teacher’s personal attitude towards technology will influence technology integration. In particular, an open and positive attitude towards technology may drive a teacher’s willingness for future technology training and workshops related to technology integration (Aldunate & Nussbaum, 2013). In Harley’s case, an open and positive attitude drove his motivation for self-education with regards to educational technology.

4.3.2 Staff motivation to be involved with effective technology integration supported individual teacher efforts to integrate technology in the classroom.

Both participants identified the support of principals motivated to incorporate technology into classrooms as a large contributing factor to the success of their own individual efforts. Amelia indicated that when the principal is already pushing technology on staff, oftentimes they will be inclined to assist teachers’ achieve their own tech-based goals. Amelia elaborated on one principal’s efforts, “I was at a school where I had an amazing principal. And she really did everything she could, fundraise to get Chrome books, to get iPads.”

Harley also supported the concept of principal support as a contributing factor to successful technology integration. Harley noted that a principal’s enthusiasm could push
technology integration throughout the entire school as a whole. However, he specified that individual teachers’ successful efforts are needed to highlight and demonstrate effective practices for other teachers to be positively influenced. He explained,

> If you get a new principal who comes in and they're like, ‘tech for everybody!’ and everybody's like, ‘Who are you, new guy?’ Right, that might be problematic. But if that 80% [the middle group of teachers on the spectrum of tech-based educational practices] sees the cool things the [top] 10% are doing, because there's some sort of sharing assembly, like, it could sway those people.

These findings align with the existing literature that have identified support from colleagues, administration, and in particular the support from the head of the school, as predictive factors of successful technology integration (Petko, Egger, Cantieni, & Wespi, 2015). Similar to both participants’ insights, the research suggests that when staff members advocate, organize, and encourage professional development in educational technology, it can lead to more quality implementation of the technology. Harley specifically provides some insight as to how this implementation might happen.

**4.3.3 Access to digital resources supported the extent to which technology could be effectively integrated within the classroom.**

Both participants stressed the importance of having enough funding to support the demand for the resources (i.e., various electronic devices) needed to execute numerous tech applications and software. Technology cannot be integrated effectively if there is no available technology to access within the school. Amelia specified that when schools are a part of more affluent communities, these schools typically accumulate an impressive collection of technology
resources through independent fundraising initiatives. Having access to these resources creates the opportunity for teachers to integrate the technology into classroom lessons.

Interestingly, Harley’s school has access to many tech resources as well, but not as a result of a wealthy school community. The school community is quite low in socio-economic status, so much that they qualify for a fair amount of funding and high allocation of resources. He explains, “We’re very high on what is called the LOI, the Learning Opportunities Index, so the higher your number, the less income your families have, the higher your funding is.” Thus, with this large amount of funding, there is a large quantity of tech resources readily available for the entire school, and as the tech lead, Harley is able to utilize them in meaningful ways for the students. This demonstrates Petko, Egger, Cantieni, & Wespi’s (2015) findings that funding support is a crucial factor affecting technology integration in classrooms. This funding does come in a variety of ways, which can offer more opportunities for schools to obtain the necessary funds.

4.4 Teachers Who Integrate Technology in the Classroom Face Challenges Obtaining Resources and Finding Effective Strategies to Use Those Resources

Both participants identified specific challenges to effective technology integration in the classroom. This theme particularly considered the challenges associated with funding and individual approaches to technology as the primary concerns. This section will provide helpful insight when assessing one’s success with technology integration with consideration to the potential challenges teachers face. Specifically, participants explored how a lack of funding can be incredibly limiting to one’s intention to integrate technology effectively. Participants also discussed the challenge of not having Ministry mandated requirements to guide effective technology integration.
4.4.1 Lack of funding is a major roadblock to obtaining the technology needed for effective integration within the classroom.

As acknowledged earlier in 4.3.3, funding for technology resources was identified as major support for effective technology integration by both participants. It was also mentioned by both participants that without this funding, it would be incredibly challenging to implement technology integration in the classroom. Amelia has had experiences in lower income communities where the lack of tech resources was definitely a setback to her typical methods of teaching. She explained, “If you’re in a struggling community and your fundraiser is like, you raise $2000, that’s nothing, that’s like what, four iPads for the entire school?” Amelia revealed that in these cases her lessons would typically be limited to group work, so that the few available resources could be shared between groups. She mentioned that this limitation of sharing resources would sometimes extend the time needed to complete the one lesson.

Amelia’s experience with lower income schools is interesting when compared to Harley’s experience. Harley’s school, as mentioned in 4.3.3, was also a lower income school, however, it was so low that it qualified for school board funding support from its rank on the Learning Opportunities Index. Therefore, it appears that the schools that are not low enough in income to qualify for external support, but are also not high enough in income to self-fund, that face the greatest challenges with regards to technology integration. Research has found that regardless of teachers’ abilities and support to adopt technology initiatives in the classroom, these efforts are negated when low funds cannot support the acquisition of tech resources (Petko, Egger, Cantieni, & Wespi, 2015). Therefore, despite Amelia’s knowledge and passion for technology integration, when teaching in a lower income school, her practice was limited to what little resources were afforded for classroom use.
4.4.2 Lack of Ministry-mandated requirements for technology use within the classroom hinders the quality of technology integration.

Both participants have recognized the lack of any concrete Ministry-ordered obligations to use technology in the classroom in certain ways. Both Amelia and Harley have noted that this rather open policy to technology integration leaves much room for individual interpretation, which consequently has created a large gap between teacher practices. Amelia articulated that without a mandated “push” for specific practices, there is a spectrum of teacher willingness with regards to technology. She provides an example, “The problem is a lot of teachers are just on the cusp of just using like a Google doc.” Harley also recognized that some teachers are not aspiring to improve their tech abilities as needed for effective technology integration, which is another part of the issue. Harley expressed, “10% [of teachers in schools] don’t care, because they are, they’re close enough to retirement or they don’t see it as relevant enough to their position.”

Amelia and Harley’s experiences echo the research findings that a teacher’s actual skill level and personal attitude towards technology will affect which digital resources will be integrated and how they will be integrated into the classroom (Hermans, Tondeur, van Braak, & Valke, 2008).

Furthermore, Amelia adds that another consequence of not having specific practices enforced is that teachers can misunderstand how to enact effective technology integration in the classroom. She explains, “Ineffective is me teaching from a PowerPoint and thinking that’s technology.” This idea of using a PowerPoint reflects a very basic understanding of technology integration, as explored through the SAMR model (Puentedura, 2012). The SAMR Model (Figure 1) explores the different levels of technology use in education, with higher levels indicating greater transformative integration of technology. When technology only replaces the older technology (e.g. PowerPoint replaces chart paper), it is considered as the lowest level of the
model, which is Substitution. As part of learning in the 21st century, teachers should be aiming to enhance the learning experiences to higher levels of the model that promote more transformative integration of the technology and learning task (Jacob-Israel & Moorefield-Lang, 2013).

Moreover, when teachers adhere to Constructivist Learning Theory, it is believed that learning *with* technology promotes more meaningful learning experiences (Jonassen, 2000). Yet, as Amelia indicates when mentioning a teacher relying on substitution levels of technology integration (e.g., use of PowerPoint), the students are learning from technology as opposed to *with*, which does not elevate the learning experience. Research has found that many teachers do not implement technology in ways that elevate the learning outcomes (Keengwe, Onchwari, & Wachira, 2008). As both Amelia and Harley had acknowledged, without Ministry mandated requirements and without teachers taking the initiative to reach more transformative levels of technology integration, the quality of learning experiences will be at risk.

### 4.5 Teachers Indicated Effective Technology Integration Produced Positive Intrapersonal and Interpersonal Student Outcomes in Academic and Non-Academic Domains

Both participants shared positive outcomes for students that resulted from effective technology integration. This theme explored how students experienced intrapersonal and interpersonal benefits. This section considers student feedback and visible student outcomes as possible determinants as to whether effective technology integration is being practiced. Specifically, participants discussed how effective technology integration lead to positive emotional outcomes, opportunities to explore personal and academic goals, and positive interpersonal outcomes.
4.5.1 Effective technology integration produced learning environments that promoted personal and emotional development for students.

Both participants recognized that effective technology integration can promote enthusiasm for learning and, in particular, confidence in students. Amelia specifically referenced many occasions where the use of technology provided students confidence in their abilities and knowledge. She explained, “I gave them the opportunity to become the expert in one thing, the confidence, the science confidence for example, was strengthened in the student, even the lower students.” Amelia extended the concept to add that the use of technology provided a place for all students to speak to their abilities, which also helped strengthen the confidence in their abilities. This relates to findings that support student-directed learning as a pedagogical approach that supports more meaningful learning outcomes (Jonassen, 2000). Amelia’s students have greater confidence in what they know when they were the ones to discover the knowledge.

Harley identified another personal outcome of effective technology integration as students finding representation of themselves in successful work. He further explained that in elementary education, there is a large number of middle-class white women that are teachers, which may pose a challenge for minority students to connect with these teachers. Harley expanded on the importance of students seeing themselves accomplishing non-stereotypical achievements and/or careers and doing important things. He provided an example:

If you are a Somalian boy who's lived his entire life in refugee camps, chances are you're not going to have all that much in common with a white woman from Burlington. But if you can look on the internet and see there's a book written by Somali kid who saved his entire village. Here's a book about a Kenyan kid who made flashy lights that stopped lions from attacking the livestock.
While some of the literature does allude to evidence linking technology use to positive emotions and attitudes towards school (Lee et al. 2008; Koo et al. 2011), there is not anything specific in the literature with regards to students finding representation through technology use, which in turn might improve their attitudes towards school and learning. Harley has pointed out how technology produces an accessibility to the rest of the world, which can support students’ representation and goal development. This would be an interesting area of research to pursue.

4.5.2 Effective technology integration produced safe spaces for learning that promoted interpersonal collaboration within the classroom.

Both participants reported using online learning portfolios as a part of their classroom community, which also acted as an online forum for students to interact with each other. Amelia stated using the Desire2Learn e-portfolio, where she encouraged students to participate on a literacy blog and respond to each other’s ideas. Similarly, Harley used the online portfolio application Seesaw, where students would comment on each other’s posts and displayed work. Both participants’ use of online portfolios contributed in creating an online community for students to feel supported in their individual learning journeys. It is interesting that having an online space provided positive outcomes, as much of the research on social networks indicate that children engaging in online communities can put them at risk for cyber-bullying, which would lead to negative emotional outcomes (Waddell, 2007). Yet both participants indicated high levels of social engagement, reflection, and general participation within their respective online portfolios.

Both participants also reflected on the positive role of tech applications that allow students to anonymously post live contributions to class discussions on the interactive whiteboard. Amelia specifically stated, “Some students…don’t think they are smart and they don’t
want to give the wrong answer.” Both participants agreed that these applications (e.g., Padlet and Today’s Meet) provided a risk-free space for students to express their thoughts and ideas. These specific positive outcomes were not encountered in the literature review, other than a general link between technology use and increased social support, positive emotions and positive attitudes towards school (Lee et al, 2008; Koo et al, 2011), as well as an association between student response technologies and greater lesson engagement for introverted students (Sawang et al, 2017). Both participants’ experiences provide new insight that indicates a positive impact for anonymous responses to be implemented during classroom discussions as it promotes a safer space for all students to express their ideas.

Furthermore, Amelia identified that the allowing students the freedom to explore their interests and express their work through technology can provide students with the opportunity to connect in new ways with their peers. Amelia had an event at her school that allowed students to use technology to explore an area of interest and present their findings to the school. One student that did not interact much with her peers created an iMovie to present to the class. She elaborated, “When we presented to the entire division, when she got up on that stage and she showed her iMovie, like students saw her in a different way. Like they didn’t know she was so talented.” Having this technology platform allowed her to connect with the other students, when she was otherwise having difficulty with that task. The research finds that technology is being used effectively when students are given the opportunity to use it, become the experts in areas of interest, and represent their new knowledge to others. Amelia’s student was able to carry out this process, which resulted in a specific connection between effective technology integration and improved interpersonal relationships. The research does encounter links between effective technology use and greater student social engagement within the lesson (Gebre et al, 2014),
however Amelia’s experience with her student indicates the technology use may be associated with more salient and meaningful social connections that extend beyond the lesson.

4.6 Conclusion

Through the process of analyzing the interview data, this study found that technology can be effectively integrated across all subjects for subject-specific, general assistive, and communicative needs. Student-directed learning is the main success criterion for determining whether technology integration has been effective, mostly because student-directed learning promotes more meaningful engagement with learning material. Funding is a key factor in determining the extent to which technology can be utilized and integrated effectively. This study also found teacher and staff motivation to support effective technology integration, whereas the lack of Ministry-mandated requirements for technology integration can challenge the quality of technology use. Interestingly, this study found many positive emotional and social outcomes related to effective technology integration in classrooms. The literature explores common negative impacts of technology overuse and regular use, as well as some general connections between positive attitudes towards school and technology use. However, the literature does not explore explicit connections between effective technology integration and positive intrapersonal and interpersonal emotional outcomes for students. This study did find that effective technology integration creates opportunities for students to find representation of their identities in positive roles across the globe, which may be related to personal learning and career goal development. Additionally, this study found that effective technology integration produced safe spaces for learning that promoted interpersonal collaboration within the classroom. This extended the current research that suggested online spaces could lead to cyber bullying, as this was not the case for either participant. This study specifically found that effective technology use can lead to
greater social connections outside of the classroom, whereas the existing literature has only
explored links to greater social engagement within the classroom.

Next in Chapter 5, I discuss the implications for these findings, give recommendations
and note potential areas of further research.
Chapter 5: Implications

5.0 Introduction

In this chapter I discuss the implications of my research study. I begin by providing an overview of the key findings of my research on teachers’ perspectives and practices of effective technology integration. I discuss the broad implications of these findings for the educational community as well as the implications for myself as a teacher and researcher. With consideration to these implications, I make recommendations for the relevant stakeholders in the educational community (e.g. teachers, school boards, and tech developers and companies). Finally, I identify and suggest important areas that would benefit from further research.

5.1 Overview of Key Findings and Their Significance

I organized my key findings into five main themes. My first finding explored the integration of technology within the classroom for curricular, communicative, and assistive needs. Both participants identified specific websites and programs that transform necessary content knowledge into more accessible information for students. Interactive and explorative aspects of applications and programs are identified as the ideal qualities that support meaningful learning. Both participants also recognized that these programs are needed to reflect 21st century learning for these students which are digital natives. These technologies are relevant to students’ interests and digital lives in general, and should be incorporated into the classroom for more accessible and engaging learning experiences. Additionally, both participants made mention of the incredible support assistive technology provides for students facing obstacles in their learning. Technology can be used as a tool to overcome learning exceptionalities to support acquisition and expression of content knowledge on an even playing field for all students.
The next theme explored student-directed learning as a key success criterion for the effective integration of educational technology. Both participants identified students’ independent engagement with technology as a tool to explore their own academic interests as an indicator of effective technology integration. Students are able to lead their own journey of discoveries through the use of technology as a tool for exploring their own interests, general inquiries, and problem-solving needs. This independence, engagement, and open-ended exploration of the content knowledge through student-directed technology provides a more elevated learning experience than teacher-directed use of technology in the classroom.

The third theme explored motivation to effectively integrate technology and access to resources as support for quality technology use within the classroom. Both participants expressed the importance of being self-motivated to gain knowledge and expertise in the educational applications of technology through their own sought-out education and self-learning experiences. Their willingness to learn about using technology in the classroom supported effective practices. Additionally, both participants acknowledged that the initiatives of colleagues and other staff members to integrate technology further supported their own individual efforts. This staff support includes team lesson planning, as well as acquiring new technology resources for the school. Available funding and access to technology resources is indicated as a major support for effective technology integration, as the resources available to a school influences the extent to which they can be effectively integrated into lessons.

The next theme explored the challenge of obtaining resources and finding effective strategies to use those resources. Both participants expressed an issue of insufficient funding as hindering effective technology integration in the classroom. Funding can be determined by the social-economic climate of a school community, which challenges a school’s efforts to acquire
necessary resources. While lower income schools may benefit from school board support and higher income schools may be able to self-fund, there is a middle range lacking financial support, which limits the potential for meaningful outcomes from tech-based lessons. Both participants also acknowledged the lack of Ministry-ordered obligations for specific technology practices in the classroom. Without a mandated push for specific practices, a large gap between teacher abilities and practices of integrated technology has emerged. The open policy to technology integration also allows for greater misunderstanding of effective technology integration in the classroom, which perpetuates ineffective practices that do not elevate learning experiences.

The final theme explored the positive intrapersonal and interpersonal student outcomes effective technology produces in academic and non-academic domains. Both participants identified personal and emotional gains observed in student outcomes. In particular, confidence in students’ academic abilities is strengthened when given opportunities for independent exploration of content knowledge to develop expertise. Additionally, opportunities to use technology allows minority students to find representation of themselves in successful work, which can improve their attitudes towards school and learning. Furthermore, both participants expressed that effective technology integration promotes positive interpersonal collaboration within the classroom. The use of online portfolios to highlight individual learning journeys and anonymous student response systems, students can engage with established safe digital spaces to expand their learning experiences. Also, the use of technology may allow new outlets and platforms for students to express their individual talents and interests to their peers.
5.2 Implications

In this section, I outline the implications of my research for both those in the educational community – including school boards, schools, and educational professionals – and my own practice and development as a new teacher.

5.2.1 The educational community.

The literature, as well as the key findings of the present study, support student-directed initiatives for effective technology integration. At the classroom level, teachers are demonstrating best practices when creating opportunities for students to independently engage with various websites and applications to lead their own learning discoveries. As current students are digital natives and have certain exposures and comfort with a range of 21st century technologies in their general lives, their academic learning should also take a 21st century approach with regards to educational applications of technology. When technology is used effectively in classrooms, learning is more relevant and accessible to students.

Both participants indicate a current gap of Ministry-mandated policies outlining specific classroom technology standards. Without any policies in place to outline or mandate specific technology use in classrooms, there will continue to be inconsistencies in effective practices at the teacher level across classrooms. These inconsistencies may also affect a school’s willingness to seek out additional technology resources.

The literature and participant interviews indicate positive outcomes are observed through effective technology integration practices. Aside from achievements in learning, regular effective technology use can benefit students’ emotional and social development. Confidence and improved attitudes towards school and learning result from the independent engagement with
tech-based resources and global access to communities and positive role models representative of minority students. Safe digital spaces can be facilitated through online portfolios, which can provide opportunities for student collaboration while also providing a platform for students to express individual talents and interests to their peers.

5.2.2 My professional identity and practice.

The key findings related to teacher motivation to actively practice effective technology integration in the classroom shed some light into my own needs as a future teacher. My personal motivation to become knowledgeable about effective technology practices will be helpful when approaching the application of such practices in classrooms I will need to independently pursue future workshops and education to build upon my tech knowledge and effective practices as new technologies and programs become available.

With consideration to the issues of acquiring the funding to support technology integration, I may need to personally advocate for funding for my classroom and school. This will become a specific need if I happen to have students with learning exceptionalities that will require such technology support to obtain learning goals. As a teacher, I will need to advocate for student access to the technology I know will benefit them.

5.3 Recommendations

Based on my research and the identified implications of my findings, I make recommendations to various relevant stakeholders in the educational community, including teachers, school boards, and technology developers and companies.
5.3.1 **Recommendations for teachers.**

Teachers should pursue tech-related education, workshops, and professional development in classroom technology integration. This will help with building the expertise and comfort with effective practices, which the literature has indicated as a supportive effort for effective technology integration in the classroom. Teachers should also be aware of students’ learning needs in relation to available technology tools. Teachers will need to advocate for students’ needs (whether for general education or assistive purposes) to have access to technology in the classroom.

5.3.2 **Recommendations for school boards.**

The gaps of specific policies regarding technology-based practices for classrooms has left too much room for interpretation at the teacher level. This has ultimately created a wide range of classroom practices currently in effect. School boards should aim to provide clearer guidelines and/or policies to outline effective technology practices for schools to enact. As the issue of access to technology resources can limit effective practices and corresponding positive outcomes, school boards should also provide more support for technology acquisition through applying for available funding opportunities. School boards should also continue to assess/evaluate appropriate programs and applications that can support learning in the classroom and approve such successful programs for school board use.

5.3.3 **Recommendations for technology developers and companies.**

Given the expressed need for technology in the classroom, there is a continuously growing market for technological educational tools. Developers should consider the ways their existing, as well as new, programs and applications can be introduced into classrooms.
Applications can be specifically targeted towards certain streams of education or may be general tools used to assist learning. Companies should consider approaching school boards and marketing their products through an educational lens.

5.4 Areas for Further Research

In this section I outline areas of further research based on my research findings. One participant indicated the opportunity for minority students to find representation and positive role models through online communications with professionals across the globe. This opportunity to find representation, which this participant has linked to improved attitudes towards school and learning, has not been touched upon in the existing literature. While some studies support correlations between general technology use and positive attitudes towards school and learning, this specific variable of student representation in digital spaces has not been formally identified or explored. Further research is needed to explore these specific conditions that may facilitate improvements in social-emotional development with regards to student representation, as well as the possibility for other specific social-emotional outcomes.

5.5 Concluding Comments

This research study has helped me conceptualize what effective technology in the classroom looks like. Much of the literature in effective technology integration either generally explores student academic outcomes, critiques of current practices and what teachers are failing to do, or the various factors that limit opportunities for effective practices. With so many factors that can support or challenge effective technology integration in the classroom, it was important for me to establish how teachers themselves define effective technology integration. This research study has explored teacher perspectives on the definition of effective technology integration, the
gaps in effective practices, their experiences of factors supporting and challenging their own effective practices, as well as their observable students’ outcomes from their own practices. The specific data gained from these teachers’ perspectives and experiences has provided greater insight into effective technology integration at the individual classroom level. This insight may inform future practices for educational professionals, as well as for myself. Furthermore, findings from this research study regarding students’ positive social-emotional development in relation to representation in digital spaces imply the need for future research in this context of effective technology integration.
References


technology, and special education supports for students with physical, visual, severe and multiple disabilities. *Journal of Developmental and Physical Disabilities, 27*(5), 637-660.


Koo C., Wati Y., Jung J.J. (2011). Examination of how social aspects moderate the relationship between task characteristics and usage of social communication technologies (SCTS) in...


SAMR Model. (n.d.) Retrieved from https://sites.google.com/a/msad60.org/technology-is-learning/samr-model.


Appendix A: Letter of Consent

Date:

My Name is Veronica D’Aprile and I am a student in the Master of Teaching program at the Ontario Institute for Studies in Education at the University of Toronto (OISE/UT). A component of this degree program involves conducting a small-scale qualitative research study. My research will focus on teacher perspectives on, and practices for, effective technology integration. I am interested in interviewing teachers who have experiences implementing different components of available technology into lessons, assessments, and the classroom environment in general. I think that your knowledge and experience will provide insights into this topic.

Your participation in this research will involve one 45-60 minute interview, which will be transcribed and audio-recorded. I would be grateful if you would allow me to interview you at a place and time convenient for you, outside of school time. The contents of this interview will be used for my research project, which will include a final paper, as well as informal presentations to my classmates. I may also present my research findings via conference presentations and/or through publication. You will be assigned a pseudonym to maintain your anonymity and I will not use your name or any other content that might identify you in my written work, oral presentations, or publications. This information will remain confidential. Any information that identifies your school or students will also be excluded. The interview data will be stored on my password-protected computer and the only person who will have access to the research data will be my course instructor Dr. Angela MacDonald-Vemic. You are free to change your mind about your participation at any time, and to withdraw even after you have consented to participate. You may also choose to decline to answer any specific question during the interview. I will destroy the audio recording after the paper has been presented and/or published, which may take up to a maximum of five years after the data has been collected. There are no known risks to participation, and I will share a copy of the transcript with you shortly after the interview to ensure accuracy.

Please sign this consent form, if you agree to be interviewed. The second copy is for your records. I am very grateful for your participation.
Sincerely,
Veronica D’Aprile
Phone Number: (xxx) xxx-xxxx  Email: xxxxxxxxxx@xxxxx.ca

Course Instructor’s Name: Dr. Angela MacDonald- Vemic
Contact Info:  Phone Number: (xxx) xxx-xxxx
               Email: xxxxxxxxxx@xxxxx.ca

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Consent Form

I acknowledge that the topic of this interview has been explained to me and that any questions
that I have asked have been answered to my satisfaction. I understand that I can withdraw from
this research study at any time without penalty.

I have read the letter provided to me by Veronica D'Aprile and agree to participate in an
interview for the purposes described. I agree to have the interview audio-recorded.

Signature: ______________________________________

Name: (printed) ____________________________

Date: ______________________________________
Appendix B: Interview Questions

Introductory Script:
Thank you for agreeing to participate in this research study, and for making time to be interviewed today. This research study aims to learn how a sample of elementary school teachers use and integrate technology effectively into the classroom environment. This interview will last approximately 45-60 minutes, and I will ask you a series of questions focused on your background, your beliefs, teaching practices, and what supports and challenges you in this work. I want to remind you that you may refrain from answering any question, and you have the right to withdraw your participation from the study at any time. As I explained in the consent letter, this interview will be audio-recorded.

Do you have any questions before we begin?

Background Information
1. How long have you been a teacher?
2. What grade(s) and subject areas do you currently teach?
3. Can you tell me more about your school? (e.g. size, demographics of students, program priorities)
4. What experiences contributed to developing your interest in, and preparation for, integrating technology into your teaching?
   a. Personal experiences?
   b. Educational experiences? (e.g. academic focus/major during your undergraduate education, teachers college courses)
   c. Professional experiences? (courses or workshops related to technology or digital media? [If yes: Can you list the names/general topics of those courses/workshops?])

Teacher Perspectives/Beliefs
5. When we talk about ‘technology integration’ in schools, what specific technologies do you consider?
6. What does ‘technology integration’ mean to you? What are some key characteristics of technology integration in teaching?

7. More specifically, what does ‘effective’ technology integration mean to you? What distinguishes effective from non-effective approaches, in your view?

8. What role do you believe technology has to play in teaching and learning?

9. What do you believe are the benefits of technology integration?

10. In your view, how well are schools and teachers doing effectively integration technology into teaching and learning? What indicators do you see?

11. What do you believe are some of the greatest barriers to effective technology integration in schools?

12. What are some the primary concerns you have when it comes to technology integration?

13. What do you think is necessary for technology use to be successful in the classroom?

14. If I were to spend a day in your classroom, what evidence would I see that you are committed to technology integration?

15. How do you integrate technology into teaching?

16. What subject areas have you used technology to teach a lesson?

17. Can you provide me with some examples of how you have effectively integrated technology into your teaching?
   a. What subject/grade were you teaching?
   b. What were your learning goals for the lesson?
   c. What was the specific technology/digital media used for this lesson?
   d. Were there any learning opportunities specifically facilitated through the student’s use of the technology/digital media?
   e. Were there any challenges implementing the technology during this lesson?
   f. What outcomes did you observe from your students? What indicators of learning did you see?
   g. What feedback did you receive from your students regarding this lesson, if any?
h. How, if at all, did use of technology factor into your assessment and evaluation of student work?

18. Can you tell me more about how know whether technology integration is effective? For example, what range of success criteria do you use for determining that technology use has been effective?

19. Do you establish any classroom rules for student’s use of technology/digital media inside the classroom/during classroom time? [If yes: Can you provide some examples of these rules?]

20. Are there any other ways you use technology and digital media within the classroom environment, aside from lessons/assessment/evaluation?
   a. For example: for communication purposes?

Supports and Challenges

1. What factors support you in your capacity to effectively integrate technology into teaching?

2. What technology resources are available and readily accessible to you and your class?

3. How is this range of technology made accessible to you? (e.g. school resources like computer labs, mac trolleys, parent support, students’ personal devices, grants, donations)

4. What challenges have you encountered with regards to integrating technology/digital media into lessons, assessments, evaluations, and general classroom environment?
   a. How have you responded to these challenges?
   b. How could the education system further support you in meeting these challenges?

Next Steps

5. What, if any, goals do you have as you move forward integrating technology into your teaching?

6. What do you think technology use in the classroom will look like in the future?

7. What advice, if any, do you have for beginning teachers who are committed to effectively integrating technology into their teaching?

Thank you for your participation in this research study.