ABSTRACT

This Master of Teaching Research Project is a qualitative study that addresses the topic of meaningful technology integration in student-centered environments. Despite the research that has been done in this area, there are still a number of challenges that face teachers who wish to integrate technology into their classrooms. Therefore, this research study aims to explore exactly how elementary teachers are achieving success with technology integration. The following question was used to guide this study: How is a sample of elementary school teachers meaningfully integrating technology through student-centered pedagogy? The principal themes that emerged from the data were how past lived experiences and supportive work environments positively contributed to the integration process, that technology integration produced new and engaging learning opportunities for students and that teachers can overcome issues with integration by drawing on resources from the wider educational community. The goal of this study is to help beginning teachers, like myself, and the greater educational community understand the strategies that others have used, so that they too can implement technology into their learning environments.

Key Words: Elementary Education, Technology Integration, and Student-Centered Learning
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Chapter 1: Introduction

1.0 Research Context

Over recent years the research surrounding technology in schools has evolved from debating its potential benefits for students to discussing how teachers can meaningfully integrate technology into the classroom (Sheingold & Hadley, 1990; Newby, Stepich, Lehman & Russel, 2000; Okojie, Olinzock, & Okojie-Boulder, 2006; Mishra & Koehler, 2006; Bauer & Kenton, 2005; Levin & Wadmany, 2008). There is an abundance of research outlining the positive affects technology integration has on students, including the increased opportunities for students in student-centered learning environments (Hannifin & Land, 1997; Weimer, 2002; Levin & Wadmany, 2008). Approaches to learning that include both student-centered activities and technology integration have the possibility of giving students the skills required to achieve the futures they deserve. This is done by providing learning environments where students can think critically and foster both creativity and innovation. Integrating technology into student-centered learning environments can also enable teachers to address multiple learning needs and styles and subsequently deepen student understanding (Hannifin & Land, 1997). As such, the relationship between the two has been widely researched.

Meaningful technology integration has the potential to drastically change the way in which teachers teach and students learn. Teachers take on the role of facilitator and students are able to take responsibility for their own learning. The possibilities for student success are infinite. However, despite this potential, there are significant challenges that teachers continue to face.
1.1 Research Problem

Although there is much scholarly research to support technology integration in the classroom, the literature is firm in the need to distinguish the difference between simply having technology in the classroom and having the technology be a tool for heightening the learning potential of students (Sheingold & Hadley, 1990; Okojie, Olinzock, & Okojie-Boulder, 2006; Levin & Wadmany, 2008). Meaningful technology integration is more than something to add onto a lesson at convenient times, rather it should be used to facilitate and enhance the learning process (Okojie, Olinzock, & Okojie-Boulder, 2006). This distinction is vital as it is the basis of my research design.

Despite the research that has been conducted on the benefits of technology integration in the classroom, there are still many challenges that teachers must overcome in order to successfully achieve integration. Such challenges include, but are not limited to, organizational, administrative, pedagogical, and personal (Sheingold & Hadley, 1990; Ertmer, 1999; & Okojie, Olinzock, & Okojie-Boulder, 2006). Organizational challenges include shortage of resources but also the large amount of time and planning required to integrate technology into the teacher’s pedagogy (Okojie, Olinzock, & Okojie-Boulder, 2006). Administrative challenges come from a lack of support from the other staff or the school administration (Okojie, Olinzock, & Okojie-Boulder, 2006). The challenging task of changing how the teacher teaches and opening the mind up to understand what “technology integration” really is are categorized as pedagogical challenges (Ertmer, 1999). And finally, personal constraints refer to the underlying belief about learning and teaching and how technology fits into that belief (Sheingold & Hadley, 1990). Although teachers might not face all of these challenges all at once, the literature suggests that any one of these challenges can have significant effect on the potential for successful
implementation (Hadley & Sheingold, 1993; Hannifin & Savenye, 19993; Hativ & Lesgold, 1996). Having a greater understanding of these challenges will help teachers formulate effective strategies to overcome them. Therefore, I hope that the participants in my study will help shed invaluable insight into the challenges involved with meaningful technology integration.

1.2 Research Purpose

As a result of the many challenges teachers face when attempting to integrate technology into the classroom and the potential benefits that it holds for student-centered learning environments, I plan to research this relationship further. Given the problems discussed above, the purpose of my research is to learn how teachers meaningfully integrate technology in ways that are student-centered, and to learn from them what strategies they used to reach successful integration. I aim to share these findings with the education research community in order to further inform technological support in elementary schools. The results of this study will be helpful to educators aiming to implement technology into their learning environments. Additionally, it will be helpful to school administrators who want to provide their teachers with support and adequate resources.

1.3 Research Question

The topics covered in this study are important to the greater educational community because of the suggested benefits for students and teachers. Furthermore, implementation practices that have led to successful technology integration can be shared with the educational community, which could increase the number of integrated classrooms in Ontario. In order to
ensure that all students are provided with greater opportunities for learning and growth, it is critical that we find answers to the questions that this study poses.

The main research question guiding this study is: How is a sample of elementary school teachers meaningfully integrating technology through student-centered pedagogy? Subsidiary questions to further guide this study include:

1. What does meaningful technology integration mean to these teachers and why?
2. What factors and resources support these teachers in their effort to meaningfully integrate technology in student-centered ways?
3. What range of challenges do these teachers face integrating technology in student-centered ways, and how do they respond to these challenges?

1.4 Background of the Researcher

As someone who has had limited exposure to technology, I want to ensure that as a teacher I will provide greater opportunities to my students. Throughout my K-12 schooling, I very rarely had access to computers and seldom had teachers who encouraged the use of technology. Aside from an ancient overhead projector, there was no technology use in the classroom by teachers and no use by students. In high school, there was a computer lab, but access was limited and the learning that occurred was basic (simply learning how to operate Microsoft Word or Excel). More recently, I have been exposed to classrooms where technology integration is varied. Some classrooms offer their students’ similar opportunities to engage with technology as I had, while other classrooms have seamlessly incorporated technology into the students’ learning process. One example out of many is the implementation of Google Classroom. This service enables the teacher to move all online; students receive and submit their assignments and can access all class material from home. These students are able to actively
participate in their learning by way of technology, while others are simply being left behind. I was taught and subsequently have seen how technology has the potential to positively effect a student’s learning development. As a teacher candidate in the Master of Teaching Program at OISE, I aim to learn from the participants of this study who have meaningfully integrated technology to enhance my professional knowledge and pedagogy, so that my students are able to experience the many benefits of technology.

1.5 Overview

To respond to the research questions, I will conduct a qualitative research study using purposeful sampling to interview teachers about their instructional strategies for meaningfully integrating technology through student centered pedagogy. In Chapter 2 I review the literature in the areas of technology integration and its effects on student-centered learning. 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 integration and student-centered learning environments. More specifically, I review themes related to how teachers use technology to support student-centered learning environments. I start by reviewing the literature in the area of “meaningful” technology integration and I consider the effects that such integration has on teachers’ pedagogy. Next, I review research on student-centered approaches to effective technology integration in order to discover some of the potential benefits of integration for both students and teachers. From there, I identify four specific challenges facing teachers with regards to technology integration and I explore how they deter teachers from moving forward with technology. Finally, I highlight some of the possible strategies for meaningful technology integration.

2.1 What Is “Meaningful” Technology Integration?

Over recent years the research surrounding technology in schools has evolved from debating its potential benefits to students to discussing how teachers can meaningfully integrate technology into the classroom (Sheingold & Hadley, 1990; Newby, Stepich, Lehman & Russel, 2000; Okojie, Olinzock, & Okojie-Boulder, 2006; Bauer & Kenton, 2005; Mishra & Koehler, 2006; Levin & Wadmany, 2008). For the purpose of my research, it is important to highlight the difference between simply having technology in the classroom and having technology heighten the learning potential of the students. Meaningful technology integration is more than an “appendage to be attached to any convenient state during the course of instruction, conversely it should be used to facilitate and enhance the learning process” (Okojie, Olinzock, & Okojie-Boulder, 2006, p. 66). This distinction is vital as it is the basis of my research design.
2.1.1 What it isn’t vs. What it is

It is often easier to identify what something is by showing what it is not. This first example illustrates that technology will not reach its optimal potential by simply being present. Global programs like the One Laptop Per Child (OLPC) were started under the assumption that technology had the power to change the way people learn. However, a study conducted by Christia et al. (2012), assessed the initiative over a 15-month period and found no evidence of the effects of enrolment on test scores in Math or Language. Though the program did dramatically increase access to computers, which is undeniably admirable, there is little evidence to support its impact on learning outcomes. This study is fundamental to the discussion surrounding “meaningful” technology integration because it supports the idea that simply having technology available to students does not guarantee effect learning outcomes. The more important question to ask is how the technology is used (Mishra & Koehler, 2006).

Additionally, work conducted by Larry Cuban in his book Oversold and Underused: Computers in Classrooms, found that despite the integration of computers and other CIT in Kindergarten and Primary classrooms, there has been little to no revolution in how the teachers organize or teach in these “technology integrated” classrooms (Cuban, 2001). Cuban’s comprehensive work explains how often having the technology present does not guarantee a substantial change in how teachers teach or how students learn.

In order for technology integration to be meaningful, new benefits must be presented, while simultaneously maintaining the integrity of the strategy/activity (Vasinda & McLeod, 2011). An example of such meaningfulness is the addition of Podcasting to the literacy strategy Readers Theatre. Readers Theatre is a dramatic presentation of a written work in a script form. Readers read from a "script" and reading parts are divided among the readers. Rather than
simply performing the script in front of the class, students were able to record their voices and post their Podcast online for students and parents to listen to. For authors Vasinda and McLeod (2011), it is critical to maintain the integrity of the literacy strategy while integrating technology. Simply adding technology for the purpose of adding it is not worth while because although it might spike initial engagement, students would likely eventually become bored. This being said, the authors did find that incorporating technology into this teaching practice proved beneficial. Student engagement was increased and the levels of achievement were higher (Vasinda and McLeod, 2011).

2.1.2 Effects on teacher pedagogy

Teachers who have technology successfully integrated into the classroom have a deeper knowledge about technology and more importantly of how it can effect both their students and their own teaching practices. Another way to understand the problem of “meaningful” technology integration is offered by the Technological Pedagogical Content Knowledge (TPCK) framework. Mishra & Koehler (2006) state that:

> TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (p. 1029)

The work done by these two authors is important to my research because it demonstrates how a teacher with a greater knowledge of technology will have greater success with implementation
than a teacher with low levels of technological comprehension. In order to help teachers and teacher candidates obtain such knowledge, teacher education programs have implemented instructional technology in ways that encourage integration (for examples, see Fulton, Glenn, & Valdez, 2003; Fulton, Glenn, Valdez, & Blomeyer, 2002; Hacker & Niederhauser, 2000; Loucks-Horsley, Hewson, Love, & Stiles, 1997; Niederhauser, Salem, & Fields, 1999; Niederhauser & Stoddart, 2001; Strudler & Wetzel, 1999). A teacher with high levels of technological knowledge will be able to see the greater picture and understand the larger possibilities in the curriculum (Mishra & Koehler, 2006). A teacher with TPCK will be able to implement technology into their pedagogy in areas that heightens the students’ opportunity for learning and growth. Understanding the “greater picture” enables the teacher to find the specific areas where technology can be advantageous.

The effects of “meaningful” integration are not only felt by the students, but by the teachers themselves. There is adequate research to support the idea that after a teacher introduces technology into their practice, their practice itself will begin to change (Sheingold & Hadley, 1990). Teachers became more flexible problem-solvers, more open minded to change, and more experimental (Sheingold & Hadley, 1990). This type of change, change in a teacher’s pedagogy, is important because it can have the potential to foster classrooms that are more student-centered and “conditions for deep, engaged, and meaningful learning” (Sheingold & Hadley, 1990, pg. 25).

2.2 Student Centered Approaches to Effective Technology Integration

Preparing students for the 21st century is not a simple task. Rather it takes a complete change in how teachers approach the curriculum (Action Canada, 2013). Teachers must shift
their “emphasis from the instruction of facts to a model which focuses on competences such as critical thinking, character, creativity, innovation, as well as digital and computer literacy” (Action Canada, 2013 p. 3) One possible way to getting closer to such a model is by using student-centered approaches.

Weimer (2002) is an authority on the subject of learner-centered education, which is interchangeable with the term “student-centered”, and has developed a list of five elements of Learner-Centered Education, which include: shared power between instructors and students, course content as the means to knowledge and not its end, role of the teacher as facilitator, shifting the responsibility of learning, and using evaluation to promote learning (as cited in Mahendra et. al, 2005). Although it is not necessary to have all five elements present at once, the most important aspect, shared power between instructors and students, should be the jumping off point for classroom wanting to make the transition into student-centered learning.

A student-centered model shifts the responsibility and power off the teacher so that students are in control of their own learning. This shift is crucial because without it, students will remain unmotivated and uninterested. As stated in the research, student-centered approaches to teaching are effective and can lead to increased student motivation (McCombs and Whisler, 1997; Chall, 2000; Hirumi, 2002; Cornelius-White, 2007; Van de Walle et ale., 2007). Rather than waiting for information to be delivered to them, students are actively perusing knowledge acquisition. Students’ ideas and interests are valued which results in a positive belief in their abilities.

Integrating technology into student-centered learning environments enable “individuals to address unique learning interests and needs, study multiple levels of complexity, and deepen understanding” (Hannifin & Land, 1997 p. 168). The advances in technology have heavily
effected the evolution of student-centered learning environments by providing more opportunities to engage in self-directed lessons (Strommen & Lincoln, 1992). However, in order to achieve this level of student engagement and higher order thinking, teachers must first overcome a multitude of challenges.

**2.3 Current Challenges with Regards to Integrating Technology**

Despite the proven advantages associated with meaningful technology integration, teachers still experience many challenges that prevent many from moving forward. Such challenges include: organizational, administrative, pedagogical, and personal (Sheingold & Hadley, 1990; Ertmer, 1999; and Okojie, Olinzock, & Okojie-Boulder, 2006). Organizational challenges include limited access to technology and often time consuming task of integrating technology into the daily routine of a classroom (Okojie, Olinzock, & Okojie-Boulder, 2006). Challenges of the administrative nature relate to the often lacking support from fellow colleagues or the administrative staff (Okojie, Olinzock, & Okojie-Boulder, 2006). Pedagogical challenges are difficult to overcome because they require changing one’s narrow perception of what “technology integration” looks like and what it can mean for students learning (Ertmer, 1999). Finally, personal constraints can greatly limit a teacher’s chance of achieving successful integration because it involves altering one’s underlying beliefs surrounding learning and teaching more generally (Sheingold & Hadley, 1990). Although teachers might not face all of these challenges all at once, the literature suggests that any one of these challenges can have significant effect on the potential for successful implementation (Hadley & Sheingold, 1993; Hannifin & Savenye, 1993; Hativ & Lesgold, 1996). Furthermore, these four challenges encapsulate many of the hardships that teachers face, however they in no way cover all the
possible barriers.

As developed by Ertmer (1999), there are two broad categories of barriers or challenges, first-order and second-order. The category first-order, refers to challenges that are “extrinsic to teachers” (p. 50). Broadly speaking, these challenges are described in terms of the types of resources (e.g., equipment, time, training, support) that are either missing or inadequately provided. For the purpose of my research, these types of challenges have been divided into two sub-categories, organizational and administrative. These sub-categories are important to understand because as the research shows, these barriers are easy to measure and relatively easy to eliminate (Fisher et al., 1996). As Ertmer mentions, the underlying assumption was that once adequate resources were obtained, integration would follow (Ertmer, 1999). The second category, second-order, are barriers that “interfere with or impede fundamental change” (p. 51). Such barriers are rooted in teachers’ beliefs about teaching and learning (e.g., fears about technology, effect on student learning). Current literature suggests that these second-order barriers are common among today’s teachers and more importantly, cause more difficulties than first-order barriers (Hannafin & Savenye, 1993; Riedl, 1995; Kerr, 1996; Fisher et al., 1996; Dede, 1998). As detailed below, there are two sub-headings relating to these more intrinsic barriers, pedagogical and personal constraints.

2.3.1 Organizational

Organizational barriers can easily be identified as one of the greatest challenges facing today’s teachers. Despite wanting to introduce technology into the classroom, there are often many organizational barriers present. One specific barrier that teachers face is the shortage of computers and overall limited access to technology (Okojie, Olinzock, & Okojie-Boulder, 2006). Many schools simply do not have the funding available to outfit classrooms with the necessary
technology. In a recent study connected by People for Education, many teachers and principals expressed concern over the cost of technology within their school budgets (Chen, Gallagher-Mackay, & Kidder, 2014). One principal from Hamilton-Wentworth DSB expressed this concern by mentioning, “In an old school it is very difficult to be connected to the internet through wireless. It is a huge expense for a board and while there is a list of when we will have wireless, we are being expected to be technology savvy when the infrastructure is not there” (Chen, Gallagher-Mackay, & Kidder, 2014, p. 3) This challenge is difficult to overcome because there are often a multitude of voices and opinions advocating for numerous projects. However, without technology in the classroom, the talk of integration becomes a mute point.

Additionally, technology-based instruction requires teachers to select and/or adapt instructional technology to match the objectives based on the students’ needs (Okojie, Olinzock, & Okojie-Boulder, 2006). Not surprisingly, this method of instruction takes large amounts of planning in the early stages of adaptation. Researchers for Apple Classrooms of Tomorrow (ACOT; Sandholtz et al., 1997) highlighted how the introduction of technology can cause teachers “back into a first-year-teacher mode, starting all over again with issues of classroom management, discipline, role definition, and lesson development” (p. xvi). With an already overloaded schedule, teachers can fail to implement technology in a way that increases the higher-order thinking that students require.

2.3.2 Administrative

For some the school and district administration can be a source for support, but for many, it is one of the greatest challenges. Lack of support from staff, school, and community can cause teachers to feel isolated in their efforts and can create further stress associated with technology (Okojie, Olinzock, & Okojie-Boulder, 2006). When achieving successful technology integration,
teachers received support from both the micro and macro levels, meanings fellow colleagues and administrative staff as well as school boards and higher levels of government provided support teachers’ efforts to integrate technology into the classroom. The school and the districts at large allocated resources to foster the type of teaching practices which are likely to result in technology integration (Becker, 1994) One of the more frustrating aspects of administrative challenges is the feeling of pressure. Lack of resources and support are challenges teachers must overcome before even beginning the integration process (Ertmer, 1999).

2.3.3 Pedagogical

Though some teachers are constrained by Ertmer’s “first-order barriers”, including limited equipment, training, and administrative support, other teachers struggle with “second-order barriers” or challenges that are more intrinsic in nature (Ertmer, 1999). Pedagogical challenges relate to the teacher’s beliefs about teacher-student roles and traditional classroom practices, which can include teaching methods, organizational and management styles and assessment procedures (Ertmer, 1999). Challenges of this nature are difficult to overcome because it can require teachers to completely rethink their teaching pedagogy, which for some teachers, they have spent years developing.

Fear of technology integration is often brought about because teachers have a narrow perception of what “technology integration” means and what it looks like (Okojie, Olinzock, & Okojie-Boulder, 2006). Teachers can build up in their minds what an ideal classroom is and find barriers that make that situation impossible to achieve. For example, one teacher’s vision for integration requires a complete re-imagination of the classroom, “a wholly integrated classroom is one in which students have opportunities to see the connections between subject areas and in which multidisciplinary learning occurs” (Ertmer, 1999, p.49). Rather, Okojie et.al., suggest that
teachers must simply use technology is ways that benefit them and their students (2006, p. 67). Due to the different technologies that exist, there are limitless possibilities as to how a teacher can integrate technology into their pedagogy. Examples of such integration found in research include digital storytelling (Etmer et al., 2012; Sadik, 2008) and digital photography and journaling (Ching et al., 2006).

Changing teacher pedagogy for the purpose of technology integration requires more than just learning how to use a specific piece of hardware or software. Rather, “pedagogy-based training begins by helping teachers understand the role of learning theory in the design and function of class activities and in the selection and use of instructional technologies” (Diaz & Bontenbal, 2000, p.52). As previously mentioned, simply having computers in the classroom is not enough. The teacher must provide their students with opportunities for authentic learning, and this is possible with technical tools such as blogs, wikis, and podcasts. Explicit examples of successful integration practices will be highlighted throughout Chapter 4. These examples illustrate how teachers are able to overcome pedagogical challenges and incorporate technology into their teaching.

2.3.4 Personal constraints

Personal constraints are typically rooted in a teacher’s underlying belief about teaching and learning. Similar to pedagogical challenges, personal constraints can often be the most difficult to overcome. The reason for this is because they are less tangible than the extrinsic challenges mentioned previously, but more so because they are more personal and more deeply ingrained to the individual (Ertmer, 1999). Technology integration can mean a complete transformation of the classroom. Even if all the equipment and support is present, some teachers are still unable to achieve meaningful integration because of their personal beliefs surrounding
what it means to be a teacher and what it means to be a student. Thus, one of the major challenges to overcome is, as Sheingold (1991) outlined, that “teachers will have to confront squarely the difficult problem of creating a school environment that is fundamentally different from the one they themselves experienced” (p. 23). This can be extremely difficult for some teachers as changing one’s teaching practice often includes changing what teaching and learning look like. And as is often said, teachers are most likely to teach the way that they were taught. Therefore, many teachers must stray from their comfort zone and start anew, which is easier said than done.

In addition, these personal constraints can take the form of perceived lack of experience with technology and lack of computer skills/computer intimidation (Okojie, Olinzock, & Okojie-Boulder, 2006). Sheingold & Hadley (1990) state that it takes time for teachers to master computer-based practices and approaches, potentially five or six years of teaching with technology is needed in order to become fully confident (p. 19). The time component is just one more challenge that teachers must overcome in order to achieve meaningful levels of integration.

Despite these challenges, teachers have been able to successfully integrate technology into the classroom. The literature highlights possible strategies for meaningful integration which will be outlined below.

### 2.4 Effective Strategies for Meaningful Technology Integration

Throughout the research numerous strategies for meaningful technology integration are explored (Becker, 1994; Mishra & Koeler, 2006; Schrock, 2015; Keengwe & Onchwari, 2009). This portion of the research has practical implications for teachers as these strategies can be used within the classroom in order to successfully integrate technology.
2.4.1 The SAMR Model

A model that is used by numerous teachers is SAMR, which stands for substitution, augmentation, modification and redefinition. The model was developed by Dr. Ruben Peuntedura and describes the different levels at which teachers may utilize technology to design, develop, and incorporate digital learning (Schrock, 2015). The lowest level, substitution, would look like students typing a report of Microsoft Word rather than using pencil and paper. Whereas the highest level, redefinition, requires a complete reinvention of a task, or having the students perform something that would not be possible without the inclusion of technology. An example of redefinition is using an interactive iBook during independent reading. Rather than simply replacing a traditional medium with a digital one, the model encourages technology integration that is more transformative (Schrock, 2015). This model is beneficial for teachers because it allows them to vary the use of each level depending on their learning goals with the technology.

2.4.2 Setting goals

The process of technology integration can be extremely daunting for many teachers. And this is especially true if the teacher has had limited exposure to technology in the past (Sheingold & Hadley, 1990). As noted by the Office of Educational Research and Improvement (OERI, 1993): “Most teachers will find little incentive to tackle the technical and scheduling problems associated with technology unless they have a clear vision of how the technology can improve teaching and learning” (p. 85). Therefore, it is necessary to determine the goals of technology in teaching and learning and then identify the types of technology tools that will support efforts to meet said goals (Keengwe & Onchwari, 2009) Similar to other aspects of teaching preparation, understanding the end goal before implementation can result in higher chances of success.
2.4.3 Use the environment

The research has shown that teachers who are able to take advantage of their environments are more likely to be successful when it comes to integrating technology into the classroom (Sheingold & Hadley, 1990; Becker, 1994; Okojie, Olinzock, & Okojie-Boulder, 2006). In a study conducted by Becker (1994), demonstrated that “certain conditions make exemplary computer-using teachers more likely to be present” (p. 290). Exemplary teachers (teachers who were integrating technology in a meaningful way) in the study taught in a representative range of communities, schools, and classrooms; but they taught in schools and districts where resources had been used to nurture and support the kind of teaching practice classified as exemplary. Teachers who are able to utilize the resources that surround them have a greater likelihood of achieving success (Becker, 1994). In others, teachers who are able to find support both in terms of personal and technical, have a greater chance of achieving technology integration in the classroom. Teachers will most likely fail if they try to do it on their own.

How a teacher uses their environment will look different in every case, it might include forming a relationship with a teacher who has already successfully integrated technology in their classroom, or it might mean taking supplemental courses offer by the school district in order to build expertise. Hadley and Sheingold (1993) stressed that “on-site support and colleagueship are critical ingredients to successful technology integration” (p. 299). Through ongoing conversations with staff and experts and engagement in workshops, teachers gain access to a supportive network which can help them achieve meaningful technology use. Often, lack of support can appear as a challenge to teachers, but more often than not, there will be like-minded people who wish to achieve similar levels of integration. Therefore, it is advisable that teachers use their environment to its fullest potential.
2.5 Conclusion

In this literature review I looked at research on meaningful technology integration and student-centered learning environments. This review elucidates the extent that attention has been paid to encouraging teachers to implement technology into their classrooms. The benefits of technology in regards to student learning and growth has been thoroughly identified. The literature also raises questions about the plethora of challenges, both extrinsic and intrinsic, that teachers are facing. In light of this, the purpose of my research is to learn how teachers meaningfully integrate technology through student-centered pedagogy. Additionally, it will help identify the gaps which exist in teachers’ understanding of technology integration and student-center instruction, as well as the extent to which teachers require further professional development and support in order to achieve successful integration. I then hope to can share these findings with the education research community in order to further inform technological support in elementary schools.
Chapter 3: Research Methodology

3.0 Introduction

In this chapter I will review the research methodology utilized for this study. I begin by reviewing the qualitative research approach and its procedures. This is followed by an examination of data collection instruments, before elaborating more specifically on participant sampling and recruitment. I then explain the data analysis procedures used and review the ethical considerations pertinent to my study. Relatively, I identify a range of methodological limitations, but I also speak to the strengths of the methodology. Finally, I conclude the chapter with a brief summary of key methodological decisions and my rationale for these decisions given the research purpose and questions.

3.1 Research Approach & Procedures

The methodology employed for this qualitative research study began with a literature review of technology integration and student-centered learning. It was followed by semi-structured interviews with teachers in Ontario who fit the participant research criteria. Creswell (2013) states that we should use qualitative research when a problem or issue needs to be explored and we need a complex, detailed understanding of that issue. This particular account lends itself to this research study because its aim is to identify and understand the unique perspectives of the participants and their experiences with technology integration. In addition, the reflective and holistic nature of qualitative research allowed for the common themes amongst participants to be identified and then further analyzed.

This study also draws upon characteristics of a phenomenological research study. Starks & Trinidad (2007) identify the main goal of phenomenology research, which is to “describe the
meaning of the lived experience of a phenomenon” (p. 1373) Through the interviews conducted, it was possible to better understand what experiences shaped and influenced the participants’ method of technology integration as well as any barriers they faced.

3.2 Instruments of Data Collection

Data was collected through three semi-structured interviews. Interviews as a data collection method was appropriate because they allowed participants to describe their perspectives and experiences with technology integration in the classroom (Willis, Jost, & Nilakanta, 2007). The benefit of using a semi-structured interview protocol lies in its simultaneous structure and flexibility. Wengraf (2001) identifies semi-structured interviews as being designed to have a number of interviewer questions prepared in advance while still allowing for flexibility and spontaneity in the participants’ responses. The characteristics of semi-structured interviews lend themselves to this research study because of the narrative-style responses that were desired. The participants were provided with the opportunity to tell “their story” or their personal experiences with technology integration. Moreover, it allowed participants to be asked related follow-up questions and further elaborate their responses to earlier questions.

The process of formulating questions was informed by the literature review conducted at the beginning of the research process. The interview protocol was first drafted and later altered with approval from a professor at the University of Toronto. The interview protocol can be found in Appendix B.

Both interviews were conducted over Skype due to the distance between the interviewees and myself. Apple Voice Memos was used to record both interviews.
3.3 Participants

In this section, I will be identifying the sampling criteria, recruitment methods, and participant bios of those involved in this research study.

3.3.1 Sampling criteria

I identified sampling criteria to ensure that all participants are able to contribute in the form of substantive responses during the interview process. I established three criteria that all participants must meet. First, all participants must be currently teaching in an elementary classroom. This is to ensure that participants can draw upon what is currently present in schools, rather than what was. Secondly, participants must teach within Ontario as I want my findings to be in accordance with the Ontario curriculum and have practical implications for the teachers within the province. Thirdly, all participants must have demonstrated commitment and/or leadership in the area of technology integration i.e., use technology in their everyday teaching practice. This criterion ensures that the teachers I interview have a commitment to technology integration and have included it into their teaching pedagogy.

3.3.2 Recruitment

Both purposeful and convenience sampling was used to recruit participants. As the sample size of this study will only consist of a maximum of three participants, it was important to use purposive sampling to ensure that all participants would be able to provide useful data to the research question (Green & Thorogood, 2009).

Conversely, given how the teachers I sampled from are part of a pool of existing teacher networks, convenience sampling was appropriate (Green & Thorogood, 2009). As I am already immersed in a community of teacher colleagues and mentor teachers, I shared an overview of my research study within this community and asked them to share my information with anyone who
meets my sampling criteria. I provided my information rather than ask these individuals/organizations to provide me with the names and contact information of people they think would be suitable. This ensured that teachers were volunteering to participate rather than feeling pressure or obligation to participate. For this same reason, I did not rely on principals to share my information with their staff.

3.3.3 Participant biographies

Participant 1: Wes

Wes is a Grade 4/5 teacher with the Limestone District School Board. He is in his sixth year of teaching and has taught in grade four or five for the past five years. He is a certified Primary, Junior, Intermediate, and Senior teacher and became interested in using technology from a young age by his father. He began using technology in his classroom as a way of providing greater opportunities to his students. Wes now consistently integrates technology into all subjects of the curriculum. Finally, he has organized multiple school-wide initiatives and regularly attends technology-based Professional Development days.

Participant 2: Olivia

Olivia is currently a special education teacher in the Peel District School Board with students in Grades 1, 2, and 3 in her class. She has been teaching for the past three years and has taught grades ranging from kindergarten to grade 5. Olivia is an avid technology user in her personal life and has been integrating technology into her classrooms since her began teaching. She is always searching for new apps and programs to try and regularly shares her findings with other teachers in her school.
3.4 Data Analysis

Before the process of data analysis could begin, I transcribed both interviews. The transcription procedure followed that of Creswell (2013), whereby I transcribed each of the interviews by listening to the recording and manually typing the text of each conversation strictly verbatim into a Word document.

Data collected through the semi-structured interview process was then analyzed using the thematic content analysis method (Braun & Clarke, 2006). Thematic analysis is a method “for identifying, analyzing, and reporting patterns (themes) within data” (Ibid, p. 6). This method of data analysis was chosen because of its compatibility with the phenomenological methodology, which focuses on reporting the perspectives and experiences of participants. The data analysis method used includes six steps which I strictly followed. Braun & Clarke (2006) outline these steps as follows: I first familiarized myself with the data by transcribing and then re-reading the scripts several times. Then, I generated initial codes based on interesting features across the entire data set. Following this, commonly considered codes were placed into potential themes. Next, I reviewed the themes to ensure they accurately represent the entire data set. Finally, I defined and named the themes and reflected on how to best report them (Braun & Clarke, 2006).

3.5 Ethical Review Procedures

Due to the nature of my research study, there were three main ethical issues that were addressed (DiCicco-Bloom & Crabtree, 2006). The first ethical issue was reducing risk of potential harm to the participant. I minimized this risk by by re-assuring them throughout the interview and in the consent letter that they had the right to refrain from answering any question that they did not feel comfortable with, as well as re-stating their right to withdraw from
participation. In addition, participants were assured that there were no known risks involved with participation.

Secondly, I wanted to protect all participants’ personal information (DiCicco-Bloom & Crabtree, 2006). All participants’ identities will remain confidential, through the use of a pseudonym, and any identifying markers related to their schools or students were excluded. Additionally, all data collected throughout the study is now stored on a password protected computer which only I and the course instructor have access, and all data will be destroyed after 5 years.

Lastly, I effectively informed all participants about the nature of the study prior to their agreement to participate (DiCicco-Bloom & Crabtree, 2006). Participants were 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).

3.6 Methodological Limitations and Strengths

It is important to note that there are some limitations associated with this research study. First off, due to the limited sample size (2 participants) I was not able to generalize the results of the study. However, in qualitative research the details collected from each participant is of equal importance to the total number of participants (Creswell, 2013). Therefore, I am not concerned that the sample size will effect the overall importance of my study. Additionally, due to ethical protocol limitations, only interviews with educators were approved. Consequently, the voices of parents and students were not included in the study.
The strengths of this study are a result of the research method utilized. Qualitative research allows for detailed experiences and insights of participants to be documented and then shared with readers (Creswell, 2013). Additionally, teachers aiming to incorporate technology into their pedagogy will benefit from learning strategies and supports of those who have succeed in the practice. Lastly, administrations can use the findings of this study to better support their teachers and ultimately their students.

3.7 Conclusion

In this chapter I explained the research methodology. Qualitative research design was chosen for this study because of its focus on the perspectives and experiences of the participants. Purposeful and convenient sampling was used to find participants who fit the specific criteria. Given the research purpose, semi-structured interviews were conducted to record the detailed accounts of participants in their journey with technology integration. The data collected from all participants was analyzed to help identify any themes present in the data set. This included examining individual interviews before looking for common patterns. Throughout the entire process, the ethical issues of the study were considered, including consent, right to withdraw and data storage. Next, in Chapter 4, I categorize these themes and report on the research findings.
Chapter 4: Research Findings

4.0 Introduction

This chapter outlines and discusses the findings from the interviews of two elementary teachers in Ontario. As a requirement to participate in this research, both teachers consistently integrated technology into their classroom in meaningful and student-centered ways. The results of these interviews help to answer my research question: How is a sample of elementary school teachers meaningfully integrating technology through student-centered pedagogy? Throughout this chapter, convergences are made between the participants’ experiences and the current literature on the topic, which was reviewed in Chapter 2. The findings were arranged into three main themes, each then divided further into three sub-themes. The themes are:

- Teachers identified similar past lived experiences and present work environments as factors which positively supported their effort to integrate technology meaningfully,

- Teachers recognized a range of purposeful and meaningful technology integration practices that are essential in providing new and engaging opportunities,

- Teachers faced issues including, limited support, limited funding and lack of knowledge, but overcome these challenges by drawing on resources within the wider educational community.

For each theme, I will first explain it, highlight the participant’s specific experiences, then highlight relevant support from the literature. Lastly, I summarize all of the findings and briefly outline recommendations for the future.
4.1 Teachers Identified Similar Past Lived Experiences and Present Work Environments as Factors Which Positively Supported Their Effort to Integrate Technology Meaningfully.

Both participants explained how their past lived experiences, as well as their present work environments, positively supported their effort to integrate technology meaningfully. This theme is important to the overall research study because it helps to contextualize the other findings of the study. Specifically, participants highlighted how their backgrounds strengthened their familiarity in technology. They both agreed that having a supportive school and community environment was an important factor that facilitated meaningful integration. Furthermore, both participants identified how access to resources within the school environment often led to successful technology integration.

4.1.1 Teachers identified their past lived experiences as a factor that strengthened their familiarity/interest in technology.

Wes describes his long personal history working with computers and other technologies as a contributing factor to his success in integrating technologies into the classroom. Of his past lived experience, Wes specifically stated, “growing up I was always interested in computers…I guess I’m saying that technologies have just been kind of a hobby of mine for many, many years.” He spoke to numerous examples from his childhood where he engaged with computer manuals, took computers apart and then tried to rebuild them, and learned to program. Wes’s technology-rich past is an important factor in his teaching practice as it has led him to be an “avid and confident” technology user. Wes is “not afraid of new technology” and is “keen” to have it in the classroom.

Past experiences with technology enabled Wes to slowly integrate technology into his classroom. He would advocate for better resources because he had seen them work outside the
classroom, and because he was comfortable with how they operated, he pushed to have them incorporated. When Wes first arrived at his current school, the level of technology use was very “basic”. But then Wes “started really pushing for things like iPads, Chrome books and mobile technology.” He knew of what alternative technologies existed and believed in their ability to help students learn.

Olivia, who currently teaches media literacy and special education, spoke of a similar past lived experience with technology. This participant described her previous experience with technology prior to becoming a teacher as “constant”. She added,

I didn’t know all of the different apps and how to use the SMART Board until I got into Teachers College. But I would say I had a pretty good understanding of how to use different technologies. I like to learn on my own, so if there is a new program, I’ll test it out and I’ll figure it out instead of me waiting to be told step-by-step how it works. I am not afraid of technology. I’ve always loved it. It’s always been a part of my life.

Olivia’s initiative-taking prior to becoming a teacher is significant because it speaks to the importance that she places on learning how to engage with different technologies. Olivia criticizes other teachers who use their lack of knowledge as a reason to not incorporate technology into the classroom. She explained that, “even if I didn’t have the experience of using a SMART Board or iPads, I think I would personally go out there and learn. I wouldn’t just let it sit there, right?” Olivia’s comfort level with technology, from years of working with it, gives her confidence to expand her knowledge.

The past experiences of these two teachers are important to note because it aligns with the current research on success with technology integration. Mishra and Koehler (2006) claim that a teacher with a greater knowledge of technology will have greater success with
implementation than a teacher with low levels of technological comprehension. By understanding the technology, these teachers were able to put their effort on finding areas where technology would be advantageous, rather than learning the technologies’ basic functions.

4.1.2 Teachers identified having a supportive school and community environment as a factor that facilitated meaningful integration.

Both participants addressed the importance of having a supportive school and community environment when implementing technology into the classroom. Wes referred to an overall “supportive culture” within the school which aided him in achieving successful technology integration. However, Olivia specifically identified principal and board support as factors that facilitated technological integration. As stated within the research, in order to achieve successful technology integration, teachers must receive support from both school staff and the board (Okojie, Olinzock, & Okojie-Boulder, 2006). Olivia works in a board that supports her choices regarding technology use and integration. “I feel very fortunate that I work for a board that is open to it, open to technology. I can’t complain.” This supportive environment, both in the school and throughout the board, affords Olivia the space to try new things and strive for complete integration.

Wes discussed a similar environment, where both the principal, school district and the greater community gave support towards technology integration in the classroom. “I think that our administrator created sort of a culture where she wanted us to experiment with technology, in a non-traditional way outside the use of a computer lab.” The principal fully supported Wes’s goals of integration and was able to provide resources in order for Wes to achieve his goals. Wes describes the process as a “slow build-up of things”.
We had both worked at another school previously together so we knew one another and she knew I had an interest in technology but that we didn’t really have the resources. And so she made a commitment to increasing the number of resources in her school and started with things as simple as projectors which we didn’t have. Replacing all of the overhead projectors with digital projectors and then eventually started purchasing iPads and SMART Boards, a couple or so every year. And then the school district added resources and everything just built from there.

The supportive relationship that Wes describes is important to note because it demonstrates what is possible when a common goal is shared amongst the members of a school. Wes and the administration worked collaboratively in order to ensure their school had the resources required to achieve integration.

Without the support of the administration, neither Wes nor Olivia would have been able to make the pedagogical decisions that they did. Simply having the content knowledge is not enough. A teacher must have support, from both the administration and the board, in order for integration to be successful. However, there is another factor that both participants identified which aided them in their goal of integration, access to resources.

4.1.3 Teachers identified access to resources as a factor that facilitated availability of technology.

In addition to the participants’ past lived experiences and their supportive environments, both teachers recognized access to resources as an important factor which aided them in integrating technology into the classroom. Wes’s experience in his current school is an important one to study because he mentioned the transition from a “traditional model” of technology integration in the form of computer labs, to a “one-to-one or shared model” which includes
iPads, Chrome Books etc. Wes admitted that a true “one-to-one” model is “not realistic in the district due to cost”, so the school must use a combination of different strategies to ensure the students have the technology they require.

The way we do it is some kids who do own their own device, bring it in and use their own. Within our class we have a good number of devices, maybe seven, eight, or nine devices. And then next door there is another dozen or so devices. So between the teacher next door and myself we just say, “Hey, can we use the devices the next period?” “Oh ya, no problem.” We just send them back and forth. We can pretty well make sure that we have one-to-one when we plan for it.

The collaboration between staff is essential, as it allows the school to overcome one of the greatest barriers to integration, which is cost. Teachers who are able to utilize the resources that surround them have a greater likelihood of achieving success (Becker, 1994). Wes had to be slightly creative in order to ensure he had access to the technology when he needed it. But because he knew how important technology was to his teaching practice, he took the necessary steps in order to achieve sufficient access.

In contrast, Olivia teaches in an environment where access to technology is abundant. As a teacher in a Special Education classroom, Olivia has fewer students compared to a regular classroom. Therefore, she feels “lucky that everyone has a laptop and I have a SMART Board and I have five iPads.” Unlike Wes, Olivia has constant access to technology. She acknowledged her unique situation and understands that it is “easier to use technology in my classroom compared to the class with 25 kids that only has one or two iPads.” Because of Olivia’s access to technology, she used technology “all the time” which resulted in it becoming “part of the daily classroom routine.”
4.2 Teachers Recognize a Range of Purposeful and Meaningful Technology Integration Practices That Are Essential in Providing New and Engaging Opportunities.

In the previous section, it was determined that a number of different factors contributed to successful technology integration. As a result of these positive factors, both participants recognized a range of purposeful and meaningful technology integration practices that resulted in new and engaging opportunities for students. The ideas presented in this section are valuable because they help explain the many benefits of technology integration and why other educators should strive to achieve technology integration. Specifically, the participants identified purposeful selection of devices as an important step in achieving integration. They both agreed that once meaningful integration has occurred, it can result in increased student engagement. Furthermore, the participants agreed that meaningful technology integration can also result in new learning opportunities for students.

4.2.1 Teachers indicated that purposeful selection of devices and software supports more meaningful technology use.

Instead of simply using iPads or computer games with students because the technology is available, Olivia emphasized the importance of purposeful selection of the devices and how they are to be used within the classroom. Specifically, she explained that,

There has to be a purpose. You have to decide what the purpose of using the technology is, is it going to be to assess them, is it going to be used to do something collaborative?

Don’t just use technology for the sake of using technology.

In order to find what technology will work for her and her students, Olivia uses her personal time to attend technology-based workshops or just “tinkers” with new things. “I like seeing what’s out there and learn what works and what would not because there are tons, there is loads of things
that you really just have to try and see what would work in your class.” Finding what works can be a slow process, but both participants said that proper selection saves time in the end and is more “impactful” on students.

Wes, who uses a variety of different technologies in his teaching practice, emphasized how he is “always sort of reflecting on whether or not the use of technology in this particular moment is appropriate.” Furthermore, he explained that sometimes the use of technology “takes time and adds steps” to the learning process. And for him, if that is the case, if it “distracts from the learning” then he will not use the technology. This high standard set by Wes resulted in a “slow and steady progression” of integration but eventually led to having more ways in which students could explain their thinking. This is important to note because it speaks to the amount of self-reflection and assessment that Wes is constantly doing during his teaching. As the research states, technology should not be something used “just because” but rather because it aids the students in achieving their learning goals (Okojie, Olinzock, & Okojie-Boulder, 2006).

The idea of purposeful selection is echoed in the research as a key identifier for meaningful integration practices. The literature is firm in the need to distinguish the difference between simply having technology in the classroom and having the technology as a tool for heightening the learning potential of students (Sheingold & Hadley, 1990; Okojie, Olinzock, & Okojie-Boulder, 2006; Levin & Wadmany, 2008). Meaningful technology integration is more than something to add onto a lesson at convenient times, rather it is well thought out and creates greater learning opportunities for students.
4.2.2 Teachers indicated that meaningful technology integration results in increased student engagement.

Both participants recognized that once meaningful integration has occurred, it can result in increased student engagement. Wes explained that since incorporating meaningful technology in the classroom, there have been more opportunities for “students to engage in content or express themselves.” He recounted an example that clearly exemplifies student engagement in learning: When introducing a new math concept, for this example multiplying two digit numbers, Wes provides varied opportunities throughout the week where the students can engage in the content. The students work in learning teams and rotate through different centers. One center uses the app *Explain Everything* where the students work out a math problem on a digital whiteboard and then record their voices over the animation. Their work is then sent to Wes via *Google Classroom* for him to assess later. Another center applies the specific math skill to a game on an iPad, where the kids “don’t even know they are using their math knowledge” to win. Wes is at another center teaching a mini lesson with the SMART Board that is recorded and posted on *Google Classroom* for the students that were absent. This process proves effective for Wes because it allows him teach a very specific skill while still keeping it open. This offers “students the opportunity to learn multiplication in new and different ways.” Additionally, it keeps all students engaged and excited to learn because they are participating in numerous activities and centers, rather than the more traditional model of listening to a teacher lecture.

Olivia also identified student engagement as one of the principal outcomes of technology integration. Olivia gives her students a fair amount of freedom when it comes to how they want to demonstrate their learning. “Whether they record a song or make a presentation on *Google Slides*, I find that they develop a greater sense of ownership than if I told them what to do.”
ownership over their own learning is important because it led to increased engagement in Olivia’s classroom. The results that Olivia shared are not surprising, given what the research says about student-directed learning. According to Hannifin and Land, when students maintain control of their own learning they actively participate in the learning process because their interests are being targeted (Hannifin & Land, 1997). Furthermore, technology has heavily effected this, as demonstrated by Wes and Olivia, by providing even more opportunities for student choice and self-directed learning.

4.2.3 Teachers indicated that meaningful technology integration results in new opportunities for students.

In addition to helping maintain high levels of engagement, meaningful technology integration can also result in new learning opportunities for students. Both participants shared how their students are able to do things that were not possible before technology was integrated into the classroom. In Olivia’s Special Education classroom, students are able to more easily put down their ideas and share them with others. “I use an app called Draw & Tell with my Grade 1 students.” After reading or listening to a story, the students use the app to easily articulate their thinking. “Whether it is facts from the story or a reflection, the students can either write, draw or record their ideas and then share it with me and their peers.” This piece of technology has provided Olivia’s students, who would otherwise struggle to share their thinking, an opportunity to engage with the material and communicate their knowledge with others while maintaining independence.

Wes has experienced similar results from the use of technology, as it “provided positive opportunities for students.” In addition, Wes highlighted the ultimate goal for using technology as enabling “students to express what they couldn’t really before. It’s about opening up the
opportunity to learn and express.” An example of this that Wes shared was using Ted-Talk style presentations to share their expertise on a particular topic. “It's where students pick something they are passionate about and learn how to put together a persuasive speech in a Ted-Talk style.” The students present in the gym that has been outfitted to look like a Ted-Talk convention. “We black out the gym, rent a lighting kit and use wireless microphones.” The whole thing is then recorded and posted on YouTube for the entire community to watch.

With the use of technology, the entire experience is heightened from a simple writing task to a community-wide, broadcasted event. Wes summarized the benefits of the technology use in this example by saying,

It is all about choosing a way to express the learning that is interesting and relevant to the students. I find that they are excited about how they are going to present their knowledge, which makes them more interested in learning the specific curriculum expectations that they need to cover in order to do well in the project.

Wes’s students were excited to learn the elements of persuasive writing because they knew it would make their Ted-Talk event better. Additionally, the research supports this type of technology integration as it enables “individuals to address unique learning interests and needs, study multiple levels of complexity, and deepen understanding” (Hannifin & Land, 1997 p. 168).

Both participants experienced higher levels of student engagement and new learning opportunities when technology was purposefully selected. The results shared by the participants are important because they illustrate how technology can dramatically change a classroom and the learning that the students are able to accomplish. However, it is important to note that even though these teachers were able to see the positive effects of technology integration, they
encountered many challenges that they are still trying to overcome, which will be the focus of the following theme.

4.3 Teachers Face Issues Including Limited Support, Limited Funding and Lack of Knowledge, But Overcome These Challenges by Drawing On Resources Within The Wider Educational Community.

Despite the positive effects of technology experienced by Wes and Olivia, both of the participants emphasized the unique challenges that are associated with meaningful technology integration. These challenges are important to identify because it aids future teachers in improving their own practice. By understanding what the challenges are, teachers can begin the work to overcome them. The primary challenge that the two participants faced was the lack of funding available to them or the school more generally. This resulted in equipment and system upgrades being difficult to obtain. Furthermore, this lack of resources led to teachers being unsupportive of the work that Wes and Olivia were trying to accomplish. Lastly, the lack of knowledge held by teacher colleagues was a reason why the participants believed that integration was not successful in all parts of their schools. Yet, despite these barriers, the participants agreed that it was possible to overcome the listed challenges by drawing on resources within the wider educational community.

4.3.1 Lack of school and parental support was a challenge to integrating meaningful technology but utilizing collaborative practices is a potential positive solution.

When Wes first arrived at his current school, there was a shared assumption amongst staff and parents that “teaching and learning was paper-based.” Both teachers and parents were taught using “paper and pencil” and therefore thought that current students should be taught the
same way. Wes found the culture “disheartening” but with the support of his principal, Wes has helped his colleagues slowly introduce technology into the school. “We have increased the number of times a day a piece of tech is accessed, and teachers are slowly coming around.”

In addition to challenging colleague push back, Wes faced resistance from parents. Lack of exposure to technology caused many of the school’s parents to have hesitation around integration. Wes explained that, “for a lot of parents, they did not use technology in school and so it is new and different and sometimes parents can be a little bit afraid about a different approach to things.” Yet, when Wes had parents come into the classroom and saw their child engaged in school, they were “overwhelmingly impressed” and came around. Increasing parents’ and teachers’ exposure to technology was an effective strategy for Wes in combatting hesitation or overall lack of support.

According to the research, lack of support from staff can cause teachers to feel isolated in their efforts and can create further stress associated with technology (Okojie, Olinzock, & Okojie-Boulder, 2006). Olivia explained how collaborative practices helped her staff overcome their reluctance to support technology integration. Sharing what technology was effective in the classroom and strategies for integration was common amongst the staff. “It was non-threatening when we were learning from each other versus having the principal or someone else instruct us on what to do.” The building of a community, one with a common goal of technology integration, made it easier for teachers and led to higher levels of successful integration.

4.3.2 Insufficient funding was a challenge to integrating meaningful technology but grant funding is a potential positive solution.

In addition to lack of support from colleagues and parents, both participants identified lack of funding as a barrier to integrating meaningful technology. Olivia highlighted how some
schools she has worked at “just don’t have enough technology.” It proved difficult to use technology in any meaningful way when “you only have a computer lab and you are booking it once a month.” It was clear that funding was being allocated to other areas of the school. In order for more technology to be placed in schools, “it takes a principal or board to ensure funding is spent on technology.” Without pressure from the administration, school resources will end up in another area.

Wes’s school had limited funding for technology when he first arrived at the school. He was able to overcome that barrier by applying for a government grant. He shared this long process by saying,

The technology was so very limited in what you could do and because it was so costly we did not have very many of them and they were quite old. They were literally falling apart and always in terrible disrepair. It was not until I was introduced to Khan Academy that I realized the possibilities of what you could do with technology. So I applied for a grant for iPads. We were successful and the school received 12 iPads. This was the beginning, and we just decided to put funding into technology because we all saw what amazing things it could accomplish.

The allocation of funding was a slow process in the school, but it all started with Wes realizing technology’s potential and advocating for additional funds. Applying for a grant is just one of the ways that that Wes was able to overcome the lack of available funding in his school. As previously mentioned, by using a “shared model”, students working in groups with a piece of technology rather than everyone having their own, the school is able to achieve integration with less. Additionally, sharing devices between classrooms means that not every classroom has to have a complete class set.
The research has shown that teachers who are able to take advantage of their environments are more likely to be successful when it comes to integrating technology into the classroom (Sheingold & Hadley, 1990; Becker, 1994; Okojie, Olinzock, & Okojie-Boulder, 2006;). Schools do not and should not wait for there to be a 1:1 ratio of devices to students in order to begin the integration process. The participants have shown through experience that solutions exist which can help overcome a school’s lack of funding.

4.3.3 Lack of prior knowledge was a challenge to integrating meaningful technology but Professional Development is a potential positive solution.

Olivia described how teachers can often be “obstacles themselves” to technology integration. Teachers are often unaware of the most basic functions of technology and are therefore afraid to use it. Due to the amount of technology that exists, Olivia understood why it might prove difficult for some teachers to get their “foot in the door”.

There is just so much stuff out there, some great and some really bad. There just needs to be more time to practice, practice with the technology. There are a million other things to do during the day and now your adding technology, I can see why it’s overwhelming for some teachers.

The practice time that Olivia mentions is worthy of attention because Okojie, Olinzock, and Okojie-Boulder (2006) argue that it is one of the greatest challenges facing teachers. Additionally, researchers for Apple Classrooms of Tomorrow (ACOT; Sandholtz et al., 1997) highlighted how the introduction of technology can send teachers “back into a first-year-teacher mode, starting all over again with issues of classroom management, discipline, role definition, and lesson development” (p. xvi). Not surprising, many teachers are uninterested in returning to a time where they felt like they had no idea what they were doing. Therefore, Olivia suggests
Professional Development workshops held by teachers who are proficient in technology. In the future, Olivia hopes to hold a PD day in the school and “have teachers talk about technology they use in the classroom. Share what works and what teachers can do to integrate it.”

Similarly, Wes found lack of teacher knowledge a primary barrier to technology integration. He described a time when funding was spent on resources but that lack of training meant no one knew what to do with the technology. He explained,

Two years ago, our district made a big investment in technology. They purchased iPads, Chrome Books, laptops etc. As a result, each school was swamped with devices. The problem was that no teachers were given any training on how to use the device.

This example illustrates how access to the technology is not always the greatest barrier to integration. In this case, the teachers simply did not know what to do with the technology once it was in the classroom.

In order to prevent similar situations from happening again, Wes emphasizes the importance of shifting priorities from purchasing technology to professional development.

I think sometimes you have to change your focus from just increasing the ratio of devices to kids to how can we provide maybe a lower ratio of devices but make sure it’s being used right and effectively because it not uncommon to go into a classroom and see a brand new tech tub of five iPads and they are hardly ever used. And that is an incredible waste of resources. So I think we need to make sure that instead of just addressing the ratio of devices we should be addressing professional development.

Looking to the future, both participants hope that professional development becomes easily accessible and regularly attended. However, neither participant knew how this could happen. This next step, the how, is lacking in the current research and therefore leaves teachers wanting
to know more without the ability to fill their gaps of understanding. The acquisition of knowledge is a critical piece of the puzzle and will hopefully lead to more teachers integrating technology into their pedagogical practices, resulting in increased learning potential for students.

4.4 Conclusion

This study found that teachers who have achieved meaningful technology integration have similar past lived experiences and present work environments and that these proved to be contributing factors in achieving technology integration. Additionally, teachers pointed to a range of purposeful and meaningful integration practices that positively effected students but also highlighted the challenges that are associated with meaningful integration. These findings are important because in addition to highlighting the positive effects of technology integration and specific practices in achieving it, they call for greater professional development for teachers and a significant increase in funding allocation. While these findings are great additions to the research, there are areas that require further attention. How can it be ensured that professional development on technology integration is seen as a priority amongst principals and teachers? Consequently, in Chapter 5, I will pose more questions and make recommendations for future research and discussion.
Chapter 5: Implications and Recommendations

5.0 Introduction

The following chapter discusses the overall implications and significance of this research study. I begin with a brief overview of the key findings of my research, as outlined in Chapter 4, followed by their significance. I then review the implications of these findings on the greater educational community followed by the implications for my own development as a teacher and a researcher. Next, I outline action-based recommendations for various stakeholders in the educational community, including teachers, principals and faculties of education programs. Finally, I identify areas for further research, followed with concluding comments.

5.1 Overview of Key Findings and Their Significance

As discussed in Chapter 4, teachers identified similar past lived experiences and present work environment as factors which positively supported their effort to integrate technology meaningfully. Both participants highlighted how their backgrounds strengthened their familiarity with technology. Being comfortable with the functionality of different technologies allows for more time to be spent on effective implementation practices. Additionally, a supportive school and community environment rich with resources often led to successful technology integration. These findings are significant because they help contextualize the other findings of the study. Additionally, understanding what goes into successful technology integration will help other educators with their own efforts to integrate technology. When these factors are present, teachers are more likely to achieve success when implementing meaningful technology into the classroom.
The participants both recognized a range of purposeful and meaningful technology integration practices that are important in providing new and engaging opportunities for students. They identified purposeful selection of devices as an important step in achieving technology integration. Furthermore, they agreed that once integration has occurred, increased student engagement will soon follow. Finally, both participants explained that the integration of technology results in new learning opportunities for students. For example, both participants highlighted various ways that students, of differing abilities, could demonstrate their learning using iPads and Google Classroom. The value of these findings is they help to explain the many benefits of technology integration and why educators should pursue technology integration.

In addition to the positive effects of technology integration, the participants identified facing similar challenges when integrating technology. These challenges include limited support from colleagues and administration, limited funding from the school and even their own lack of knowledge regarding technology. These findings are important because they highlight the need for greater professional development for teachers and a significant increase in funding. Moreover, understanding the challenges associated with technology integration can aid teachers in improving their own practice and begin the work needed to overcome them.

5.2 Implications

In this section, I outline the implications of my research findings. I begin with the broad implications, including for the greater educational community. This is followed by implications for my own development as a teacher and researcher.
5.2.1 The education community

The findings from the research highlight how new learning opportunities for students are created when meaningful technology integration is achieved. The unique strategies used by the participants to achieve integration have value and can be used in classrooms across Ontario. In order to prepare students for the futures that await them, it is vital that they are given every opportunity to learn and succeed. Thus, the findings of this study are greatly significant to the education community.

The importance of purposeful technology selection was stressed by both participants as an important factor for integrating technology in a meaningful way. In accordance with the literature, instead of simply using technology for the sake of using technology, both participants understood the learning outcomes they wanted the particular piece of technology to achieve (Okojie, Olinzock, & Okojie-Boulder, 2006). The act of integrating technology increased the learning opportunities for students and led to increased engagement. Effective selection of technologies is possible when educators are knowledgeable about the available technologies, which, for the participants, came from independent research and attending professional development. The idea of purposeful technology selection is valuable for the greater educational community because it stresses the knowledge required behind the action of integration. Teachers must be equipped with the necessary information to make informed decisions about what pieces of technology will best help their students achieve success.

To aid educators in the acquisition of knowledge, an environment must exist that is willing to support them, both pedagogically and financially. Both participants shared the benefits of having a supportive administration, which encouraged them to try new technologies without the fear of failing. A supportive administration is also important because they can help advocate
for the funding necessary to achieve successful technology integration. Understanding the current financial situation within the school, as well as identifying the areas of need, will aid in effective resource allocation. Sometimes more funding is not always required; rather, simply understanding how to better utilize the resources that are present is sufficient. However, teachers are not able to reach integration alone; collaboration with principals and other support staff enhances the rates of success. recommended.

5.2.2 My professional identity and practice

Like the participants in this research study, my past lived experience is one rich with technology. I realized the benefits that it had in my personal life and therefore wanted to understand the potential role it could have in the classroom. After conducting research on meaningful technology integration, I have achieved my primary goal of understanding the benefits of technology in the class, and I am hopeful of the future and where this field of study will go.

The experiences of the two participants have introduced what is possible with technology. Technology integration is more than substituting pencil and paper with a computer; it reimagines what is possible in the classroom. However, I am aware of the many challenges that educators face when trying to achieve integration. These challenges can easily build up and make it seem impossible for technology integration to be accomplished.

With this in mind, as a new teacher I know that I will not know everything. Despite the knowledge I have acquired by conducting this study, there is and always will be more learning to do. Therefore, I must seek out additional learning opportunities. I cannot simply wait to be told what information I need to know. Rather I need to pursue professional development that will aid me in my goal of achieving a fully integrated classroom. As Olivia mentioned, there is a plethora
of workshops and conferences that I as a teacher can attend, often at a low cost. Technologies and implementation strategies will always be changing, and it is my responsibility as an educator to stay on top of these changes and to keep my classroom the best learning environment for my students.

Engaging in the collaborative process is another way to ensure that the best integration practices are being used in the classroom. I hope to embrace collaborative practices with other educators, sharing my ideas and gaining new and effective strategies. Education is not an isolated profession. Knowledge is more valuable when it is shared with others and I believe that a school can achieve greater results if all of its teachers are working as one rather than a building of individuals. Whether I share my ideas with the teacher down the hall or speak at a conference, I am committed to sharing my passion for technology in the classroom. Collaborative work is not always easy but progress cannot be achieved with classroom doors closed.

5.3 Recommendations

Over the last several years, changes have been made to create greater learning opportunities for students. However, there is still room for improvement in terms of technology integration. I make the following recommendations for teachers, school boards/administrations, and faculties of education, in order to ensure the findings of this research study are felt in the classroom.

Within the educational system, there are many voices fighting to be heard. With a finite amount of funding and resources available, it is important for teachers, who are striving for technology integration, to advocate for themselves and their students. It is recommended that teachers speak to their colleagues, principals and school boards about available opportunities for
more professional development in technology or more resources for the classroom or larger school community. Both participants understood the importance of technology in achieving academic success and therefore fought to have it for their students.

In addition to more resources and learning opportunities for teachers, there are ways in which school boards can make technology integration a greater priority. By increasing the frequency and quality of time for exploration, teachers would as a result have the tools to try new technologies in their own teaching. I recommend that school boards and administration provide supervised practice time for all staff, on a regular basis. This would allow staff to try new technologies in a safe space, where they can ask questions and learn effective strategies. A teacher’s day is quickly filled with expected and unexpected responsibilities, which leaves little time for free exploration. Having a scheduled time where teachers can try out new technologies places a priority on exploration and encourages teachers to challenge themselves without pressure of success or fear of failure. It is simply an opportunity to increase exposure and comfortability.

The final recommendation is directed at faculty of education programs with the intent of equipping newly certified teachers who enter classrooms with the tools necessary to integrate technology in a meaningful way. In order to achieve this, all faculty of education programs in Ontario should have mandatory training in technology pedagogy and integration practices for all students, regardless of specialization or qualification. I was fortunate enough to have a technology integration course during my teacher’s education program. As a result, I have learned many strategies to achieve successful technology integration. With the newly adopted two-year program, this addition would now be possible across all institutions. Being able to use an iPad is not enough to ensure meaningful integration. New teachers need to be taught the benefits of
technology as well as how to overcome any challenges they may face. By making technology a priority within the faculty, there is an increase in likelihood they will advocate for appropriate resources and funding once they enter into schools. It’s simple, with proper training, there is a greater chance of achieving integration success.

5.4 Areas for Further Research

The existing research on meaningful technology integration is limited, especially on its effect on student learning. Therefore, in this section I outline areas of further research based on my findings and what I learned over the course of the study. Both participants spoke not only of the challenges that they faced while implementing technology, but highlighted some of the strategies that they used to overcome them. I believe that this area is one that should be researched further. Because of the limited sample size of my study, there are certainly more challenges that exist and even more strategies to combat them. Consequently, I encourage researchers within the educational community to continue researching technology integration, but with a larger sample size. This will ensure that more data can be collected, including more perspectives, which enables a more comprehensive conclusion to be drawn.

As stated in my findings, professional development is a vital piece of the technology integration puzzle. It assists educators in acquiring the knowledge needed to select the right piece of technology for achieving certain learning goals. Each participant mentioned that they regularly attended professional development sessions. However, the specifics of those sessions still remain unclear. In order to assist educators in achieving technology integration, I believe more research needs to be done around effective professional development. What type of sessions are most popular amongst teachers? What do they find most helpful and more
importantly, what type of professional development is not? The answers to these questions could potentially help new and experienced teachers continue to learn and better their own teaching practice.

5.5 Concluding Comments

In this chapter, I highlighted the findings as mentioned in Chapter 4 and explained their significance. It was found that there was shared past lived experiences and present work environments amongst teachers that had successfully integrated technology. Additionally, teachers shared a range of purposeful and meaningful integration practices that resulted in new and engaging opportunities for students. Finally, teachers highlighted the challenges they faced while implementing technology but also shared how they overcame these challenges by drawing on resources within the wider educational community.

The implications of these findings, both for the greater educational community and myself as a teacher and researcher were outlined. The act of sharing successful integration practices as well as failures will help the integration process evolve and make it easier to advocate for ourselves and students. With that in mind, I then outlined recommendations for teachers, school boards and faculty of education programs. Steps towards attending more professional development, supervised practice times for teachers, and mandatory training in technology for teacher candidates will hopefully increase the rates of success in terms of classrooms that have fully integrated technology.

Lastly, areas for further research were suggested, such as finding more strategies for tackling the challenges teacher may face by increasing the sample size of future projects. Understanding what professional developments sessions are most effective will also aid teachers
in gaining the most amount of knowledge as efficiently as possible. Overall, this study has highlighted the many benefits of meaningful technology integration and how teachers can begin to provide new and engaging learning opportunities for their students.
REFERENCES


Allyn and Bacon


APPENDICES

Appendix A: Letter of Consent

Date:

Dear _______________________________,

My name is Erin Stephenson 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 how teachers meaningfully integrate technology in student-centered ways. I am interested in interviewing Ontario teachers with experience teaching in elementary classrooms, and who have a demonstrated commitment to technology integration and student-centered learning. 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 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. 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,

Erin Stephenson
Email: erinclare.stephenson@mail.utoronto.ca
MEANINGFUL TECHNOLOGY INTEGRATION

Course Instructor’s Name: Dr. Angela MacDonald

Contact Info: angela.macdonald@utoronto.ca

**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 Erin Stephenson and agree to participate in an interview for the purposes described. I agree to have the interview audio-recorded.

Signature: ______________________________________

Name: (printed) ________________________________________________

Date: _______________________________________
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 teachers meaningfully integrate technology through student-centered learning.

This interview will last approximately 45-60 minutes, and I will ask you a series of questions focused on your perspectives and experiences with technology in the classroom.

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 grades/subjects have you taught over your career?
3. What grade(s) and subject areas do you currently teach?
4. Can you tell me about the school you currently teach in? (e.g. size, demographics, program priorities)
5. As you know, this study is focused on learning how teachers integrate technology through student-centered practices. Can you tell me what role technology and student-centered learning have in your philosophy of teaching? *listen, probe re: each one
6. Can you please describe your experience with technology prior to becoming a teacher?
7. What experiences contributed to developing your interest in technology integration into teaching and learning?
8. What experiences contributed to preparing you for this work in schools?
9. What is your relationship with technology outside of the classroom?

**Teacher Perspectives/Beliefs**

10. What do you believe is the role of technology in education?
11. What do you see as the principal benefits of technology for teaching and learning?
12. In your view, what does it mean to integrate technology in meaningful ways?
13. In your experience, how is technology typically implemented in schools and classroom learning?
14. What do you believe are some of the key barriers to meaningful technology integration?
15. How do you think these barriers could be addressed?
16. You have shared that you integrate technology through a student-centered approach. What does this mean to you?
17. In your experience, how does technology effect a student-centered learning environment?

Teacher Practices
18. What does meaningful technology integration look like in your classroom teaching?
   a. What specific technology resources do you use in the classroom and why?
   b. How do you use these technologies?
   c. What curriculum subject areas do you tend to use technology in and why?
   d. If I were to observe your classroom teaching for a day, what would I see in terms of how you integrate technology in student centered ways?
   e. Can you provide me with a few examples of how you have integrated technology into some lessons using a student-centered approach?
19. Can you give me an example of how you have used technology in a student-centered learning environment?
   *Prompts for each example:
   a. What subject/grade were you teaching?
   b. What were your learning goals for the lesson?
   c. What opportunities for learning did you create, and what role did technology play in the lesson? How did students interact with the technology and why?
   d. What outcomes did you observe from your students?
   e. What made your integration of technology into these lessons student-centered?
20. Do you use technology in your assessment practice? Can you please explain why or why not? How, if at all, do you assess students’ engagement with technology?

Supports and Challenges
21. What factors and resources support you in realizing your commitment to meaningful technology integration? (*listen and the probe as necessary e.g. access to technology in school, students access to personal devices, grants/funds, admin committed to this etc.)
22. Have you experienced any barriers to technology integration during your teaching practice? If yes, what barriers and how did you confront them?
23. What range of challenges do you encounter when using technology in the classroom?
24. How do you respond to the challenges you face and why?

Next Steps
25. What are some of your goals for integrating technology in your teaching program? How could the education system support you in meeting these goals?
26. What advice, if any, do you have for a beginning teacher who is interested in meaningful technology integration using student-centered approaches in their teaching?

Thank you for your participation in this research study.