

Teachers' Construction of Technology Integration Practices Within a Technology  
Supported Environment

A DISSERTATION  
SUBMITTED TO THE FACULTY OF THE  
UNIVERSITY OF MINNESOTA  
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY

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July 2019

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## Acknowledgements

Each PhD can only be earned by an individual, but its accomplishment is made possible with the support of many. I want to take this opportunity to thank the many people in my life that made this PhD journey possible for me.



**Chue**, thank you for your love and patience as I chased this dream



**Sofie and Phoenix**, thank you for your unconditional love, even when this journey took time away from being with you both. Thank you for helping me to dream bigger and fight harder to be an example that you can look up to! You two inspire me to do better and be better, so that I can help create a better future for our family



My mom, **Lee Xiong**, dad, **Leepao Chang** and parent in-laws, **Yalor Moua** and **Mee Moua**, thank you for laying out dreams for your children to pursue



**Mom**, thank you for showing me the power and value of education and for pushing me to pursue opportunities that you could only dream about doing yourself



To my siblings (**Hong, Nou, Keecha, Ta Linda, David, and Peter**) and sibling in-laws (**Ber, Bee, Mai, Shua, Tong Pao, Kabao, Nos Neeg, Zia, Cheenou, Wendy, Linda, Ethan, Ting, Yang, Na, Pakou**), thank you for taking on more familial duties that allowed me to work on class assignments, projects and my dissertation



Amy, my work-sister and friend, thank you for making it possible to pursue this dream while teaching full-time



Tiffany, my colleague and friend, thank you for all the advice and support in navigating this journey



To my past and present committee members, **Dr. Angel Pazurek, Dr. J.B. Mayo, Dr. Dave Earnst, Dr. Martha Bigelow, Dr. Cassie Scharber, Dr. Misti Sato and Dr. Aaron Doering**, thank you for helping me be a better student, researcher and person through your guidance, expertise, and support



J.B., thank you for helping to smooth out what would have been a bumpy ride on the last leg of the journey



Angel, thank you for your mentorship, it has helped me stay on course and complete the journey



Maija, thank you for all your advice and support on writing this dissertation, your help and expertise made this dissertation a finished dissertation



LTers, thank you for sharing and commiserating with me along the way

## **Dedication**

*“If we teach today’s students as we taught yesterday’s, we rob them of tomorrow.”*

*~John Dewey*

This dissertation is dedicated to my children, Sofie and Phoenix, nieces and nephews, Dynasty, Melody, Valerie, Dylan, Levi, Ivy, Emma, Samuel, Mitchell, Vicky, Breanna, Kendrick, Brandon, Gloria, Julie, Joselyn, Nick, Lillian, Nathan, Lani, Vincent, Alycia, Xavier, Audia, Joe, Giselle, Mason, YoYo (Ares), Titus, Kraven, Allura, Elspeth, Olivia, and all future nieces and nephews. Let’s work together to create a better tomorrow!

## Abstract

Students have more access to technology, but teachers have identified “ineffective professional development” as an obstacle to integrating technology into classrooms (Schoology, 2017). This interpretative case study responds to the need to change current technology integration professional development practices by building upon teachers’ lived experiences. I foreground the voices of teachers who are doing the learning in order to inform the design of professional development. The study took place in a small, first-ring, suburban district with five teachers who taught in a 1:1 setting. I collected participant artifacts, interview data, and field observations and subsequently analyzed the data through coding and three-dimensional narrative inquiry space. The following research questions framed the focus of the study: 1) How do teachers construct technology integration practices in a technology supported environment? 2) What informs teachers’ technology integration practices? 3) What are the practices of secondary teachers related to tech integration? The findings indicate that four factors inform teachers’ technology integration practices: values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge. The study also suggests that teachers enacted technology integration practices along a process-oriented and product-oriented spectrum. Taking these two findings into account, I developed the Pinwheel Framework in order to explain how teachers constructed their technology integration practices. This research shifts the conversation from designing technology integration professional development for teachers (a product-oriented approach) towards

using teachers' lived experiences as part of technology integration professional development practices (a process-oriented approach).

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## Chapter 1: Introduction

*As Fiona and I sat next to each other in my office space, I wondered how I should start. I looked out the sidelight window into the hallway and listened to bodies shuffling by as students made their way through the crowded hall to their next classroom. There was a cacophony of voices and laughter competing to be heard as the passing time music signaled to students that they had a minute left to get to their destination. And finally, all that could be heard was the buzzing of the refrigerator, letting us know that one of us should make the first move.*

*Fiona was not one for small talk and broke the silence that had started to envelop the office. “You know, Owen wants me to put all my stuff online,” she stated, knowing full well Owen had already spoken to me about the situation. “I told Owen, if you want me to do this, you have to give me time with Yeng to work on it. I’m not about to figure this out by myself without help. So here we are.” Yes, here we are.*

\*\*\*

The vignette above represents an increasing trend for teachers to start integrating technology use into their classrooms. Fiona\* (pseudonym) represents one of many teachers who had to re-examine her teaching practices as more technology became available to students. Nationwide, there is an increased expectation from administrators for teachers to use technology to increase student access and support student learning (Project Tomorrow, 2017 see [https://tomorrow.org/speakup/speakup\\_data\\_findings.html](https://tomorrow.org/speakup/speakup_data_findings.html)). This is especially true in the state of Minnesota.

## **Statement of Problem**

Many school districts in Minnesota have started, or are starting, 1:1 initiatives. These are programs in which each student in the school has access to a digital device—whether it be a laptop, iPad, or tablet. According to the Minnesota Department of Education (2016), 55% of school districts in Minnesota have a 1:1 program, with 30 more programs expected to be implemented. Nationally, 54% of teachers and students were projected to have access to a school-issued computing device by 2016 (Molnar, 2015). With increased technology adoption, there are increased expectations for teachers to integrate technology into their curriculum. Lawless and Pellegrino (2007) have identified that more students have access to technology tools than to teachers who are able to effectively integrate them into the curriculum. Professional development efforts have been implemented to support teachers' integration of technology for teaching and learning (Brinkerhoff, 2006; Ertmer, 1999; Glazer, Hannafin, & Song, 2005; Kopcha, 2012); but many teachers' needs are not being met with the professional development they are receiving.

In a survey of 2,846 educators from 89 countries, conducted by Schoology.com (2017) on trends of digital learning in K-12 education, 41.8% of all administrators of the survey stated that providing relevant effective professional development was one of the top challenges to digital learning. In the same survey (Schoology.com, 2017), 32% of respondents said ineffective professional development was a major obstacle to integrating technology for teaching and learning. This was the identified major obstacle, coming

behind lack of time to incorporate technology and not enough devices for students to use (Schoology.com, 2017). These are not the only barriers to technology integration.

Barriers to technology integration need to be minimized to help teachers develop their technology integration practices. Barriers to technology integration can be categorized as first-order barriers or second-order barriers. First-order barriers are factors that are out of the teacher's control, and may include lack of access to resources, absence of administrative vision for technology integration, or not enough time for teachers to implement new practices, added to the already identified ineffective offerings of professional development (Ertmer, 1999). Second-order barriers have to do with teachers' attitudes and beliefs about their own technology skill sets or the purpose of using technology for teaching and learning (Ertmer, 1999). There is also debate around which barriers to address first.

There are mixed opinions on which barriers should be addressed first to support technology integration efforts. Some studies believe second-order barriers can only be addressed after attending to first-order barriers (Kopcha, 2012; Glazer et al., 2005; Sugar 2005; Hixon & Buckenmeyer, 2009). Other researchers disagree and believe that second-order barriers may influence the impact of first-order barriers, and at times prove more challenging to address (Ertmer, 1999; Hew and Brush, 2007). Deciding on which barrier to address first is contextually based on the needs of the teacher. Although both barriers should be tackled, current research (Ertmer, Offtenbreit-Leftwich, Sadik, Sendurer, & Sendurer, 2012; Ertmer and Ottenbreit-Leftwich, 2010; Ertmer, 2005) has shown that

first-order barriers have been reduced with more availability of and access to technology resources and training, making room to focus on second-order barriers.

There is a variety of research based on second-order barriers and technology integration, specifically addressing teachers' beliefs and their implications on practice. Most of the research has examined teachers' pedagogical beliefs (Ertmer, 2005; Ertmer et al., 2012; Tondeur et al., 2016) and its impact on constructivist practices of technology use. For example, Ertmer (2005) found that teachers who had constructivist beliefs tended to integrate technology through constructivist means. Others (Vongkulluksn et. al, 2018; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Hur, Shannon & Wolf, 2016) focused on teachers' value of technology and its impact on their practice. For example, a study (Ottenbreit-Leftwich et al., 2010) found that teachers who valued the use of technology to support student learning and to prepare them for the future, "used technology as a tool to engage and motivate students, improve student comprehension and promote higher-level thinking, as well as a means to facilitate technology skill development that could transfer to future applications" (p. 1327-1328). How teachers value technology influences how they will use the technology. Some may argue that teachers' mindsets may also influence their use of technology.

An aspect of teachers' beliefs about technology integration may stem from teachers' mindsets and how they view technology integration, whether it is product-oriented, process-oriented, or a continuum of both. Product-orientation and process-orientation help identify how teachers enact technology integration practices based on their beliefs about learning. There is a nuance to understanding the difference. Product-

oriented teachers view learning as acquiring knowledge or achieving a goal, with the purpose focused on attainment of the knowledge or goal. Process-oriented teachers view learning as a process and see the journey as part of the learning. Therefore, product-oriented teachers will focus on which tools to use and process-oriented teachers will focus on how the tool can be used to support learning. Product-orientation contextualizes the learning with a specific tool, whereas process-orientation focuses first on how one goes about the learning before identifying which tools can be used to support that process.

The concept of process- and product-orientation partly stems from Carol Dweck's (2006) growth mindset research and the constructivist perspectives on learning that "...shift the focus from knowledge as a product to knowing as a process (Ültaner, 2012, p. 196-197). Growth mindset extends from previous research on implicit theories of intelligence. The concept of growth mindset is in contrast to that of a fixed mindset. Fixed mindset stems from entity theory and growth mindset stems from incremental theory (all part of implicit theories of intelligence). Implicit theories of intelligence take into consideration an individual's behavior pattern, perceived present ability, goal orientation, and their views of intelligence (Dweck & Leggett, 1988). Entity theory postulates that individuals who believe their intelligence is fixed (fixed mindset) have performance goal orientation, where they "seek to establish the adequacy of their ability and to avoid giving evidence of its inadequacy" (Dweck & Leggett, 1988, p.259). Individuals with entity theory may engage in mastery-oriented behaviors (e.g., seek out challenges, has high persistence, focus on learning) or helpless behaviors (e.g., avoid



challenges, has low persistence, focus on their abilities), depending on whether they have high or low views of their abilities (Dweck & Leggett, 1988). In line with entity theory, a person with a fixed mindset gives up when they feel challenged (Dweck, 2006) and is product-oriented. Incremental theory, on the other hand, suggests that individuals who believe their intelligence is malleable (growth mindset) have learning goal orientation and “view achievement situations as opportunities to increase their competence and may pursue, in these situations, the goal of acquiring new skills or extending their mastery” (Dweck & Leggett, 1988, p.259). Individuals with incremental theory, whether they have high or low views of their ability, will engage in mastery-oriented behaviors (Dweck & Leggett, 1988). Aligned with incremental theory, a person with a growth mindset persists through learning difficulties (Dweck, 2006) and is process-oriented. So, a teacher with a growth mindset, who enacts process-oriented technology integration practices, may persist in trying to integrate technology into their classroom, despite facing technological fears and setbacks. Whereas a teacher with a fixed mindset, who is more product-oriented, may give up after a failed attempt, or not even try, because of their fear of not knowing as much as their students about technology.

Something that is missing from the literature is examining how teachers construct their technology integration practices. There have been studies that examine what the technology integration practices are (Hsu, 2016; Palak & Walls, 2009; Judson, 2006), but not focused on how teachers have constructed those practices. There have been many studies that examine the influence beliefs have on the types of practices teachers engage in with technology (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2010; Kim, Kim, Lee,

Spector, & Demeester, 2013; Ertmer, 2005; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012), but this inquiry regarding construction goes beyond looking at an isolated variable and allowing for multiple variables to inform the inquiry. Also, many of the research has examined technology integration prior to the ubiquitous presence of 1:1 personal devices in the educational setting and more teachers are now teaching within a technology supported environment (Ertmer et al., 2010). This research seeks to examine technology integration within this new context, where 1:1 initiatives are becoming the norm, moving away from desktop computers and laptops, with the incorporation of applications and resources specifically developed for the use on personal devices. This new context also takes into consideration that teachers are faced with less first-order barriers than they had over a decade ago.

### **Research Purpose**

This study seeks to understand how teachers are constructing their technology integration practices within a technology supported context. Specifically, by exploring what teachers are doing and identifying the factors teachers are using to inform and influence their technology integration practices, this may lead to a better understanding of teachers' construction of technology integration practices. Professional development has been used as a way to support teachers' technology integration needs, so participants were identified from a professional development course called Tech for Teachers. Also, being a part of the Tech for Teachers course adds on to their technology supported context. The Tech for Teachers course did not take the spotlight in the study, but served as a learning experience that helped teachers build on their beliefs and knowledge about

technology integration and served as a context from which to study teachers' technology integration practices.

### **Research Question**

This study aimed to look at how teachers construct their technology integration efforts. Through this line of inquiry, teachers' technology integration practices are described and factors that influence their practice are identified. Particularly, by examining teachers who worked within a technology supported environment, where barriers such as technology access, resources, and support are minimized, we can focus on how teachers construct their technology integration practices. The following primary research question was used to guide this inquiry:

- How do teachers construct technology integration practices within a technology supported environment?

There are also two secondary questions used to support the exploration of the primary research question:

- What influences teachers' technology integration practices?
- What are the practices of secondary teachers related to technology integration?

The main focus of the study sought to understand the process(es) teachers undertook to construct their practices, moving away from the products of teachers' technology integration efforts.

### **Significance of Study**

Despite investment in resources and professional development for technology integration in the past thirty years, there has not been much return on investment

(Lowther, Inan, Strahl, and Ross, 2008). There needs to be a change in current practice. This study shifts the scholarship out of research using professional development narratives and examines the narratives of teachers' lived experiences. This study provided an opportunity to explore teachers' lived experiences as informed by their past interpretations about technology integration and how their current grasp of the concept is impacted with and between others, creating various possibilities for future constructions, enactments, and experiences. This scholarship moves the focus from an individual experience and examines the intersection of various experiences to inform teachers' construction of technology integration. So, instead of viewing teachers' construction of technology integration practices as something that happened linearly and informed through one perspective, this scholarship creates space to examine teacher's technology construction practices to be viewed from multiple points of views that shift between past and present experiences.

Part of a critique about current studies on technology integration professional development has been that it is dependent upon self-reporting (Hew & Brush, 2007). This study places value on teachers' self-reporting, their lived experiences. It positions the voice of those who are doing the learning to have value in helping highlight how certain experiences may be educative or non-educative (Dewey, 1938), leading to various constructions of technology integration practices. With the spotlight on how teachers' past and present lived experience informs their technology integration practices, we can identify how to design professional development that extends and builds upon teachers' knowledge and experience. This research will help shift the conversation from how to

design technology integration professional development for teachers (a product-oriented approach) towards using teachers' lived experiences to inform a technology integration professional development (a process-oriented approach).

### **Assumptions**

There are three assumptions I am making about how teachers constructed their technology integration practices. First, how teachers construct their technology integration practices is not something that can be seen. This assumption is made by distinguishing between examining how a practice is formed and what is that practice. Teachers' technology integration practices are the products of their construction. Before the products are formed, there is a process (or many processes) that teachers took to construct their practices. Second, identifying the products of teachers' technology integration practices can help identify factors that influence teachers' technology integration practices. This assumption is derived from literature that has linked teacher beliefs with teacher enactments. Third, knowing what factors influence teachers' technology integration practices will help inform how teachers are constructing their practice. The literature informs the assumption that factors like values and beliefs influence teachers' technology integration enactments.

### **Overview of the Dissertation**

Chapter One discussed how an increase in 1:1 technology initiatives has led to a need to support teachers with technology integration. Although there is a need for professional development to help teachers integrate technology for teaching and learning, these professional development efforts have been largely ineffective in helping teachers

to integrate technology into their practice. This study proposed to explore how teachers construct their technology integration practices, in order to gain a better understanding of how to support teachers' practices of technology integration and add to the scholarship of technology integration.

Chapter Two provides a literature review of the scholarship informing and framing the study. First, there is a need to explore how other researchers have framed technology integration. Second, identification of effective professional development and how researchers have constructed their studies of technology integration professional development were examined. Third, barriers to technology integration were identified, defined, and explored. Fourth, the literature review investigated how other researchers studied the impact of belief on technology integration. Lastly, the chapter explored the conceptual framework used to construct the study.

Chapter Three details the methodology used in this study. It examines why case study methodology was used and how that informed the site and participant selection as well as the type of data collected. A description of the Tech for Teachers course is provided, and followed with a detailed list of the data collected. The chapter will end with a description of the data analysis methods (which included the use of Clandinin and Connelly's (2000) three-dimensional narrative inquiry space and coding) and a discussion of the validity and transferability of the study.

Chapter Four explores the findings from the study. First, it will start with a narrative retelling (Clandinin & Connelly, 2000) of how the school district and I came into each other's stories (providing context for when I began working in the district and

describing the context of the district). Second, a narrative description of each teacher is provided to contextualize the relationships that had been present prior to the start of the study. These two narratives are important to address in this section. Some may argue that they would be best placed in the methodology section, but the decision was purposely made to place it in the Findings chapter because it represented the relationships and connections I (re)discovered as I analyzed and tried to make sense of the data. Lastly, the findings are shared.

Chapter Five concludes the dissertation. A summary of the study will be provided, followed by a discussion of implications of the study for secondary teachers' professional development related to technology integration based on the findings. The chapter will end with limitations of the study and recommendations for future research.

## Chapter 2 Literature Review

*Fiona is a phenomenal teacher. She knows her subject matter well, gathers feedback from students to revise her class activities, utilizes assessment data to revise how content is taught, and truly cares about students. Fiona is intentional in the changes she makes to the curriculum and how she teaches; so, she was taken aback when she was told that she needed to do something to a curriculum that she had meticulously cultivated over the years. There was a disconnect here. Fiona knew she was a great teacher; Owen had even commended her in regards to her teaching, so why was she being asked to do something different with her curriculum? Why was she being asked to post her curriculum online?*

\*\*\*

In trying to contextualize and ground the study, there were iterations of questions and lines of inquiry that were explored. The following questions were created to help narrow the literature review and identify research that would inform this study:

What is technology integration?

What are effective professional development practices?

How has professional development been used for technology integration?

What are barriers to technology integration?

How do beliefs impact technology integration?

The first part of this literature review provides responses from the literature to answer the above-mentioned questions, provide a context of how the topic has evolved, reveal where the gaps are in the literature and help hone the focus of this study. The second part of the



literature review provides a conceptual framework that was used to help inform the formation of the study.

### **What is Technology Integration?**

When it comes to technology integration, what does it entail? How do we know if technology is being integrated? Does the use of technology in a classroom represent technology integration? There is unclear scholarship on what constitutes technology integration (U.S. Department of Education, 2002; Hew & Brush, 2007). As there is lack of clarity in the literature, that may also be the case for how people come to interpret and enact their understanding of technology integration (Chen, 2008). This area of scholarship will help to contextualize an understanding of technology integration for this study, so it can be used to intersect, combine and (re)define what is meant by technology integration.

The U.S. Department of Education (2002) described technology integration as “...the incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools... it is important that integration be routine, seamless, and both efficient and effective in supporting school goals and purposes.” Hew and Brush’s (2007) review of the literature found differing definitions of the term technology integration; but have found that there is a common understanding of the terminology: researcher’s use of the term connects the “use of computing device for instruction” (p. 225). Hooper and Rieber placed more emphasis on the role of technology in the classroom, emphasizing that integration occurs when “...teachers consciously decide to designate certain tasks and responsibilities to technology, so much so that the

lesson fails if the technology fails... (as cited in Bauer and Kenton, 1999, *p.* 522). Bauer and Kenton also saw technology integration as having a reliance on using technology as part of the daily instructional practices. So far, these definitions of technology integration are focused on what the teacher does with the technology for instruction and does not take into consideration students' use of technology in the classroom.

Ertmer (1999) deviated from the above-mentioned definitions and moved her definition of technology integration beyond the use of technology as part of classroom practices towards how it is used to support student learning. Ertmer (1999) envisioned technology to not only support current learning, but to helping students prepare for futures that may not resemble the current status quo. She believed that technology integration was "...both curriculum-based and future-oriented... one that emphasizes preparing students for the future that they will inherit... technology adds value to the curriculum..." (Ertmer, 1999, *p.*49). Ertmer is not concerned about just using technology, but the purpose of how it is being used and for what purpose. Other researchers were also concerned about the purposes of technology use. Specifically, Inan and Lowther (2010) organized technology integration into three categories of purpose: "technology for instructional preparation, technology for instructional delivery, and technology as a learning tool" (*p.* 138). Each category of use is differentiated on whether it's for teacher use, student use, or both.

Current researchers are also expanding on the definition of technology integration. Tiffany Nielson-Winkelman (2018), described technology integration as incorporating "... how practices using technology are leveraged in educational contexts to

impact people, learning and society through the relationships among educators, learners and the technologies to produce social change” (p. 30). Nielson-Winkelman extends technology integration towards creating social change, along with supporting teaching and learning. Aron Sterling’s (2009) definition contextualized technology use to:

- facilitate learning by allowing for differentiation of content, pace and learning style;
- allow wider, non-location and non time-dependent communication between the learner and his or her sources of education;
- enable learners to utilize high-order thinking skills by facilitating routine tasks; and
- engage the learner by heightening interest and enjoyment (p. 11).

Sterling situates technology integration with student learning that expands beyond traditional pedagogies (i.e., lecture, bookwork) and transcends physical and temporal spaces.

For the purpose of this study, I will extend Hew and Brush’s (2007) definition and define technology integration as the process of using 1:1 devices (laptops, iPads, Chromebooks) and digital tools (i.e. apps, learning management systems) with pedagogy to support teaching and learning for students and teachers. I have chosen to contextualize 1:1 devices with the definition because that is part of the context of my site and participant selection. Although the definition contextualizes the use of tools, I want to reiterate that the focus is not on the tools (product), but rather the process of how to integrate technology for teaching and learning.

### **What are effective professional development practices?**

There is a wide range of structures for teacher professional development. Professional development where teachers attend an “expert” lectures—also known as

sit and get—have been argued or shown not to be effective (Garet et al., 2001; Desimone, 2005; Darling-Hammond et al., 2005; Lawless & Pellegrino, 2005; Mouza, 2011).

Teachers often return from professional development with no further support (e.g., time to implement what they learned) (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2005; Darling-Hammond et al., 2005; Lawless & Pellegrino, 2005). Fortunately, professional development types have moved beyond just sit and gets and into more reform-type (Garet et al., 2001), such as use of professional learning communities or coaching. The duration of professional development also varies, some may be an hour, a week, or even over years and may differ based on sessions within the overall professional development program. As there is a lack of coherence in structure, there is also no common measurement of teachers' learning from professional development.

With teacher professional development, there is no set of agreed upon principles to indicate effectiveness of professional development (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2005; Darling-Hammond et al., 2005; Lawless & Pellegrino, 2005; Mouza, 2011). The purpose of teachers attending professional learning is to be able to take back what they have learned and enact them in the classroom, in order to impact student learning (Garet et al., 2001; Desimone, 2005). There is not much data to support that this is happening (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2005; Darling-Hammond et al., 2005; Lawless & Pellegrino, 2005; Mouza, 2011). Much of the data that is collected is based on teachers' self-reports on how they felt about the professional development and not the impact their learning had on student outcomes (Garet et al., 2001; Desimone, 2005; Lawless & Pellegrino, 2005). Despite the lack of

correlation between professional development and its impact on student achievement, teachers' self-reports about professional development are still important to help understand how teachers are taking (or not taking) up what they learned in the professional development sessions. Also, it is difficult to draw a line between professional development efforts and student achievement outcomes because there are so many variables that influence students' achievement (Holloway, 2006). These variables (e.g., the students themselves, their home life, schools, principals, peer effects, and teachers (Hattie, 2003)) make it hard to isolate the sole factor for students' achievements.

There are various studies on what constitutes effective practices of professional development, but there is no consensus among the literature (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2009; Darling-Hammond et al., 2005) as to what those features are. Despite a lack of consensus on what are THE effective professional development features, Desimone (2009) argues that there is "...research consensus on the main features of professional development that have been associated with changes in knowledge, practice, and, to a lesser extent, student achievement" (p. 183). Desimone argues that many studies have the same components, but just utilize different terminologies. From the literature (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2005; Darling-Hammond et al., 2005), there are principles that can be applied to effective professional development. Desimone (2009) identified content focus, active learning, coherence, duration, and collective participation as five features of effective professional development. These features are the same features Garet et al. (2001) identified in their study, with activity type missing from Desimone's (2009) list.

Garet et al. (2001) had conducted a large-scale empirical comparison of the features of professional development identified in the literature as effective and their impact on teacher's knowledge and skills and teaching practices. Garet et al. (2001) found that three structural features of professional development in conjunction with three core features of professional development activities had a positive impact on teacher's self-reported learning and practice. The three structural features are types of activity, collective participation, and duration. In terms of types of activity, this is in reference to the activities being traditional sit and get workshops that typically are conducted outside of the school day, or reform type activities where teachers engage in activities, like a lesson study, typically done during the school day. Collective participation is in reference to teams of teachers with similar teaching context engaging in professional development together. Duration examines the amount of time and the span of time of a professional development. These three professional development features work in conjunction with the three core features.

The three core features are professional development activities focused on content knowledge, opportunities for active learning, and coherence with teacher's professional goals. Content knowledge is in reference to the subject matter that teachers participating in the professional development teach, or information about how students learn. Some examples of active learning activities include discussion, observation, or lesson design. Coherence involves connecting the professional development to other goals and activities the teacher is a part of (e.g. school goals) and aligned with state/district standards.

All six features, in conjunction with one another, led to results that supported teacher growth and change in practice. The following highlights some of the findings of the study in regards to the core features:

All three of our measures of the core features of activities have a positive influence on enhanced knowledge and skills... enhanced knowledge and skills have a substantial positive influence on change in teaching practice... teachers report changing practice more as a result of reform activities than traditional activities... (Garet et al., 2001, p. 933-935).

Just as there is a correlation between core features towards enhanced teacher learning and practice, this was also true of the structural features. The results showed that reform activity types tended to have longer duration (in span of time and contact hours), and a longer duration allowed for active learning and coherence opportunities (Garet et al., 2001).

### **How Has Professional Development Been Used for Technology Integration?**

**Traditional professional development efforts.** There are no agreed upon principles of effective technology integration professional development (Lawless & Pellegrino; Mouza, 2011; Hanover Report, 2014). In effect, when it comes to technology integration professional development, the described effective principles of teacher development are ascribed to technology integration professional development (Lawless & Pellegrin; Mouza, 2011; Kopcha, 2012). Mouza (2011) builds on Garet et al. (2001) and Desimone's (2005) framework and suggests the following: after teachers engage in technology integration professional development designed with effective professional development principles, they will gain skills/knowledge that they will enact in their

classroom, impacting student learning, causing teachers beliefs about technology integration to change. This is described as an iterative cycle.

Lawless and Pellegrino (2007) do suggest a framework on evaluating technology integration professional development in order to evaluate and define effective principles of technology integration. They argue that it is not clear what is effective professional development, what content is actually learned in the professional development, and if the evaluation is measuring the intended outcome. They proposed three phases to examine, 1) the structure of the professional development (i.e. type, duration, tech use,) 2) the content being taught (teacher's knowledge, beliefs, and pedagogy), and 3) how the professional development is aligned with student achievement. These three phases are used to create clarity to identify effective principles of technology integration professional development. Unclear understanding of effective technology integration professional development may result in professional development that are not meeting the needs of teachers.

Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) indicate that many teachers are dissatisfied with the professional learning they take part in. Most professional development address subject-matter content, that covers breadth and not depth, or there is a lack of coherence between what they are learning and what they are expected to do in the classroom (Darling-Hammond et al., 2009; Lawless & Pellegrino, 2007). The purpose of teachers attending professional development is to be able to use what they learned to support student learning (Garet et al., 2001; Desimone, 2005); but this is not happening (Hawley & Valli, 1999; Garet et al., 2001; Desimone, 2005;



Darling-Hammond et al., 2009; Mouza, 2011). The clear consensus from many years of research is that technology integration professional development must change if teachers are expected to effectively integrate technology into their classrooms.

**Changing professional development.** Traditional sit and get professional development will not change teachers' beliefs or practices. Research must move beyond learning to use technology (product-orientation) and move towards process-orientation, like connecting technology with pedagogy by using student-centered instruction (Ertmer, P., Gopalakrishnan, S., & Ross, E., 2001; Mouza, 2011; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Kopcha, 2012; Ertmer & Ottenbreit-Leftwich, 2013; Ertmer & Ottenbreit-Leftwich, 2011). Connecting technology and pedagogy has started to replace technology integration professional development that has been focused on learning how to use technology (Ertmer et. al., 2012; Ertmer & Ottenbreit-Leftwich, 2011; Kopcha, 2012; Mouza, 2011). These are important moves in technology integration professional development, as they provide different experiences for teachers in coming to understand and enact their own technology integration practices. An area of research coming into its own is the use of situated professional development (Glazer et al., 2005; Kopcha, 2012; Sugar, 2005).

Situated professional development "...focuses on particular technology needs that teachers would like to learn and integrate in their classroom as opposed to dictating particular technology competencies that a teacher must exhibit and possess" (Sugar, 2005, p. 550). This means teachers receive support in the areas that they need and want—sometimes known as just-in-time support. In addition, Ball and Cohen (1999) emphasized

a need to learn content “situated in context” (p. 12). Putnam and Borko (2000) emphasized situated learning needed to incorporate “authentic activities in classrooms... activities that are similar to what actual practitioners do” (p. 4). This meant learning how to use technology in the way teachers would use them in the classroom.

This area of scholarship informs the various ways teachers have engaged in technology integration professional development. The research gives voice to the experiences of technology integration professional development that has come before, so the current context can be understood in how these different experiences intersect within this study. Along with understanding the literature on technology integration professional development, there must also be an understanding on the barriers to technology integration.

### **What are barriers to technology integration?**

Barriers to technology integration are known as first-order barriers and second-order barriers. First-order barriers are external challenges that teachers face, such as not having access or the knowledge of how to use certain technologies (Ertmer 1999). Second-order barriers are internal challenges, such as teachers’ values or beliefs about technology use for teaching and learning (Ertmer, 1999). Brickner (1995) first introduced this concept in her unpublished doctoral dissertation and Ertmer (1999) popularized the concept through her research. Ertmer et al.’s (1999) research indicated a connection between what teachers believe and how they enact their beliefs about technology integration towards supplementing the curriculum, supporting the curriculum, or creating emerging curriculum. Teachers’ beliefs also impact how they respond to first-order

barriers. For example, a teacher who sees technology as a supplement, will feel they can't do anything about technology integration if they are not given more computers; on the other hand, teachers who believe computers support the curriculum would find ways to address the same barrier, i.e., create stations so students may all have access to its use even if it is not at the same time (Ertmer et al., 1999). Her research has strengthened the need to help teachers address second-order barriers.

Some studies suggest second order barriers can be addressed only after addressing the first order barriers (Kopcha, 2012; Glazer et al., 2005). For instance, Kopcha (2012) attends to building teachers' technological skills first before addressing their technological beliefs. Others (Ertmer, 1999; Ertmer et al., 1999; Lawless & Pellegrino, 2007) disagree and state that first-order barriers and second-order barriers can shift in terms of being challenges. Whether to address first-order or second-order barriers first is contextually-based on the needs of the teacher; although it seems second-order barriers are harder to address (Ertmer, 1999; Ertmer et al., 1999). Ertmer (1999) writes, "it is generally acknowledged that first-order barriers can be significant obstacles to achieving technology integration, yet the relative strength of second-order barriers may reduce or magnify their effects" (p. 53).

Teachers' experiences in regards to technology integration may influence their levels and/or ways of integrating technology into their practice. How teachers frame technology integration in context to their role in teaching and learning may heighten or lessen barriers for technology integration. An understanding of the scholarship of barriers

to technology integration helped contextualized barriers teachers may face when trying to integrate technology for teaching and learning.

### **How Do Beliefs Impact Technology Integration?**

Beliefs have been identified as a second-order barrier to technology integration, but how do beliefs impact teachers' change in practice? In regards to teacher change, Guskey (2002) wrote that teachers need to change their practice before their beliefs will change. As Guskey (2002) described:

... significant change in teachers' attitudes and beliefs occurs primarily after they gain evidence of improvements in student learning. These improvements typically result from changes teachers have made in their classroom practices... The crucial point is that it is not the professional development per se, but the experience of successful implementation that changes teachers' attitudes and beliefs. They believe it works because they have seen it work, and that experience shapes their attitudes and beliefs... (p. 383-384).

According to Guskey, teachers must change their practice first, and if they see improvement in student learning based on those changes, then they will change their beliefs. Application of Guskey's model to technology integration means effective technology integration professional development should result in improvements in student learning before teachers will support the use of technology as part of their pedagogy. Research specifically looking at beliefs and technology integration does not align with Guskey's proposal.

Other researchers ( Ertmer, 1999; Ertmer and Ottenbreit-Leftwich, 2010; Kim, Kim, Lee, Spector, & Demeester, 2013; Ertmer, 2005; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012) have found that beliefs, specifically pedagogical beliefs, influenced teachers' technology integration practices. In their exploratory mixed

methods study, Kim et al. (2013), found a significant correlation between teachers' beliefs about effective teaching practices and how they chose to integrate technology into their classroom. They wrote:

the more sophisticated epistemology teachers had, their conceptions were closer to the student-centered approach... their status of technology integration showed a more seamless use of technology, meaning that the focus and emphasis remained on the learning rather than on the technology... (Kim et al., 2013, p. 81).

This meant that how teachers believed they should teach also influenced how they implemented technology integration practices into their classroom. Research on value beliefs and technology integration practices (Vongkulluksn, Xie, and Bowman's, 2018; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010) found similar results. This meant that teachers who valued using technology incorporated it into their practice.

In contrast, Tondeur, van Braak, Ertmer, and Ottenbreit-Leftwich (2017) indicates the correlation may not be as clear-cut. Their meta-aggregative synthesis of qualitative studies around pedagogical beliefs and technology integration practices found that beliefs and technology integration practices had a bidirectional impact on one another (Tondeur, et. al., 2017). Sometimes beliefs influenced the practice and sometimes the practice influenced the belief.

### **Conceptual Framework**

The review and critique of the literature, paired with my own experience, contributed to the development of a conceptual framework to be used with this study. The conceptual framework incorporated constructivism, theory of experience, growth

mindsets, visitor-resident typology, three-dimensional narrative inquiry space, narrative knowledge, and narrative authority.

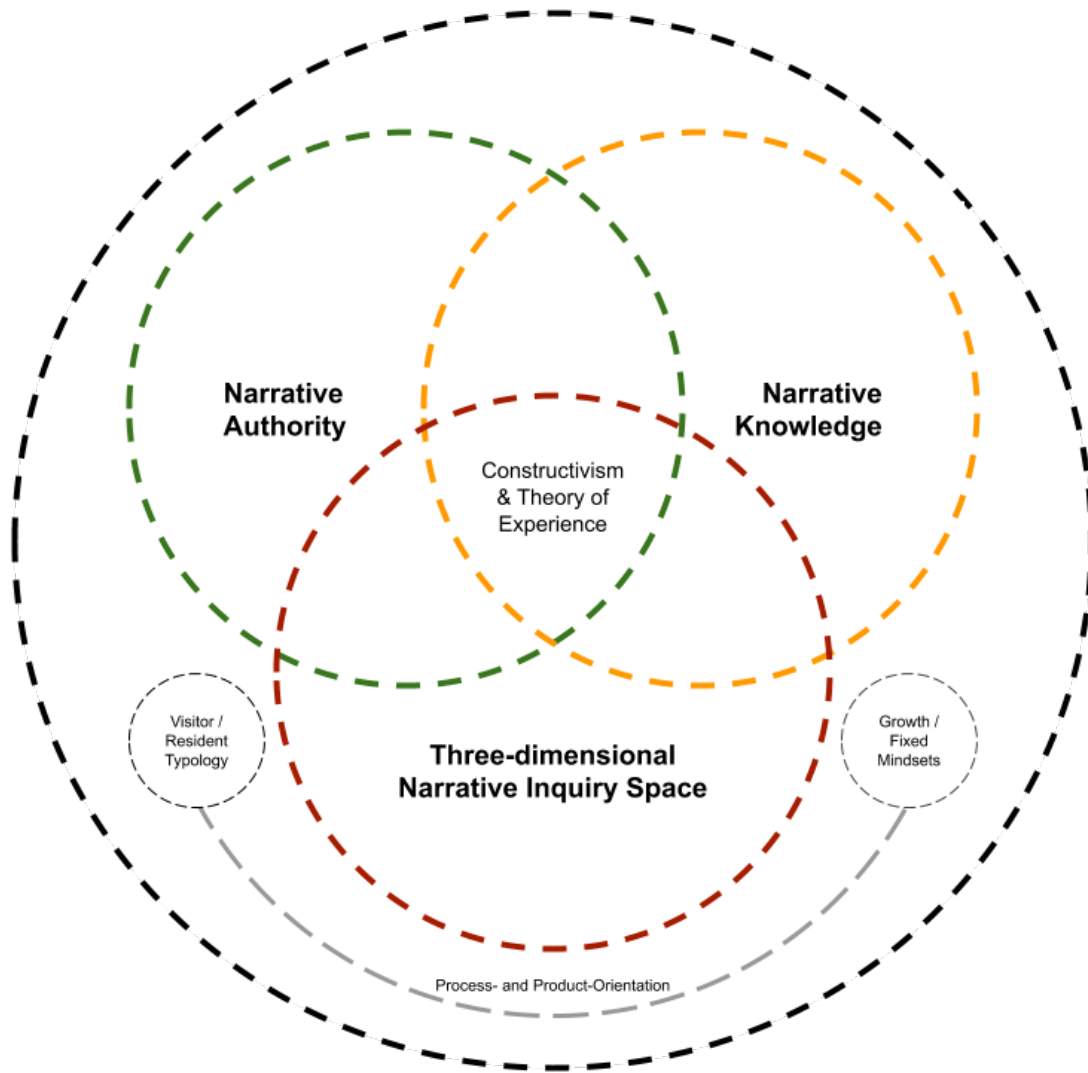


Figure 1. Visualization of the conceptual framework.

Figure 1 helps visualize which theories take center stage and which theories play supporting roles in the conceptual framework. The outer-most circle represents the conceptual framework of the study. The size of the circles symbolizes the leading or supporting role each theory has within the conceptual framework. The dashed lines of the

circle represent continual openness to incorporating and being influenced by other factors and experiences. The connections formed with the lines represent the connectedness of the theories to each other. Narrative authority, narrative knowledge and three-dimensional narrative inquiry take center stage as leading theories with the largest circles. Three-dimensional narrative inquiry space helped me to interpret and make sense of the data. Narrative authority and narrative knowledge helped me to understand the components that informed teachers' integration practices.

Although Constructivism and Theory of Experience do not have their own circles, they exist at the center of the three interlinked circles. They are not as prominent in the conceptual framework, but both provide the foundational understandings upon which narrative authority, narrative knowledge and three-dimensional narrative inquiry space take their foundational ideas from—the understanding of knowledge as co-construction and learning through experiences. Without the ideals of Constructivism and Theory of Experience, narrative authority, narrative knowledge, and three-dimensional narrative inquiry space would not exist.

Growth/Fixed Mindsets and Visitor/Resident Typology play secondary roles within the conceptual framework. It is through these two theories that I developed the concept of Process/Product-orientations and the understanding that these orientations of technology integration practices exist along a spectrum that changes based on context. The following sections will provide more in-depth discussion of each theories in the conceptual framework.

**Constructivism.** There are many philosophers from which constructivist theory stems, such as Dewey, Piaget, and Vygotsky. The premise of constructivism is that learners are creating their own knowledge, individually and socially; when learners are constructing meaning, they are learning (Hein, 1991; Maxwell, 2013; Ültaner, 2012). Knowledge is not something that is “out there,” nor is it independent of the meaning we connect to the experience (Hein, 1991). Maxwell (2013) states that “what people perceive and believe is shaped by their assumptions and prior experiences as well as by the reality that they interact with” (n.p.). Knowledge is continually being constructed based on what the learner already knows and in the experiences the learner engages in. Learners must continually “engage in meaning-making” (Ültaner, 2012). This shifts knowledge from being a product to a process (Ültaner, 2012).

Constructivism supports the notion that past experiences inform the present and in order to grow in our learning, we must continually build on that experience. With constructivism, knowledge is never complete or final, it is continually being constructed and reconstructed (Hein, 1991; Maxwell, 2013; Ültaner, 2012). Participants’ interpretation about technology integration is continually being formed based on past and present experiences. Jonassen (1999) states (in relation to constructivism), “Since knowledge cannot be transmitted, instruction should consist of experiences that facilitate knowledge construction” (p. 217). In helping teachers construct their interpretations about technology integration, they must have learning experiences that help them to further build on their past experiences. By providing the Tech for Teachers course,



participants were provided a learning experience to help them build on and develop their beliefs and knowledge about technology integration.

**Growth/Fixed mindsets.** Dweck's (2008, 2009, 2015) work was centered around helping students move from what she termed fixed mindsets to growth mindsets and the positive impact it had on their academic achievements. Fixed mindsets are in reference to students believing their abilities were things they could not change; whereas students with growth mindsets believed they had the power to develop their abilities (Dweck, 2008; 2009; 2015). People with fixed mindsets tend to believe people are born with a certain amount of talent and are afraid to try new things due to fear of failure (Dweck, 2008; 2009; 2015). They are concerned with how people will judge them and will only do things that they know they can accomplish (Dweck, 2008; 2009; 2015). On the other hand, people with growth mindsets tend to try new strategies or seek help when they get stuck (Dweck, 2008; 2009; 2015). They also acknowledge what their weaknesses are and search for ways to work with and through those weaknesses (Dweck, 2008; 2009; 2015). There has been much research on developing mindsets with students, but not much with teacher or technology integration.

In an interview with *Education Week*, Dweck (2015) stated that teachers who say they have a growth mindset, might actually have a fixed a mindset. In not recognizing their own beliefs about abilities, they may pass on fixed mindset messages to their students. For example, Rattan et. al.'s study (2012) found that participants with a fixed mindset attributed student's low math test score to meaning they had low math skills instead of not having studied the material. These participants were also less likely to offer

support to the students to help them increase their math ability, and instead, consoled them on the fact that it was ok, not everyone is good at math (Rattan et. al., 2012). In helping teachers to develop a growth mindset (e.g. modeling how to work through struggles), this not only helps teachers see their students' abilities as malleable, but may foster teachers' belief in their own ability to integrate technology. Teachers' growth mindsets may be developed through contextualizing the learning as process- and not product-oriented.

***Process-oriented and product-oriented.*** Dweck's (2008, 2009, 2015) research on growth and fixed mindsets helps to contextualize individual's perception of learning as either a process or product. Those with a fixed mindset see learning as a product, something that they have attained or not. Whereas those with a growth mindset view learning as a process, something that is continuous where they can continually improve on. In conjunction with the constructivist understanding that "shift the focus from knowledge as a product to knowing as a process" (Ültaner, 2012, p. 196-197), and growth mindset research, I offer the suggestion that technology integration can also be seen as process-oriented and product-oriented. Also, just like growth and fixed mindset is not meant to be a binary, where someone may have a fixed mindset with growth mindset tendencies (Dweck, 2015), teachers also have process and product-oriented leanings.

***Leanings toward process-oriented practices.*** Process-oriented practices focus on pedagogy and doing. This focus is on what Jonassen (1996) termed "learning with" technology. There is more of a focus on constructivist practices and student-centered learning activities. Examples include collaborating through shared Google Docs or using

the capabilities of a tool to meet a need. Process-oriented practices look at ways of building community and using a tool to help facilitate a learning experience. The technology is used in a way to aide in learning. It is connected to growth mindset and pursuing learning goals, in which the purpose of using the technology is part of the process. Even if there are technology failures, this does not necessarily constitute failure in teaching/learning. Process-orientation practices engage in troubleshooting strategies to address technology failures.

*Leanings toward product-oriented practices.* Product-oriented practices focuses on the use of the tool. It is what Jonassen (1996) would describe as learning from and about technology. Product-oriented practices focus on how to use the tool, specifically based on what the tool was designed to accomplish. The tool is primarily used to deliver content, or serve as the main vehicle from which students learn. Examples include learning how to use an authoring tool or learning content by watching a video. These activities tend to be teacher-centered and technology is used to support teaching purposes rather than learning purposes. It is connected to a fixed mindset and pursues performance goals. Teachers have a limited view on how they can use technology for teaching and learning. If there is a failure that means more hesitation in wanting to use the technology again. Success on the lesson is dependent on whether the technology worked and not the overall lesson.

The lens through which I am looking at teachers' experiences with technology integration is that of a growth mindset. Dweck's (2008, 2009, 2015) research shows mindsets can be taught and changed. Growth mindset research supports the underlying

conceptual framework that if we can help create experiences for participants around technology integration being process-oriented and not product-oriented, this will help them to shift their technology integration practices that are in line with someone with a growth mindset. Also, understanding how teachers conceptualize their technology integration practices provide an understanding as to why teachers construct technology integration practices in a certain manner.

**Visitor-Resident typology.** As part of reframing tech-integration as process-versus product-oriented, there needs to also be a reframing around the narrative of digital natives and digital immigrants (Prensky, 2001). This typology has been spread in education and created a narrative used by some teachers as to why these teachers cannot or should not have to try integrating technology into their practice. The concept of digital natives and digital immigrants creates a product-oriented typology. When one identifies with being a digital native or digital immigrant, there is a focus on the product (presence of digital medium) indicating one's labeling. Being a native is an identity someone is born with, not something that can be changed. As an immigrant, one always will be identified as foreign and never truly part of the native landscape. There is an undertone that being a native is something that is good and that is what people should aspire to be. And being an immigrant is synonymous with being less-than... someone who can never fully become a native, no matter how hard they try. This promotes a narrative and rationale for why some teachers see themselves as never being able to catch up with the use of technology because they were not born with technology like their students (digital natives). This creates a tension of not knowing enough and a struggle for power, in terms

of knowledge and experience, between students and teachers. Instead, we need to reframe this typology and reinterpret this narrative.

White and Cornu (2011) offer a different typology, one that invites all to be on a spectrum of a visitor or resident in digital spaces and changes in context of its use for personal or professional purposes. This typology invites everyone to identify where they are on the spectrum based on their interaction with technology use and perception of technology as a tool or place. There is no binary space (White and Corn, 2011), but it allows for a person to shift back and forth and in-between their interactions with technology. There is a blurring of when visiting shifts into residing. Being a resident and visitor is about a choice in how one wants to engage with the technology. It is not about being born into a category. Movement is expected along the spectrum, a drastic change from the stationary categories of native and immigrant. Although White and Cornu (2011) use this framework to talk about digital interaction, I am borrowing this understanding to reframe how teachers see their relationship with the use of technology—towards being a spectrum and not fixed. This reframing helps teachers rebalance their roles when it comes to technology (i.e., capitalizing on their pedagogical knowledge to use technology to assist in the process of learning and not be a product for learning). They can tap into their knowledge as an educator to help students transition between being a resident and visitor in how they engage with technology for personal and professional settings.

The Visitor-Resident typology is important as part of my conceptual framework because it was an integral part of conversations with participants in framing and

reframing their experience. It has also been helpful as a practitioner to use this typology to help teachers leave the binary of digital immigrants and natives to a typology where they can see their place with technology for teaching and learning—moving along the spectrum as a visitor or resident user of technology. This typology helps teachers experience technology integration as being process-oriented, and not product-oriented.

**Theory of experience.** Dewey (1938) states, “...genuine education comes about through experience does not mean that all experiences are genuinely or equally educative” (p. 25). Learning occurs through experience, but not all experiences support learning. Dewey (1938) philosophizes that there are two principles, continuity and interaction, that can be used to measure the “educative significance and value of an experience” (n.p.) Continuity considers that experiences are informed by past and current experiences to create conditions to allow for more growth in the future. Interactivity refers to how experiences influence the individual and how the individual interacts with others. Clandinin & Connelly (2000) built on this Deweyan view of experience to construct their process of studying experiences within a three-dimensional narrative inquiry space that utilizes three components: interaction, continuity and situation.

**Three-dimensional narrative inquiry space: Interaction, continuity, and situation.** Clandinin and Connelly interpret experiences as being temporal (past, present, future), spatial (space and place), and moving inward and outward (personal and social) (Clandinin & Connelly, 2000; Clandinin, 2006). These three components are used to “develop a narrative view of experience” (Clandinin, 2006, p. 46). There is a multiplicity to our lived experiences, as they are always intersecting between the past and present and

what we want for the future. We may understand, see, and experience in one way, but someone else's lived experience might understand, see, and experience the same moment in different ways. Or our understanding about a moment in time may alter, shift, and morph based on new experiences that influence how we view our past experiences. Our interaction and connection with one another about that moment may shift each other's understanding, seeing and experiencing of that same moment. It might not be that the act of the lived experience changes, but there is multiplicity in the understanding of the lived experience that shifts and changes with new information, new interactions, new experiences, and new situations.

Both Dewey's (1938) and Clandinin and Connelly's (2000) interpretation of experience has helped frame my understanding of participants' technology integration experiences as being intersections of past and present experiences, along with what they want for the future. These scholars' ideas have helped to contextualize experiences as both educative and non-educative (Dewey, 1983), dependent on the context of the experience in consideration to temporality, continuity, and situation. I am also using this understanding later on to help me analyze the data. It is important to identify how participants' past experiences influence their current construction of technology integration practices; some may have had experiences that made them deter further learning and engaging with technology integration. Studying the lived experiences includes acknowledgment of narrative authority and narrative knowledge.

**Narrative knowledge and narrative authority.** Narrative knowledge and narrative authority consider a teacher's lived experience in helping to understand their

construction of technology integration practices. Narrative knowledge and narrative authority build on Dewey's (1938) theory of experience and Clandinin and Connelly's (2000) narrative inquiry. All takes into account a teacher's lived experience in constructing knowledge that is temporal, relational and situated. Clandinin and Connelly (1988) expressed personal practical knowledge as:

in the teacher's past experience, in the teacher's present mind and body, and in the future plans and actions. Personal practical knowledge is found in the teacher's practice. It is, for any teacher, a particular way of reconstructing the past and the intentions of the future to deal with the exigencies of present situation (as cited in Clandinin, 2002, p. 1).

In other words, a teacher's personal practical knowledge represents their lived experience and how they call upon that knowledge to respond to their current experiences.

Olson (1995a) speaks of personal practical knowledge as narrative knowledge, which is synonymous with personal practical knowledge. This study will also take up Olson's typology. Olson (1995b) states, "Each of us constructs personal practical knowledge differently because of our individual continuity of experience and the particular interactions we experience" (p. 35). Teachers' construction of narrative knowledge will be different from one another because their individual and collective experiences are not the same. Our differing narrative knowledge influences different forms of narrative authority.

Olson and Craig (2000) explain that, "narrative authority becomes the expression and enactment of a person's personal practical knowledge that develops as individuals learn to authorize meaning in relationship with others" (p. 670). Experience is about knowledge that is transactional, making knowledge co-constructed. These experiences



form their knowledge; which continually changes with new interactions as time goes by and we renegotiate what it means to know. Olson (1995a) argues that an “individuals' narrative authority forms, is informed, and reforms through the continuous and interactive nature of experience. Thus, a person's narrative authority grows through experience’ (p. 123). Not only does it grow with experience, the narrative authority of others can also “enhance and constrain” a teacher’s narrative authority. Olson (1995a) states that foundational to the understanding of narrative authority is that knowledge is, “...embodied within individuals who interpret experience through personally and socially constructed symbolic forms” (p. 122). Narrative authority, therefore, comes from a person’s personal and social experiences.

Narrative knowledge and narrative authority posit learning as a process and not a product (Olson, 1995a), aligning with concept of product- and process-orientation. Olson (1995a) exemplified this with the following example:

When we believe teacher education students need to get an education in order to be prepared to teach, education is storied as a product received rather than as the ability to learn through experience. We add more courses thinking students need to receive particular information in order to know enough before they can teach. We pay attention to what courses we believe students need to take and what the best order of presentation would be. The narrative authority which individual students construct and reconstruct through personal experience seems out of place in this story of constructing a good teacher education curriculum (p. 130).

So, when education is seen as a product, it is seen as a laundry list of things to accomplish. This view of education does not allow room for teacher’s narrative knowledge and narrative authority to have a voice in their own learning.

## Summary

This chapter explored various scholarship and concepts that have been used to inform the study. From identifying how technology integration is defined in the study, to examples of previous technology integration professional development, and identifying barriers to technology integration, previous scholarships has been used to shape and define the structure of this study. This chapter also explored the various theories and typologies that are part of the study's conceptual framework, such as having a constructivist understanding of knowledge formation and the role of experience in learning. In the next chapter, the methodology for the study will be defined.

## Chapter 3: Methodology

*Fiona started by sharing her concerns with using technology as I gave nonverbal cues that I was listening. In the midst of listening, I asked, "What are you afraid about putting your content online?" Without missing a beat, her response came out instantaneously, as if the words had been waiting on the edge of her lips waiting to slip out and be heard. "What is going to prevent students from skipping my class if they have all my notes and materials? Why would they need me?" All the years I had known Fiona, the confidence she exuded, the purposeful decisions she made, I was surprised that she was questioning her role as a teacher.*

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The purpose of this study was to explore how educators were constructing their technology integration practices. The study sought to understand how teachers enacted technology integration practices based on their technology integration experiences and to

identify factors that attributed to their actions. In seeking to understand this phenomenon, the study addressed the following question:

- How do educators construct technology integration practices within a technology supported context/environment?

Two secondary questions used to support the exploration of the primary research questions are:

- What informs teachers' technology integration practices?
- What are practices of secondary teachers related to technology integration?

In this chapter, I first start with a description of case study research and why it was selected as the methodology of this study. Second, criteria for the site and participants selection are explained. Third, the role of the researcher is described. Fourth, an overview of the Tech for Teachers course that formed a part of the teachers' technology supported context is given. Fifth, a detailed listing of the types of data will be provided. Sixth, how the data were analyzed using coding and three-dimensional narrative inquiry space is explained. Lastly, the validity and transferability of the results are discussed.

### **Qualitative Case Study**

The purpose of this study was to conduct a qualitative interpretive case study to investigate how teachers in a technology supported context constructed their technology integration practices. Teachers' experiences hold many interpretations based on continuity, interaction, and place (Clandinin & Connelly, 2000). Qualitative research allows for the collection of rich data to support the interpretation of their stories. It also

enabled the structuring of a “conversation between the reader and the data” (Merriam, 2009); allowing the reader to do their own interpretation of the teachers’ experiences.

To get a sense of teachers’ experiences (Merriam, 1988; Merriam & Tisdell, 2016), the data source will be more narrative focused than it is numbers focused (Merriam & Tisdell, 2016), requiring me, as the researcher, to be the “primary instrument for data collection and analysis” (Merriam & Tisdell, 2016; p. 16). I wanted to observe teachers in their natural setting (Merriam, 1988; Merriam, 2009; Merriam & Tisdell, 2016), which would make it difficult to control for variables that a quantitative study requires (Merriam & Tisdell, 2016). The case was bounded by in-service teachers who work in a 1:1 setting in a Midwest, first-ring suburban district and who participated in the Tech for Teachers course, limiting the amount of people who could partake in the research (Merriam & Tisdell, 2016). The reason why participants are pulled from 1:1 setting is to help limit first-order barriers and to represent the present teaching landscape where personalized technological devices are becoming ubiquitous. Also, 1:1 settings tend to have the network infrastructure to support the devices, along with personnel to support the use of the devices. This is not to say that all first-order barriers are limited, but they are minimized.

### **Site Selection**

In identifying a site, I wanted to be in a district that had an established 1:1 initiative and provided their staff with technology integration professional development. A site with a 1:1 initiative meant that both students and teachers would have access to their own personal devices, whether it be a laptop or tablet. Providing staff with

technology integration professional development meant offering on-site opportunities (i.e. training sessions during staff development days) or offering opportunities to attend training sessions that are off-site. This would help to minimize first-order barriers.

East Brooke Schools (EBS), situated in a midwestern first ring suburb, is a district that mirrors both urban and suburban demographics. According to EBS's website, the district serves 7,500 students from seven neighboring suburbs. The district's racial demographics are comprised of 48% White, 21% Asian, 17% Black, 13% Hispanic and 1% American Indian. In EBS, 28% of students speak another language other than English at home and 46% qualify for free or reduced lunch. One of their neighboring urban district serves over 37,000 students with racial demographics encompassing 24% White, 31% Asian, 29% Black, and 13% Hispanic and 2% American Indian. This urban district has 36% of their students identified as English Learners and 73% of the student population who qualify for free or reduced lunch. One of the neighboring suburban district serves 11,297 students with racial demographics breaking down with 62% White, 12% Asian, 11% Black, and 9% Hispanic and 1% Native American. This suburban district has 5% of their students speaking another language other than English at home, and 28% of the student population qualify for free or reduced lunch. EBS's demographics make them not quite urban and no longer (stereotypically) suburban, but contains demographics that are transferable to other school districts.

EBS had 1:1 initiatives in three of their secondary schools. The 1:1 initiative provided iPads to all the students and teachers in the schools. The initiative started with the two middle schools in the district in 2014 and expanded to one of the two high

schools the following year. In the high school site, the 1:1 initiative was first introduced to grade 9 students in its first year. It expanded to grade 10 the following year and went school-wide in the 2017-2018 school year. Only teachers from one of the middle schools and one of the high schools were part of the initiative because teachers from the two sites had teachers who participated in the Tech for Teachers course.

In preparation for the two schools to begin the 1:1 initiative, many provisions were made to lessen first-order barriers. These provisions included the network infrastructure (e.g. wireless access) being upgraded, cloud computing being expanded (TECHISDTechPlan, 2013), and a learning management system (Schoology) being adopted. There were also personnel hired to support the initiative: a coordinator, a mobile support specialist, and two teachers on special assignment (hereon known as instructional technology coaches), to support the technology integration needs of the teachers. Although all three sites did not employ an instructional technology coach, both schools where teachers from the study were pulled from did have an instructional technology coach. These moves helped provide an infrastructure to support the 1:1 initiative as well as provide access to technology resources and support. To address helping teachers acquire the knowledge needed to teach within a 1:1 environment, in-service professional development was provided.

As each school started the initiative, professional development was provided to support teachers in the initiative. At the start of the initiative, professional development for teachers was part of the school's staff development days and covered various topics (e.g. iPad for teacher efficiency, Schoology training), but went away after 2-3 years of

implementation. Off-site professional development opportunities were also offered over the summer at a local technology professional development center. Most of the professional development was product-oriented, focusing on how to use the iPad, Schoology, and other apps/resources afforded with teaching in a 1:1 environment.

The instructional technology coaches at each location served as a resource for teachers. The instructional technology coaches at both locations were part time positions. Half their time was spent teaching and the other half supporting the technology integration needs of the staff. The instructional technology coach position at the middle school ceased to exist after three years, whereas the instructional technology coach position at the high school went from a part-time position to a full-time position during the third year of implementation when all grade levels in the school went 1:1.

### **Participant Selection**

The participants were taken from teachers who enrolled in Tech for Teachers. The course was taken for board credits (board credits are used to help teachers move lanes for increased pay, but these board credits are only recognized in the district and does not transfer if they leave the district) and offered to pre-K-12 teachers within the district. Purposeful sampling was used to select the participants (Patton, 2015). Patton (2015) describes purposeful sampling as a way to select, "... cases that by their nature and substance will illuminate the inquiry question being investigated" (p. 264). This study sought to look for cases that represented typical teachers representing the core discipline areas, with varying years of experience and technology skill sets that taught in a 1:1 school site and attended the Tech for Teachers course. The criteria that the participants

teach in a school within the district that is currently supporting a 1:1 initiative ensured that participants had access to technology resources and support (as was identified in the Site Selection section).

Participants selected represented populations of teachers that could be found in other 1:1 schools based on their content area and years of teaching experience. Gender and racial make-up were not considered because potential teacher participants did not have diverse representation. Table 1 provides a demographic matrix of each participant.

Table 1

*Teachers' Demographic Data*

<b>Name</b>	<b>Discipline Area</b>	<b>Years of Teaching Experience</b>	<b>Technology Use</b>
Brook	Science	11+	Product-oriented leanings
Helen	English	6	Process-oriented leanings
Molly	Social Studies	3	Product-oriented leanings
Paul	Math	11+	Product-oriented leanings
Robin	Special Education	8	Process-oriented leanings

There were teachers from the core discipline areas: English, Math, Science, Social Studies, and Special Ed. Teachers also had a range of teaching experience. Two teachers had taught over 11 years, and the other three taught, one to three years, four to six years, and seven to ten years. Each teacher also had varying levels of using technology for teaching and learning, ranging from using technology as a tool for teaching (product-



oriented leaning), towards amplifying student voice through technology (process-oriented leaning). By choosing participants that represented the general population based on their content area and years of experience, this helped with the transferability of the findings.

### **Researcher Positionality**

In an effort to be transparent, I want to acknowledge that I previously was a secondary teacher in the district and also worked part-time as the instructional technology coach for two years in the high school when the 1:1 initiative began. While employed in the district, I had proposed the Tech for Teachers course and got it approved for board credits. Although I am no longer employed in the district, I still served as the facilitator of the Tech for Teachers course and was the sole designer of the course: from the syllabus, the activities, and what participants needed to do to earn the board credits. Having taught for 12 years in the district, I also have established relationships with participants in the Tech for Teachers course and some of the participants for the study. Within this study, I positioned myself as a participant-observer (Patton, 2015) and was transparent with the participants about my role and what I was doing as part of the research.

As a participant-observer, I have access to insider knowledge (Patton, 2015; Merriam & Tisdell, 2016) that helped contextualize my understanding of what happened during the study; but at the same time may have shown bias on how I interpreted the data. This is where it was important for me to continually investigate my understandings and engage in a reflexive process (Patton, 2015). Patton (2015) states that reflexivity "...calls on us to think about how we think and inquire into our thinking patterns even as we apply thinking to making sense of the patterns we observe around us" (p. 70). This meant I had

to continually ask myself, how and why I came to the interpretations that I did. Engaging in reflexivity meant keeping memos and journaling. The memos and journals help keep a physical written record of all the thoughts running through my head. For example, after I storied some data and mapped out potential plotlines, I started reflecting on what I had written thus far and noticed that Paul's narrative was missing. I asked why and questioned if my prejudice for wanting teachers to integrate technology made me focus more on stories of tangible integration. Continual reflection of what I had written led me to look for how Paul and my story intersected and informed each other, leading me to take a closer look at the role of relationship. By seeing these thoughts written down, I am able to go back and reevaluate those thoughts, to strengthen, question, or add on to my interpretations (Patton, 2015).

### **Tech for Teachers Course**

This study is not about the professional development, but there must be an overview of what the professional development entailed to help contextualize this component of the participants' lived experience. The Tech for Teachers course was proposed for the 2016-2017 school year while I was the instructional technology coach at the high school. To meet the three board credit requirements that the course offered, the course had to incorporate 30 hours of class time. Eighteen hours were set aside for physical class time. The physical class time was scheduled for every Tuesday from April 3 to May 8, in the evening at the high school's media center.

The first day of class was during a snowstorm and school was cancelled. I had to get creative and design an online learning module to make up for the missed class time.

For the missed class, participants chose between taking an online class offered through Lynda.com or engaging in a Twitter chat. Three participants engaged in a Twitter chat and two took the same course on Lynda.com.

The class sessions were broken into two sections, with the first half of class focused on engaging in a learning experience together. The second half of class time was for participants to workshop their own interests or participate in a guided quest (walking participants through an activity on their quest list (explained below)). Each session had a topic that helped me design what our learning experience would include. The following topics were used: defining tech integration, tech integration frameworks and typology, collaboration via technology and digital literacies, instructional media, and online learning. The learning experience incorporated various pedagogical moves to help participants learn content, with the intent on always modeling technology integration practices to support the teaching and learning.

The other 12 hours were constructed as independent study. The independent study comprised of three activities that they had to do each week: quests, digital portfolio, and the technology integration log. The quests were a list of varying levels of difficulty technology-related activities that participants chose to complete. Examples of quest activities included organizing their Google Drive to developing their own podcast. Participants were asked to document their quests on a digital portfolio using Google Sites or another website hosting platform. They embedded artifacts to show what they did for each quest and reflected on the experience. Also part of the independent study, they were

asked to try at least four new technology integrated activities/lessons in their classes and reflect on the experience.

The district also required a summative ending to the course. This was accomplished by having the participants design a lesson or project that they would implement in their teaching context that incorporated what they had learned about technology integration from the course.

### **Data Collection**

I want to make it clear that I am not trying to study the effects of the Tech for Teachers course teachers engaged in. The professional development part of the study is representative of the teachers' current experience that informs and interacts with their interpretation of technology integration, as well as supports their context of being in a technology supported environment. Dewey (1938) talks about how learning can have experiences that detracts from the learning, and I want to use the Tech for Teachers course to be (re)educative.

Conducting a descriptive qualitative case study requires providing thick descriptions (Merriam, 1988, 2009; Merriam & Tisdell, 2016). In order to provide thick descriptions, there must be a rich body of data (Merriam, 1988, 2009; Merriam & Tisdell, 2016) to pull from. To provide for this, I collected the following data: technology integration belief statement, technology integration log, semi-structured interviews, participant-observer field notes, and professional development artifacts. Secondary data from the district website were collected to provide context for the district and the start of the 1:1 initiative.

**Technology integration quick write.** On the first night of class, participants were asked to respond to the following prompt in Schoology (the learning management system we were using): *Define technology integration. Provide a personal example of technology integration (as an educator or as a student).* This statement provided insight to how participants at that moment were currently constructing their technology integration practices thus far. Although not as important, it also provided insight on how their participation in the Tech for Teachers course may or may not have influenced their technology integration practices. Pedagogically, for me as a facilitator, this may be the first time the teachers were asked to intentionally reflect on their technology integration practices; and it served as an entry point for them to think about technology integration as a process for learning and not products used to learn.

**Technology integration log.** Participants kept a log of examples of when they integrated technology into their classrooms. They were asked to document at least four examples. The log consisted of four question prompts:

Describe the context for the technology integration.

Describe the technology integration.

Describe the successes you may have had.

Describe the challenges that may have occurred.

This technology integration log was helpful in identifying how participants enacted their technology integration practices. Because participants kept their own logs, they provided their own accounts of how they integrated technology into their practice and giving voice— in their own words— of what technology integration looked like.

The technology integration log was posted on Schoology as an assignment. They were provided a template (an example of the log can be seen in Figure 2) that they used to document their technology integration practices. They were asked to implement a technology integration practice once a week if they were able to, but were expected to have documented four instances by the end of the course.

**03 Technology Integration Log**

Apply what you have learned in the class and keep a log of opportunities when you have integrated technology into your classrooms. Each week, try one new thing. At minum try 4 new things. Use this log as a way to reflect on your technology integration practices. Feel free to write, make a video, create something for your reflection; just remember to respond to the following prompts in your reflection:

- **Describe the context for the technology integration.**
  - Which class(es) did this occur in?
  - Why did you decide to integrate technology in this context?
  - In what ways, if any, did it connect to the lesson objective(s)?
- **Describe the technology integration.**
  - How did you integrate technology in this context?
- **Describe successes you may have had.**
  - What contributed to the success?
- **Describe challenges that may have occurred.**
  - How did you or how would you have addressed the challenges?

Date	Reflection

Figure 2. Example of a technology integration log.

**Semi-structured interviews.** A sample of teachers were invited to be a part of the study and complete a semi-structured interview (Merriam, 1988, 2009; Merriam & Tisdell, 2016) after the conclusion of the course to share about their experiences with technology integration. Initially, the intention was to conduct two interviews, one at the start of the Tech for Teachers course and another at the conclusion of the course; but due to weather and time constraints, only one interview was conducted. In doing a qualitative

interpretive case study, it is best to keep the interview semi-structured so I can shift the interview focus based on what is revealed during the interview process (Merriam, 1988, 2009; Merriam & Tisdell, 2016). This was helpful in providing more in-depth information on teachers' temporal technology integration experiences.

The interview guide contained experience and behavior questions (Merriam, 2009). These types of questions allowed teachers to share their lived experiences and identify their technology integration behaviors. Even though the questions were purposeful, they were still open-ended enough so that teachers could provide thick descriptions about their experiences (Merriam, 2009). Probes (Merriam, 2009) were also utilized to inquire more specifically into teacher's narratives, and expand on what they were saying.

Interviews were conducted on location at each participants' teaching site. Three interviews were conducted at the end of the school day, right at the end of the last teaching hour. Two were done during the participants' prep hours. This created a time limit on how long the interviews would be, as well as interruptions that occurred during the interviews. All interviews were conducted after the conclusion of the Tech for Teachers course, towards the end of the school year. I am noting these contexts, as this may have influenced the participants' experience during the interview and how they responded to the questions. For example, as the interviews were conducted towards the end of the school year, many participants spoke of their technology integration as part of the future, something they will do in the next school year.

All interviews were recorded. In recording, there were three devices that were used: an iPhone with an audio recorder app, an iPad with the camera feature, and a laptop with a camera feature. All were used in case one of the technologies malfunctioned. Luckily, all three devices worked properly. Each audio from the iPhone recordings were later transcribed and stored on the researcher's university issued Google account. The Google account is password protected and require two-factor authentication (e.g., requiring a password and another form of authentication to access the account), making the data more secure than a password alone.

**Participant-Observer field notes.** In the role of facilitator, I also took on the role of participant-observer (Patton, 2015; Merriam & Tisdell, 2016). This provided me with opportunities to gather information that I did not have access to, (e.g. participants may reveal more to me about their beliefs or practices because I was positioned as the person who could help them address their technology integration needs). This does raise ethical dilemmas (Patton, 2015; Merriam, 1988, 2009; Merriam & Tisdell, 2016) and I had to be transparent with participants about my roles and do member checks (Merriam, 1988, 2009; Merriam & Tisdell, 2016) to gain consent on information I collected as a participant-observer. Member checks also allow participants an opportunity to review the findings to make sure it reflected their experience (Merriam, 1988, 2009; Merriam & Tisdell, 2016). As Maxwell (2013) stated, "This is the single most important way of ruling out the possibility of misinterpreting the meaning of what participants say and do... as well as being an important way of identifying your biases and misunderstandings of what you observed" (n.p.). In conducting member checks, I emailed my write-up of the



findings to each participant for their feedback. None of the participants contradicted the write-up, but some did use that opportunity to share how they had moved forward with their technology integration efforts.

Table 2

*Teacher Selected Quests, Projects, and Activities*

	<b>Quest 1</b>	<b>Quest 2</b>	<b>Quest 3</b>	<b>Quest 4</b>	<b>Final Project</b>	<b>Online Learning</b>
Brook	Organizing Google Drive	Schoology HyperDoc	Google Search Literacy	YouTube Playlist	ThingLink summative assessment	Lynda.com (21st Century Classroom)
Helen	Organizing Google Drive	Schoology HyperDoc	Presentati on Remix	Doodler	Personalized Learning for students	Twitter Chat #2ndaryela
Molly	Organizing Google Drive	Screencast -o-matic	Schoology HyperDoc	Book Creator	Summative Video for AVID	Lynda.com (21st Century Classroom)
Paul	Organizing Google Drive	Screencast -o-matic	YouTube Playlist	Doodler	Twitter Chat Flipped Lesson	Twitter Chat #flippedclass
Robin	Organizing Google Drive	Schoology HyperDoc	Doodler	4 C's	HyperDoc activitiy for absent students in English class	Twitter Chat #edchat

**Professional development artifacts.** Teachers collaborated, created, and engaged in critical thinking throughout their experience in the Tech for Teachers course. The artifacts available were based on teachers' interest and choice. They included quests

teachers engaged in to explore interests, presentations they created to share their learning, etc. Artifacts that were included were identified by the teachers in their interviews. Table 2 shows what each participant completed as their quests, the final projects they turned in, and which online activity they completed for their make-up day activity.

### **Data Analysis**

Data analysis required making sense of the data (Merriam, 1988; Merriam & Tisdell, 2016). It involved multiple reads of the data in order to find patterns and themes (Merriam, 1988, 2009; Merriam & Tisdell, 2016). The first read was to see what possibilities were contained in the data. Additional reads were to help refine and hone into what the data was revealing (Bloomer & Volp, 2016). At times, I had to engage in playing with metaphors and analogies (Bogdan & Biklen, as cited in Merriam, 2009) to understand what the data was trying to tell me. This led me to develop the Pinwheel Framework to understand teachers' construction of technology integration practices. Two methods of data analysis primarily used in this study was coding and analyzing within the three-dimensional narrative inquiry space. Both methods were used in conjunction with one another.

**Coding.** To make sense of the data, I had to create a process to help organize and analyze the data. Artifacts from the Tech for Teachers course was downloaded as a PDF file and placed in a Google Drive folder. Interviews were transcribed and placed in the same folder. Data analysis started with a read of the data (Maxwell, 2013; Merriam, 1988, 2009; Merriam & Tisdell, 2016). Then I went back again and had what Maxwell (2013) termed “a conversation with the data— asking questions of it, making comments

to it, and so on” (p. 204). I utilized open coding (Maxwell, 2013; Merriam & Tisdell, 2016) to generate potential codes. After reading each data, I wrote memos (Miles, Huberman, & Saldana, 2014; Patton, 2015; Maxwell, 2013) of my thoughts and summaries of my initial interpretations. I also used NVIVO, a coding software, as a digital process to analyze the data.

With the purchase of NVIVO, I started over with another read of the data and open coding. I chose to start with open coding, because I did not want to limit my interpretations of the data (Merriam & Tisdell, 2016), but did do some closed coding after my first open coding round. As part of open coding, I engaged in descriptive coding (Miles et al., 2014), which meant I created a word or phrase to summarize the data. With closed coding (Maxwell, 2013; Miles et al., 2014), I specifically looked for process-oriented and product-oriented enactments. I also implemented close coding to identify types of technology integration practices. This concluded my first round of coding.

For the second round of coding, I took the list from the first round and created a master list from which I formed categories from the codes, a process known as pattern coding (Miles et al., 2014). This was an inductive and comparative process (Merriam, 1988, 2009 ; Merriam & Tisdell, 2016), looking at all the codes to generalize for patterns, which is what interpretive research aims to do (Patton, 2015; Merriam, 1988, 2009; Merriam & Tisdell, 2016). Through category construction (Merriam & Tisdell, 2016), I identified general themes that helped me answer my research questions. Data matrices (Maxwell, 2013; Miles, et al., 2014) were also used to display the data. Miles et al. (2014) wrote that this type of data display made it easier to see the data and make

comparisons. Case study requires thick descriptions and this helped me identify common themes that the thick descriptions would describe. Along with the coding, I analyzed within a three-dimensional narrative inquiry space (Clandinin & Connelly, 2000) to give voice to participants and their storied experiences (Clandinin, 2016).

**Three-dimensional narrative inquiry space.** Analyzing within a three-dimensional narrative inquiry space required engaging the data and my personal experience through the following three dimensions— interaction, continuity and situation (Clandinin & Connelly, 2000). As Clandinin (2006) wrote, “Narrative inquirers cannot bracket themselves out of the inquiry but rather need to find ways to inquire into participants’ experiences, their own experiences as well as the co-constructed experiences developed through the relational inquiry process” (p. 47). As I immersed within the data and participants' stories, I negotiated the movements between their stories and my own (Clandinin, 2006), traversing between the three dimensions. I examined the dimension of time by traveling between the narratives of the district, the teachers, and myself and when we came into each other’s stories. Interaction was explored through my relationships with the teachers. The situation dimension was represented by the physical location of the district and the district’s demographic characteristics, as the district made its journey towards implementing the 1:1 initiative.

### **Validity and Transferability**

In order to address the issue of validity, I used multiple data sources for triangulation, conducted member checks, and engaged in reflexive practice (Merriam, 2009; Merriam & Tisdell, 2016). With triangulation, this meant that different data

sources were used to “confirm emerging findings (Merriam & Tisdell, 2016). I used data from the semi-structured interviews, technology integration logs, technology integration quick writes and artifacts that teachers referenced or produced as part of the Tech for Teachers course. In conducting member checks, I sent copies of the findings to each teacher and asked them to review what I had written to see if my interpretations aligned with what they meant to say (Patton, 2015; Merriam, 1988, 2009; Merriam & Tisdell, 2016). I also engaged in reflexivity through writing memos and journaling, questioning how I came to my interpretations or how my biases may have influenced the interpretations (Patton, 2015; Merriam, 1988, 2009; Merriam & Tisdell, 2016).

Many research focuses on the generalizability of their findings, but case study is more about transferability (Merriam, 1988, 2009; Merriam & Tisdell, 2016). Transferability entails providing thick descriptions “...of the setting and participants of the study, as well as a detailed description of the findings with adequate evidence” in order for future researchers to assess whether or not the context of the study is similar enough to their own setting (Merriam, 2009, p. 227). What this meant for the design of this study was the site and participants were selected to reflect the general population (Merriam, 2009; Merriam & Tisdell, 2016). When choosing my participants, I made sure to select participants with varying years of teaching experience, with different teaching disciplines, and varying comfort levels with integrating technology into their practice. The site also represented socioeconomic and cultural demographics that could be found in urban as well as suburban districts. The findings also incorporated thick descriptions of quotes from the interviews.

## **Summary**

In this chapter, I explored why I chose case study as my methodology and how it helped me to design my study. Case study is a methodology that allow various methods to be used (Harrison, Birks, Franklin & Mills, 2017; Merriam 1999; Merriam & Tisdell, 2016) to explore the case at hand, which allowed me to use coding and the three-dimensional inquiry space to analyze the data and intertwine participants' experiences with my own. In the next chapter I will focus on the findings of the research.

## Chapter 4: Findings

*The vulnerability Fiona shared about her fears of being replaced by technology was not lost on me. That moment of raw revelation started an exchange between Fiona and I that helped Fiona start to contextualize technology's role in her teaching practice. "Where does the content for your notes come from?" I asked. "From the textbook," Fiona responded. I probed further, "Do your students read the textbook?" She laughed and interjected with, "If I'm lucky." I continued, "So, if your notes contain the same content found in the textbook, and they barely read the textbook, what makes you think they will just read the notes if they are posted online?" The simple and short "Oh..." from Fiona created a crack in her fear of putting her course content online. I proceeded to remind her that she is a great teacher and the reason students came to class—the learning process she facilitated could not be replicated with the digital reproduction of her notes. She wasn't immediately swayed; she was still engaging in an internal battle on how to proceed. "You know, I post my notes and course materials online," I said. With a raised eyebrow of interest, she responded with a "You do?!" I shared with her how posting my course materials not only helped students who needed access to them, but also how it helped me with processes like organization, distributing materials to absent students, and staying on the same page with my co-teacher who taught the same classes that I did.*

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In this study, I explored how teachers constructed their technology integration practices in a technology supported environment. This chapter will report on the findings

of the study. First, it will start with a storying (Clandinin & Connelly, 2000) of how the school district, teachers in the study, and I came into each other's stories. Although this first section could be placed in the Methodology chapter, it was a purposeful decision to place it in the findings chapter because it represented the relationships and connections I (re)discovered as I analyzed and tried to make sense of the data. This storying represents my emic (Patton, 2015; Maxwell, 2013) three-dimensional narrative inquiry analysis (Clandinin and Connelly, 2000; Clandinin, 2006) of the context for the study. Second, the main findings of the study are presented. Third, a presentation of the framework developed from the study's findings will be introduced to help explain how teachers constructed their technology integration practices. Lastly, a discussion of unexpected findings is provided.

### **Introducing East Brooke Schools**

Stories are interconnected, layered, and always unraveling. And like many stories, the setting of this story crosses space and time, and is interconnected with other narratives. In retelling the story of the East Brooke Schools (EBS) district, it may be best to start with *where* the story began—where in place, where in time, and where in relation to my own story.

My story with EBS began in 2005 when I was fresh out of college with my 5-12 social studies teaching license. I recently turned 22 and starting to teach 9<sup>th</sup> and 10<sup>th</sup> grade students. As I grew and changed as a teacher, so did the district. When I first started, EBS was a different place demographically and culturally. It resembled a stereotypical middle-



class, predominantly white suburb. Now, EBS is a district that has some qualities of urban and suburban districts in terms of their demographic and socio-economic diversity.

From the time I started in 2005 to my resignation in 2017, EBS went through a fast-paced technology integration implementation process, specifically at the secondary level. I remember my first years of teaching using an overhead projector (the machine that dissuaded me from becoming a math teacher because I did not want to come home with hands that bled with overhead markers from working through problems with students on the overhead projector). A blue iMac G3 teacher's computer, overhead projector, and suite of Microsoft Office software were the arsenal of availability and choice in using technology for teaching and learning. When I resigned from the district in 2017, overhead projectors could be found piled in a storage room at the high school collecting dust (although there was a teacher in my department who still clung onto hers and had a spare hidden near her room... just in case). In my classroom, I had a cart of iPads (for my 12<sup>th</sup> grade students who had not been phased into the 1:1 initiative), a screen projector, iPad stand and document camera. I no longer used the Microsoft suite of tools and relied solely on Google's cloud-based Drive and Schoology, the district's learning management system. It was expected that all my 9<sup>th</sup> graders would use iPads as part of their learning materials. All these changes happened within my 12 years of teaching in the district, with most of the technological changes occurring in the last three years with the start of the 1:1 initiative.

Although not explicitly stated, movement towards the possibility of a 1:1 initiative began in 2011 as a response to the state's Department of Education requiring

districts to create a technology plan if they wished to maintain eligibility for state and federal programs. EBS's technology plan identified the following goals and strategies:

- Improve and enhance network infrastructure to support emerging technologies.
- Explore cloud computing storage options that will allow document access anywhere.
- Provide online learning management tools and electronic curriculum resources.
- Improve access to technology tools that engage students and allow flexibility within the learning environment.
- Enhance web presence to utilize web 2.0 tools and improve communications with families and community.
- Provide staff development opportunities to train staff on new technologies (TECHISDTechPlan.pdf).

Eventually, the iPad became the emerging technology that the district's improved and enhanced network infrastructure supported. It was also the technology tool that improved access and allowed for flexibility within the learning environment. All these goals and strategies paved the way for the 1:1 initiative to become possible.

EBS had a couple phases for the implementation of the 1:1 initiative. The first phase started in the 2013-2014 school year with a few middle school teachers piloting the program and then went to full implementation at both middle schools the following year. The second phase involved the high school and had a longer transition time compared to the middle schools. In 2015-2016, the 9<sup>th</sup> grade class went 1:1, with each subsequent year incorporating the next grade level, until all four grades were 1:1. I piloted 1:1 iPads in my classroom during the 2014-2015 school year and the school district hired me the following year as the instructional technology coach when the 9<sup>th</sup> grade class started the 1:1 initiative. At the time of the study (2017-2018), all grade levels at the high school had fully transitioned into the 1:1 initiative.

It is only in reflection that I am able to tell this story and make sense of the 1:1 transition. During that time, the process was chaotic with many questions that I did not have answers to. Why is the district asking about the types of technology we use in the classroom? What is happening at the middle school, and why are they getting iPads and we are not? The birds' eye view of what had happened during the rollout of the 1:1 initiative is only starting to come more into focus now. This is also true of my working relationships with the teachers who participated in the study and how our connections with one another enabled this study.

### **Introducing the Teacher Participants**

After twelve years of teaching in EBS, I had cultivated and maintained relationships with four out of the five teachers that joined the study. The only one who I had no working relationship with was with the science teacher who taught at the middle school. This was not to say that I only chose teachers who I knew. Out of 25 people who finished the course, 10 people volunteered to be a part of the study. Only two people were teachers who I had not taught with before. The other eight were former colleagues who I had shared students with because we taught the same grade level, gone to trainings or done special projects with because of our interest in supporting English Language learners, or those who had been a part of my department. Out of these eight there was only one who I had not known for more than four years, and that was because she was newly hired. The teachers that came to be part of the study were Brook, Helen, Molly, Paul, and Robin.

The teachers in the study represented different discipline areas, grade levels, and years of experience. Brooke has been teaching science for over 11 years, but she was the only teacher who I had not had a working relationship with because she taught in the middle school. Helen has been teaching English for six years. She completed her student teaching in the district and taught sheltered-content courses. I also taught sheltered-content classes and we shared students throughout the years, not to mention, for a couple of years, we shared the same lunch hour and “broke bread” weekly together until our lunch schedules changed. Molly had been teaching for three years, and although I had not known her very long, she and I shared the most interactions as she taught in the Social Studies department with me. She was the only non-tenured teacher in the study. Paul has taught math for over 11 years. Prior to teaching at the high school, he had taught at the middle school. For a couple of years, he and I taught in the same wing of the school and shared students because we taught the same grade level. Robin has been teaching for seven years as a Special Ed teacher. She and I came to know each other as we collaborated on how to support students we had in common. (See Table 1 for full teacher participant demographics). All the teachers brought to their roles, values and beliefs, knowledge, relationships, and experiences that would influence and inform how they constructed their technology integration practices. The next section will provide thick descriptions of what influenced their practice, how they enacted their practice, and provide a framework to understand how all these components formed to help them construct their technology integration practices in a technology supported environment.

## **Main Findings**

Trying to explain how teachers construct their technology practices is not an easy feat. It required a finessing of what was meant by “construct.” Construct went beyond how teachers used technology, it required seeing something that was not tangible. Through this study, as I read and reread the data, I was able to respond to the two secondary questions: 1) What informs teachers’ technology integration practices? and 2) What are practices of secondary teachers related to technology integration? It wasn’t until these two questions were addressed that I was able to start thinking metaphorically (Bogdan & Biklen, as cited in Merriam, 2009) with the data to respond to the main research question: How do teachers construct technology integration practices in a technology supported environment? The following summarizes the three major findings that emerged from this study:

1. Factors that influence and inform teachers’ integration practices include: values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge.
2. Teachers’ enact along a spectrum of process-oriented and product-oriented technology integration practices.
3. Teachers’ construction of technology integration practices can be explained using the Pinwheel Metaphor.
  - a. Teachers are continually changing how they construct their practices (how the pinwheel spins).

- b. Factors that influence/informs teachers' integration practices have different compositions (wheel composition).
- c. There are internal contexts that influence/inform how teachers enact technology integration practices (stick and pushpin).
- d. There are external contexts that influence/force teachers to enact technology integration practices (blowing of pinwheel).

The following section will provide description and depth to the above-mentioned findings. It will first discuss the technology integration factors, then move on to the technology practices. The chapter will end with an explanation of how the Pinwheel Framework metaphorically represents how teachers construct their technology integration practices.

### **Finding 1: Technology Integration Factors**

Four components represent the factors that inform and influence teachers' technology integration practices in a technology supported environment. These four components were identified after the second round of coding. With this in mind, I am not saying that these four components represent all the factors teachers consider when constructing their technology integration practices. What I am saying is that it encompasses the vast majority of factors based on what each teacher shared. These four components are: values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge. The following section will delve deeper into the four components.

**Values and beliefs.** Through coding and looking for themes in the data, codes that eventually formed the theme of values and beliefs were the most prolific. There were 32 codes that were referenced 151 times in the data. I bring this up not to show its abundance, but to highlight the numerical influence that values and beliefs had on teachers' technology integration practices as well as the complexity involved in reading and creating a narrative with the data. To help make sense of this data, the theme was broken down into three components: **teaching** values and beliefs, **technology** values and beliefs, and **enactment** values and beliefs.

*Teaching: What it means to teach.* Each teacher had differing values and beliefs of what it meant to be a teacher. Robin and Helen carried "sacred stories" (Olson, 1995) of what it meant to teach English. Brook and Molly did not separate technology's role in their teaching identity. In how they described what it meant to teach, Brook and Molly provided insights into what that meant for their technology integration practices.

Robin's teaching values and beliefs shifted between what it meant to be an English teacher and what it meant to be a Special Ed teacher. This created tension with her espoused beliefs about technology and her enactments of technology integration practices. As an English teacher, she placed value on reading and writing with pen and paper, but as a Special Ed teacher, she appreciated technology's affordances and capabilities to provide differentiation and accommodations for her students. Robin carried the English department's "sacred stories" of what it meant to be a teacher in that department. Part of that narrative is the preference to using paper and pencil for reading and writing:

I think part of it is because I teach English. I think that a lot of it is because I want kids to know how to read in a, especially when they're doing writing. I'm less ... I want them to do the actual physical act of writing first on paper. And I also think, I'm thinking a little bit about both of my classes, not just my class, but the classes that I share with other people. I know I have one co-teacher that I've taught with that is less tech savvy and then one that's really tech savvy. But we're still like in English, in the English department, we're still pretty paper, pencil for a lot of stuff and kids have requested that (Robin, Interview, May 24, 2018).

As an English teacher, Robin's narrative knowledge places value on reading and writing with paper and pencil. Robin makes it clear that this preference is not due to a teacher's technology competency, but inclusive of teachers who are "really tech savvy" and "less tech savvy" in this preference. This "sacred story" becomes a part of Robin's narrative knowledge of what it means to teach reading and writing in the English department.

Through Robin's tech integration log, she shares the conflict she is having with teaching writing and wanting to provide differentiation and accommodations for students as a Special Ed teacher. An example of this was her reflection on creating a Google assignment through Schoology for her Fundamentals English class (a course taught through the Special Ed department). Creating a Google assignment in Schoology meant she could push out a Google Doc template that made individual copies for each student to use. Robin wrote:

Students were writing their essays on "The Princess Bride" and story patterns. Students in this class have a wide range of abilities and needs. Some students were writing a paragraph and others were writing the full five paragraphs. I created sentence starters and an outline so students could rough draft on Google Docs first and then go back and create their final drafts. Some students really did well with this model. Other students struggled and I had to go back to paper (Robin, Tech Integration Log entry, April, 27, 2018).

Robin's teaching values and beliefs about writing using paper peeks through with her beliefs about technology being a tool to differentiate learning for her students. It's not



clear if the students were struggling with the process of writing/rewriting, or they were struggling with using the iPad as the medium for writing. What is clear is that she had to go back to using paper with students who struggled.

Helen also carried the “sacred stories” of the English department. She believed that reading on screens was not effective and students needed the kinesthetic marking on physical text for deeper reading.

I would say if we're doing a close reading, because of the way the brain processes screens, it's actually not as effective to have students read on the screen. So I don't like to do close readings there, and there is, I think, just something about the kinesthetic marking a physical text that helps students read more deeply on the page, which is not quite the same as kicking it into Notability and marking it on there. Those students are pretty ready to do that because they've been doing that for so long, so they're like, "Oh, yeah, I know how to do this." They've got that digital cycle down. So close reading I would not want to put on there for that reason...

Yeah, so the reading stuff is a big deal because the brain just doesn't process in the same depth or level... (Helen, Interview, May 24, 2018).

Helen's values and beliefs about how the brain takes in information through reading and writing with pen and paper, dissuades her from using technology for such activities as close reading.

Molly's teaching values and beliefs was a main proponent in how she constructed technology integration practices. Because Molly valued technology as part of her teaching practice, there was not much of a question on whether she should use it, rather in how and when to use it. Molly's teaching values and beliefs positioned technology as something she needed to take up. This began the moment she started teaching. As she recalled:

When I started teaching at EBS three years ago was our first year of piloting 1:1 for 9th graders and I was a 9th grade teacher. So I think it just was, it made sense. It was like, "I need to buy into this way of teaching and this way of implementing technology into the classroom because it's here, it's not going away..." (Molly, Interview, May 24, 2018).

Molly believed that using technology for teaching and learning was not a fad, but the way that the teaching profession was heading. She held onto that belief and made sure technology integration was part of her teaching practice every day. So much so that, as Molly put it, "If a student doesn't have their iPad, they're going to have to find one to check out in order to be successful nearly every single day" (Interview, May 24, 2018). Molly valued the iPad as a learning tool that was part of students' learning materials they had to bring to class every day. Just as students needed to come to class with paper and pencil, they were also expected to come to class with their iPad.

Brook believes teaching should not be boring and done with passion. If it becomes boring and the teacher is not passionate in what they are doing, technology will attract the attention of students. She remarked, "when we're competing with so much technology. If we don't, you're going to lose the kids... They see all these flashy things and beautiful sounds and they come to school and if you just, "Wah wah wah," you're going to lose them" (Brook, Interview, May 10, 2018). Brook does not want to be a boring teacher and seeks opportunities to learn new things to keep her teaching from becoming boring. She states, "I don't want to be bored and I don't want to be boring, so every time new apps come out, that's what I take classes for..." (Brook, Interview, May 10, 2018). For Brook, boring comes in the form of packets and she remarks, "...packet, packet, packet... I don't teach that way... The packet thing just totally turns me off"

(Brook, Interview, May 10, 2018). Brook believes she needs to show passion in how she teaches to get students excited about learning. She also sees the advantage of engaging students with technology. She commented:

Everybody says that paper and pencil are still better. I think part of it's how passionate you are with it because if I get all excited, my kids will get excited. If I can throw them a silly sock puppet movie just to get them going, it gets them going. I love doing that (Brook, Interview, May 10, 2018).

Brook believes students need to see their teachers passionate in what they are teaching in order to buy into what they are learning. Brook does this through continually reflecting and revising her lessons, and using what she is passionate about. She says, "I'm really big into reflecting and nothing's ever good enough, which is why you lesson plan all the time. But that's okay. That's my passion. This technology is partly my passion too, not just the kids" (Brook, Interview, May 10, 2018). Brook continually reflected and revised her lessons so that it engaged her students. She does this because she is passionate about teaching and the use of technology for teaching and learning. Brook believes she needs to compete with technology for students' attention, and so she utilizes the technology to move students towards learning.

Teachers are concerned with how technology disrupts the traditional teaching/learning practices they are familiar with, and how technology created ambiguity for students' and teachers' learning. Yet, each teacher had their own response to how they would use technology in response to technology's disruption. As teachers grappled with how to respond with technology for teaching, they also questioned why it should be used.

***Technology: Why technology should be used.*** Teachers struggle with what technology's role and influence should be in the classroom, as well as question and

negotiate where their technology competencies should be if they did not grow up with technology. Some teachers talked about the intentional use of technology and having a clear purpose for why and how they use technology in their practice. Others discussed technologies' capabilities as to why they advocate and incorporate technology enactments.

Helen's teaching values and beliefs make her conscience of when and why she will incorporate technology into the classroom, as well as how often it is used. For Helen, the why is very important in her decisions about technology use. She explained:

I think the big takeaway for me in the Tech for Teachers class was are they you using the iPads to solve problems, or whatever the technology is versus just like, "Oh, I'm writing on a piece of paper, or I'm writing on the iPad," so the replacement idea. I think that was really helpful for me in looking at how do I use this more effectively in the classroom, especially as my students have already been using the iPad for longer in school, and I'm pretty new to it having just moved 1:1 in 11th and 12th grade this year (Helen, Interview, May 24, 2018).

Helen needed technology to have a purpose in her classroom practices and not just be a replacement of what she could do with paper and pencil.

Not only does Helen believe technology should be used with purpose, she also believes there needs to be consistency and expectations around how technology use is communicated to students

...one of the things that we run into is if you don't use it consistent enough, students don't have the iPad ready to go, you know. It's kind of like if you ask them to take notes, but you never check them, they're going to stop taking their notes... So, I found the more that I've asked them to use the iPad, the more that they're sure to have it ready to go (Helen, Interview, May 24, 2018).

Helen understands that she cannot just expect students to know how to use technology for learning, she must help set up guidelines and expectations on how to use technology to

support student learning. Also, as Helen utilizes the iPad more in her class, students respond to being prepared with the tool because they know it is part of the learning process.

Similar to Helen, Molly believes technology come second nature to students, but they still needed to be taught how to use it for learning. Molly shared her belief that students' needed opportunities to play and make mistakes with technology as part of their learning. She emphasized the need to provide opportunities for students to play with technology in low-risks context before expecting them to use it for high-stakes summative projects. Molly stated, "I found that the summative was very well done using these apps because I had students use both apps for formative work leading up to the summative. They were familiar with the application and could use it easily for an assignment that was worth 80% of their grade (summative)" (Technology Integration Log, April 27, 2018). Molly saw that, as a teacher, she still needed to scaffold the learning with technology process.

Paul values continually learning and growing as a teacher through the use of technology, but he wants it to be intentional and done at a comfortable pace that stretches him to grow, but not too much to break him.

I think the biggest draw for me was I kind of did a few things on the iPad, and I kind of felt like okay, that's all the farther I can go on it. I needed to find some other ways to stretch with technology, and I know it's always evolving, so I need to ... so, that was probably my biggest motivation...

Yeah. Part of it was I was just finishing up my Masters, boards, and it's sort of like you're always kind of questioning what can I do better, what can I do better? The other thing is after teaching for over 25 years, I need to do some things to keep things fresh, and also meet the needs of students...

Once I've done it a little bit, I get a little bit more confident, I can stretch a little bit more, tried more things (Paul, Interview, May 16, 2018).

Part of Paul's motivation to continually learn stems from his desire to grow as an educator and make sure he is meeting the needs of his students. Paul sees technology as an area of growth for him. He believes not growing up with technology makes it harder to learn. He commented, "I think part of it is just the first hurdle is I did not grow up with technology, and so it just takes me longer to learn stuff... younger student teachers, they pick it up a lot quicker" (Paul, Interview, May 16, 2018). Paul acknowledges that learning how to use technology is made harder with having to learn how to use it later in life, but he does not use it as an excuse for why he should not be using technology in his practice. Instead, he sees it as an opportunity for growth and way to "keep things fresh" in his teaching.

***Enactment: How technology should be used with purpose.*** Molly and Brook want to capitalize on the capabilities of technologies to support teaching and learning. Molly valued technology as a way for students to show their learning. She believes students should be provided opportunities to "...use the device that they are given to apply to their learning and to further deepen their understanding of what we're talking about" (Molly, Interview, May 24, 2018). She gave an example of a summative assessment she had students produce in her AVID class:

The technology connected to the lesson objective because it created an interesting, creative lens into the day in the life of an AVID student. It brings a lot of the experience of being AVID to life and can be used for our greater community to explain what AVID is. The ability to record, add images, and text in Adobe Sparks added to the success of the final product (Molly, Interview, May 24, 2018).

Molly saw the affordances that apps like Adobe Sparks and the use of the iPad could provide. She encouraged her students to use these technology resources to complete their summative project of sharing what it meant to be an AVID student.

Brook values technology to be used to engage students into the learning. She recognizes that sometimes, the technology does not look much different than what could be done with paper and pencil, but the tool itself is what draws kids to do the learning. Brook recalled, "...we just did this planet one and I just showed them how to use Canva and that's not a lot different than doing it by the book, except that I got almost 100% of the kids engaged..." (Interview, May 10, 2018). Brook understands that sometimes she needs to capitalize on technology as the shiny and new object to "trick" students into wanting to use the tool for learning.

Each teachers' enactment values and beliefs made them use technology in different ways. Molly's enactment values and beliefs made her use technology as a vehicle for bringing in student voice, learning by creating, and providing choice in their learning. She wrote in her Technology Integration Journal:

In my World Studies 10B course, I changed what my students produced about a lesson on the Karen people by adding in a discussion board. Students read a short story book about the experience of a Karen refugee and posted a discussion on what was similar and different about her experience to theirs. The second day, students responded to one another posts. I was inspired to do this by the formatting we used in this course for questions we have about tech. I decided to integrate technology in this context because I hoped it would provide a different way to bring in student voice (Molly, Technology Integration Journal, April 20, 2018).

Molly wanted her students to share their experiences and connect it to what they were learning in class. She found that by providing a discussion board, it allowed for more

voices to be heard and for students to have time to think and process before posting. Her experience in the Tech for Teachers class provided an opportunity for her to experience what it was like for her students to use a discussion board and became a format that she used within her own class.

Molly also believes in providing choices in technology use. She reflected:

I think there's been times that I've forced it on students without giving them the option to take what they would like and giving them choice in their technology use. So I've changed that, of like, 'Okay, we've used ThingLink, we've used Explain Everything and we've used Adobe Sparks in different formative assessments throughout this trimester. Use whichever one or even one that you feel more comfortable with that's approved by me to do your final product' (Molly, Interview, May 24, 2018).

Molly exposes students to a variety of tools, but allows them choice on which tools to use when it comes to using them for summative assessments.

Helen's enactment values and beliefs shows that she wants to make sure students learning with technology is personalized for students and allows for student voice, feedback and collaboration for each other. As she explained:

So, I designed some extension activities that I put on Schoology with an online discussion board that they had to complete, so they used the Schoology app on the iPad and they picked whichever one sounded interesting, and then they had different activities that they had to do that they had to then post to the discussion board. So students were getting exposed to the different writing, but they could ultimately have a little bit more choice. So, I could've done that in stations in the room also, but I liked the idea of, it felt more like it was being brought to a close by doing this Schoology discussion board, and then they could really see each other's work and see a little bit more of his writing...

And then again, the online discussion board is great because it gives ... I have a nonverbal student in that class, but she can now talk to students in the class through that format, or just some other students that are a little more reticent to speak up in first hour, because they're tired or they're a little unsure or whatever. That gives them a little bit more room to be an authority on something, which is kind of cool (Helen, Interview, May 24, 2018).



Helen's use of technology utilizes the affordances of the technology to support learning activities and goals that she would be implementing with or without the availability of technology. Helen's focus is not on the tool itself, but using the tool to allow for student voice, feedback and collaboration.

Paul is interested in using technology as a learning resource, formative assessment and used for providing feedback, personalized lessons, as well as flipped learning. He stated:

...I chose to try flipped teaching with this class is to try to personalized the learning more. The class is large with 35 students (last trimester was 37 students) and it is challenging to build a more personal relationship with them. Additionally, these students come in with a variety of experiences with Geometry. The flipped teaching should personalize that learning more by allowing students with rich Geometry backgrounds to work through some of the material quicker. And students with little or poor Geometry experiences to take more time with the flipped teaching videos to master the basic concepts...

I was trying to find a way where I could get the students to do some of the more basic stuff, and then we could dive into more of the enrichment and investigation type stuff, and then also have time to answer their more high level questions (Paul, Interview, May 16, 2018).

Paul's use of technology supports his need of managing large class sizes with varying skillsets. He believes flipped learning can help mediate the situation because the technology provides a way for him to give access to resources that will support students learning goals.

Teachers engage in an iterative inquiry process in constructing their values and beliefs on *what it means to teach, why technology should be used, and how to use technology and for what purpose*. Overall, they question why technology should or should not be used for teaching and learning. Teachers also question technology use

within product and process orientations. What they value and believe in accordance to these teaching, technology, and enactment inquiries informs how they construct their integration practices. What is challenging about this is not how they respond to these lines of inquiry, but how these lines of inquiry are iterative and therefore manifest in multi-faceted manners in conjunction with the other factors.

**Narrative authority.** Teachers negotiate and consult their relationships and narrative authority when constructing technology integration practices. Olson and Craig (2000) wrote:

Our narrative authority develops through experience made manifest in relationships with others. Because the narrative version of knowledge construction is transactional, authority comes from experience... each person both shapes his or her own knowledge and is shaped by the knowledge of others” (p. 670).

Therefore, a teacher’s narrative authority is never the same and takes into consideration who they are interacting with, and the nature of their relationship to one another. For example, a non-tenured teacher may have the narrative authority to provide insight on the latest technology integration practices, but their narrative authority on this topic may become constrained in the presence of a seasoned teacher because of the power dynamic in the relationship due to tenure and seniority, or perceived experience based on years of teaching. Many of the teachers also provided examples of how they constructed their narrative authority through relationships.

***Amplifying narrative authority.*** Brook, Helen, and Paul both sought out experiences to increase their narrative authority with technology integration. Brook is collaborative and wants to innovate with colleagues. She utilized her relationships with

her 8th grade team to attend the Tech for Teachers course together so they could develop common knowledge and skills around technology integration to design their 8th grade science curriculum. It also helped that she had colleagues in this grade level who also wanted to do it. Brook mentioned:

Dan\*and Aaron\* (pseudonyms) have been working with them really closely with them this year because I'm teaching 8th this year. It's the first time I've had 8th at this school. They're really into technology also, so it's been really fun to work when they're pretty passionate about things also. We've really grown a lot because we've all had something to teach each other. They said, "Oh, this class is free." And its like, "Oh yeah." So you get a little bit of comradery. It's fun... It's kind of fun to kick around ideas, especially when we were all in science. It's really neat to see, "Oh, we could do this and we could do that." Now I can bring it down to the 7th grade teachers. It's exciting (Brook, Interview, May 10, 2018).

Brook's 8th grade team are on the same page as each other when it comes to technology integration. The team decided to sign up for the Tech for Teachers course as a team and utilize the opportunity to learn and design their curriculum together.

Helen's narrative authority on technology integration provided her an ease and fluency in how she took up tech integration practices. Helen was willing to seek out like-minded people like her to collaborate and integrate with. Helen wrote in her digital portfolio for her final project, "After creating a SparkVideo with Bree\* and Robin\* about Individualized Learning in the classroom, I felt really inspired to look at how I can implement more individualized learning in my 10-12th grade elective Creative Writing class" (April 10, 2018). Helen's relationship with Bree and Robin expanded her narrative authority on individualized learning. As she continued to author her story about technology integration, she continued to add individualized learning as part of her narrative.

Paul felt like he did not have much narrative authority when it came to technology integration. He explained that what helped him develop his narrative authority was “I really need people one on one just to sit down with me, and so your course really helped, and then also having Jane\* (pseudonym) aboard... So, just having that access to someone” (Paul, Interview, May 16, 2018). Paul understood that he is someone who needs to work with others and is not afraid to seek help where he could. He did it through the Tech for Teachers course and working with his teaching site’s instructional technology coach, Jane\*. He was also open to engaging in social media experiences to increase his narrative authority.

As part of a choice activity, Paul chose to participate in a Twitter chat. This is an activity where people use Twitter (a social media platform) to discuss with one another about a topic that the group has decided upon. Paul wanted to use flipped learning in his math classes, but did not have much experience/authority on the topic, so he negotiated online relationships to start developing narrative authority on flipped learning. This was Paul’s first Twitter chat and he was pleasantly surprised with his experience, stating, “...that was really a lot more enjoyable experience I thought, just because you can interface with colleagues throughout the country, and I was able to ask a question, get some feedback, and it was just very helpful” (Paul, Interview, May 16, 2018). These relationships that he was able to foster helped him to pursue using flipped learning and other technologies he learned in the class.

Both Brook, Helen and Paul's narrative authority were not minimized and so they felt empowered to want to learn more to implement what they were learning. This was not the case for all teachers in the study, as Molly's narrative authority was diminished.

***Diminishing narrative authority.*** Although Molly was well-versed in using technology, as a new teacher, her narrative authority was minimized based on her years of teaching experience. The colleagues Molly worked closely with embraced technology and what it meant to teach in a 1:1 setting. In the previous years, her department had opted out of buying textbooks and used those funds to create their own digital textbooks for the new World Studies curriculum that was being implemented in grades nine and ten. Much of the lessons she was working with had a tech heavy influence because it was designed with students having 1:1 devices in mind. Molly's mentor teacher was also a proponent of technology integration so Molly followed the lead of her colleagues and mentor teacher on how to proceed with technology integration efforts. She remembers:

Well my first year of teaching 9th grade when it was first year with 1:1, I worked with a teacher in our department who was going to implement this 100% and that was really helpful. She was also my mentor teacher. So it was just like, she was already going to be helping me through in general just being a teacher. And then I was going to... She was going to model a lot of what we were going to do in class and so it was a really easy way to latch on right away to technology (Molly, Interview, May 24, 2018).

Molly's narrative authority became diminished as she became an actor in her departments' technology integration narrative and her voice started to take on the message of the department (Olson & Craig, 2000); but as she gained more experience, she was able to assert her own narrative authority through her lesson design.

Each teacher's narrative authority was influenced by the context of their relationships with other teachers. Some teachers sought to increase their narrative authority by working with other teachers to create experiences that would support their needs. Others had their narrative authority diminish because of their years of experience teaching, but they continued to seek out experiences to amplify their narrative authority on technology integration.

**Knowledge of and access to resources.** Knowledge of and access to resources are important in combination with one another. Having access to resources is not the same as having knowledge of their existence. If there are resources made available for all to use, but teachers do not know that it is available, does that resource really exist for them? This is why knowledge of resources is also important. There are a couple of resources to consider: school resources, tech savvy colleagues, and knowledge of troubleshooting. In this context, school resources are material or human capital that schools have provided free of charge for teachers use. Tech savvy colleagues are peers who have experience using technology and are able and willing to help share what they know with others. These colleagues are important not only to provide support, but to model what technology integration could look like for teaching and learning. (I do want to put in a caveat here and clarify that I am not saying that all tech savvy teachers are effective at using technology for teaching and learning.) Tech savvy teachers can help troubleshoot technology integration issues, but teachers themselves must know how to develop and access their own troubleshooting skills as well. Inexperience with using

technology is made worse without personal troubleshooting skills. These resources require teachers to know about their availability and how to access them.

*School resource.* The high school's instructional technology coach (Jane\*) as well as the Tech for Teachers course were identified as resources that the teachers appreciated knowing about and having access to. Jane\* was a resource that many teachers utilized and referenced:

...like sometimes I don't know what exists. So, a lot of times I've gone to Jane\* and I'm like, "Help." Or like, "Do you know? Do you have ideas about X, Y, or Z?" And she has like six... Or if they don't know, like Jane\* ... there's stuff that has come up with like our Synergy thing. I'm like, "Jane\*, I don't know how to fix this." She finds the answer and then we fix it and it's awesome. It's nice to have a Jane\* in the building. I think everyone should have a Jane\* (Robin, Interview, May 24, 2018)

Students had to find something that inspired awe and then they had to find an example of what happened when they did not have enough awe. Using Jane's\* advice that morning, I created a template and inserted it into Schoology for students to access and then assigned them a specific slide to use, so they didn't jump around on the PPT (Helen, Technology Integration Log, April 11, 2018).

Jane\* provided teachers with resource and advice they could use to support their technology integration efforts. Jane was able to provide just-in-time support because her position is full-time. I remember being in the position of the instructional technology coach, but with the position only being part time, time to collaborate with teachers was an issue. As Paul stated, "...having full time in that position helps a lot too because then it fits preps better and stuff like that because I remember when you were part time, that was a little bit tougher to work it" (Paul, Interview, May 16, 2018). What usually happened with teachers that was teaching when I had my instructional technology coach hours was that we would meet before school, during lunch, or after school. These were not

opportune times for teachers as these were also times that they dedicated to providing support for students, or met basic needs like eating.

The Tech for Teachers course was another resource that really helped teachers. A few of the teachers commented on how the course was helpful for their technology integration development:

...don't really know how to find the tech resources like the apps and stuff. Then, when I do it's a little hard to imagine sometimes how it can fit in the classroom, and with the Tech for Teachers class, I liked that it was taught by a teacher from our school who was able to explain how she used it in her classroom (Helen, Interview, May 24, 2018).

We had always done paper up until the year I've started and then we tried for two years things like YouTube Capture or they could do iMovie on their own. We just found that the product was weak and that the technology got in the way. But I think we just weren't trying hard enough and it really struck a nerve in the Tech for Teachers class when it was like, "We need to do things that are low-threat." The technology where if it's a score that goes with it it's not a summative. It's going to really crush their grade. And a group project too. I think that really hit with me. I talked to the teacher I work with in that class and just said, "We need to do this project again because it's so well-done with the 4Cs" (Molly, Interview, May 24, 2018).

... I think I'm at a good place. I think I've grown more this year than I thought I would, and I think that your class helped a lot (Paul, Interview, May 16, 2018).

The Tech for Teachers course provided mindset and skill set development for teachers to help them think about how to use technology as part of pedagogy. Teachers found it helpful that the course went beyond how to use a technology tool, but how to do so through the lived experience of the Tech for Teachers instructor and beyond just using the technology (also including information of how to think through the use of technology).



*Tech savvy colleagues.* As a new teacher starting at the beginning of the 1:1 initiative, Molly had access to many tech savvy colleagues. As the instructional technology coach who was in her department, she had access to me more than others because we had department meetings and professional learning communities' meetings together. Also, as a new teacher, she was assigned a mentor teacher who would help her, not only with curricular needs, but also how to navigate in her role as a teacher. Her mentor teacher was also the department chair who had knowledge and connections. Helen did not have a mentor teacher, but she knew who to go to for help.

Helen has a network of people she goes to for support with her tech integration efforts. Helen stated:

I think the motivation is increased and the feeling of success, or the support system I know is, I have those things in place, so I know I've got Jane\*...

Oh, the other thing I think too, I've done some video projects in my classes and George\* was super helpful in helping me think through the goal of the project and eventually get all of the steps in place and I felt like I had a lot of freedom over the course of a few trimesters to really pilot the video project because it was a video analysis, figure out what skills I needed the students to have, how to fill in all of the gaps, and I felt like it was some of the culture of the school is really allowing us as teachers to try and fail and figure out how to do it better. I know George was really helpful for me in figuring out how to do that and how to balance a bunch of kids with cameras and editing software on iMovie and then, somebody else I know introduced me to We Movie, which is like an early Spark video. Spark video's way better (Helen, Interview, May 24, 2018).

Knowing that Helen has her network of support motivates her to keep trying new things.

She utilizes this network of support not just for resources, but for skill building, designing project management, and developing self-efficacy.

Helen has also extended her network of support online through social media. Over the summer, Helen emailed me about engaging in a Twitter chat. She had done it during

our Tech for Teachers course but did not find it helpful and decided to give it a try while on summer break. She was amazed by what she got from the chat, writing:

Because of our tech class this spring, I feel compelled to tell you that I participated in a Twitter Chat last night for #urbanEDchat with Angela Watson. It was a little crazy to follow -- I just discovered how to follow the hashtag updates by latest vs. top tweets this morning -- but it was definitely an hour that flew by. Hearing from teachers from all disciplines across the country was a pretty cool opportunity (Helen, Personal email correspondence, July 6, 2018).

It was great to hear that she built on what she had learn from the class and did not allow disappointment during her first attempt to keep her from developing her professional learning network online.

***Troubleshooting skills.*** Brook had developed enough narrative authority on troubleshooting to not be worried when things didn't go exactly as planned. She referenced during the interview a few examples of how she had handled situations when the technology did not work as expected:

You always have little quirks. I still have three kids I cannot get the Google apps to hook up with Schoology. And you know, when you have those little problems, even though you send in a tech request and we went up and we reloaded stuff, we still haven't figured it out. So you get some of these little quirky things you got to work out. But luckily, I know it enough, I just made them a copy. You know what I mean? I made a copy in my Google Drive and shared it with them so they skipped Schoology for the couple that couldn't connect. It's kind of quirky sometimes...

You just have to have that backup plan. But the nice thing is I can project a sheet of paper up and they take a picture and still write on it...

When we couldn't get stuff to work, sometimes you can fix it within an hour. We had trouble hooking the Google up to Schoology. It wasn't working just right. We figured out we had to do it on our own laptops. It didn't work on the school computer. Some of that stuff you can do on the fly. I figured it's better for those student teachers to come in here and make a mistake because I might be able to... It always helps to have another set of eyes (Brook, Interview, May 10, 2018).

Brook's knowledge of troubleshooting skills helped her have more ease to handle situations when the technology did not work. She is not afraid to scrap what she was doing and use an alternative path when the technology did not go according to plan.

Helen also had troubleshooting skills, so minor technical difficulties did not derail her. She has gained enough narrative authority in this aspect to handle the situations that came her way. She wrote in her Technology Integration Log:

Difficulties: I had to edit all 3 poems to include the extension directions to ensure students had the directions both on the PPT screen at the front of the room, in the Schoology discussion board, and on their document because they're not great at thoroughly reading directions. Ultimately, though, this was a smooth lesson, so I think that extra work to prep it helped the lesson run successfully. This was still largely an independent day for students, but I like that I could use this type of a lesson to buy me time to check in on students 1on1, so that's definitely a benefit. It also allows me to vary assignments more for students, especially if we're doing something like poetry where I want students exposed to some poems, but I'm not necessarily looking for students to arrive at the same endpoint -this allows room for student choice and differentiation, which I like (Helen, May 2, 2018).

Helen recognized that the issues that may come with using technology does not overwhelm the impact it has on her ability to personalize and provide individual support to students through its use.

For Robin, troubleshooting for her meant learning how to create an organizational system with her learning management system.

As I've become a more seasoned teacher in air quotes, that's something overall, not just digitally that I've become better at is the organization piece and what just works best. But definitely, like while I'm thinking about my plans, I'm also thinking about how, like where's this folder gonna go in my like web of folders on Google Drive and how can I make sure that kids have access to the things I want them to have access to? Like where's the best place, the most obvious place for them to find it? That's a thing I think about in conjunction with lesson planning, which I think is just ... should be a natural part of it. It's just another and. Like yes and, we're going to do, make sure that this is just a piece of the lesson. It's not just

like ... oh I have to ask, also I must use Schoology, no, like Schoology is a really awesome tool (Robin, Interview, May 24, 2018).

In this aspect. Robin is not faced with having to troubleshoot technical glitches that comes with using technology, but organizational structures that come with using online learning management systems. These are new skills she has had to learn to develop, but will make her students' experience interacting on Schoology a more efficient one.

**Narrative knowledge.** Narrative knowledge in the context of this study takes into consideration teachers' personal and professional experiences of using technology. Olson explains that narrative knowledge is:

embodied, and personally and socially constructed through the continuous and interactive nature of experience. Narrative knowledge is constructed from the contextual contingencies and complexities of our individual biographies in interaction with the sociocultural and historical contexts in which we live (as cited in Olson, 2000, p. 109-110).

These experiences are in reference to past and present experiences. It considers teachers' lived experience and knowledge construction beyond their role as a teacher. It formed teachers' "stories to live by" (Clandinin & Connelly, 2000). Teachers' narrative knowledge has a role in how they enact their technology integration practices, as well as contrasting technology integration practices between personal and professional contexts. For example, a teacher's personal use of technology may not translate into their professional use and vice versa. Each teacher had their own narrative knowledge about using technology. The next few sections will share how the teacher's in the study negotiated their narrative knowledge with technology integration.

**Robin.** Robin's personal preference in using technology stems from her past experiences with technology use. One of those experiences was through chatting and

learning to type. Robin's narrative knowledge on typing was cultivated in her youth, not for school, but by playing and learning through the process of chatting. Robin explains "Oh I learned how to type efficiently... when chat rooms came out when I was in high school... you had to look at the screen to talk to people and keep up with what they were saying" (Robin, Interview, May 24, 2018 Robin's experience engaging in chat rooms motivated her to learn how to type so she would not have to stare at the keyboards and could focus on what was being written. This aided her speed in response and active participation in the chats. It was through this play and learn that she came to acquire the typing skills she has now.

Robin now wants to extend this opportunity of learning through play to her students. In reflecting on her experience in the Tech for Teachers course and her own experience as a child as to what technology integration meant, she saw the benefits of having opportunities to play and make mistakes, and learning from the mistakes. She stated:

... it felt good when we were able to play and then later when we were able to put things together, things felt more natural for us. I can imagine being a student who's already a digital native in some ways and just having a little bit of time to kinda mess around with stuff or have like a little baby assignment where they can use a tool and play around with it and then later use that tool in a more formal way where they're doing some sort of an assessment... (Robin, Interview, May 24, 2018).

For Robin, tech integration incorporated elements of play and opportunities to learn from mistakes. Technology integration meant scaffolding the process so that students have opportunities on how to make the summative assessment the best it could be in the end.

Although Robin did not go as far as saying she grew up with technology in the same manner her students are now, she acknowledged that technology had a presence in her home while growing up:

And growing up, technology was always a big thing for me... I think we had, it was called a Commodore, where if you wanted to play a video game, which I think was like Frogger... so I grew up with that. I remember getting a huge computer, it was a huge tower in eighth grade and we got the first CD-ROM it was like a huge deal. My mom was super jazzed and she bought me an encyclopedia for the CD-ROM and that was like the biggest deal because no one else had CD-ROMs and we were like the first one and it was such a big, cool thing. Then eventually there were video games and Oregon Trail and all those things. But we always had technology in our house (Robin, Interview, May 24, 2018).

The technology in her home were tools to be used, whether it was the Commodore that allowed for Frogger to be played or a computer that could process encyclopedia CD-ROMs. Technology were tools that were a part of Robin's childhood, something that has been carried into her adult life.

In Robin's personal life today, technology maintains a presence in her home. She is proud of the technology she uses, and positions them as tools to help daily life be easier. An example of this is her use of Alexa:

We have Alexa in our home and sometimes she is frustrating to me because when I want her, like I'll be cooking and I can set like five different timers, sometimes she doesn't hear me and then she doesn't turn off. She also listens to the television and so sometimes she will turn on and answer questions from the television because she's right next to it. We have them, like I have it set up so there's a network of lights that turn on and off and we can just tell her to do stuff (Robin, Interview, May 24, 2018).

Her personal narrative knowledge positioned technology as a helper. She referenced Alexa as a person, giving human qualities to a technology that used voice-recognition to administer commands like setting timers and turning on and off lights.

Robin extends technology's position as a helper into her classroom and is perplexed when her students do not use it in the same manner:

But they don't use the internet as a tool to help them be successful in school and it's hard for me to understand that. Because when I was in high school we just started out there, it was still like Dogpile and maybe Yahoo and I think Ask Jeeves was something when I was in college. Those were the tools that we used. I still had to use the card catalog...I'm curious what the barrier is. Like why aren't they using it to learn instead of to just entertain. Because we do have the tools in school, so should we be doing more about how do I use technology ... to help myself learn (Robin, Interview, May 24, 2018).

Robin does not understand why her students are not using technology beyond entertainment purposes and wonders what role schools need to play in helping students to leverage the tools they have to support learning. And in asking what role schools should play, she is interrogating her part in this question.

**Molly.** Molly's personal narrative knowledge influenced her values and beliefs about teaching with technology and how to integrate them. Specifically, Molly's personal narrative knowledge provided experiences to feel at ease in using technology and showed her what not to do with technology. As a college student, she was expected to use an online learning management system as part of her coursework. As Molly described it, "That was the expectation and... online learning was basically the way that you earned credit... I as a learner had some experience with it so it was helpful then when I switched to the educator..." (Molly, Interview, May 24, 2018). Her personal experience engaging in a system that expected her to use digital tools helped her transfer the skills and experience into her role as a teacher.

Molly's personal narrative knowledge was not necessarily an experience where she learned what to do, but one of what not to do. Molly recalled:

I felt like professors were incredibly disorganized in their organization system of how we access content... I felt always confused about how to access materials and so that was something I was really going to make sure I did differently... make it through the eyes of the student versus the eyes of the educator ... I would say just sometimes the lack of technology that I had in courses made me really want to change the way I do it in the future. Because there were a handful of classes where it could have been so much more efficient had they allowed us to do more... I felt like we could go much deeper if we had used more technology (Interview, May 24, 2018).

As a student, Molly experienced the inefficiency and disorganization that came with her professors not knowing how to use technology to support learning. This experience provided her insight on using technology from the perspective of a student, looking at how to organize and provide structure for students using technology, and to deepen learning with technology, instead of being a replacement for paper and pencil activities. Although her experience had not been positive as a student using technology as part of her learning tools, it influenced the value and belief she placed on how technology should be used and the role she, as the teacher, needed to take on so that students did not have similar experiences to hers.

**Brook.** Brook did not grow up with technology in the same sense that today's students are, but she has developed narrative knowledge around technology use that makes her more open and willing to incorporate technology integration practices into her teaching. Her professional narrative knowledge from careers before teaching has also helped influenced her technology integration practices. Brook recalled:

I got one of the first Macs ever out there. I was in electronic publishing, I've done some programming, I've got a two-year degree in programming from the '80s so they don't even have C++ and all that old stuff. So I've always had this interest in computers...



Part of it's because I was in graphic arts years and years ago before I went back into teaching, so part of it's I like things to look good and I know they do too (Brook, Interview, May 10, 2018).

As a second career teacher, Brook came into teaching with experiences using what was cutting edge technology at the time and relied on technology to get her job done. She expected nothing less when she entered the educational setting.

**Paul.** Paul's narrative knowledge in regards to tech integration is lower than he would like it to be, but his experience with his content knowledge allows him space and freedom to explore his tech integration practices. It seems to empower him to be able to increase his narrative knowledge with using technology. Paul recounts:

This year, I had a point where all the courses I've been teaching, I've taught for about 3, 4 years, so I feel comfortable with just the basis of the curriculum, and now I feel like I'm at a point where I can try some new things and work, and I have a little bit of that time, and then it's kind of exponential (Paul, Interview, May 16, 2018).

Paul is not looking to increase his narrative knowledge of technology integration overnight, but he sees each experience he partakes in, provides him more confidence to do more.

**Summary.** In examining how teachers constructed technology integration practices, values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge were found to influence and inform teacher practices. Teachers' values and beliefs made them question what it meant to teach, why technology should be used, and how to use technology and for what purpose(s). Their narrative authority was enhanced or constrained based on the context of their relationships. Teachers' knowledge of and access to resources were categorized by resources provided by the school, connections to tech savvy teachers, and their own troubleshooting skills. Teachers'

narrative knowledge was an intersection of their personal and professional lived experiences and its influence on their technology integration practices. These factors provided a narrative about how teachers enacted their tech integration practices along a process- and product-oriented spectrum.

## **Finding 2: Process and Product Oriented Leanings: Technology Integration Practices**

Teachers' technology integration practices can be identified along a continuum where process-oriented and product-oriented practices are at opposite spectrums. This is not to say that one end of the spectrum is better than the other, or that teachers remain stationary at each spectrum. It also does not dismiss the consideration that teachers may lean towards one spectrum over another and that similar contexts may result in different enactments, regardless of past or present practices. This section will not discuss how teachers' technology integration enactments are constructed, but will be identifying the practices found in the data based on their orientations. In the following sections, I will describe process-oriented and product-oriented practices and provide a table (Table 3) that identifies each teacher and how they enacted these practices. I will also analyze how teachers defined technology integration based on their orientations.

Teachers described many lessons that integrated technology, with many that leaned towards product-orientation with a focus on students' needs. Two teachers favored process-oriented lessons, while three teachers used product-oriented activities. Some examples of process-oriented uses were to bring in student voice and provide ways to differentiate student learning; while product-oriented uses were to allow students to show

what they had learned (formative assessments and projects). Table 3 shows examples of process-oriented or product-oriented practices implemented or designed by the teachers.

Table 3

*Teachers' Enactments*

<b>Teacher</b>	<b>Process-Oriented Practices</b>	<b>Product-Oriented Practices</b>
Brook	<ul style="list-style-type: none"> <li>• share out stories and for exit tickets through Today's Meet</li> </ul>	<ul style="list-style-type: none"> <li>• Thinglink for photosynthesis project</li> <li>• Schoology rubrics</li> <li>• Hyperdoc planet assignment</li> <li>• Stop motion videos</li> <li>• Green screen videos</li> <li>• YouTube playlist for MCA prep</li> <li>• Schoology</li> </ul>
Helen	<ul style="list-style-type: none"> <li>• Extension activities, choice and personalized learning using Schoology and online discussion board</li> <li>• Bring in more student voice through the use of discussion boards</li> <li>• Generate discussion by using Plickers to gather data on what students thought.</li> <li>• Collaboration via Google Slides</li> <li>• Collaboration, sharing and providing examples via hyperdoc/slides</li> <li>• Embedding and auto updating Google Slides to Schoology for access</li> </ul>	<ul style="list-style-type: none"> <li>• PearDeck and Kahoot for formative assessments</li> </ul>

Table 3 (continued)

Molly	<ul style="list-style-type: none"> <li>• Bring in student voice by having them share information through discussion boards</li> <li>• Create a system to demonstrate and disseminate lots of information through the use of Screencast-o-matic, Google Suite of tools (not teaching related use)</li> </ul>	<ul style="list-style-type: none"> <li>• Use of iPad: post discussion, research, textbook, online resource, current events</li> <li>• Schoology: grading</li> <li>• Explain Everything: produce artifact for project</li> <li>• Thinglink / Canva / Sparks Video / iMovie: summative assessment</li> </ul>
Paul	<ul style="list-style-type: none"> <li>• Visualize information through the use of graphic organizers</li> <li>• Create a system of organization to aide students</li> <li>• Dialogue between teacher-student</li> </ul>	<ul style="list-style-type: none"> <li>• MathXL: formative assessment and feedback</li> <li>• Screencast-o-matic: make video for absent students (access to resources)</li> <li>• Kahoot: formative assessment</li> <li>• Schoology Quiz: formative assessment</li> <li>• Deliver content</li> </ul>
Robin	<ul style="list-style-type: none"> <li>• Check-ins / develop relationships with students with Google Forms</li> <li>• Rough draft with differentiation (sentence starters/outlines) through Google Docs</li> <li>• Providing feedback through Google Docs</li> <li>• Show process of writing through a screencast to allow students to view/rewind to areas they need more help on</li> <li>• Organizational system on Schoology to promote autonomy and self-guidance.</li> </ul>	<ul style="list-style-type: none"> <li>• Google Drawing: graphic organizers</li> <li>• Google Quizzes: formative assessment</li> <li>• Canva/Google Docs/Google Slides: pamphlets for Mytopia</li> <li>• Learning Ally: reading app</li> </ul>

**Quests.** In choosing the activities to complete for their Quests, teachers started with product-oriented activities and then started exploring process-oriented activities. They started with what they were familiar with (Google Drive) and then started to explore new terrains. All participants started with the product-oriented quest of organizing their Google Drive. This quest was a low-stakes introduction to using technology for teaching that utilized their narrative knowledge. All the teachers have a Google Drive account and have been required to use it in their role as a teacher in the district- whether it was part of their professional learning communities or to share resources with students and colleagues. By the third and fourth quests, teachers started taking different paths on their technology integration journey. Many stayed with what they were familiar with, working on Google or Schoology assignments, but many started venturing out to learn more in terms creation and digital literacies. Table 4 show, in order, the activities teachers completed and Figure 3 will describe the quests teachers were able to choose from.

Table 4

*Teachers' Quest Completions*

	<b>Quest 1</b>	<b>Quest 2</b>	<b>Quest 3</b>	<b>Quest 4</b>
Brook	Organizing Google Drive	Schoology HyperDoc	Google Search Literacy	YouTube Playlist
Helen	Organizing Google Drive	Schoology HyperDoc	Presentation Remix	Doodler
Molly	Organizing Google Drive	ScreenCast-o-matic	Schoology HyperDoc	Book Creator
Robin	Organizing Google Drive	Schoology HyperDoc	Doodler	4 C's
Paul	Organizing Google Drive	ScreenCast-o-matic	YouTube Playlist	Doodler

## 01 Quests

1. Organize This: [Organize](#) your Google Drive using the following organizational techniques/strategies.  
[Naming Convention](#)  
[Color-coding / Symbols Folders](#)  
[Star](#)  
[Shift Z](#) (make a link of an item in other folders)
2. Schoology Online Classroom Skillset: [HyperDoc with Tutorials](#)  
Open up the document and complete each linked activity.
3. Designing Summative Assessments with the 4Cs: [Create, Collaborate, Communicate, Critical Thinking](#)  
Scan through the attached document on the 4 C's and create a summative assessment that incorporates these principals.
4. Search is the New Literacy  
Being able to teach your students how to be literate at being able to do advanced searching is a key skill. Complete an advanced power searching course by Google. This will be HUGEY valuable for you. You may also want to view some of the case studies to get some ideas.  
<http://www.powersearchingwithgoogle.com/>  
Create a page on your digital portfolio where you share some of your favorite techniques and have a reflection on how you will incorporate search techniques with your students. You may also want to view some of the case studies to get some ideas.
5. YouTube Playlist: [Create a YouTube playlist](#)  
Create a playlist of educationally appropriate videos that addresses a standard. Minimum of 8 videos. Must use a variety of video types. At least 4 different video types: Direct lecture, music video, advertisement, documentary, tv show, machinima, student project, animation, cartoon, screencast, etc
6. Doodler  
Create a Graphic Organizer using a Web 2.0 drawing tool. Check out [Popplet](#), [Lucidchart](#) or [Google Draw](#).
7. Screencast Video Tutorial: Use a screencast tool to create a video tutorial.
  - a. [Screencast-o-matic](#)
  - b. [iPad](#)
8. Author an eBook: Use a digital app to create an eBook that you can use with your students.  
[BookCreator](#)  
[iBooks Author Starter Kit](#) (Use this to help you start using the software.)  
[Download iBooks Author Software](#)  
[Teaching Language Classes iBook](#) (Although this was made for language teachers, I found valuable ideas on how to create my iBook from this iBook.)  
[Create Interactive Multi-Touch Books](#) (This provides a great idea on how to use maps to become interactive.)  
[Creating Digital Books: 15+ Ideas & Resources](#) (Terrell, 2015).  
[Overview of ePub Apps for Mobile Devices](#) (EdTech Teacher, 2017).  
[9 Great Book Creator Tools for Teachers and Students](#) (Kharbach, 2017).  
[13 Useful Software's Help You to Create Your First E-Book](#) (Barloso, 2016)  
[8 Tools to Create an Irresistible Ebook](#) (Grant, 2012).
9. Remixing Your Presentations: Recreate a presentation you have already made with [Sway](#), [Sparks Page](#), or another presentation tool.
10. Create Your Own Quest: Create a quest for our learning community related to technology integration in your content area. Incorporate an exemplar.

*Figure 3.* List of Quest activities that teachers chose from to complete.

By the end of the course, five teachers completed the Organizing Google Drive quest, four completed the Schoology quest, three completed the Doodler quest, two each completed the Screencast-o-matic and YouTube Playlist quest, and one each completed the Presentation Remix, Book Creator, Google Search Literacy, 4 C's quest. All of these quests were product-oriented, but many of the teachers learned how to use the tool and applied it in process-oriented activities in their classrooms.

**Technology integration definitions.** Teachers were asked to define technology integration at the beginning of the Tech for Teachers course and again during the interview. Table 5 provides a side by side view of how each teacher defined technology integration during each moment.

Table 5

*Teachers' Definition of Technology Integration*

	<b>Schoology Submission (April 10, 2018)</b>	<b>Interview</b>
<b>Brook</b>	Using technology in the classroom to increase student engagement and creating richer, deeper content. Students, for example, really enjoy using PicCollage for Projects instead of just drawing a poster, or doing a google slide presentation. We've used media folders for students to share work, including pictures and video. I feel that technology is all about choice and it really adds more choice and engagement to students. Stop Motion Type videos are really a hit for seventh graders. I have just had an either grade student do a fun green screen video. Last year I had a student that whenever we had a project due, he always wanted to do	It is just trying to use technology to go deeper into your subject matter, and it's also trying to use technology to get the kids engaged, especially when we're competing with so much technology.

Table 5 (Continued)

an animation video as he loved to draw electronically and produce his animations. It just really lets students take learning to a different level.

<b>Helen</b>	Technology integration is the ability to use technology seamlessly in your classrooms in ways that enhance student's learning and helps them see technology as a useful tool. One example was pickers, which another teacher and I used to "quiz" students on if a quote was a hip hop song or poem.	Yeah, I would say the opening lesson for Tech for Teachers was really helpful in shaping a framework for actually using technology, which I don't think we had done as clearly in our professional development before because it was really about trying to get the iPads used versus how do we construct with the iPads. I think the big takeaway for me in the Tech for Teachers class was the are you using the iPads to solve problems, or whatever the technology is versus just like, "Oh, I'm writing on a piece of paper, or I'm writing on the iPad," so the replacement idea. I think that was really helpful for me in looking at how do I use this more effectively in the classroom...
<b>Molly</b>	Technology integration involves having technology be a means to producing work and show was you know about a concept of topic. I believe that is aims to support learning in the 21st century. I have used technology integration for summative and formative assessments and as an organizational tool in the way of schoology. Exit tickets, collaboration and discussions have all been enhanced/grown due to technology integration in my classroom.	I think that it is going for even just substituting what we talked about of just instead of doing it on paper now you do it on a device and actually implementing ways that you wouldn't be able to do the assessment or the task that you put in front of the students without the use of technology and without access to that one-to-one for myself and my students. And then having them use the device that they are given to apply to their learning and to further deepen their understanding of what we're talking about.

Table 5 (Continued)



- Paul** Technology integration is using different types of technology to make learning more meaningful for the individual. An example is using Quizlet to help students review their Geometry vocabulary.
- Robin** Technology integration involves purposefully including technology into instruction, assessment, and assignments. I LOVE using google docs for essay writing and being able to provide feedback to students this way. Students then always have that assignment and ideas that they can refer back to in the future. It also streamlines the process. My dear colleague Bonnie\* also developed a sweet form/rubric set up for grading our students' writing. This was super efficient, but also provided very valuable feedback. Also, I have done google form "check ins" with students in our classes and also on my caseload to see how they are doing. This has been a great way to develop relationships with students that you sometimes don't get to check in on or who are more comfortable providing information digitally.
- It's a tool that helps me present my information through lecture, but also through notes, also through helping students making up work. It's also been a tool for me to learn how to assess students, but mainly from your course, it was the presentation part of it.
- ...it has to be purposeful and it's not just ... I think sometimes feel people have to just plop it in there without a purpose and without showing kids how to integrate things and how to use things. Like it felt good when we were able to play and then later when we were able to put things together, things felt more natural for us. I can imagine being a student who's already a digital native in some ways and just having a little bit of time to kinda mess around with stuff or have like a little baby assignment where they can use a tool and play around with it and then later use that tool in a more formal way where they're doing some sort of an assessment. That felt good for me as a student, and I feel like doing that for my students and providing opportunities for them to try new things and feel okay with making mistakes and exploring is a huge part of tech integration. Sometimes we just have to try a bunch of stuff and see what works best. I think also it provides opportunities. Especially as a special ed teacher, it provides-doing it correctly you're providing students with opportunities to ... to level things, like differentiate.

Teachers' technology integration definitions shifted between process- and product-orientation. Sometimes teachers' examples could not be clearly distinguished as process- or product-oriented. Some teachers focused on defining technology integration

as a tool be used to support teachers and students, while others gave examples of how specific technology could be used to support the process of learning. Although many of the teachers' definition stayed the same throughout the Tech for Teachers course, their interpretations of how they applied it to practice changed. For example, Robin defined technology integration as purposeful uses of technology. In her initial definition, she provided examples of how she used technology to support the processes of feedback and relationship-building, but the focus was on how it supported her role as a teacher. In the interview, she shifted her process-oriented lens on technology integration towards how students could use it to support their learning. The comparison of how each teacher defined technology integration at the start of the Tech for Teachers course and after the course ended does not mean that both interpretations of technology integration did not co-exist in each teachers' experience. Whether there was a conscious change in how teachers contextualized their understanding of technology integration or what they stated was just a captured moment of understanding at the particular time the question was asked of the teacher. What the definitions do show is teachers' interpretation of technology integration is not static and different experiences may result in a strengthening or reshaping their understanding of technology integration.

**Summary.** Teachers' technology integration practices shift along a spectrum of process- and product-orientation. In one instance, teachers exhibited product-oriented enactments before moving towards process-orientation, as seen in their Quests. In another instance, teachers showed how their definition and application of technology integration shifted throughout the study—whether it was a change between process- or product-

orientation, or how they applied their definition of technology integration for teaching or learning purposes. Although the ends of the spectrum were straight-forward, identifying and understanding where an enactment should be placed along the spectrum is harder to discern, but labeling the enactment is not important. What is important is the understanding that teachers' technology integration enactments will shift based on context and won't necessarily stay the same.

### **Finding 3: Pinwheel Metaphor: Teachers Construction of Technology Integration Practices**

Often in technology integration professional development research, a teacher's experience is contextualized within the professional development setting. I too had been focusing on looking at the teacher's experience within the context of their environment, and eventually came to realize that I needed to look at the teacher as the context and examine factors within the teacher that influenced them to integrate technology. I wanted to look at the context of the teacher more holistically based on stories teachers were willing to share (Clandinin & Connelly, 2000). What I mean by this is I wanted to inquire beyond a particular professional development setting and beyond their role as a teacher. Just as important in how a teacher decides to construct their technology integration practices is based on their teaching context, their lived experience outside of teaching may also play a part in influencing their technology integration practices.

As I read and re-read the data, looked for plots and storylines, I realized that I needed a metaphor to explain how teachers constructed their technology integration practices. The plotline of continual shifting and changing of practices based on context

(White & Cornu, 2011) kept reemerging. During a reflexive conversation with some initial findings, my thoughts started to explore metaphors and symbols that would help put words to budding ideas. Eventually the metaphor of the pinwheel emerged as a response to help explain how teachers constructed their technology integration practices; taking teachers' lived experiences into account. Figure 4 provides a visual representation of this pinwheel metaphor.

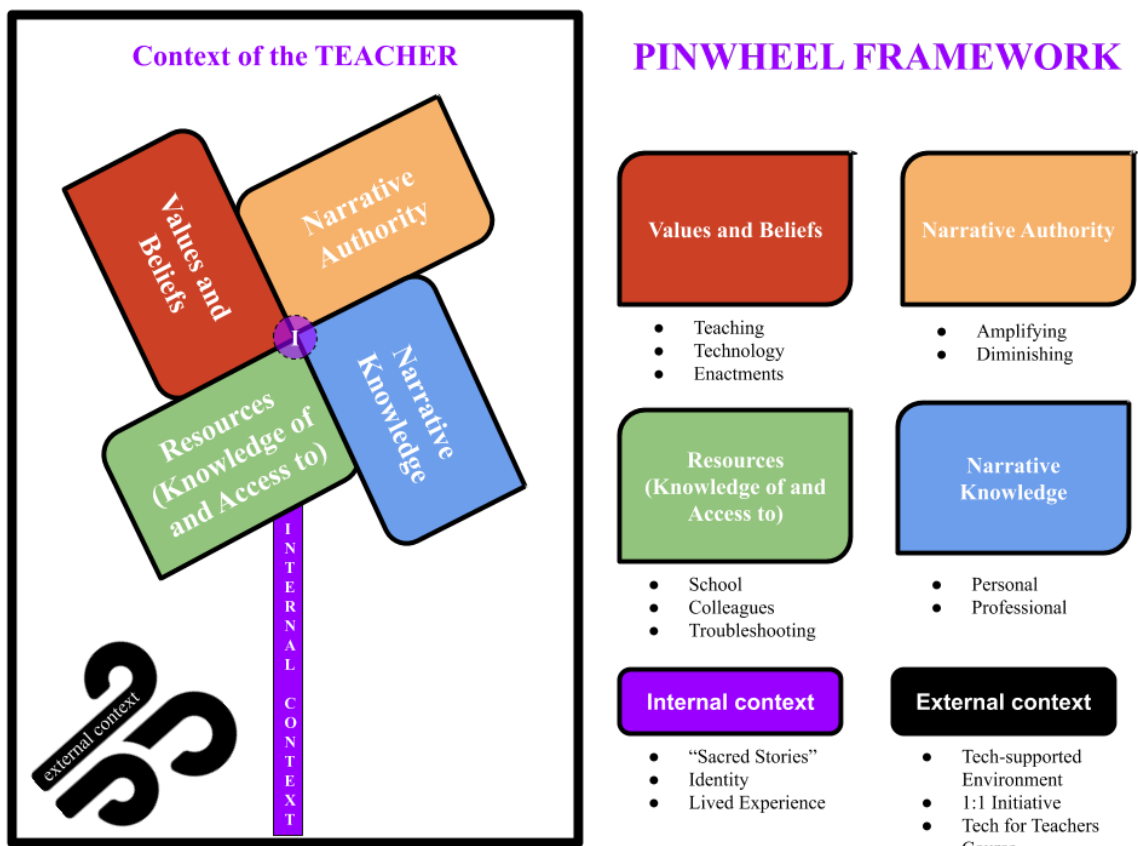


Figure 4. Visualization of the Pinwheel Framework.

In this next section, I will use the metaphor of a pinwheel to explain how teachers construct their technology integration practices. First, I will start by discussing the

components of the Pinwheel Framework. Second, a detailed description and explanation of each Pinwheel component will be provided. Last, I will summarize the Pinwheel Framework and how it helps to visualize teachers' construction of technology integration practices.

**Pinwheel components.** The Pinwheel Framework helps to explain how teachers construct their integration practices and answer the question: How do teachers construct technology integration practices within a technology supported environment? According to wikipedia.com, a pinwheel consists of three components: “[1] a wheel of paper or plastic curls attached at its axle to [2] a stick by [3] a pin. It is designed to spin when blown upon by a person or by the wind” ([https://en.wikipedia.org/wiki/Pinwheel\\_\(toy\)](https://en.wikipedia.org/wiki/Pinwheel_(toy))) The pinwheel's wheel is made up of what I term blades. The blades represent the factors that informs/influences teachers' construction of the wheel. The shape, size, structure, material, or makeup of each blade will vary from teacher to teacher. The stick represents the internal context(s) the teacher is living and working within. The pin represents the internal context that is at the moment influencing their construction of technology integration practices.

The action of blowing represents the external named and unnamed context the teacher exists within. This blowing external context differs from the stick and pin internal context in that it is the external context all the pinwheels exist in, whereas, the stick and pushpin internal contexts are the contexts that exists only for that particular teacher. This is not to say that the blowing each pinwheel experience will feel the same. For example, a pinwheel may experience more blowing than other pinwheels, even though they are in the

same external context. An example of this may be a school that is going 1:1 (everyone is in that context) and a teacher is on a teaching team that have taken up technology integration and so they have this gust of pressure to follow the team's lead. Whereas others who are on a teaching team where this is not the same expectation, they may not feel the extra gust of wind and their enactment, or spinning action, will look differently.

**Pinwheel blades.** The blades of the pinwheel are what informs teachers' tech integration practices. The number of blades that form the wheel may vary, but for this framework, there are four blades that are represented by the four components discussed earlier: values and beliefs, relationships and narrative authority, knowledge of and access to resources, and teachers' narrative knowledge. Values and beliefs take into consideration how teachers identify with what it means to teach, why technology should be used, and how they should use technology. Knowledge of and access to resources helps minimize first-order barriers that teachers may have. Narrative authority connect their experiences in conjunction with their relationships, each diminishing or influencing the other. A teacher's narrative knowledge considers their personal and professional narrative knowledge that is based on the intersection of experiences and the context that these experiences occur within. These four components were heavily represented through the data as factors/influences that informed teachers' technology integration practices.

**Pinwheel pin and stick.** The pin and stick represent the internal context of the teacher. The internal context is what the teacher has determined to be the context that they exist under. At any one time, a teacher works with(in)/between many internal contexts, with one dominating the other. The dominating internal context becomes the

push pin that holds the four blades to the rest of the internal context stick. As the internal contexts competes to be the pin, each blade of the pinwheel may shift/change in prominence and strength, or become totally unraveled and the teacher will have to figure out how to put the wheel back together again. It is their internal context that binds them to work in a certain way, but it does not mean it overshadows and diminishes the blades. The internal context is transparent and so each influence may even cover the context so it has minimal/no influence. Each teacher will have a different set of internal contexts they have identified for themselves, which is different from the external contexts.

Adapting White and Cornu's (2011) Visitor-Resident typology towards the idea that how a teacher uses technology is constantly shifting and for different purposes, helped me to construct the idea of competing internalized contexts that resulted in differing construction of technology integration practices. Just as technology use is a spectrum and changing based on its use for personal or professional purposes, teachers' internalized context is also continually shifting and results in technology integration enactments that look differently based on how they have identified their context. This was exemplified by Robin's competing contexts.

Robin had competing contexts of how to construct technology integration practices based on her two roles as an English teacher and a Special Education teacher. Robin, when identifying as an English teacher wanted her students to use pen and paper for reading and writing activities and identified with the "sacred stories" of the English department that valued this practice. On the other hand, in the context of a Special Education teacher, she wanted to use the affordances of technology to meet the needs of

her students. One of Robin's technology integration log entry was about her integration practices in her English Special Education course and it revealed these competing narratives of how she constructed technology integration practices.

Fundamental English IC-Individualized essay assignments through Google Assignments App through Schoology - Students were writing their essays on "The Princess Bride" and story patterns. Students in this class have a wide range of abilities and needs. Some students were writing a paragraph and others were writing the full five paragraphs. I created sentence starters and an outline so students could rough draft on google docs first and then go back and create their final drafts. - Some students really did well with this model. - Other students struggled and I had to go back to paper. - - In the future, I would like to do some screencasting of me writing an essay so students could see how the process shakes down and they could go back online and rewatch the instruction. I still really like the individualized assignments because it allows for me to go on and find the assignments without students having to share with me individually. - The assignments also end up in the same place! (Robin, Technology Integration Log, April 27, 2018).

Robin's competing context of what it meant to be an English teacher and the needs of her students in Special Ed created differing considerations when it came to her technology integration practices. On the one hand, she enjoyed the flexibility of creating individualized writing assignments through the use of Google Docs and Schoology, but on the other hand, she felt some students needed the paper version to be successful. Although she initially started with a technology integrated assignment, she quickly defaulted to paper when some of her students had difficulty with the assignment. It is not clear if it was the technology that was making students struggle in the process, or other factors, but the default was to go back to using paper. Even though she went back to paper, she still considered using technology to scaffold the learning for her students with the use of screen-casting videos in the future.



**Pinwheel blowing.** The external contexts are the contexts that exist for all, and represented by the blowing. For this study, the external context was identified as being in a technology supported environment. Part of the technology supported environment that were explicitly blowing at the teachers were their enrollment in the Tech for Teachers course and working at a 1:1 teaching site.

Teachers' enrollment in the Tech for Teachers course carried specific actions on their part to complete learning activities that had them integrate technology into their courses. All the teachers in the study were taking the course to earn board credits, with earning board credits being an identified rationale for why the teachers took the Tech for Teachers course. If they did not complete the learning activities, they would not be able to earn the board credits. These learning activities were in addition to attendance and participation in class activities. There were three learning activities that were identified to be used to identify teacher's enactment practices: technology integration log, quests, and their final project.

These activities required enacting technology integration practices for teaching and/or learning and documenting what they did for their enactments. The technology integration log required that they identify and reflect on four instances during the timeframe of the class that they integrated technology into their classes. The quests provided a list of ten activities teachers could participate in to expand their technology competencies. The final project was an open ended and flexible in form. The purpose of the final project was for teachers to apply what they had learn in the course to design a learning experience for their students that integrated various components of what they

had learned in the course. The main requirement was that whatever they designed, they must include instructions and materials that any teacher could take and use in their own classroom. Teachers were encouraged to combine activities that fulfilled these three requirements. For example, we had teachers who completed the quest of learning to use Google Draw to create a graphic organizer. They then used these graphic organizers in their classes as part of their technology integration. Their final project included a component of using technology tools to create graphic organizers. The course, as an external context, blew on the teachers for five weeks straight, resulting in all teachers in completing the requirements of the course and earning their board credits.

Working in a 1:1 school influenced each teachers' need to learn how to integrate technology into their classrooms. Due to the fact that the high school had different rollouts of iPads based on grade levels, teachers felt the 1:1 influence at different times. Molly started teaching when the 1:1 initiative was rolled out in the ninth grade when she was hired on to teach. Half her teaching load was in the ninth grade, so she embraced the fact that she would need to be using technology in her classroom right away. As Molly stated, "I'm brand-new to the game so I might as well hop on this so I don't have to feel like I'm playing catch up" (Interview, May 24, 2018). To her, technology was a part of her instructional toolset. Unlike Molly, Helen did not feel the need to start integrating technology into her practice until her students were also 1:1.

The 1:1 initiative and its introduction to the junior class Helen was teaching motivated her to join the Tech for Teachers course to learn more about how to integrate technology into her courses. Helen commented:

I was like, ‘Oh, we’re 1:1 for the first time, okay.’ But, it was 1:1 for me, but all of my juniors have had these iPads since the seventh grade, so they had the digital workflow down and all of that stuff and I was like, ‘Oh, okay, so I’m behind the curve here’ (Helen, Interview, May 24, 2018).

Helen realized that with all her students having 1:1 devices and having had experience with using the iPad, she needed to make sure that her pedagogy and practice responded to her students’ needs and expectations.

These external contexts are important to identify and acknowledge, as they influenced each teacher’s technology integration experiences. These two contexts also became a part of all the teachers’ lived experience and became factors in how they negotiated their narrative authority and narrative knowledge in the interviews and artifacts they produced.

**Pinwheel spinning.** The spinning action of the pinwheel represented the technology integration enactments of the teacher and is influenced by the three components of the pinwheel and the blowing. The goal is to have a fluid spinning action, but that is not always the case depending on how the blades of the pinwheel are constructed. The competing contexts may create one blade that is larger than the others and make it hard to spin. Or the construction material of the blades may inhibit it from spinning the way it should. Some blades might diminish in size or not look like what it is expected to. Or the blades may have no issues spinning. The blades and internal context are in constant flux and change and have varying dominance on a teachers’ enactments. These constant renegotiation and arrangements of the blades and internal contexts will result in different ways the pinwheel will spin. The blowing action will also be felt and reacted to differently, based on the makeup of the pinwheel itself. This helps to explain

why teachers who may be faced with the same external contexts, have different constructions of technology integration practices.

An example of this is Paul's spinning action when it came to implementing flipped learning into his math courses. Paul had a desire to use flipped learning so he could have students learn the content through videos as homework, spend more time in class to delve deeper into the topics, and have time respond to student questions. His values and beliefs about why he should be using flipped learning supported his willingness to try flipped learning, but his narrative authority and narrative knowledge about flipped learning made him hesitate. As part of a choice activity, Paul decided to engage in a Twitter chat about flipped learning to get advice on how he should proceed:

I wanted to know if people thought you should start off flipping by just going all in, or should you kind of do a few little lessons. With my personality, I was going to do a few little lessons, and everybody came back I should go all in so you can get that buy in, but I kind of felt with the end of the year, I couldn't do that. It wouldn't make sense, but I'm really going to think about this summer and probably start all in next summer with the one course, the pre-AP geometry, and give that a shot (Paul, Interview, May 16, 2018).

Although Paul hesitated with using flipped learning that school year, he did give it a try in the following school year. He wrote me an email telling me:

...my partial Flipped Geometry class is going really well. It is meeting my needs of having more time to do group activities, ask higher level questions, and time to work with and answer individual student's questions during class time. And the students have responded well with watching and interacting with the videos (Paul, Personal email correspondence, January, 30, 2019).

Paul's spinning action changed various times throughout the Tech for Teachers course. He had moments when the pinwheel was not moving, then there was momentum with encouragement and advice from his engagement with the Twitter chat, eventually his

pinwheel started spinning continuously as he partially implemented flipped learning into his Geometry course and received positive feedback from his students.

**Pinwheel summary.** The Pinwheel Framework helps to answer the question, how do teachers construct technology integration practices within a technology supported environment? Teacher's technology integration practices are symbolized by the spinning of the pinwheel. The components of the pinwheel represent these influences: values and beliefs, narrative authority, knowledge of and access to resources, narrative knowledge, and internal/external contexts that the teacher exists within. All these components constantly negotiate their structure and composition and their interaction with the other components.

In summary, the Pinwheel Framework can be used as an analytical tool to help us understand how teachers construct their technology integration practices within a technology supported environment. The Pinwheel Framework highlights the teacher as the context and it's within the context of the teacher that influences and informs their technology practices. The teacher is continually revising their pinwheel composition, switching out and between internal contexts that they have identified for themselves, and reconfiguring different blades that help create these enactments. Their spinning action may be fluid, shaky, or non-existent based on how these components interact with one another. Each teacher's construction of technology integration practices looks different from one another, and their pinwheel composition will reflect this.

## Unexpected Findings

**Relationship.** What I did not expect to find was the influence my past relationship with teachers had on their current technology integration practices. A few stated in their interviews that part of the reason why they decided to take the Tech for Teachers course was because I was the instructor and they wanted to be able to work with me again. The teachers also reflected back on professional development experiences they had with me, as well as the coaching I had provided. This reinforces the importance relationships have on teachers' willingness to engage in learning about technology integration.

**Tech for teachers course.** Although the Tech for Teachers course was only meant to serve as a technology supported context for the teachers, many of the teachers identified how the structure of the course influenced their implementation of technology integration practices. Some teachers appreciated the situatedness of the technology integration activities so they could easily translate it into their practice. For example, after engaging in a discussion board activity, Molly implemented the practice within the week with her students. Helen also took what she learned in the course and implemented it right away. Helen shared that she had implemented an activity using the concepts of a collaborative slide she had learned about on the first night of class. She recalled:

[So I] set up a template and made a bunch of slides and assigned them to the students, so each hour had one PowerPoint, but they were only working on the one slide like we did for the opening activity on the first day of Tech for Teachers. I literally did that the next day, and I was like, 'Okay, great. This was a thing that I wanted to do, but now I have a model for how that looks' (Helen, Interview, May 24, 2018).

Helen's ease and comfort with this particular technology integration activity was made accessible to Helen because she experienced it as a student and had it modeled on how it could be used to support learning.

Teachers also appreciated how the course structure provided opportunities to play and learn and make mistakes while learning with and about technology. Helen stated, "...we had room to play around and then be like, 'Okay, we can totally use this.' It just felt more accessible, which makes me feel more willing to try it and looking for different ways to try it" (Interview, May 24, 2018). Robin commented, "That felt good for me as a student, and I feel like doing that for my students and providing opportunities for them to try new things and feel okay with making mistakes and exploring is a huge part of tech integration" (Interview, May 24, 2018). The opportunities to play and permission to make mistake, helped increase the teachers' self-efficacy with integrating technology into their own classroom.

**Storied experiences in temporal context.** In using three-dimensional narrative inquiry space to analyze the data, I looked for common plotlines in the stories shared with me. This process revealed the temporality of teachers' storied experiences with technology. Some teachers were willing to share plotlines that wove a longer temporal element-reaching into their childhood; whereas others were only willing to share moments from the past few years. Paul and Helen spoke about their technology integration narrative from the past couple of years as the district started implementing the 1:1 initiative at the secondary level. Brook, opened up chapters from a few decades ago when she entered her professional career. Robin wove a tale that took us back to her

childhood years when her family got their first gaming system and computer. Molly's timeline ventured back and forth between her experiences from college and her first year of teaching. These experiences had been educative for each person as it created memories from which they were able to draw on to encourage them to continue with technology integration in their current practice. Most spoke about positive memories that encouraged their continued growth, but it was Molly's negative experience with her teacher education courses in college that she drew on to move her technology integration efforts forward—she had not wanted her students to endure a similar experience to hers.

### **Summary**

In this chapter, I presented the findings of the study. I started with a storied retelling of the temporal, relational, and situational context of the district, the teachers in the study and myself. I then proceeded to describe the three main findings of the study. The findings of the study indicated that there are four factors that inform teachers' technology integration practices. These four factors are values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge. The study also found that teachers enacted technology integration practices along a process-oriented and product-oriented spectrum. The last finding provided the Pinwheel Framework to conceptualize how teachers constructed their technology integration practices. This chapter ended with a description of three unexpected findings: the influence of past relationships, structures of the Tech for Teachers course, and role of storied experiences. The following chapter will provide a discussion of the findings.



## Chapter 5 Discussion and Summary

*Maybe Fiona felt more at ease knowing another teacher was doing the same thing she was being asked to do. Or maybe she felt her questions and needs were acknowledged. I am not sure what it was, but our conversation shifted the moment I shared my experience with her. Fiona's fears moved away from something internal to something external. "You know what I don't like? Schoology. I feel like it is impersonal and stale. It has no color." Fiona was shifting away from addressing the issue of using technology as an internal issue to an external, tangible issue that I could help address right away. No longer did she see the conversation being about her as a teacher and having to create a product for her students to use, but it was about the process of learning to use a tool to fit her need. We spent the rest of our time learning how to personalize the Schoology learning management system, organizing her electronic files, putting up profile pictures, and talking through how to teach with technology that had value-added components. Although in those hours, I was only able to help Fiona, she came to be one of my biggest advocates in helping other teachers see how they could use technology to support their teaching and learning needs.*

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To explain how teachers constructed their technology integration practices, this study explored how teachers used technology and identified factors that informed their technology enactments. The findings of this inquiry may provide professional development facilitators insight on how to incorporate teachers' lived experiences to design and facilitate technology integration professional development. In this chapter, I

will provide an overview of the research study. Then a discussion of the findings will be presented. Next, I will explain the implications of the study's findings for professional development practices. Finally, I end the chapter by addressing the limitations of the study and make recommendations for future research.

### **Summary of Research**

The study took place in a small, first-ring, suburban district that had implemented 1:1 initiatives in their secondary schools. Five teachers who taught in a 1:1 setting and attended the Tech for Teachers course were selected to be a part of the study. An interpretative case study methodology was used in conjunction with the following methods: coding and three-dimensional narrative inquiry space. Artifacts from the Tech for Teachers course and teachers' interviews were collected and analyzed to help respond to the following questions: 1) How do teachers construct technology integration practices in a technology supported environment? 2) What informs teachers' technology integration practices? 3) What are the practices of secondary teachers related to tech integration? The following section will provide a response for each of the research questions along with a discussion and recommendations for professional development practices.

### **Discussions of the Findings**

The study provided three findings in response to the research questions. First, there are four factors that influence and inform teachers' integration practices: values and beliefs, narrative authority, knowledge of and access to resources, and narrative knowledge. Second, in constructing technology integration practices, teachers enacted

along a process-oriented and product-oriented continuum. Third, taking the first two findings into account, the Pinwheel Framework was developed to help explain how teachers constructed their technology integration practices. The following sections provide a discussion of the findings and the implications for professional development practices.

**Alignment with literature.** Many of the findings from this study in isolation does not add to the field but reinforces findings of past research. The findings align with previous research regarding the influence teachers' values and beliefs had on their enactments of technology integration (Ertmer, 2005; Ertmer et al., 2012; Tondeur et al., 2017; Vongkulluksn et. al, 2018; Hur et al., 2016; Ottenbreit-Leftwich et al., 2010). Also, teachers' narrative knowledge and narrative authority reflect constructivist's perspective that knowledge is co-constructed (Hein, 1991; Maxwell, 2013; Ültaner, 2012), meaning that knowledge comes from experiences that people have, and call upon those experiences to inform their construction of knowledge (Dewey, 1938). Throughout time, between people, and in different places, these experiences may come to hold different meanings (Clandinin and Connelly, 2000), based on the context at hand (White and Cornu, 2011). The findings are consistent with the literature on first-order barriers and second-order barriers shifting in terms of being challenges (Ertmer, 1999; Ertmer et al., 1999; Lawless & Pellegrino, 2007), which help to explain the interchanging composition of the four factors.

**Conversations with the literature.** What is unique about this study is that it brings multiple areas of research into conversation with one another. It is through the

conversations that relationships are established to bring new understandings to the field of technology integration professional development. These conversations resulted in a new typology and framework to discuss and explain teachers' construction of technology integration practices.

***Process- and product orientations.*** The typology of process- and product-orientation were influenced by various components of the study's conceptual framework. Literature on constructivism and growth mindset's position of learning as a process (Dweck, 2006; Ültaner, 2012), in conversation with the Visitor-Resident typology perspective that online engagement is a spectrum that changes based on context (White and Cornu, 2011), helped to inform the development of the process-oriented and product-oriented typology. Literature on growth mindset helped explain why teachers faced with similar situations had different outcomes with technology integration enactments. Teachers who viewed learning as a process did not dwell on failures and looked for ways to grow from those instances; whereas teachers with fixed mindset were unwilling to move forward when there was failure (Dweck, 2006). The implications of using process- and product-orientation to understand how teachers learn to use technology can help teachers find their place along the spectrum, and to understand that their practices may shift between process- and product-orientations.

***Pinwheel framework.*** The Pinwheel framework is a manifestation of various bodies of literature in conversation with one another, to explain how teachers construct technology integration practices. The framework combined research on factors that influenced technology integration (Ertmer, 2005; Ertmer et al., 2012; Tondeur et al.,

2017; Vongkulluksn et. al, 2018; Hur et al., 2016; Ottenbreit-Leftwich et al., 2010), first and second order barriers (Ertmer, 1999; Ertmer et al., 1999), narrative knowledge (Clandinin and Connelly, 1988; Olson, 1995a), narrative authority (Olson and Craig, 2000), and effective professional development practices (Garet et.al., 2001; Desimone, 2005), to help explain the competing factors teachers negotiated between when making decisions on technology integration enactments. The framework pulled on literature about mindsets (Dweck, 2006), constructivism (Hein, 1991; Maxwell, 2013; Ültaner, 2012), experience (Dewey, 1938), three-dimensional narrative inquiry space (Clandinin and Connelly, 2000), narrative knowledge (Clandinin and Connelly, 1988; Olson, 1995a) and narrative authority (Olson and Craig, 2000) to inform how the four factors may diminish or expand their influence on each other. The visitor-resident typology informed how teachers' practices may change based on context (White and Cornu, 2011). The following sections will provide further discussion of the pinwheel composition.

The wheel of the pinwheel is created from different combinations of four factors that influenced and informed teachers' integration practices: values and beliefs (Ertmer, 2005; Ertmer et al., 2012; Tondeur et al., 2017; Vongkulluksn et. al, 2018; Hur et al., 2016; Ottenbreit-Leftwich et al., 2010), narrative authority (Clandinin and Connelly, 1988; Olson, 1995a), knowledge of and access to resources (Ertmer, 1999; Ertmer et al., 1999), and teachers' narrative knowledge (Olson and Craig, 2000). The inclusion of teachers' narrative knowledge and narrative authority had been missing from the conversation about teachers' technology integration practices. These two elements indicate the need to end isolated technology integration factor research and incorporate

the lived experiences of teachers. Both narrative knowledge and narrative authority call for a holistic view of teachers' lived experiences to be a part of the conversation so that relationships and connections can be made about the factors that influence teachers' construction of technology enactments. Technology integration practices are socially-constructed processes and not formed in isolation, we must move research away from examining siloed factors of technology integration and allow room to examine the intersectionality of multiple factors.

The stick and pin, and the blowing of the pinwheel, represent the internal and external contexts that influence and inform how teachers enact technology integration practices. For this study, there were two specific external contexts, working in a 1:1 setting and participation in the Tech for Teachers course. These internal and external contexts were in constant flux and changed periodically (White and Cornu, 2011). The understanding that practices change based on context help explain why teachers who seem to experience the same context differ on how they respond with their enactments. How the pinwheel spin is a representation of how teachers are continually changing how they construct their practices. Consistent with the literature in regard to first-order barriers and second-order barriers shifting in terms of being challenges (Ertmer, 1999; Ertmer et al., 1999; Lawless & Pellegrino, 2007), help to explain the interchanging composition of the four blades. A teacher's wheel will spin differently based on the composition of the four factors, internal contexts, and external contexts. Each teachers' construction of technology integration practices is unique to the individual and

contextually based. This makes providing technology integration professional development very difficult.

*Implications of relationships.* Whispers about relationships could be heard throughout the study, but it was not until different areas of literature combined with findings of the study and my own lived experience intersected that the chatter of relationships became deafening. The concept of relationship went unseen until I pulled back from the study to take a bird's eye-view and saw the paths and intersections that had been established with relationship within the study. Even though I can now see and hear relationships' presence, relationship's existence feels like a shadow: present to the naked eye but intangible. According to Microsoft Word's Smart Lookup, relationship can be described as the state of being connected between two or more concepts, objects, or people, but I am extending the definition to include the component of trust (i.e. relationship is a connection that is driven by trust).

The concept of relationship in this study could be found in the conceptual framework. Relationship is found in constructivism through its social co-construction of knowledge (Hein, 1991; Maxwell, 2013; Ültaner, 2012). Growth/Fixed mindset and relationship intertwined with the trust people had in their abilities or the trust people gave others to judge their abilities (Dweck, 2006). Nestled in the interpretation of the Visitor-Resident typology is the connection between the two spectrums and their relationship with the context of personal and professional online social engagements (White and Cornu, 2011). Narrative knowledge (Clandinin and Connelly, 1988; Olson, 1995a) and narrative authority (Olson and Craig, 2000) drew on three-dimensional narrative inquiry

space (Clandinin and Connelly, 2000). This was where relationship made its deepest mark, as relationships were contextualized with meaning-making of past experiences, branding it as educative or non-educative (Dewey, 1938). Relationships also shaped and informed the re-storying of experiences based on internal and external interactions (Clandinin and Connelly, 2000), and influenced a person's narrative knowledge and narrative authority.

Traces of the influence relationship had on teachers' construction of technology integration practices could be seen in the stories each teacher shared. Teachers' trust and connection with technology in a technology supported environment aided their choices to move forward with using technology. Teachers could trust that the technology would be available and work for them. Some teachers' relationship with technology began in their childhood. For example, Robin shared how technology had a presence in her home when she was very young, and today her trust and connection with technology encouraged her to create a home filled with smart technologies.

Teachers' relationships with their colleagues also influenced their technology integration practices. It could be seen in who signed up for the Tech for Teachers course. The majority came with members of their departments. For example, Brook attended the course with her 8th grade Science team. Teachers' relationships with their instructional technology coaches also influence their technology integration practices and their willingness to take risks involved with changing their classroom practices by integrating technology.



In my lived experience as an instructional technology coach, I have seen the importance of relationships. The epigraph found in each chapter of this dissertation documented my narrative construction (Ollerenshall & Creswell, 2002; Connelly & Clandinin, 1990) and narrative smoothing (Polkinghorn, 1995) of an interaction that influenced, informed, and transformed how I worked with teachers as a coach. This story has influenced how I made meaning from my experiences and influenced my understanding of teachers' technology integration practices. The story of Fiona, is the story of me and how I came to intentionally cultivate relationships in my practice. This is not to say that relationships were never a component of my work, but my interaction with Fiona and the continual revisiting and re-storying of our interaction helped me to see, feel, and come to understand the importance relationships had on teachers' construction of technology integration practices. Each time I reconstructed the story, I brought a different reading because of new experiences, contexts, and understandings that are now a part of my lived experience. As I revisit Fiona's fear of posting her curriculum online, I could feel the distrust and disconnect she had with technology.

Fiona could not see how technology fit with her teaching practice. Until Fiona could connect technology with her practice, she did not trust technology to be a part of her pedagogy. That was one layer of the complexity of relationship in this interaction. Another layer had to do with Fiona and my relationship with one another. Fiona and I were connected through our roles as teachers in the same school and same department, but she did not trust me enough to take risks with technology... yet. It was through listening and addressing her concerns that made room for trust to enter the

relationship. It was through sharing common experiences that allowed trust to be a part of the relationship and for Fiona to be willing to take risks with me in regard to her technology integration practices.

As I stated in the unexpected findings, it may have been my relationships with the teachers in the study that brought them to the class and to volunteer to be a part of this study. Although relationship had been a part of the study from the beginning, it wasn't until the end that I came to recognize the presence and influence of relationships. The factor of relationship is also missing from the literature and is an area that needs further exploration.

**Professional development implications.** The purpose of this study was to help professional development facilitators design technology integration professional development that incorporated teachers lived experience. The findings of the study support the following recommendations for professional development: make beliefs and practice explicit, design educative experiences, offer process- and product-oriented practices, and embed instructional technology coaching.

***Make beliefs and practice explicit.*** Teachers' values and beliefs may influence their technology integration practices (Ertmer, 2005; Ertmer et al., 2012; Tondeur et al., 2017; Vongkulluksn et. al, 2018; Hur et al., 2016; Ottenbreit-Leftwich et al., 2010); but teachers may be unaware that they hold these values and beliefs. Teachers should have opportunities to reflect on their technology integration teaching philosophies so their values and beliefs are explicitly identified and can be addressed. It should be understood that teachers can have conflicting values and beliefs about technology integration, but

that does not mean that they negate each other (Ertmer, 2005). It just means that based on the context of the situation, a certain value or belief may come to the forefront to influence how a teacher decides to use technology (Ertmer, 1999). Ertmer and Ottenbreit-Leftwich (2010) state, "...teachers filter new information delivered through professional development programs through their belief systems before they assimilate it into existing knowledge structures" (p. 263). Beliefs and practice inform one another (Tondeur et. al., 2017), therefore professional development should be designed to be educative.

***Design educative experiences.*** Educative experiences create opportunities for future growth and learning (Dewey, 1938). As teachers continue to build on their narrative knowledge and narrative authority through their experiences in professional development, designers of professional development need to take into consideration how to create learning experiences that will fuel future growth. These experiences need to build on and address teachers' past experiences (if they were non-educative) and situate it in teachers' practice (Dewey, 1938; Putnam and Borko, 2000). The situatedness of activities can support teachers' ability to translate the learning into their own classroom (Putnam and Borko, 2000). Also, professional development designers need to be cognizant of relationship structures amongst teachers, so that teachers who are asked to work together can support each other's narrative authority, versus diminish each other's experience (Olson, 1995a). In designing educative experiences, the structure of technology integration professional development may need to be reconsidered.

***Offer process- and product-oriented practices.*** Offering technology integration practices along the process- and product-oriented spectrum help teachers engage in

various forms of technology enactments. One form of practice is not better than the other, each has its own place in a teacher's skill set. What is important to note here is that teachers should not stay in one orientation, but shift orientations based on the needs of their students, curriculum, or teaching context. These orientations are not meant to be binary but seen as a continuum that teachers may shift between for different purposes (White and Cornu, 2011). Teachers need to be aware of both orientations and learn how to shift between each orientation based on their needs. Process- and product-orientations can help teachers to understand that their technology practices are varied and multifaceted and provide new ways to practice technology integration.

***Embed instructional technology coaching.*** Technology integration professional development for teachers cannot be done in one sitting. Teachers do not learn in isolation (Hein, 1991; Maxwell, 2013; Ültaner, 2012). Their learning is constructed through social interaction, collaboration, and reflection. They need opportunities to learn based on their context and lived experience. An instructional technology coach can support the needs of teachers (Glazer et al., 2005; Kopcha, 2012; Sugar, 2005) and help address the principles of effective professional development (Glazer et. al., 2005; Desimone, 2009; Lawless & Pellegrino, 2007; Mouza, 2011; Kopcha, 2012). Instructional technology coaches can provide long duration professional development for teachers (Glazer et. al., 2005; Desimone, 2009), allowing them the opportunity to facilitate, build and maintain relationships with teachers (Glazer et al., 2005; Kopcha, 2012; Sugar, 2005). Through these relationships, instructional technology coaches gain an understanding of each teacher's context and can individualize the coaching and support each teacher need,

whether it be through content knowledge, active learning (Glazer et. al., 2005; Desimone, 2009), or activity type (Glazer et. al., 2005). Instructional technology coaches can help bridge teacher's varied experiences and use those experiences to support how teachers can structure and assemble their technology integration practices. Due to the nature of their responsibilities, instructional technology coaches have insider knowledge to create coherence (Glazer et. al., 2005; Desimone, 2009) needed for individual and site-based professional development.

### **Limitations**

The study had a few limitations. One limitation is that the study was not designed to be generalizable, so the results are not meant to be applied to the general population. The study was designed to support transferability. That means, researchers who would like to replicate the study will need to determine for themselves if the characteristics of their population is similar enough to the characteristics of the teachers and district in this study.

Due to limitations of personal resources, data was unable to be collected of classroom observations when teachers were enacting their technology integration practices. Instead, teacher's self-reported technology integration practices through the use of the technology integration logs and quest logs were used to inform what teachers' practices were. Although this is not the same as direct classroom observation, it does provide two things that could not be provided by direct observation: 1) an insider perspective of how each teacher described their own technology integration practices and 2) some accounts provided rationales for why they implemented certain practices. These

accounts provide an emic perspective of the classroom context that an observer would not be privy to.

The study is also limited in the manner that participants were selected to be a part of the study. As the sample came from the Tech for Teachers course, it limited the sample from the potential hundreds of teachers to just a handful, as everyone who taught in a 1:1 setting did not sign up for the course. Despite this limitation, the teachers selected to participate in the study represented characteristics that supported the transferability of the study.

### **Recommendations for Future Research**

Instructional technology coaching is an area of research that has not been fully explored as a way to support teachers' technology integration efforts. There are a few studies, but the ones that have been conducted are few and far between. Some studies conducted examined the role of the coach as a form of professional development, identifying practices and support that the instructional technology coach provided (Glazer et. al, 2005; Hatten and Young, 2012; Kopcha, 2012; Sugar, 2005; Sugar and Tryon, 2014). An aspect of research in relation to instructional technology coaching would be to examine how coaches' lived experiences influence and inform their coaching practices. Another area would be to identify effective technology coaching practices that support teacher change. As technology integration use and expectations increase, teachers will need different approaches to support their journey towards technology integration, and instructional technology coaching may provide what teachers need to help them along their journey.

Another area of research that I personally would like to pursue is to study the structure and design of the Tech for Teachers course. Specifically, I would like to describe the theories and research that informed the formation of the course, as well as identify the structures of the course that teachers found helpful in their integration of technology. I would also want to examine the impact the course had on teachers' practice as well as students' learning.

### **Concluding Statement**

In this study, each teacher had their own unique way of constructing their technology integration practices. The ways in which this study captured their construction represents but a glimpse into each teachers' practices. The study captures only moments in time that was constructed through years of experience. It was with stories and through stories that gave voice to the lived experience of teachers in the study. It is also stories that influenced and informed this study.

Researchers concerned with how to design professional development to support teachers' construction of technology integration practices need to start hearing the stories teachers tell about their lived experiences and begin asking different questions to guide their research. Examples of potential questions are: How are teachers storying their experiences with technology? How can teachers' past and present experiences help inform technology integration professional development design? The conversation needs to shift from how to design technology integration professional development for teachers (a product-oriented approach), towards using teachers' lived experiences to inform a

technology integration professional development (a process-oriented approach). Most importantly, teachers' lived experiences and their stories need to be at the forefront.



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# Appendices

## Appendix A: IRB Approval

### UNIVERSITY OF MINNESOTA

*Twin Cities Campus*

*Human Research Protection Program  
Office of the Vice President for Research*

*D528 Mayo Memorial Building  
420 Delaware Street S.E.  
MMC 820  
Minneapolis, MN 55455*

*Phone: 612-626-5654  
Fax: 612-626-6061  
Email: [irb@umn.edu](mailto:irb@umn.edu)  
<http://www.research.umn.edu/subjects/>*

#### EXEMPTION DETERMINATION

March 30, 2018

Aaron Doering

612-625-1073  
[adoering@umn.edu](mailto:adoering@umn.edu)

Dear Aaron Doering:

On 3/30/2018, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Mindsets and Technology Integration
Investigator:	Aaron Doering
IRB ID:	STUDY00002835
Sponsored Funding:	None
Grant ID/Con Number:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	<ul style="list-style-type: none"> <li>• Mindsets and Technology Integration Study Interest Survey, Category: Recruitment Materials;</li> <li>• Letter of Support, Category: Letters of Support / Approvals (Location);</li> <li>• HRP-580 - Mindsets and Technology Integration, Category: IRB Protocol;</li> <li>• HRP-582 Social:Behavioral Consent Form, Category: Consent Form;</li> </ul>

The IRB determined that this study meets the criteria for exemption from IRB review. To arrive at this determination, the IRB used “WORKSHEET: Exemption (HRP-312).” If you have any questions about this determination, please review that Worksheet in the [HRPP Toolkit Library](#) and contact the IRB office if needed.

**Driven to Discover<sup>SM</sup>**

This study met the following category for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that Human Subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the Human Subjects responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects financial standing, employability, or reputation

Ongoing IRB review and approval for this study is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a Modification to the IRB for a determination.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the [HRPP Toolkit Library](#) on the IRB website.

For grant certification purposes, you will need these dates and the Assurance of Compliance number which is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003).

Sincerely,

Bri Warner  
IRB Analyst

We value feedback from the research community and would like to hear about your experience. The link below will take you to a brief survey that will take a minute or two to complete. The questions are basic, but your responses will help us better understand what we are doing well and areas that may require improvement. Thank you in advance for completing the survey.

Even if you have provided feedback in the past, we want and welcome your evaluation.

[https://umn.qualtrics.com/SE/?SID=SV\\_5BiYrqPNMJRQSBn](https://umn.qualtrics.com/SE/?SID=SV_5BiYrqPNMJRQSBn)

## Appendix B: Research Interest Survey

### Dissertation Research Study Interest Survey

Hello!

My name is Yeng Chang. I am a PhD Candidate in Learning Technologies in the Department of Curriculum and Instruction at the University of Minnesota. I was also an educator for 12 years in the district, teaching at Roseville Area High School. As the final step in my doctoral degree I invite you to consider being a part of my study to explore how our experiences with technology integration informs our mindsets and enactments of integrating technology into the classroom for teaching and learning. Please take a few minutes to complete this brief form to express interest in the study.

The following identifies some commitments that will be asked of you in being a part of the study:

1. An interview in April.
2. Participation in the technology integration professional learning course April 3-May 8, 2018.
3. An interview, scheduled between May and July.

Please note: Participation is voluntary and you will be provided a \$25 gift card for your engagement.

I look forward to learning with you!

Thank you,

Yeng Chang  
[chan0496@umn.edu](mailto:chan0496@umn.edu)  
612-229-5261

\* Required

1. **Email address \***

---

2. **First Name \***

---

3. **Last Name \***

---

4. **May Yeng contact you for a follow up conversation about your interest in participating in this study? \***

*Mark only one oval.*

- Yes, I look forward to learning more about this study. *Skip to question 4.*
- No thank you. *Stop filling out this form.*

### Contact Information

5. **Email me at... \***

Please list your preferred email.

---

6. **Call me at...**

(Optional)

---

## Appendix C: Research Consent Form

### Consent Form

## Research Consent Form

**Title of Research Study:** Mindsets and Technology Integration

**Researcher:** Yeng Chang

**Supported By:** This research is supported by the University of Minnesota.

### Why am I being asked to take part in this research study?

I invite you to be a part of my dissertation research study to explore how educators construct technology integration practices within a technology supported environment.

**Background Information:** Teachers' react, enact and respond to tech integration differently based on their context and environment. I want to explore how being in a technology supported environment influences/impacts teachers' tech integration practices.

**Purpose:** The main purpose of this research is to explore and investigate how teachers' construct technology integration practices in a tech-rich environment.

**Who Can Participate?:** Classroom teachers teaching at a Roseville Area Schools that is currently implementing a 1:1 initiative and taking the Tech for Teachers course.

### What should I know about a research study?

- Someone will explain this research study to you.
- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.

### Who can I talk to?

For questions about research appointments, the research study, research results, or other concerns, you may contact the study team at:

**Faculty Researcher Advisor:** Aaron Doering  
**Email Address:** adoering@umn.edu

OR

**Researcher:** Yeng Chang  
**Email Address:** chan0496@umn.edu

This research has been reviewed and approved by an Institutional Review Board (IRB) within the Human Research Protections Program (HRPP). To share feedback privately with the HRPP about your research experience, call the Research Participants' Advocate Line at 612-625-1650 or go to <https://research.umn.edu/units/hrpp/research-participants/questions-concerns>.

**You are encouraged to contact the HRPP if:**

- Your questions, concerns, or complaints are not being answered by the research team.

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- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

## Why is this research being done?

- The purpose of the research is to explore how teachers construct technology integration practices in a tech supported environment.
- There are many research on the barriers of technology integration, this study will focus on experiences.
- Involvement in the study will help teachers build mindsets and skill sets around technology integration, along with time and space to explore the subject.

## How long will the research last?

You have been invited to participate in a research study that includes 2 phases: a professional learning cohort, and a 1:1 interview. You can expect that you will be in this research study for a maximum of 19 hours of direct contact time with the researcher. This includes:

### Professional Development Course

- 6 sessions on Tuesdays between April 3, 2010 - May 8, 2018
- Sessions will be from 4-7pm.

### Interview

- One 1:1 interview with the researcher between April and July 2018
- Maximum of 1 hour

## What happens if I say, “Yes, I want to be in this research?”

### General:

- You have expressed interest in participating
- You have had a follow-up conversation with the researcher, Yeng Chang, to discuss the purpose of the research, your duties and this consent form. You have had an opportunity to ask questions and receive clarification about this study.
- Should you decide to participate, you will provide informed consent by signing and returning this form to Yeng Chang within 2 weeks.
- You will be part of a community of 3-5 teachers in this research study.
- You will be compensated with a \$25 gift card for your participation at the conclusion of the second interview.
- This research is planned to occur on site at Roseville Area High School.
- Interview will occur at mutually agreed upon dates and times.

### Please Note:

- Participation is voluntary.
- Participation is in no way tied to your employment, nor will participation or non-participation have negative consequences (e.g. disclosure of stigmatizing information; connection to seniority, promotion or tenure; etc.).
- You may ask additional questions or express concerns at any time to the researcher or faculty advisors.
- You may withdraw at any time, without consequence, in which case compensation will be prorated.
- The protection of your data is important. Please see the section “What happens to the information collected for this research?” section below for specific plans that are in place to ensure your protection and ethical research practices.

### Professional Development Course

- The course is secondary to the research (it would have been offered regardless of the the study), but your participation in the course allows us to examine how current experiences interact with past experiences.
- There will be about 20-25 other teachers taking the course that may not be a part of the study.

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- Time requirements of the course:
  - 6 sessions on Tuesdays between April 3, 2010 - May 8, 2018
  - Sessions will be from 4-7pm.
- You will be asked to complete the following coursework for the course that will be used for the study:
  - Technology Integration Statement
  - Technology Integration Log
  - Other artifacts that you create as part of your participants in the course (quests, lessons, etc)

## Interview

- You will interact 1:1 with the researcher as we explore your experiences with technology integration.
- You may decide to share an artifact from your teaching or reflective practice in the interview. This is optional and determined by you.
- Interview will be structured as conversational to explore your technology integration experiences.
- Interview will be audio and video recorded. These recordings will be transcribed.
- Informal follow-up to clarify any statements made in the interview or professional development course to ensure accurate representations and identify any evolution of thinking that may have occurred since the professional development course experience.

## What happens if I do not want to be in this research?

You will contact the researcher, Yeng Chang, and notify her that you are opting not to participate in the research.

## What happens if I say “Yes”, but change my mind later?

You can leave the research at any time and it will not be held against you. You will notify the researcher, Yeng Chang, that you wish to change your consent to participate in the research.

If you decide to leave the research you and the researcher will determine what will happen to data collected up to the point of withdrawal and follow up with a notification in writing signed by both parties.

## Is there any way being in this study could be bad for me?

There is no foreseeable risk in being a part of this study. Taking part in this research study will not lead to any costs to you. Inconveniences related to this study has been reduced as much as possible by hosting the professional learning at a site within the district participants work after school hours and locating at mutually agreed upon dates, spaces and time for both scheduled semi-structured interviews.

## Will being in this study help me in any way?

I cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include opportunities for developing mindsets and skill sets around technology integration. You will earn a \$25.00 gift card, outside of your contracted teaching salary, for participation.

## What happens to the information collected for the research?

Efforts will be made to limit the use and disclosure of your personal information, including research study records, to people who

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have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of this institution. An exception to our promise of confidentiality is when we in good faith are permitted by law or policy to report evidence of child abuse or neglect as Mandatory Reporters.

**Further, the protection of your data is important and the following plans are in place to ensure ethical research practice:**

- All data materials will be anonymized and identifying features will be removed, where this is not possible pseudonyms chosen by you will be used to code the secured data.
- Visual images, if any, with identifiable information will be blurred for your protection. The original visual images will be in a sealed envelope and stored in the locked file cabinet.
- All data collected will be secured on a private and password protected device and backed up on a password protected external hard drive.
- Items held in online platforms (Google Drive) will remain password protected and stored online.
- Physical consent forms, the researcher's journals, and identifying materials will be stored in a locked box.
- Pseudonym and identifying information alignment will be maintained in a password-protected document on a password-protected computer.
- Only the researcher will have access to the data.
- The data will be stored in secure locations for 5 years after the conclusion of the study.
- The researcher will honor any additional requests you make regarding privacy.
- The researcher will not have access to medical, student, or employee records. No data will not be placed in the your records (e.g. medical, employment, educational).
- The researcher will not have access to any other sources of private information about you.

## Can I be removed from the research without giving my OK?

The person in charge of the research study or the sponsor can remove you from the research study without your approval. The only circumstance in which you will be withdrawn by the researcher is the lack of attendance across multiple sessions and or not completing the interviews.

## Will I be compensated for my participation?

If you agree to take part in this research study, you will be paid with a \$25.00 gift card for your time and effort at the conclusion of your second interview.

## Will I have a chance to provide feedback after the study is over?

The Human Research Protection Program (HRPP) may ask you to complete a survey that asks about your experience as a research participant. You do not have to complete the survey if you do not want to. If you do choose to complete the survey, your responses will be anonymous.

If you are not asked to complete a survey, but you would like to share feedback, please contact the study team or the HRPP. See the "Who Can I Talk To?" section of this form for study team and HRPP contact information.

## Research Consent

**Your signature below documents your informed consent and permission to take part in this research. With this signature you are consenting to participation in the professional learning cohort and interview. You will allow the researcher to utilize the data collected in the professional learning cohort, interview and interview follow-up (if applicable).**

**Consent Form**

\_\_\_\_\_  
Signature of participant Date

\_\_\_\_\_  
Printed name of participant

\_\_\_\_\_  
Signature of person obtaining consent Date

Yeng Chang  
Printed name of person obtaining consent

**Please return this consent form to Yeng Chang  
via email at [chan0496@umn.edu](mailto:chan0496@umn.edu)  
within two weeks of your interest conversation.**



## Appendix D: Interview Guide

1. How would you define technology integration now that you have completed the course?
  - a. What does technology integration mean to you?
  - b. What does technology integration look like? Example?
  - c. How would you know someone was integrating technology as part of their practice?
2. Describe how you use technology for teaching and learning?
3. What prevents or get in the way of your using technology for teaching and learning?
  - a. What do you do if technology does not work?
  - b. Is there anything about technology preventing you from using certain technology?
  - c. Are there times when you choose not to integrate technology? Why?
  - d. Are there cases where you don't feel like it's appropriate to integrate technology?
4. Tell me about an experience, or experiences from your past that has helped you or helped you to integrate technology for teaching and learning?
  - a. Professional development
  - b. Discussions with colleagues
  - c. positive/negative modeling/experiences
5. Think back to when you first decided to sign-up for this PD. What made you want to take this course?
  - a. Was there something about the way the description of the PD was structured in the description that drew you to want to take the course?
  - b. Were there colleagues you talked to that influenced your decision to take the course?
  - c. What about your past experiences led you to sign up for the course?
6. Give me an example of something new you have done with tech integration because of the Tech for Teachers course.
7. What shifts have you noticed about how you think about technology integration after taking this course.
8. What new plans for tech integration do you have for next school year?
9. What other forms of professional development, courses or learning have you had on technology integration?
  - a. What was helpful?
  - b. What did you wish had been done differently?
  - c. What kinds of things have you done to learn more about technology integration?
10. Imagine you have a student teacher in the next school year. How would you support them with technology integration for teaching and learning?
  - a. How would you frame the conversations?
  - b. What resources would you provide them?
  - c. What advice would you give them after an unsuccessful attempt at trying to integrate technology into one of their lessons.
11. In your Tech Integration Log you wrote —Could you expand on — What did you mean by —How did this inform —
12. What do you need in moving forward with your technology integration journey?