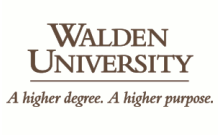

2020

Teachers' Perceptions of a One-to-One Teacher Laptop Program and Teacher Technology Efficacy

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This is to certify that the doctoral dissertation by

Johnson Kulangara Jacob

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2019

Abstract

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by

Johnson Kulangara Jacob

MEd, College of New Jersey, 1999

BE, Bangalore University, 1982

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

Schools all over the world are embracing technology because they view technology as a catalyst to improve teaching and learning, leading to further investment in technology initiatives for school improvement. The 1:1 teacher laptop program is one such initiative that continues to gain interest and momentum. Despite widespread adoption, teachers continue to face challenges with the use of technology. Furthermore, while research has indicated that teacher technology efficacy is a significant enabling factor for technology use, there is limited evidence for how the 1:1 teacher laptop program has influenced teacher technology efficacy. The purpose of this qualitative pragmatic study was to describe the perceptions and experiences of teachers who participated in a 1:1 teacher laptop program at an international school in relation to teachers' technology efficacy. The study was framed through the model of adult learning proposed by Knowles and the construct of self-efficacy posited by Bandura. Thematic analysis was used to analyze data. Findings from this study identified 7 overarching themes: access to the teacher laptop, change in practice, support structures, concerns and barriers, attitude towards technology, self-directed learning, and perceived value. Interpretations revealed that while participants were positive about the program and acknowledged that the program helped raise their technology efficacy, participants also shared concerns. This study adds to the body of knowledge for an understudied topic and provides teachers a voice to influence implementation fidelity. This study also contributes to social change by adding a global perspective through experiences at an international school to inform school leaders to prepare teachers to use technology effectively to improve student learning.

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Dedication

I dedicate this dissertation to my dear (late) mother, Amma - Elizabeth Jacob, who cared and stood by me all my life. I would not have embarked on this doctoral journey if it was not for her persistence and encouragement. I thank my dear (late) father Kulangara Verghese Jacob, who inspired me to do my very best. I also dedicate this dissertation to my beloved wife, Janice, and my children Nikhil, and Jessica for their unconditional patience, support, and love throughout this journey. In the end, I could not have accomplished this dream without the blessing of my Lord and Savior.

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I would like to acknowledge the unwavering dedication and support given to me throughout this incredible learning journey by my amazing committee members. I could not have made it this far without the care, intellectual expertise, and guidance I received from Dr. Janet Strickland, Dr. Cheryl Keen, and Dr. Catherine Watt. I would like to also acknowledge and thank Dr. Deborah Inman for her kindness and gentle encouragement.

Table of Contents

Chapter 1: Introduction to the Study

Digital technology is increasingly becoming an embedded part of our lives and how we do business. The proliferation of digital technology offers new opportunities for transformation and innovation. As a result, both schools and other educational institutions are embracing technology as a catalyst for change through new opportunities, grounded through past and current beliefs and attitudes about the value of technology in reimagining teaching and learning (Ditzler, Hong, & Strudler, 2016; Ifenthaler & Schweinbenz, 2016; Yarbro, McKnight, Elliott, Kurz, & Wardlow, 2016). However, this enthusiasm is challenging traditional approaches and the status-quo through expectations for accountability and results (Pachler, Preston, Cuthell, Allen, & Pinheiro Torres, 2010). The rapid proliferation of technology has resulted in a changing educational landscape, posing continuous challenges and demands on stakeholders (Digital Promise, 2018; Harper & Milman, 2016; U.S. Department of Education Office of Educational Technology, 2016a, 2016b, 2016c). Consequently, there is increased interest in investigating and examining the role and place of technology in education. Over the last decade, one technology initiative that schools have adopted and that continues to gain momentum is the one-to-one (1:1) laptop program (Bebell & O'Dwyer, 2010; Harper & Milman, 2016; Lei & Zhao, 2008; Penuel, 2006). The 1:1 program was designed to provide students and teachers anytime and anywhere access through an Internet enabled laptop as a way to enhance practice for improved student learning (Harper & Milman, 2016; Penuel, 2006; Stanhope & Corn, 2014).

Several studies related to 1:1 programs have added to the body of existing knowledge with the aim of examining how this initiative influences teaching and learning for the development of 21st Century skills, including teacher concerns during implementation, the need for teacher readiness, differences teaching within a 1:1 learning environment (Donovan & Green, 2010), teacher perceptions and the need for teachers to share experiences to improve practice (Storz & Hoffman, 2013), influence on student learning and the changing role of teachers (Harper & Milman, 2016), teacher technology efficacy and teacher voice as a factors to improve student learning (Mourlam & Montgomery, 2015), implementation fidelity to enhance student learning experiences (Williams & Larwin, 2016), preparation of teachers for meaningful integration (Bakir, 2015), attitudes towards technology through student experience and voice (Zheng, Arada, Niiya, & Warschauer, 2014), teacher perceptions for their own technology efficacy (Zheng, Warschauer, Lin, & Chang, 2016), and proliferation of technology leading to new challenges for teachers and students (Warschauer, Zheng, Niiya, Cotton, & Farkas, 2014). Argueta, Huff, Tingen, and Corn (2011) found improvement in student achievement as a consequence of increased student motivation and engagement through 1:1 programs, which was further confirmed through a review of literature on 1:1 initiatives over a period of 10 years (Harper & Milman, 2016). Infenthaler and Schweinbenz (2016) found that acceptance of 1:1 programs was positively influenced and predicted technology use by attitudes towards technology, which confirms that heightened technology efficacy may be a positive enabler of technology integration (Giles & Kent, 2016).

A review of the literature provided further insights about 1:1 programs through an examination of changes in the classroom environment, effects on student motivation and engagement, classroom use of technology, and challenges arising from the use of technology (Harper & Milman, 2016). Furthermore, researchers have noted the need for more research to understand how to successfully implement 1:1 initiatives to improve teaching and learning, while keeping up with the rapid proliferation of technology (Harper & Milman, 2016; Stanhope & Corn, 2014).

Teachers play a central role in education (Dewey, 1997; Tyack & Cuban, 1995). Through an extensive meta-analysis, teachers have been identified as a significant factor for improving student learning and achievement (Hattie, 2015). Teachers also have played an integral role in the successful implementation of 1:1 initiatives (Bebell & O'Dwyer, 2010). Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) found that teachers' role is pivotal because they are in the frontline with the power and control for how technology is used for teaching and learning. Teacher beliefs, attitudes, and judgment regarding the benefits of technology were found to determine their willingness and ability to use technology (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010). While several researchers found different reasons for limited application of technology in the classroom, teacher technology efficacy was also identified as a contributing factor for affordance of technology in teaching and learning (Bakir, 2015; Giles & Kent, 2016; Kalemoglu Varol, 2014; Lee, Cawthon, & Dawson, 2013; Mojavezi & Tamiz, 2012; Mourlam & Montgomery, 2015). Factors influencing teacher self-efficacy for technology integration included learning by observing others and goal setting, which helped and

influenced teacher self-efficacy beliefs for the use of technology in teaching (Wang, Ertmer, & Newby, 2004). Other researchers confirmed that raising teacher technology efficacy has led to increased use of technology for teaching and learning (Bakir, 2015; Teo, 2009). The body of knowledge related to student 1:1 laptop initiatives is extensive; however, there is limited literature related to teacher 1:1 laptop initiatives, in particular how support for teacher 1:1 programs raise teacher technology efficacy.

In this chapter, I build the case and justification by providing a brief background to frame the problem statement and the purpose of the study. This is followed by the research questions, which guide the design of this qualitative study. The chapter also includes a description of the nature of the study, the conceptual framework, definitions, assumptions, scope and delimitations, limitations, and the significance of the study. The chapter ends with a brief summary.

Background

A number of studies contributing to the body of literature on 1:1 initiatives have pointed to increasing numbers of schools adopting this technology to support teaching and learning (Ditzler et al., 2016; Downes & Bishop, 2015; Heath, 2017; Henderson-Rosser & Sauers, 2017; McKnight et al., 2016; Mourlam & Montgomery, 2015; Newhouse, Cooper, & Pagram, 2015). The continued growth of technology in schools is a consequence of rapid development and availability of new technologies (Harper & Milman, 2016). Other claims for the growth of technology have included the use of technology as a tool to shape thinking (Wegerif, 2015), the value of interaction and engagement through online professional learning networks (Krutka, Carpenter, & Trust,

2016; Trust, 2016), the transformation of student learning through digital instructional strategies (McKnight, O'Malley, Ruzic, Horsley, Franey, & Bassett, 2016), the preparation of teachers for meaningful integration (Bakir, 2015), and the motivation to increase student achievement (Williams & Larwin, 2016). A study conducted to examine technology-based instructional strategies to improve student learning and how these strategies aligned with other research on learning confirmed the need for more research of situated and contextual factors, rather than on the technology itself (McKnight et al., 2016). Findings from studies have also validated and confirmed the changing role of teachers as a result of technology and how teacher practice is transforming (Bakir, 2015; Harper & Milman, 2016; Levin & Schrum, 2013; Mourlam & Montgomery, 2015). Other researchers have confirmed that teacher learning is complex and is influenced by multiple contextual factors (McKnight et al., 2016; Newhouse et al., 2015; Trust, 2016). While researchers have provided insights into teacher practice and how teachers learn, there is a continued need for further research to focus on other factors, in ensuring successful implementation and integration of technology for improved practice (Bakir, 2015; Harper & Milman, 2016; Mourlam & Montgomery, 2015; Trust 2016).

Researchers have alluded to the continued debate related to the influence of technology on teaching and learning (Zheng et al., 2016). While more students and teachers have gained access to technology, this availability has posed new challenges and demands on policy makers, schools, teachers, students, and parents (Warschauer et al., 2014). Reformers, policy makers, and researchers have argued through critical examination in favor of technology, stating the world and education requires a different

emphasis through revisioning and reinvention (Bebell & O'Dwyer, 2010; Penuel, 2006; Tyack & Cuban, 1995; U.S. Department of Education, 2016a; Wegerif, 2015; Zheng et al. 2016). While there is increased support for the use of technology, there is a lack of agreement regarding the role of technology in teaching and learning (Zheng et al., 2014). Furthermore, while there is a need to foster thinking in the digital age through dialogic approaches using technology, deeper understanding is warranted for how to apply technology (Wegerif, 2015).

Schools seek to keep abreast with technological advances and development in ensuring alignment with the context in which students live and to serve their interests (Periathiruvadi & Rinn, 2012). It was noted that teachers viewed technology as a valuable tool for learning (Harper & Milman, 2016). However, researchers have highlighted the value of further examination of and through teacher perceptions to change beliefs and attitudes for the application of technology in improving the quality of teaching and learning (Periathiruvadi & Rinn, 2012). Consequently, researchers have highlighted the need for more research to address how to raise teacher technology efficacy as a way to improve student learning outcomes (Bakir, 2015; Harper & Milman, 2016; Levin & Schrum, 2013; Mourlam & Montgomery, 2015; Zheng et al., 2014). A study framed through an adaptation of Rogers's (2003) diffusion of innovation framework to explore how teachers used technology concluded that learning to integrate and apply technology is a complex developmental process and takes time (Mourlam & Montgomery, 2015). This finding confirms the value for more research to support the integration of technology through teacher professional learning opportunities and informed decisions

based on an evidence-based approach. Researchers have also explored how to better prepare preservice teachers to use technology in teaching, highlighting the need to identify new strategies and methods needed to effectively use technology to improve learning experiences (Bakir, 2015). Themes such as administrative support, technology implementation levels, funding, technology access, technology support, and professional development were identified as gaps in understanding the application of technology for teaching and learning (Bakir, 2015). Appropriately designed professional learning and modeling are noted as strategies to change attitudes towards technology and to raise technology efficacy through real-life experiences (Bakir, 2015). Other identified factors that contributed to developing practice included teacher voice, advocacy, teacher pedagogical beliefs, and learning with technology (Bakir, 2015).

Through a review of the literature, gaps have confirmed the need to determine what is known and what needs to be known, and because technology is viewed as an integral part of schools, there is a need for a deeper understanding to respond appropriately in improving student learning (Richardson, Bathon, Flora, & Lewis, 2012). Further research was suggested to identify best practice and ways to increase transfer of technology knowledge for teachers in ensuring teachers apply this knowledge effectively in new learning situations (Clark, Zhang, & Strudler, 2015). As 1:1 programs propagated, it was predicted that more schools would continue to join the 1:1 initiative as a way to prepare students for the future through positive educative experiences (Lei, 2010). However, limited empirical evidence to support the propagation of 1:1 initiatives continue to pose challenges with several critical questions unanswered (Carol & Santori,

2015). As a result of the proliferation of 1:1 programs, further examination of enabling and inhibiting factors could shed deeper understanding in ensuring successful implementation. Through the findings of their research, Carol and Santori (2015) recommended the need to examine 1:1 initiatives through the perspectives and perceptions of teachers because teachers are ultimately responsible and expected to integrate technology into the classroom for teaching and learning. An extensive review of the literature conducted over a period of a decade on 1:1 programs also revealed the need for additional research to provide new insights to improve practice through successful 1:1 implementation (Harper & Milman, 2016). While research has provided useful insights, teacher perceptions of the value of technology to improve student learning and practice through a teacher 1:1 program have not been adequately examined through the perspective of an adult learning model and teachers as adult learners.

Problem Statement

Teachers play a pivotal role in student learning and are viewed as predictors of student achievement and success (Dewey, 1997; Hattie, 2009, 2012, 2015; Terhart, 2011; Tyack & Cuban, 1995). International schools also view teachers as catalysts in improving student learning for future student success (American International School of Bucharest, 2019; International School of Prague, 2019). Other studies validated the rapid advancement and changes in technology, stressing the need to understand impact to improve teaching and learning for the 21st Century (Periathiruvadi & Rinn, 2012; Richardson et al., 2012). International schools view technology as an integral enabler of learning, while aspiring to raise teacher technology efficacy as a way to build capacity for

school improvement (American International School of Bucharest, 2019; International School of Prague, 2019). Consequently, international schools continue to allocate a significant part of their annual budget to implement a variety of technology initiatives, and this includes providing each teacher with a laptop through a 1:1 teacher laptop program as a way to raise teacher technology efficacy (American International School of Bucharest, 2019; American International School of Budapest, 2019; International School of Prague, 2019).

Researchers have underscored teacher beliefs and attitudes towards technology as factors and predictors for successful application and implementation of technology (Ertmer & Ottenbreit-Leftwich, 2010; Lee, Cawthon, & Dawson, 2013; Mourlam & Montgomery, 2015; Richardson et al., 2012; Tilton & Hartnett, 2016). Self-efficacy is viewed as an important component of teacher beliefs and attitudes (Guo, Piasta, Justice, & Kaderavek, 2010; Moore-Hayes, 2011; Tilton & Hartnett, 2016). Subsequently, examination of links between teacher beliefs and attitudes towards technology and self-efficacy, in particular teacher technology efficacy, while adding to the body for knowledge could also provide insights for successful implementation and application of technology to improve teaching and learning. Researchers have indicated that the role of technology as an effective teaching and learning tool is dependent on how teachers perceive and use the technology (Periathiruvadi & Rinn, 2012). While existing studies support the significance of engaging teachers through 1:1 programs, there is little evidence or empirical studies that validate the value of the 1:1 program to increase teacher technology efficacy through the perspective of teachers as adult learners (Bakir,

2015; DeSantis, 2013; Mourlam & Montgomery, 2015). Attitudes towards the application of technology predicted significant improvement in performance by influencing perceptions to learn and apply technology (Jawahar & Elango, 2001). Another researcher confirms the importance of examining what motivates adults to learn and the need to identify strategies in developing approaches to improve adult learning (Ong, 2014). Furthermore, the model of adult learning (Knowles, Holton, & Swanson, 2015) highlights that adult learning works best when aligned with the learner's uniqueness and the context in which the learning occurs.

However, despite the research and investment schools make, barriers exist, and teachers continue to face challenges applying and integrating technology into teaching to improve student learning (Carol & Santori, 2015; Clark et al., 2015; Moore-Hayes, 2011; Periathiruvadi & Rinn, 2012; Richardson et al. 2012). In order to better prepare teachers, continued research is needed to identify and understand factors enabling or inhibiting use of technology for teaching and learning through the perspective of teachers to inform, influence, and improve practice in enhancing student learning, while adding to the body of knowledge through the perceptions and experiences of teachers. Consequently, I aimed to explore and describe perceptions and experiences of teachers about a 1:1 teacher laptop program and their own technology efficacy.

Purpose of the Study

The purpose of this qualitative pragmatic study was to determine how teachers who participated for 2 or more years in a 1:1 teacher laptop program perceive and describe their experiences, while identifying enabling and inhibiting factors in raising

their own technology efficacy. This study can benefit schools through an examination and understanding of the phenomenon to improve instructional practice and student learning. The study was set within the context of an international school and framed through a conceptual model of adult learning (see Knowles et al., 2015) and the construct of technology efficacy. Those experiences could reveal strategies for how teachers can raise their own technology efficacy. The study can also provide teachers a voice in the implementation of 1:1 teacher laptop programs. Furthermore, findings from the study can benefit the greater educational community through a deeper understanding of the phenomenon by adding to the body of existing knowledge.

Research Questions

The research questions for this study are as follows:

Research Question (RQ)1: How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?

RQ2: What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

Conceptual Model and Framework

This study was framed through a conceptual model of adult learning proposed by Knowles et al. (2015) and the construct of teacher technology efficacy (see Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016).

Adult Learning

The conceptual model of adult learning (Knowles et al., 2015) provided a lens to understand through experiences derived from thick and rich descriptions of teachers for

the what, how, and why adults learn within the context of the 1:1 teacher laptop program. This adult learning model presented by Knowles et al. (2015) was a pertinent framework because I aimed to explore the topic through the descriptions and perceptions of teachers as adult learners participating in the 1:1 program. This conceptual model also validated the selection of the research design and research questions, in addition to the data collection method to examine the topic through the experiences of teachers as adult learners (see Creswell, 2009; Kumar, 2011). There are six identified principles at the core of this adult learning model and these include the need to know, self-concept, prior experience, readiness to learn, orientation to learn, and motivation to learn (Knowles et al., 2015). While the six principles provided the core, the model in practice includes other factors that influence how adults learn, and this included individual and situational differences and goals and purposes for learning. Interest and research related to adult learning were influenced by assumptions about adult learners, and motivation to learn was noted as a consequence of fulfilling a need, life-centered, based on experience, self-directed, and grounded in individual differences between adult learners (Knowles et al, 2015). Framing the study through this conceptual model of adult learning allowed me to explore and examine individual and situational differences of participating teachers within the context of a real 1:1 teacher laptop program setting.

Technology Efficacy

Technology efficacy stems from the boarder concept of self-efficacy (Bandura, 1977). Self-efficacy is defined as an individual's belief in their own ability to successfully perform a task and is influenced by actual experiences, vivacious

experiences, verbal persuasions, and physiological reactions (Bandura, 1977). Researchers have emphasized the relationship of self-efficacy and one's beliefs and attitudes (DeSantis, 2013; Efe, 2015; Guo et al., 2010; Holden & Rada, 2011; Kalemoglu Varol, 2014; Lee et al., 2013; Niederhauser & Perkmen, 2010). In a study designed to examine the relationship between teacher technology attitudes and computer self-efficacy, researchers confirmed a significant and positive relationship between the variables (Kalemoglu Varol, 2014). The participants in this study were 337 physical education teachers with an equal distribution between males and females, who were surveyed using a technology attitude and self-efficacy belief scale (Kalemoglu Varol, 2014). The results of the study revealed a relationship between technology use and technology efficacy, confirming technology self-efficacy as a predictor of technology use for teaching and learning (Kalemoglu Varol, 2014).

Self-efficacy is based on social cognitive theory, which attempts to understand the connections between behavior, emotions, cognitive beliefs, skills, and the environment (Bandura, 2009). Furthermore, high levels of efficacy have been linked to improved achievement, while low levels of efficacy have resulted in a negative impact on performance (Tilton & Hartnett, 2016). In a study set within the context of a 1:1 iPad initiative at an international school, findings revealed an increase in technology use in the classroom as a result of collective self-efficacy for technology among students (Tilton & Hartnett, 2016). Furthermore, the study, which was conducted in two phases, validated the notion that allowing teachers to develop mastery through experience was the most significant contributor in influencing teacher technology self-efficacy beliefs.

Researchers also confirm the need to examine technology efficacy as a catalyst for successful application of technology in teaching and learning (Celik & Yesilyurt, 2013; So, Choi, Lim, & Xiong, 2012; Tilton & Hartnett, 2016). Consequently, there is value in examining teacher technology efficacy as a predictor and factor to influence teacher beliefs and attitudes towards technology.

Nature of the Study

In this study, I used a qualitative pragmatic research approach to gain insights through the descriptions and perceptions of teachers about a 1:1 teacher laptop program to raise their own technology efficacy (see Savin-Baden & Major, 2013). Qualitative pragmatic research, also referred to as basic or generic qualitative research (Merriam & Tisdell, 2016), is a qualitative approach used by researchers to gain a holistic picture through an in-depth understanding of a phenomenon, process, or perceptions of those involved (Auta, Strickland-Hodge, & Maz, 2017; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Because the purpose of this qualitative study was to determine how teachers who participated for 2 or more years in a 1:1 teacher laptop program perceived and described their experiences, while identifying enabling and inhibiting factors in raising their own technology efficacy, the qualitative pragmatic provided flexibility without aligning to any particular approach or tradition (see Kahlke, 2014; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Qualitative pragmatic research was selected because I aimed to answer the research questions through the descriptions and perceptions of teachers participating in the 1:1 program (Auta et al., 2017; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013).

Furthermore, this approach provided methodological flexibility as I was not guided by established qualitative traditions or methods, rather I was guided by the research questions to make sense of the reality of the participants (see Savin-Baden & Major, 2013).

This study was situated within the context of an international school, with a focus on teachers as adult practitioners who participated in a 1:1 teacher laptop program. I used a holistic approach instead of focusing on isolated factors to answer the research questions. The location and participants of the study were purposefully selected for relevancy and significance to support the findings (see Savin-Baden & Major, 2013). The research approach was also appropriate as I was an outsider and not in a position to alter or control the situation; rather my focus was on investigating the phenomenon as it existed in the natural setting (see Savin-Baden & Major, 2013). I focused on the responses of participating teachers and their perceptions to ascertain "thick descriptions" (see Merriam, 2009, p. 229). In conclusion, qualitative pragmatic research was selected as the most suitable approach for this study because it provided for responsiveness, flexibility, depth of investigation, and a deep understanding for a complex phenomenon (see Savin-Baden & Major, 2013).

Definitions

The following terms used throughout the study are defined below:

1:1 computing, also labeled *ubiquitous computing:* Refers to anytime and anywhere access to a variety of digital computing devices by both students and teachers (van't Hooft, Swan, Cook & Lin, 2007).

1:1 teacher laptop program: Refers to school initiatives whereby teachers are provided their own laptop to facilitate individual access to a variety of technology-based resources for teaching and learning (Penuel, 2006).

21st Century skills: The skills needed by students for future readiness and include learning and innovation skills, digital literacy skills, and career and life skills (Trilling & Fadel, 2009).

Adult learning: The characteristics of learning in adults and how adults learn (Knowles et al., 2015).

International school: A school offering an international curriculum to a local and expatriate multinational community (American International School of Budapest, 2019).

Technology efficacy: A teacher's self-efficacy belief in their ability to work with and use technology for instructional delivery to support student learning (Wang et al., 2004).

Teacher technology proficiency: A teacher's capacity to demonstrate technology literacy by using a variety of technologies for teaching and learning to deepen knowledge and create knowledge (International Society for Technology in Education, 2019b; Nussbaum-Beach & Hall, 2012).

Assumptions

Assumptions are a necessary part of the study design because they provide for transparent and open collection of data in gaining deep, thick, rich, and unbiased data (Yin, 2009). The first assumption was that participants had an understanding of the nature and purpose of the study. I also assumed the participants understood the interview

questions and could accurately describe their experiences and insights through their responses. A third assumption was the willingness of participants to provide responses based on their experiences and perceptions of the 1:1 teacher laptop program. In addition, I assumed participants were satisfied with the ethical standards applied in this study and were assured that none of the data collected for the study would be used in any way other than the intended purpose for which they were collected. I also assumed there would be a variety and range in the responses and perceptions because participants in this study possessed different years of experience and levels of technology proficiency. I assumed that this variety would provide dichotomy and diversity for the data collected, which provided richer and thicker descriptions. Furthermore, I assumed participants would answer the interview questions honestly and would be able to recollect their experiences to the best of their knowledge. Finally, bias on the part of both researcher and participants was also assumed.

Scope and Delimitations

The qualitative pragmatic research approach was selected for this study because it involved a contextual and in-depth exploration of a specific phenomenon through thick and rich descriptions derived from perceptions of participants (see Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). The scope of this study was based on the data derived from the responses and perceptions of a purposefully selected group of teachers from an international school who participated in a 1:1 teacher laptop program for at least 2 years. The teachers in this study represented both divisions of the school: primary and

secondary. The selection was not based on the teacher's technology proficiency or years of teaching experience.

Delimitations narrow the range of a study, and, as a result, this study is limited to an international school and a small group of teachers who participated in the 1:1 teacher laptop program. This school was selected because it had an established 1:1 teacher laptop program that aligned to the school's vision and mission, which teachers have participated in for the last 5 years. The school also supports a 1:1 student laptop program; however, I did not include the student population. In addition, perceptions of other stakeholders, including parents, were not included. While additional perspectives would have added to the richness of the data collected, the intent of this study was to limit the scope of the study through the perspective of the teachers as a way to gain insights through the lens of the practitioners responsible for implementing the 1:1 program.

Limitations

Generalizability is limited because the study was restricted by location and by the number of participants. However, the study still provides valuable information through the collection of rich and thick descriptions derived from the experiences and perceptions of a purposefully selected group of practitioners who participated in the 1:1 teacher laptop program for at least 2 years. Because current literature is limited, insights from this study provide a foundation for future studies using alternate research methods to extend and further examine the phenomenon through other populations.

My study was not intended to generalize findings, but to inform through a particular and specific phenomenon (see Creswell, 2009). The choice for the qualitative

pragmatic research approach provided new insights through identified themes in designing future quantitative and qualitative studies as a way to generalize findings. To ensure that the study can be used as a foundation for further studies, the research was conducted through rigorous steps for reliability and validity. Procedures to increase reliability included multiple checks for accuracy of transcriptions, defined codes to minimize shifting of code, and sharing of analysis with participants (see Creswell, 2009). Procedures to increase validity included using systematic checking of transcriptions, cross-checking the accuracy of themes and descriptions with participants through member checking, using detailed narratives through thick and rich descriptions, self-reflective narratives to minimize researcher bias, and transparent presentation of unexpected or counter findings (see Creswell, 2009; Savin-Baden & Major, 2013).

Despite situating the study in the same school where I am currently working, there are still advantages associated with insider research provided I consider all theoretical and practical implications to guard against potential pitfalls (see Atkins & Wallace, 2012). The advantages included quick and easy access to participants for rich and thick data collection through trust and an established relationship, leading to detailed disclosure and sharing of information. This allowed for collection of thicker descriptions and a greater understanding and interpretation of the narrative because of familiarity with the culture of the organization and the practice of the participants (see Atkins & Wallace, 2012). Notwithstanding the fact that I am a member of the school and also the sole researcher, it can be argued this research study can contribute to positive social change. This insider study can allow me to share the findings with this school and other schools to

further research by examining how a 1:1 teacher laptop program can raise teacher technology efficacy. To guard against the challenges of insider research, I guaranteed impartiality by remaining aware about study participant role identity through the application of high ethical and confidentiality standards (see Atkins & Wallace, 2012). Furthermore, I made known subjective judgment and bias through self-reflective journal entries and narratives for inclusion in the research report, while mitigating bias and guarding against power relations. I joined the school only in August 2017, and I had nothing to do with the planning and implementation of the 1:1 teacher laptop program, which was instituted over 5 years ago.

Significance of the Study

While there is a wide range of literature on 1:1 laptop programs and technology efficacy, a thorough review of the literature indicated research on teachers participating in a 1:1 teacher laptop program as adult learners and how they learn is limited or sparse (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Carol & Santori,2015). Continued scholarly research for this topic will not only add to the body of existing knowledge but will also provide insights for how to improve student learning outcomes and opportunities by responding to rapid changes in a technologically advanced world (Richardson et al., 2012). As a result, more research is needed to add to the body of knowledge for how to raise teacher technology efficacy through the perspective of adult learning, in improving student learning. Furthermore, contribution through scholarly literature can promote the effective use of technology to improve future student preparedness (Richardson et al., 2012). Researchers have examined factors that influence

technology efficacy and have argued for the need to conduct further studies for the what, how, and why to increase teacher technology efficacy (Kalemoglu Varol, 2014; Tilton & Hartnett, 2016). School success is also dependent on how schools implement and engage in professional learning, designing initiatives like the 1:1 teacher laptop program through what is already known and what we need to know, while also addressing gaps in the knowledge base (Richardson et al., 2012). Addressing this gap in the literature not only adds to a deeper understanding for the 1:1 teacher laptop program but provides insights to improve implementation and student learning outcomes through teacher voice and increased teacher technology efficacy for the use of technology in teaching and learning (see Kalemoglu Varol, 2014; Tilton & Hartnett, 2016).

In conclusion, this study is significant because it contributes to the body of existing literature by identifying new insights for the 1:1 teacher laptop program in raising their own technology efficacy through the perceptions of practitioners as adult learners. This study also supports professional practice by addressing teacher technology efficacy through a deeper understanding for how adults learn. The study is also significant because it helps to inform decision-makers and other key stakeholders within the context of the setting and beyond for how to purposefully design and maximize the potential of the 1:1 program to improve student learning through an evidence-based approach. Furthermore, empirical data derived from evidence-based research provided new insights into the 1:1 teacher laptop program through examination of practice and understanding of enabling and resisting forces. The study also provided teachers a voice in the implementation of 1:1 teacher laptop programs. Responses from the experiences of

practitioners provided rich, detailed, authentic, and contextualized insights through the lens of teachers as adult learners.

Summary

The purpose of this qualitative pragmatic study was to determine how teachers who participated for 2 or more years in a 1:1 teacher laptop program perceived and described their experiences, while identifying enabling and inhibiting factors in raising their own technology efficacy. This chapter included the introduction, background, problem statement, purpose of the study, and research questions in guiding this study. The introduction provided an overview of the changing educational landscape and demands faced by schools due to technological advances, paying special attention to the role of teachers within the context of a 1:1 environment. In the background, I summarized the findings of several studies related to the adoption of 1:1 programs and teacher technology efficacy, while stressing the need for further research. The problem statement provided justification for deeper examination through the perspective of teachers, arguing that teachers are the most significant predictor of student achievement and ultimately responsible for implementing the technology. The chapter also included details of the conceptual model and framework, nature of study, definitions, assumptions, scope and delimitations, limitations, and significance of the study.

The next chapter provides a foundation for this study through a review of literature to address the research questions within the context of the conceptual model and framework. Additional topics for the literature review include adult learning, technology efficacy, teachers as adult learners, technology in education, 1:1 technology,

teacher technology preparation, technology acceptance, technology barriers and enablers, technology integration, self-efficacy, teacher efficacy, and teacher technology efficacy.

Chapter 2: Literature Review

Technology for teaching and learning continues to evolve and spread rapidly in schools (Harper & Milman, 2016; Zheng et al., 2016). However, the value of technology as an enabler and catalyst to improve student learning is still debated (Zheng et al., 2016). As schools remain committed to allocate and invest substantial budgets on technology initiatives, there is on-going interest and concern from stakeholders in maximizing return on investment. The 1:1 laptop program is one such technology initiative gaining ground in schools (Bebell & O'Dwyer, 2010; Zheng et al., 2014; Zucker, 2004). There is a vast and increasing body of literature and research on 1:1 laptop initiatives (Harper & Milman, 2016; Zheng et al., 2016). However, there is still an impending need for deeper examination through an evidence-based approach for 1:1 laptop initiatives because of opposing viewpoints and gaps in the literature (Donovan & Green, 2010; Harper & Milman, 2016; Penuel, 2006; Warschauer et al., 2014). This study was designed to improve practice and student learning by addressing the need to further understand through descriptions and perceptions based on experiences of teachers participating in a 1:1 teacher laptop program at one international school to raise their own technology efficacy, examined through the research questions.

I begin Chapter 2 with a description of the methods and strategies used to search for appropriate and relevant literature through the perspective of adult learning as the conceptual framework and the construct of technology efficacy. The chapter continues with an overview of technology for teaching and learning, describing the changing role of technology in education. This is followed by an in-depth review of the literature on

teachers as adult learners, technology in education, 1:1 technology, teacher technology preparation, technology acceptance, technology barriers and enablers, technology integration, self-efficacy, teacher efficacy, and teacher technology efficacy. I also synthesize the literature related to adult learning and 1:1 laptop programs. I conclude Chapter 2 with justification to support the need and purposeful selection of the study with the choice for the research methodology.

Literature Search Strategy

The literature review for this section came from a variety of scholarly sources, including seminal works, books, peer-reviewed journals and articles, research studies, and dissertations. Several professional academic databases were used to find relevant literature related to the topic after initial identification of keywords and search terms using the Google Scholar search engine. The databases used included the Academic Search Complete, Dissertations & Theses, Dissertations & Theses at Walden University, Education Source, ERIC, ERIC and Education Research Complete Simultaneous Search, ProQuest Central, PsycARTICLES, PsycINFO, SAGE Premier, SAGE Research Methods Online, Taylor and Francis Online, and Walden Library Books. Thoreau Multi-Database Search was used frequently as the primary tool to search across multiple databases. Furthermore, two peer-reviewed journals were used extensively as a source for current literature on the topic, and these included the Journal of Digital Learning in Teacher Education and the Journal of Research on Technology in Education.

The following keywords and combination of search terms were used: *one-to-one computing, ubiquitous computing, one-to-one laptop, laptop initiatives, laptop program,*

teacher 1:1 laptop program, technology efficacy, teacher technology efficacy, technology proficiency, technology and learning, technology and education, teacher beliefs about technology, teacher attitudes about technology, perceptions of 1:1 laptop environments, 21st Century skills, andragogy, adult learning, and *adult education*. The results of the initial searches were narrowed through search limiters and filters. Limiters used to restrict the search included *K-12 education and international schools*, while filters used included published in the last 3 to 5 years, peer-reviewed, full-text, and published in academic journals. Subsequently, additional follow-up searches were conducted based on citations and references from selected articles. While searches were time-bound by publication dates and limited from the time my study began, prior studies from outside this period were also used as they provided useful and valuable insights about adult learning, in addition to the historical significance and development of the 1:1 computing program. Seminal works and books also provided new knowledge and additional perspectives related to technology efficacy, technology proficiency, and ubiquitous computing.

Review of literature led to the additional keywords, including *laptops in education, classroom us of technology*, *technology implementation,* and *teacher technology professional development.* After initial readings, searches were further narrowed by keywords *attitudes*, *beliefs*, *perceptions*, *outcomes*, *effects,* and *challenges.* As mentioned, the term *international school* was used as an additional keyword limiter as I focused on a teacher 1:1 laptop program situated at an international school. The resulting peer-review articles, books, and dissertations identified from the multiple searches were recorded using both a personally developed database and a freely available

citation management program. This initial list was further refined after examination based on how well they matched and aligned with the purpose of the study to answer the research questions. Sufficiency was determined as a result of duplication and redundancy when repetition of citations in the selected articles increased (see Hallinger, 2013; Machi & McEvoy, 2012; Neumerski, 2013). The narrowing of searches using the keywords *international school* and *teacher 1:1 laptop program* resulted in little to no literature about the topic.

After the conceptual model and framework section, this chapter includes an-depth review of the literature and a synthesis of research on the following topics: teachers as adult learners, technology in education, 1:1 technology, teacher technology preparation, technology acceptance, technology barriers and enablers, technology integration, self-efficacy, teacher efficacy, and teacher technology efficacy.

Conceptual Model and Framework

In the following conceptual framework section, I describe a conceptual model of adult learning developed by Knowles (1984) and expanded upon by Knowles et al. (2015) as the foundation and lens through which this study was framed. As part of this section, I discuss the fundamental principles of andragogy and in particular the core adult learning assumptions of the model. I also discuss the concept of technology efficacy as a construct of technology application to improve student learning. This is followed by a review of the literature related to key concepts and includes teachers as adult learners, technology in education, 1:1 technology, teacher technology preparation, technology

acceptance, technology barriers and enablers, technology integration, self-efficacy, teacher efficacy, and teacher technology efficacy.

Adult Learning

There is a growing relationship between education and technology for innovative learning and teaching opportunities through technology-based approaches (Jimoyiannis, 2012). However, this development also brings new challenges in mitigating resisting forces to maximize the potential of technology in improving improve teaching and learning. Change for the use of technology in teaching and learning has been slow, calling for further examination and reconfiguration (Selwyn, 2012b). One such reconfiguration recommended using the models and principles of adult learning as a lens to examine planning and implementation of technology initiatives (Palis & Quiros, 2014).

Adult learning developed over time into a conceptual framework after the publication of a seminal paper by Lindeman (as cited in Knowles et al., 2015). This led to the development of models regarding how adults learn and, in particular, andragogy. Andragogy uses a learner-centered approach to describe characteristics of adult learning to explain how adults learn (Knowles et al., 2015). Andragogy focuses on the process of how adults gain knowledge, while highlighting how adult learners want to have control over their learning (Knowles et al., 2015). While andragogy highlights the characteristics of adult learners and involvement in their own learning, it also aligns with constructive learning theory. Constructivist learning theory is both social and reflective, whereby learners make meaning through experiences and interactions in constructing new knowledge (Anderman & Anderman, 2009). Andragogy also emphasizes learner

experience, readiness, and orientation to learning based on social roles and interactions. The need and the ability to be self-directing was noted as a factor to mitigate resistance for adult learning (Knowles, 1984). Adult learning works best when aligned with the learner's uniqueness and the context in which the learning occurs (Knowles et al., 2015). Four principles of andragogy were applied to how adults learn: adults need to engage in planning and evaluating their learning, experience is essential as part of the learning process, learning has to be relevant and impactful, and learning has to be problem-centered (Knowles, 1980). Consequently, Knowles (1984) made four assumptions initially about the characteristics of adult learners. These assumptions were further expanded to include the following core adult learning principles: the need to know, learner's self-concept, role of learner's experience, readiness to learn, orientation to learning, and motivation to learn. While the six assumptions provide the core of adult learning principles in one dimension, andragogy in practice includes two other dimensions for understanding adult learning: goals and purposes for learning and individual and situational differences (Knowles et al., 2015). Hence, andragogy allows examination of individual and situational differences of adult learners within the context of a real setting.

The core adult learning principles serve as the foundation for andragogy based on "a model of assumptions" (Knowles, 1984, p. 62). The six assumptions of the core adult learning principles are as follows:

1. Learners need to know: Adult learners need to know the value and benefit of why, what, and how they are learning within a particular context.

2. Self-concept of the learner: Adult learners need a sense of independence through autonomy and self-direction for their learning.
3. Prior experience of the learner: Adult learners come with their own mental models from prior knowledge, resources, and experiences.
4. Readiness to learn: Adult learners learn better if the learning is related relevant to the situation and is developmentally appropriate.
5. Orientation to learning: Adult learners learn if the learning is problem-based or task-centered and contextualized to real-life situations.
6. Motivation to learn: Adult learners are motivated to learn through intrinsic values and personal gratification.

Adult learning and how adults learn have been investigated through multiple learning experiences across a range of contexts and settings. A multiple-case study designed to examine current practices and challenges in technology implementation in three teacher education programs revealed inconsistencies in implementation as a result of faculty attitudes and pedagogical beliefs (Bakir, 2015). Another study addressed ways to enhance teachers as adult learners and technology self-efficacy through the development of systematic professional development, concluding that teachers who participated in well-designed learning opportunities were more likely to develop technology self-efficacy in shaping attitudes and skills required to use technology effectively (DeSantis, 2013). Building from Knowles's (1984) theory of andragogy, Halpern and Tucker (2015) argued in favor of adult-centered learning strategies to inform design of online information literacy tutorials. In addition, they pointed to the value of

leveraging adult learning theory as a way to understand how adults learn and to engage adult learners.

Self-directed learning is associated to an andragogical approach to learning (Tennant, 2006). The concept of andragogy is influenced by humanistic psychology and is characterized by six assumptions adults make about their learning such as the need to know the reason to learn, a change in self-concept demonstrated through the ability to self-direct learning, use of prior experience as a source of learning, readiness to learn in order to perform within a relevant and meaningful social context, possess and prefer a problem-centered approach to learning, and motivation by responding to external and internal motivators to learn (Knowles et al. 2015). Some researchers question and criticize the value of andragogy as a construct, arguing andragogy is not a theory of adult learning (Brookfield, 1986; Burge, 1988; Candy, 1991; Davenport, 1987; Ferro, 1997; Hanson, 1996; Pratt, 1988; Welton, 1995). However, other researchers support the concept of andragogy and consider it a model to describe and explain the characteristics of learning in adults (Brockett, 1984; Eitington, 1989; Griffith, 1991; Henschke, 1987; Henschke, 2010, Houle, 1992; Jarvis, 2004; Long, 1991; Milligan, 1997; Taylor, 1986; VanGent, 1996; Zemke & Zemke, 1996; Zhang, 1996; Zmeyov, 1994).

Technology Efficacy

Educational organizations support technology as a catalyst and enabler to improve teaching practice, while offering students wider and enriching opportunities to expand and enhance learning experiences (Digital Promise, 2018; Harper & Milman, 2016; International Society for Technology in Education, 2019a; Mourlam & Montgomery,

2015; National Education Association, 2019; Williams & Larwin, 2016). Consequently, these and other organizations, including schools support the need for continued research to examination the factors and constructs that influence the use of technology to improve teaching and learning. The concept of self-efficacy, more specifically technology self-efficacy, is one such construct proposed as a strong contributing factor to increase the use of technology for teaching and learning and a predictor of technology use (Bandura, 1986; DeSantis, 2013; Krutka et al., 2016; McKnight et al., 2016).

Self-efficacy is postulated by Bandura (1977) and based on social learning and social cognitive theory. Self-efficacy is defined as an individual's judgment and assessment of their ability and situation to organize and enact a set of actions to perform a specific behavior, in completing a task successfully. The concept of self-efficacy is a well-researched and studied construct and continues to attract interest for further research since self-efficacy is linked as a predictor and a factor for the formation of behavior and attitude. The concept of self-efficacy is extended to many other areas, such as teacher self- efficacy (Tschannen-Moran, Hoy, & Hoy, 1998; Palmer, 2006), computer self-efficacy (Durndell, Haag, & Laithwaite,2000; Askar & Umay, 2001; Shih, 2006; Isman & Çelikli, 2009); internet self-efficacy (Hsu & Chiu, 2004), and technology self-efficacy (DeSantis, 2013; Krutka et al., 2016; McKnight et al., 2016).

Self-efficacy is a predictor of behavior and a factor of future action, rather than the acquisition of knowledge, skill or ability (Bandura, 1986). The four sources of self-efficacy as advanced by Bandura (1977) are mastery experience, vicarious experience, verbal persuasion, and physiological state. A fifth source proposed is imaginal

experience, described as a way for an individual to visualize effective behaviors to achieve success in a given situation (Maddux, 2005). Mastery experience or mastering a task from prior experience is shown to develop self-efficacy, whereby past successes strengthens efficacy beliefs, resulting in a heightened sense of confidence to complete a similar task. Vicarious experience is based on learning through modeling of expected behaviors for successful outcomes. Consequently, watching others model behaviors and succeeding in performing tasks strengthens an individual's efficacy about their own capability to complete a similar task successfully. Verbal persuasion through positive feedback and encouragement is the third source of self-efficacy. Consequently, individuals are more likely to tackle a task despite the challenges, if they are encouraged and made to believe they possess the ability to perform the task. Physiological state determines an individual's ability to emotionally, physiologically, and psychologically respond in judging and influencing their perceived self-efficacy.

The concept of self-efficacy was extended over time, and adapted to specific areas and situations within a range of domains and disciplines. A specific self-efficacy is defined as the perceived belief of an individual's ability to motivate themselves through behaviors in order to address demands of a particular context and situation (Wood & Bandura, 1989). One adaptation is perceived computer self-efficacy, which is defined as an individual's perception about their ability to use a computer to successfully complete a computer-based task (Albion, 1996; Namlu, 2003; Sam, Othman, & Nordin, 2005; Zehir-Topkaya, 2010), and an individual's confidence in mastering computer technology (Compeau, Higgins, & Huff, 1999). Computer self-efficacy is a predictor of perceived

ease of computer use (Venkatesh & Davis, 1996) and influences technology acceptance (Downey, 2006). Furthermore, individuals who possess higher levels of computer self-efficacy are found to be more successful in using technology, in comparison with those individuals who possess lower levels of computer self-efficacy (Lai, 2008; Wojcicki, White, & McAuley, 2009). Computer self-efficacy is also a significant predictor for the frequency of technology use (Albion, 2001; Laver, George, Ratcliffe, & Crotty, 2012).

Researchers have investigated other adaptations of self-efficacy, such as teacher efficacy (Giles & Kent, 2016; Lee, Cawthon, & Dawson, 2013; Mojavezi & Tamiz, 2012), e-learning self-efficacy (Park, 2009), internet self-efficacy (Lai, 2008), and technology integration self-efficacy (Anderson, Groulx, & Maninger, 2011; Hsu, 2010). A study designed to examine the complex construct of teacher self-efficacy, revealed significant differences between elementary and secondary teacher self-efficacy (Lee et al., 2013). Furthermore, results from the study also indicated self-efficacy is not a predictor of pedagogical change. This mixed-methods study was situated within a drama-based instruction professional development model to examine the relationship between teacher self-efficacy and pedagogical conceptual change to influence and promote pedagogical change. Findings from a study, conducted with 12 elementary teachers and 18 secondary teachers who participated in a professional development program, revealed elementary teachers had higher levels of self-efficacy and experienced greater pedagogical change than secondary teacher. Results from the study also revealed years of teaching experience negatively predicts elementary teacher self-efficacy. Recommendations from this study noted, while efficacious teachers and increased self-

efficacy influences student learning outcomes, it may not be the only way to promote teacher pedagogical change (Lee et al., 2013).

As a result of continued interest within the research community to improve the use of technology to advance student learning, the construct of computer self-efficacy was adapted (Brinkerhoff, 2006; Milbrath & Kinzie, 2006). This led to the development of technology self-efficacy, a construct to examine self-efficacy within the context of a specific technology (Holden & Rada, 2011). Technology self-efficacy is defined as an individual's perceived beliefs in their ability to successfully perform a task within the context of a particular or specific technology (Giles & Kent, 2016). In a study to determine preservice teacher self-efficacy beliefs related to technology integration, results from the study confirmed positive self-efficacy was an enabler of technology use (Giles & Kent, 2016). This study was conducted in a single university setting with 28 elementary preservice teachers, resulting in almost all teachers using technology in their teaching, while 89% indicated comfort with technology integration. Technology self-efficacy is found to influence judgement, while predicting behaviors, outcomes, and ability to adopt new technology within the context of a specific technology-based task. Consequently, technology self-efficacy is defined as a subset and sub-dimension of the broader concept of self-efficacy and the construct of computer self-efficacy. Technology integration self-efficacy is an extension of technology self-efficacy and viewed as an enabler of technology use to improve student learning, and considered more influential than technology knowledge and skills (Chen, 2010; Ertmer & Ottenbreit-Leftwich, 2010; Holcomb, Brown, & Lima, 2010; Lee & Lee, 2014; Teo, 2009).

Teachers continue to feel insufficiently prepared to use technology despite participating in educational technology courses and receiving other professional development training (Grunwald & Associates, 2010; Hsu, 2012; Kay, 2006; Periathiruvadi & Rinn, 2012; Richardson et al., 2012). A review of the literature through 64 journal articles examining the introduction of technology to preservice teachers identified strategies to integrate technology, such as modeling how to use technology, collaboration among teachers, mentoring of teachers, application of technology in practice, access to technology, and support for technology (Kay, 2006). Because of limitations and inconsistencies found across the reviewed studies, more rigorous research is recommended for deeper understanding of factors influencing technology strategies to improve teacher education, practice, and use of technology (Kay, 2006). In a study involving 206 participants, factors related to technology integration were examined to understand influence on preservice teacher use of technology to support student-centered learning (Chen, 2010). Findings from the study revealed technology self-efficacy has the strongest influence on technology use because of the perceived value of technology to improve teaching and learning, while contextual factors have a moderate influence on technology use, teacher training is also influenced by both perceived value and technology self-efficacy (Chen, 2010).

Self-efficacy is considered a context-sensitive construct, where each situation is unique and unpredictable, leading to different perceptions of self-efficacy beliefs and outcomes (Pintrich, & Schunk, 1996). Since teacher beliefs and technology self-efficacy beliefs are considered strong predictors of technology use in the classroom, further

examination can add to deeper understanding for how these constructs contribute to practice and student learning (Albion, 1999; Anderson & Maninger, 2007; Ertmer, 2005; Inan & Lowther, 2010; Teo, 2009).

Literature Review Related to Key Concepts

Teachers as Adult Learners

While teachers are proficient in content, they lack knowledge and skills to prepare appropriate learning experiences to teach adults (Knox, 1986). The research on how adults learn and the literature on adult learning supports this claim (Knowles et al. 2015; Sogunro, 2015). Adults have a need to learn and direct their own learning (Knowles et al., 2015; Merizow, 2007; Sogunro, 2015; Vilkonis, Bakanoviene, & Turskiene, 2013). Furthermore, researchers confirm adults possess different learning needs (Cassidy, 2004; Curry, 2000; Rayner, 2000; Tennant, 2006). Understanding how adults learn through the theory and model of adult learning continues to flourish and play a significant role because of the impact on individuals, organizations, societies, and humanity as a whole (Jarvis, 2004).

While andragogy and pedagogy are comparable, andragogy is favored because adults identify with the principles and assumptions (Brookfield, 1986). Merriam (2001) noted the principles and assumptions are embedded in the practice of adult education and learning. Several researchers have supported the application of andragogical principles and assumptions to design appropriate learning situations and experiences (Giannoukos, Besas, Galiropoulos, & Hioctour, 2015; Leigh, Whitted, & Hamilton, 2015; Ntombela, 2015; Osman, 2014). Learning needs of adults differ from that of children, confirming

andragogy is a valid model to examine how adults learn and are motivated to learn (Sogunro, 2015). A study conducted by Vilkonis et al. (2013) examined the readiness of adults to learn using a variety of technologies, confirming adults were ready to learn to use technology, but their readiness to learn was dependent on experience, ability, and technology efficacy. Findings from another study advocated the use of andragogy to address the lack of assessing adult learner needs for personalized learning (Leigh et al., 2015). The aim of this study was to address this gap through a learner-centered approach based on eight andragogical components: preparation for learning, creation of a climate of trust, collaborative planning, identification of needs, assessment of learning outcomes, development of learning agreements, inquiry-based self-study, and evidence-based evaluation. The findings from this study concurred with the assumptions and principles of andragogy to inform the design of an adult learning program. This was further supported through the literature on the methods and techniques for adult learning based on prior learning experiences (Giannoukos et al., 2015). The methods and techniques included supporting adult learners in the context of their learning situation through collaborative practice, dialogic group interactions, organization of teams, encouragement, and feedback. Results from a prior study supported the value of learning in a collaborative environment, eluding to life experiences as an integral component of adult learning (Peterson & Ray, 2013).

Stimulating and motivating adult learners is the cornerstone of adult education (Merizow, 2007). Findings from prior studies confirm adults learn best when they are motivated (Sogunro, 2015; Vilkonis et al., 2013). Osman (2014) conducted a study to

gain insights through an examination of teacher perceptions of web-based learning to determine how teachers as adult learners respond to their learning situations. A review of the literature identified four elements from andragogy in designing learning experiences and situations, which included the need for adults to be involved in the learning design process, learning from experiences, relevancy and direct application of learning, and learning through a problem-centered approach. Results from a study reveal the importance of making learning valuable, concurring with the principles of andragogy for the need to know the reason to learn and relevancy of the learning (Osman, 2014). Results from another study confirm a positive relationship between motivation and adult learning, revealing a set of factors influencing motivation (Sogunro, 2015). The findings from this study of 203 adult learners revealed one of the factors was self-directedness. Self-directedness contributes to higher levels of self-efficacy and regulation, resulting in motivating adult learners to learn. Self-directedness is viewed as a characteristic of adult learners and a result of prior experiences and knowledge, leading to autonomy for knowledge creation through new learning experiences (Knowles et al., 2015). Consequently, adult learners are more inclined to take control and responsibility for their learning (Knowles et al., 2015; Roberts & Pruitt, 2003; Sogunro, 2015). While findings from a study offered new insights, the researcher also added cautionary notes by highlighting the need to examine what motivates adult learners based on gender, age, culture, values, socio-economic status, and emotional intelligence (Sogunro, 2015). As a result, continued research and examination can shed more insights and knowledge to

strengthen practice based on the assumptions of andragogy and principles of adult learning.

Teachers experience a developmental process when engaged through professional growth programs, where some teachers enhance their teaching through the use of technology and others do not (Mourlam & Montgomery, 2105). A variety of methods are proposed for how principles of adult learning could inform the design of instruction to improve the learning experience (Palis & Quiros, 2014). Wang et al. (2004) conducted a study to explore how vicarious learning and goal setting influences teacher technology efficacy, confirming findings from prior studies to determine if higher levels of technology efficacy was an indicator of successful technology integration. Another study that investigated the implementation fidelity of a 1:1 teacher laptop program and the association between implementation indicators and student achievement, found inconsistencies and lack of statistical significant (Shapley et al., 2010). Recommendations from studies highlighted the need for more research to examine coherence between the theory and practice to improve implementation fidelity of 1:1 laptop programs to prepare teachers because research was still needed to examine how these environments influence learning (Spires, Oliver, & Corn, 2012). The findings from a study examining initial teacher concerns during implementation of a 1:1 laptop program revealed issues concerning teacher readiness, preparation, and differences with technology adoption (Donovan & Green, 2010). This study examined initial faculty concerns during the implementation of a 1:1 laptop program (Donovan & Green, 2010). The study was conducted at a large state university with 29 teachers in a one-year

credential program, emphasizing teaching and learning within a 1:1 laptop environment. Findings from the study reveals the need to address teacher readiness, preparedness, and differences in equipping teachers to teach within a 1:1 laptop environment. A phenomenological research study at a midwestern urban middle school examined a 1:1 laptop program, focusing on student and teacher perceptions (Storz & Hoffman, 2013). The findings from this study reveals the importance of teacher voice to share their perceptions and experiences as a way to improve implementation fidelity. Other studies, which focused on teacher technology professional development and development of technology proficiency through immersion, also identifies the importance of teacher voice (Mourlam & Montgomery, 2015; Shapley et al., 2010; Storz & Hoffman, 2013).

Technology in Education

Several studies highlight the rapid adoption, impact, and changes technology continues to make in our lives (Dornisch, 2013; Holen, Hung, & Gourneau, 2017; Kurt, 2014; O'Neal, Gibson, & Cotten, 2017; Unruh, T., Peters, M. L., & Willis, J., 2016). The emphasis on educational technology within a particular context indicates how many schools view technology with the promise and potential to fix educational challenges (Kurt, 2014). Furthermore, while schools view technology as the panacea, they continue to struggle with barriers and challenges faced by teachers are not using technology consistently or effectively for teaching and learning (Ditzler et al., 2016; Grundmeyer & Peters, 2016; Holen et al., 2017; Kurt, 2014).

A program evaluation study was designed by Holen et al. (2017) to examine the implementation of a 1:1 laptop program at a rural high school. The study applied a

mixed-methods research approach, using the activity theory model as the conceptual framework. Data were collected through surveys with students, teachers, and parents; and through interviews with 20 students from different grade levels. The study identifies the several issues and themes, such as access and equity, engagement and enhancement of learning, distraction, infrastructure challenges, and access to online resources. Consequently, while this study highlights the positive outcomes of the 1:1 laptop program and knowing if the initiative was successful or not, the study also notes the need to know how and why an initiative is successful for deeper understanding and sustainability. Findings from a qualitative study reveals while teachers are aware of the benefits of technology for teaching and learning, they express a need for additional support to gain deeper understanding of 21st Century skills, and how to integrate technology to develop and improve these skills in students (O'Neal et al., 2017). The data were collected from a focus group, consisting of nine participants who had varying experiences with the Integrating Computing Across the Curriculum intervention. Recommendations from the study includes continued examination of teacher beliefs to improve practice by supporting teachers to develop positive beliefs for the role of technology in teaching and learning.

Researchers pointed to technology as an integral part of education and acknowledge the potential and power of technology to transform the learning environment and reframe how students learn (Ditzler et al., 2016; Grundmeyer & Peters, 2016; Henderson-Rosser & Sauers, 2017; Infenthaler & Schweinbenz, 2016; Unruh et al., 2016; Trust, 2017). In a study designed to test a theoretical technology acceptance model

to determine student acceptance of ubiquitous technology, findings reveal that attitude towards technology positively influences and predicts technology use (Infenthaler & Schweinbenz, 2016). This study was conducted in three middle schools with 120 students and confirmed the need to examine factors influencing attitudes towards technology to understand how to better implement and manage technology integration.

Several factors contribute to the growing popularity of technology in education and these factors include the potential of technology to individualize, differentiate, and personalize learning based on the needs of the learner; improve comprehension; apply technological knowledge and skills in real-world and authentic situations, reduce absenteeism and dropout rates, motivate learners, and serve disenfranchised learners (Penuel, 2006). Furthermore, a review of the literature highlights the increased use of technologies in the lives of students, resulting in teachers with the responsibility and opportunity to prepare students for the digital age (Unruh et al., 2016).

Findings from research reveals increase in student achievement is a result of improved student motivation and engagement because of technology initiatives, such as the 1:1 laptop program (Argueta, Huff, Tingen, & Corn, 2011). In addition, integration of technology skills is viewed as an important factor for future readiness of students to cope in a rapid changing world, while teachers are viewed as guides to prepare students through technology enabled learning environments (Larson &Miller, 2011).

Consequently, schools are committed to adopt technology, with a focus on integration of technology and technology acceptance to improve teaching and learning through

continued investment (Ditzler et al., 2016; Grundmeyer & Peters, 2016; Henderson-Rosser & Sauers, 2017; Infenthaler & Schweinbenz, 2016; Unruh et al., 2016).

Researchers point to technology as an essential component of teaching and learning (Mourlam & Montgomery, 2015; Osman, 2014; Trust, 2016; Yarbro et al., 2016; Zheng et al., 2016). Continued growth of technology highlights the need for teachers to prepare students for the future. Consequently, Osman (2014) argues for the need to prepare students to function effectively and learn within the new information age and environment. Several other researchers support this view by arguing for the need to support teachers as adult learners, in preparing students to function effectively and learn in the information age (Ntombela, 2015; Sogunro, 2015; Vilkonis et al., 2013). Furthermore, teachers are provided with a wide range of new and emerging technologies to choose from, allowing them to explore new ways for their students to interact and collaborate (Trust, 2016). In light of these and other changes in technology, recommendations from a study notes the need to examine the nature of teacher learning and the importance of setting teacher learning within the context of different situations (Trust, 2016). Research findings and a review of the literature also reveals influences of technology on teaching and learning from the perspective and context of practice (Bledsoe & Pilgrim, 2016; Clarke & Hollingsworth, 2002; Krutka et al., 2016; Ditzler et al., 2016; McKnight et al.,2016; Yarbro et al., 2016).

Technology is viewed as an enabler, with the power to transform practice to improve student learning (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Digital Promise, 2018; Ditzler et al., 2016; Glassett & Schrum, 2009; U.S. Department of

Education Office of Educational Technology, 2016a; Yarbro et al., 2016). Researchers also confirm technology is integral and a catalyst for learning in the information age, providing opportunities for improved engagement (Gass, 2012; Mallette & Barone, 2014). While there is a growing interest in the use of technology for teaching and learning, existing research is focused on implementation and outcomes of technology, rather than on how teachers used technology in the context of their practice (Yarbro et al., 2016). Results from a study reaffirmed this finding by examining factors related to successful implementation of 1:1 laptop initiatives and the outcomes on teaching and learning (Penuel, 2006). Rapid changes in technology and the changing landscape of education highlights the need to develop deeper understanding through the perceptions of teachers and students for the role of technology (Ditzler et al., 2016). Furthermore, researchers point to the challenges teacher face as a result of rapid technological change. This claim is substantiated through the report of the National Education Technology Plan, which supports the use technology for teaching and learning (U.S. Department of Education Office of Educational Technology, 2016a). The plan points to the need to address the challenges faced as a consequence of rapid technological change (U.S. Department of Education Office of Educational Technology, 2016a). The National Education Technology Plan also highlights the need to develop teaching and learning strategies through the experiences of the teachers as a critical factor for effective implementation of technology programs (U.S. Department of Education Office of Educational Technology, 2016a). This perspective is supported by other researchers who argue for the value of making critical assessments and assertions the through perceptions

of teachers and their practice (Bebell & O'Dwyer, 2010; Ditzler et al., 2016; McKnight et al., 2016; Peluso, 2012; Trust, 2016).

A study was conducted by Trust (2015) to examine teacher participation and engagement in an online learning network to understand how learning occurs through a multistep, iterative, and social process within a situated context. Findings from this study provided insights for the development of a new model for teacher learning in an online learning network. Furthermore, results indicate increasing numbers of teachers are engaging to refine their practice to improve student learning through the use of technology. This was further supported by the National Education Technology Plan (2016a), which highlights new opportunities available to teachers through the use of technology for teaching and learning increase engagement and empowerment of students. Several other researchers support the need for further examination of learning processes to gain understanding for how teachers learning and how technology shapes the learning processes within the context of different situations (Krutka et al., 2016; McKnight et al., 2016; Trust, 2016; Yarbro et al., 2016). A study collected data from 1,417 respondents through an online survey to further analyze data from an initial study about professional learning networks (Krutka et al., 2016). The aim of this study was to develop a conceptual model to understand how teachers learn via a professional learning network. While the study was set within the context of professional online interactions, findings from the study reveals themes, such as engaging, discovering, experimenting, reflecting, and sharing. These themes provided insights for future research and the need to examine other forms of technology interactions to better prepare teachers and improve practice.

This is supported by Trust (2015), who notes teacher learning is a complex process and deeper examination can provide new knowledge to improve the design of technology interventions for teacher learning.

Investigation into the application of technology within the context of classroom learning and practice can provide deeper understanding of digital instructional strategies and the alignment of these strategies to improve learning outcomes (Yarbro et al., 2016). A study was conducted within the context of a 65 seventh through 10th grade Mathematics and English Language Arts teachers, who participated in the Digital Promise's League of Innovative Schools (Yarbro et al., 2016). This study found variations and variety in teacher use of technology for instruction, supporting the claim by Mishra and Koehler (2003) for further research into how teachers use technology in practice to understand and improve instructional strategies through the use of technology. Findings from this study reveals strategies used in the classroom, such as access to resources, increased feedback, organization of teacher time, change in purpose, audience, and change in teacher and student roles. Recommendations from this study included deeper investigation to determine the relationship between technology and practice, examination of links between digital instructional strategies and measures of learning, and investigation of digital instructional strategies and within specific contextual situations and disciplines. Findings from a related study provided insights for future research, recommending the need to examine technology interventions and application within different situated contexts to improve practice (McKnight et al., 2016). This study examined teacher perceptions for technology integration and impact of contextual factors

on technology integration to enhance student learning. Recommendations included the need to examine perceptions of teachers as adult learners to improve implementation of technology interventions and strategies to improve student learning (McKnight et al., 2016).

1:1 Technology

The continued spread of the 1: 1 program in the United States and around the world is attributed to several reasons and includes improved quality or education and academic achievement, increased equity, and economic advantage (Downes & Bishop, 2015; Penuel, 2006; Richardson et al., 2013). While findings from research on 1:1 laptop programs are inconclusive and less than positive for some schools (Henderson-Rosser & Sauers, 2017), leading them to drop the program (Hu, 2007), other schools have continued to expand the program as a result of the gains (Bebell & Kay, 2010; Downes & Bishop, 2015; Gigliotti, Carrington, & Agostinho, 2013; Keengwe, Schnellert, & Mills, 2012; Sauers & McLeod, 2012). A study conducted through 447 classrooms, as part of Florida's Leveraging Laptops Initiatives, found significant change in instructional delivery from a teacher approach to a student approach (Dawson, Cavanaugh, & Ritzhaupt, 2006). Other findings from this study include more opportunities for collaborative engagement between students and teachers through project-based learning, and increased student attention, engagement, and interest. In another case study to examine the effect of a 1:1 laptop program on inquiry-based instruction, three teachers participated in helping to identify themes (Henderson-Rosser & Sauers, 2017). The study was set within the context of an all-girls science, technology, engineering, and

mathematics-focused school and data were collected through interviews and classroom observations. Results from the study reveals technology is used in different ways to improve inquiry-based instruction and also significantly influence quality of the inquiry-based instruction.

While schools have continued to invest on 1:1 laptop initiatives as a result of increase in student engagement and motivation in the classroom (Roehl, Reddy, & Shannon, 2013), focus is the technology, rather than on how the 1:1 laptop initiative improves student learning through pedagogical change (Churches, 2011; Donovan, Green, & Hansen, 2011); leaving teachers struggling to integrate technology (Willis, 2006). To further examine the potential of 1:1 laptop initiatives to enact pedagogical change, researchers highlight the need to examine four enabling factors and these included efficacy for the use of technology, frequency of use of technology, comfort using technology, and perceptions of technology (Mayo, Kajs, & Tanguma, 2005; Tanguma, Underwood, & Mayo, 2004; Willis, 2006). On the other hand, other researchers recommend the need to examine teacher beliefs and attitudes towards technology to enhance the effectiveness of technology integration (Grundmeyer & Peters, 2016; Heath, 2017; Mouza, 2011; O'Neal et al., 2017; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Unruh et al., 2016).

A study was conducted by Unruh et al. (2016) to examine the influence of a technology initiative on teacher technology efficacy, comfort level with technology, frequency of technology use, attitude towards technology, and perceptions for the impact of technology on student engagement in comparison with a traditional teaching model.

This study compared the beliefs and attitudes of teachers working within a flipped and traditional teaching classroom setting. A total of 12 teachers were selected, of which six were flipped classroom model teachers and the rest were traditional classroom model teachers. Half of the participants were male and the other half were females, selected from a range of subject areas. The study found teachers who participated in the flipped classroom model initiative develop higher levels of technology efficacy, greater comfort with technology, higher frequency of use, and more positive attitudes towards technology; leading to increased student engagement. The findings of this study confirmed findings from prior research, concluding teachers who engage and use technology actively are more likely to develop higher levels of technology efficacy as a result of increased competence, comfort, and confidence for the use of technology, leading to more positive beliefs and attitudes towards technology (Chen; 2010; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2010; Holden & Rada, 2011; Li, 2010).

As schools continue to invest in 1:1 laptop technologies, results from a study reveals success of these technology initiatives are not only determined by the implementation of the technology, but by how the technology is used to improve teaching and learning (McKnight et al., 2016). This multisite case study obtained rich data through the perceptions of teachers for how they used technology to improve student learning in alignment with learning theory. Furthermore, this study examined contextual factors influencing successful implementation and perceived benefits of technology integration from the viewpoint of teachers and students. The study concludes by reinforcing the need for further research to examine contextual factors rather than the technology. In addition,

the findings from this study confirmed findings from other studies for the need to support teachers through professional development opportunities. As a result of the spread of the 1:1 laptop and the Bring Your Own Device programs in schools; researchers indicate the need to prepare teachers to learn about technology through modeling and collaborative practices (Newhouse, Cooper, & Pagram, 2015).

While the goal of the 1:1 laptop program is to transform education and improve student learning, research based on the perceptions of teachers is limited (Heath, 2017). A study conducted by Heath (2017) was designed to examine experiences and beliefs of teachers who initiated a 1:1 laptop program. A phenomenological case study approach was used for this study to explore perceptions of middle school teachers who initiated a 1:1 laptop program to describe their experiences for the implementation of this initiative. This case study purposefully selected two teachers as participants from a social studies department at an urban-suburban middle school. Findings from this study indicates successful implementation of a 1:1 laptop initiative is a complex process and involves several factors. However, this study also found positive teacher perceptions, beliefs, and efficacy overcomes potential barriers and pitfalls. Recommendations from the study included the importance of giving teachers a voice in the implementation of 1:1 laptop programs by soliciting their feedback to gain useful insights and understanding (Heath, 2017). Teacher voice is an important factor to reduce negative perceptions and a way for teachers to share their experiences, contributing to the success of technology initiatives (Donovan, Hartley, & Strudler, 2007; Ertmer, 1999; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). The themes derived from this study were positive beliefs

about technology, beliefs as agentic professionals, first-order bureaucratic barriers to implementation, and first-order technological barriers to integration (Heath, 2017). The study described how positive teacher beliefs and agency overcomes first-order barriers, suggesting teachers who engage in 1:1 laptop initiatives and integrated technology are those who believe in the potential technology to improve student learning. Researchers assert teachers who possess positive beliefs about technology and belief as professionals are more likely to effectively support implementation of technology programs (Ertmer, 2005; Ottenbreit-Leftwich et al., 2010). Findings from the study indicates teachers who are given time to develop positive beliefs about technology and teacher voice are more likely to efficaciously integrate technology, leading to pedagogical change (Heath, 2017).

1:1 laptop initiatives were the first phase of deploying ubiquitous computing in education (Ditzler et al., 2016). Despite the wide-spread proliferation of this technology in education, several researchers note teachers are still challenged to use technology successfully in teaching and learning (Ditzler et al., 2016; Gentile, 2012; Pilgrim, Bledsoe, & Reily, 2012). A study conducted by Ditzler et al. (2016) examined the perceptions of students and teachers regarding the use of ubiquitous technology in classrooms. The study was conducted in a middle school with 23 students and three teachers at the end of the first year of a 1:1 implementation, using classroom observations and interviews to collect perception data. The researcher argued for the need to examine perceptions of teachers to address the challenges and determine strategies to inform the implementation of 1:1 laptop initiatives. This conclusion was validated through a review of the literature and supported by findings from other researchers who state the need to

enhance practice and outcomes through improved understanding and implementation of 1:1 laptop programs (Harper & Milman, 2016; McKnight et al., 2016). Other researchers recommend the need to improve understanding of 1:1 laptop programs beyond examining effects, outcome, and implementation; suggesting a focus on examining experiences through the perceptions of teachers (Ditzler et al., 2016; DiVall & Zgarrick, 2014; Raths, 2013). Consequently, my study focused on the collection of rich descriptive data through the experiences and perceptions of teachers as adult learners to add to the body of knowledge.

Findings derived through an extensive synthesis of the literature on the implementation of 1:1 laptop initiatives revealed teacher professional development, technical support, and positive teacher attitudes contribute to successful implementation of 1:1 laptop programs (Penuel, 2006). On the other hand, while some of the studies synthesized lack rigor they did identify positive outcomes for technology use, technology literacy, and writing skills. Results from this extensive synthesis is referred to in several other studies, increasing the validity of the findings (Harper & Milman, 2016; Spires et al., 2012; Storz & Hoffman, 2013; Zucker & Hug, 2008). However, while the focus of the synthesis was on examining teacher attitudes in relation to student use of technology, the examination did not take into account teacher technology efficacy and perceptions through the lens of teachers as adults learn.

As research interest continues to grow for the 1:1 laptop program, several areas remain unexamined (Spires et al., 2012). One such area is the need to examine how to better prepare teachers to work within a 1:1 laptop environment. A study conducted by

Spires et al. (2012) offers a new learning ecology to frame the conditions of learning, in developing teacher capacity for the use of technology within a 1:1 laptop environment. While this new learning ecology highlights the teacher as a facilitator, it did not take into account or provide insights for how teachers as adult learners develop technology efficacy. The researchers conclude by stressing the need to frame learning experiences and opportunities for the use of technology to align with student needs and future preparedness. Examining teacher concerns when implementing 1:1 laptop programs is also a recommendation from other researchers (Donovan & Green, 2010). A study examining teacher concerns based on a 1:1 laptop teacher education pilot program, addresses three issues for successful implementation and includes teacher readiness, teacher preparation, and teacher differences (Donovan & Green, 2010). Since this study was conducted during the initial implementation stage, the researchers recommend for deeper examination of concerns as teachers continue to engage in 1:1 laptop initiatives.

A review of the literature on 1:1 laptop initiatives over a period of 10 years reveals the following themes: impact on student achievement, changes in the learning environment, application in the classroom, influence on student motivation and engagement, and impact on technology integration (Harper & Milman, 2016). The researchers note through their analysis that most studies focus on student achievement, highlighting the positive impact of 1:1 laptop programs on student achievement. Furthermore, findings reveal changes to student learning experiences is a result of differentiation and engagement with technology through new channels of learning . While the researchers acknowledged the limitations of their study, they did not mention

the omission of examining 1:1 laptop initiatives through the perception and experiences of teachers as a limitation of the study (Harper & Milman, 2016). Several researchers acknowledge and confirm teachers are a significant predictor of student achievement, playing a central role in the successful implementation of 1:1 laptop programs (Bebell & O'Dwyer, 2010; Drayton et al., 2010; Dewey, 1997; Hattie, 2009; Shapley et al., 2010; Tyack & Cuban, 1995). Further examination through the perspective and experiences of teachers as adult learners can add to the body of knowledge and outcome of 1:1 laptop programs to improve student learning. A qualitative case study examined the process of implementing a 1:1 laptop program at a high school, located in a small semi-rural town (Peterson & Scharber, 2017). The study was set within the context of four English classes with 103 students who participated in the pilot program. Data were collected with the help of two English teacher who served on the technology committee through pre- and post-pilot surveys, focus groups, classroom observations, and post-pilot interviews. Findings from the study reveals themes such as importance of teacher leadership, focus on digital citizenship, reliability of Internet connectivity, challenges with digital divide realities, and need for student voice. The researchers conclude by recommending a collective vision for learning to drive the design and implementation, address first-order barriers, address equitability and access, develop a sustainable plan, select devices based on learning needs, train teacher and students to use technology effectively, solicit feedback from all stakeholders, create collective agreements and policies, and identify a leader to drive the initiative (Peterson & Scharber, 2017).

Several researchers confirm the benefits of 1:1 laptop initiatives (Bebell & Kay, 2010; Downes & Bishop, 2015; Gigliotti, Carrington, & Agostinho, 2013; Henderson-Rosser & Sauers, 2017; Keengwe, Schnellert, & Mills, 2012; McKnight et al., 2016; Penuel, 2006; Richardson et al., 2013; Roehl, Reddy, & Shannon, 2013; Sauers & McLeod, 2012; Schnellert, & Mills, 2012). However, Swallow (2015) stressed the need to examine the progressive experiences of teachers and students for the sustainability of the program. In a qualitative case study designed to examine negative experiences and how these experiences influenced the program, results reveal participants perceived goals of the 1:1 laptop program were not achieved and evidenced through a decline in teaching and learning outcomes (Swallow, 2015). This qualitative case study collected data purposefully from one middle school with teachers and students who transitioned to a 1:1 program. Data were collected over a three years through a series of interviews, observations, and document examinations. Another study designed to examine attitudes towards technology through perceptions of K-12 students about a 1:1 laptop program, reveals the importance of not considering students as passive recipients, but as active participants by allowing them to share their opinions through student voice (Zheng et al., 2014). While a study was designed to investigate parent perceptions for a 1:1 laptop program, reveals high levels of support through the perceived benefits of the program; parents also express concerns about the program (Jin & Schmidt-Crawford, 2017). The study was conducted at a mid-western high school with 1,271 students enrolled from Grades 9-12. Quantitative and qualitative data were collected from parents and guardians

of students through surveys. This study confirms the importance and need to solicit feedback by addressing concerns with other major stakeholders, such as parents.

Student engagement is a factor for improved student achievement and a goal of 1:1 laptop initiatives (Williams & Larwin, 2016). While a study designed to explore the impact of 1:1 laptop programs concludes by stating schools are successful in meeting student achievement targets, findings also notes the need to further examine implementation fidelity as one of the causes for failure (Williams & Larwin, 2016). Other researchers note increased engagement, motivation, and participation as outcomes of 1:1 laptop programs (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Harper & Milman, 2016). Through an elaboration of a research framework used to examine 1:1 laptop environments developed by Zucker (2004), William and Larwin (2016) note critical input features such as intermediate implementation outcomes and impact. While the intermediate implementation outcomes consist of interventions and factors such as instruction, leadership, infrastructure and support, culture, community relations, cost and funding; it did not include teacher technology efficacy or teachers as adult learners as factors. Interventions and factors from the Zucker (2004) framework are used by other researchers to develop instruments to measure the relationship with implementation fidelity (Shapley et al., 2010). Several researchers state the importance of determining how interventions and implementation fidelity are related to program outcomes (Collier-Meek, Fallon, Sanetti, & Maggin, 2013). While research findings reveal several implications for practice, there is also a need to examine teachers as adult learners and their own technology efficacy as an implementation factor (see Williams & Larwin,

2016). The use of a qualitative study approach is justified to examine implementation fidelity through the collection of rich descriptive data (see Williams & Larwin, 2016). Consequently, exploring teacher perceptions and experiences through the perspective of an adult learning model can help shed additional insights, while adding to the body of knowledge and supporting future implementation and outcomes for 1:1 laptop initiatives.

Teacher Technology Preparation

While a review of the literature reveals large volumes of research on how teachers learn in formal technology settings (Krutka et al., 2016), there is limited empirical evidence for how teachers as adult learners learn informally through participation in technology-based interventions. Kennedy (2005) states teacher technology preparation through professional learning and development is seldom based on how teachers learn as adults, rather, learning interventions are designed for skills acquisition. As previously noted, researchers confirm teacher learning is a complex and multifaceted process and requires further research through a variety of perspectives and contexts (Kyndt, Gijbels, Grosemans, & Donche, 2016; Trust, 2016). The changing landscape of technology use justifies continued examination through other perspectives to ensure sustainability of using technology to enhance learning (Krutka et al., 2016). There is a growing mandate to prepare teachers to use technology to foster and improve student learning, as technology is viewed as an and enabler of teaching and learning (Larson &Miller, 2011; International Society for Technology in Education, 2019a; International Society for Technology in Education, 2019b; U.S. Department of Education Office of Educational Technology, 2016c). The National Education Technology Plan lists four guiding

principles related to preparing teachers to use technology for teaching and learning and includes engaging teachers actively to use technology to develop problem-solving and critical thinking skills to empower students as creators of new knowledge, developing meaningful learning experiences through professional learning networks to build capacity and competency for technology integration, fostering deeper learning through relevant and timely technology opportunities to empower teachers, and developing professional learning programs through a research-based approach, grounded through standards and best practice (U.S. Department of Education Office of Educational Technology, 2016b).

Several factors are attributed to productive use of technology. Preparing teachers to use technology effectively is the most significant contributor for successful technology implementation and integration (Bull, Thompson, Schmidt-Crawford, Garofalo, Hodges, Spector, Ferdig, Edyburn, & Kinshuk, 2016). The International Society for Technology in Education (2019a) promotes technology as an integral part of teaching and learning, supporting the need to focus on effective use of technology to improve teaching and learning, rather than a focus on the technology hardware. Consequently, organizations like the International Society for Technology in Education (2019b) continue to support technology initiatives to prepare teachers to integrate technology to realize the potential of technology to improve learning outcomes. Despite these efforts to sustain technology initiatives in schools through organizations like the International Society for Information Technology (2018a) and the U.S. Department of Education Office of Educational Technology (2016c); technology integration is a complex task and transformation of

classroom practice is still a challenge (Bull et al., 2016; Hodges, 2015; Spector, Johnson, & Young, 2015).

A shift from a teacher-centered to a student-centered approach indicates a positive relationship exists between the use of technology and the learning environment (Grundmeyer & Peters, 2016). Furthermore teachers are viewed as predictors of successful technology implementation (Fullan, 2016) and facilitators of pedagogical change (Fullan & Langworthy, 2014). However, as technology programs proliferate in schools with increased use, teacher preparation and professional development are challenged to adapt to the rapid rate of change and adoption of technology (Grundmeyer & Peters, 2016). In a study designed to understand teacher beliefs about the role of technology, teachers expressed a need for more guidance and support as they continue to feel challenged to integrate technology (O'Neal et al., 2017). Findings from this study reveals, while teachers consider technology as an enabler of teaching and learning, teachers need to feel better prepared to integrate technology through appropriate application. Other factors also influence how teachers use technology and this includes time for professional development, access to technology, support for technology, and attitude towards technology (Grundmeyer & Peters, 2016; Mouza, 2011; O'Neal et al., 2017). A phenomenological study interviewed 15 college students with at least 2 years of experience with a 1:1 laptop program to collect data for how the program prepared them for college and compared their readiness for college with other students who had not participated in the 1:1 laptop program (Grundmeyer and Peters, 2016). Findings from this study reveals the need to prepare teachers with higher levels of technological

competencies to leverage the benefits of technology to improve student learning. In order for teacher to use technology effectively teachers need to gain technological understanding and skills, and comfort with the use of technology to change practice and pedagogy (Dornisch, 2013; Grundmeyer & Peters, 2016).

Teachers feel unprepared to integrate technology in effective ways, and this is perceived as a cause for the disconnect between student comfort and teacher comfort with the use of technology (Dornisch, 2013). A study was conducted with 101 high school students from the United States to collect perception data to examine the differences between student and teacher comfort with technology, and how student perceptions of teacher comfort for technology influenced student evaluation of teachers (Dornisch, 2013). Findings from this study notes, while students perceived higher levels of comfort with technology than their teachers, teacher comfort with technology is not a predictor of student teacher evaluation. Furthermore, results reveal the need for further investigation to determine if teacher technology competency and use are factors for the difference between students and teachers. Findings from prior research indicates positive perceptions of teacher technology competence contributes to improved levels of student motivation and performance (Mulford, Kendall, & Kendall, 2004). Consequently, gaining understanding from teacher experiences through deeper insights for the issues and challenges to develop technology competency is needed to better prepare teachers to use technology for successful educational reform (see Fullan, 2016).

Technology Acceptance

Research findings indicate a growing interest and popularity for 1:1 technologies

(Liu, Navarrete, Scordino, Kang, Ko, & Lim, 2016). A mixed-methods study was conducted to examine teacher comfort level for the use of a specific 1:1 technology and the related teacher perceptions for what changes occurred during the course of implementation (Liu et al., 2016). This study was conducted in a rural K-12 school district with a total of 18,500 students with 342 teachers using quantitative and qualitative approaches. Results from the study reveal female teachers, teacher with 20 or less years of teaching, and elementary teachers are more positive than high school teachers, who have the lowest perceptions for the comfort and use of technology. Consequently, this study concludes while a host of new mobile devices such as iPads and smartphones have proliferated the educational market, underpinning challenges and issues related to teacher comfort level and perceptions for the acceptance and use of technology continue to challenge and interest the research community (Liu et al., 2016). Several researchers have explored benefits and limitations of these technologies for teaching and learning (Grundmeyer et al., 2011; O'Neal et al., 2017; Heath, 2017; McKnight et al., 2016; Newhouse et al., 2015). Findings from a mixed-method study found significance differences in teacher comfort levels related to years of teaching experience and school divisions (Liu et al., 2016). In this study, teachers were provided professional training opportunities through a variety of online and face-to-face workshops and were required to exhibit competency for technology use. While the researchers note a higher level of comfort for the use of technology, they also found no significant differences between genders as prior research indicated (Perrotta, 2013). However, a decrease in initial excitement and perception for the usefulness of the technology was noted. This finding

confirms prior research for how teacher perception for the value of technology influences the use of technology for teaching and learning (Ertmer et al., 2010; Hew & Brush, 2007). Furthermore, this study supports findings from prior research for how positive perception facilitates wider acceptance and increases use of technology (Anderson, Groulx, Maninger, 2011; Giles & Kent, 2016; Moore-Hayes, 2011; Tilton & Hartnett, 2016).

As technology continues to gain a firm hold and remains an integral part of the educational landscape, researchers highlight the need for further examination to determine the benefits and how to achieve the benefits of using technology for teaching and learning (Harper & Milman, 2016; Ifenthaler & Schweinbenz, 2016; Karamti, 2016). Although findings from prior studies notes the success of technology driven learning environments, none of these studies are conducted through the lens of teachers as adult learners (Harper & Milman, 2016; Penuel, 2006). Furthermore, there is a lack of evidence with regards to assumptions made to improve learning thorough the use of technology; arguing for the need to examine technology acceptance to understand how and why adults adopt and use technology (Ifenthaler & Schweinbenz, 2016). A study designed to test a theoretical model for technology acceptance, concludes teacher perspectives and acceptance for the use of technology are essential elements for implementation success (Ifenthaler & Schweinbenz, 2016). Furthermore, other researchers highlight that attitude towards technology is a factor for implementation fidelity (Karamti, 2016). A technology acceptance model proposed by Davis, Bagozzi, and Warshaw (1989), alluded to perceived usefulness and ease of use as contributing factors for changes in attitude

towards the use of technology (Ifenthaler & Schweinbenz, 2016). Findings from this study confirms the importance of attitude towards technology and points to technology efficacy as a driver for technology acceptance. Walling (2014) confirms the need for teacher acceptance of technology as an enabler of technology use. While the role of the teacher was highlighted, this study did not examine technology acceptance through the perceptions and experiences of teachers (Ifenthaler & Schweinbenz, 2016).

Technology acceptance and integration of technology are viewed as complex processes, leading researchers to recommend further contextual examination because evidence for the use and effectiveness of technology to improve learning is limited (Aristovnik, 2012; Ben Youssef, Ben Youssef, & Dahmani, 2013; Karamti, 2016; Kaddour, Teraoui, & Bougatef, 2012). While findings from studies reveal several factors influence the use and effectiveness of technology such as learner characteristics, technology access, student technology skills, and technology infrastructure; teacher characteristics such as competency, attitudes, beliefs, and efficacy are also identified as enablers of technology use (Brill, & Galloway, 2007; Hoffman & Oreopoulos, 2009; Karamti 2016; Ma, Andersson, & Streith, 2005; Vernadakis, Antoniou, Giannousi, Zetou, & Kioumourtzoglou, 2011). A study was conducted by Karamti (2016) to examine the relationship between technology use and achievement within the context of an international higher education setting. This study was conducted within a tertiary education system in Tunisia, where survey data were collected from 377 college students and teachers to examine the impact of technology access and use on student learning, performance, and achievement. While this study focused on attitudes and student

technology skills, the study also examined how teacher proficiency, attitudes, and beliefs of technology influence learning outcomes. Results from this study indicates positive and negative outcomes on academic performance (Karamti, 2016). While findings from the study raises questions about the effectiveness of technology for teaching and learning, it also highlights the need for further research to explore ways to support teachers to maximize the use of technology to influence student learning. This finding was supported through the findings from other studies, which note differences and mixed results of technology initiatives (Aristovnik, 2012; Harper & Milman, 2016; Wurst, Smarkola, & Gaffney, 2008). As a result, further examination through the perspective of teachers as adult learners can add to the body of knowledge to maximize the use and effectiveness of technology initiatives, while improving implementation fidelity.

Technology Barriers and Enablers

While schools continue to promote technology as a catalyst to enhance teaching and learning, literature noted enabling and inhibiting factors for technology integration (Liu et al., 2016). Factors enabling and inhibiting also provided insights for further research and include access to technology and comfort of teachers in using technology (Hew & Brush, 2007), perceptions and attitudes of teachers for the use and value of technology (Ertmer, 2010; Howard, 2011), the importance of professional learning opportunities to improve teacher technology proficiency and efficacy (Mouza, 2012; Perotta, 2013), and the need to support teachers in using and applying technology for teaching and learning (Ertmer, 2010; Hew & Brush, 2007).

Findings from empirical studies list three often addressed barriers for technology integration and include access to technology, teacher technology proficiency, and teacher perceptions and attitudes for the use and value of technology (Hew & Brush, 2007). Other studies on adoption of technology as an innovation emphasizes the need to examine the interactions between practitioners, technology used, and the setting as areas of focus to promote the use of technology (Hord, Rutherford, Huling-Austin, & Hall, G.; Zhao, Pugh, Sheldon, & Byers, 2002). In addition, results derived from studies pointed to the role, proficiency, and ability of practitioners as a significance factor in facilitating the use of technology, highlighting intrinsic qualities of teachers and how these qualities influence and impact technology integration and implementation of technology initiatives (Ertmer, 2005; Zhao et al., 2002).

A study conducted by Ertmer (2005) confirms intrinsic factors have a greater influence over extrinsic factors. Extrinsic or first-order barriers, which are external to teachers include access to technology, professional development, and technology support; while intrinsic or second-order barriers include teacher pedagogical beliefs, perceptions for the value of technology, teacher efficacy, and confidence with the use of technology (Ertmer, 2005). External factors such as professional development, administrative and financial support are also hypothesized as factors positively influencing perceived benefits of technology integration, technology use, and efficacy for technology integration (Hur et al., 2016). Furthermore, this study confirms findings from other studies for the importance of teacher beliefs and efficacy and the need to examine these

factors to positively influence and promote technology integration (Ertmer, 2010; Howard, 2011; Hur et al., 2016; Liu et al. 2016; Tilton & Hartnett, 2016).

Results from a study confirms increased use of technology by teachers because of the perceived value of technology to improve teaching and learning (Hur et al., 2016). This further confirms findings from other studies, which state teacher use and increased technology integration are positively influenced by teacher beliefs for the value of technology (Ertmer, 2005; Miranda & Russell, 2012). However, findings from the study did not find teacher efficacy or beliefs directly influences technology use (Hur et al., 2016), unlike studies conducted by Anderson et al. (2011), Giles and Kent (2016), Moore-Hayes (2011), and Tilton and Hartnett (2016). Teacher efficacy indirectly influences technology integration through perceived benefits (Hur et al., 2016). Furthermore, recommendations from the study recommend appropriate professional development to raise teacher efficacy to increase frequency of technology use for teaching and learning (Hur et al., 2016). Consequently, these and other studies confirm the need to examine a range of factors directly and indirectly enabling or inhibiting teachers in integrating technology to improve student learning (Ertmer, 2010; Giles & Kent, 2016; Hur et al., 2016; Inan & Lowther, 2010; Jääskelä, Häkkinen, & Rasku-Puttonen, 2017; Liu et al., 2016; Miranda & Russell, 2012; Moore-Hayes, 2011; Mourlam & Montgomery, 2015; Ottenbreit-Leftwich et al., 2010; Perrotta, 2013; Tilton & Hartnett, 2016). To further examine factors contributing to technology integration, a study was conducted to explore teacher beliefs (Jääskelä et al., 2017). The study was situated at a Finnish university and data were collected from 18 teachers who were

members of 11groups. Content analysis was used to derive themes to determine if pedagogical aims were achieved. Results from this study confirm teacher beliefs shape pedagogical and technological practice, highlighting technology as a tool to foster learning. More specifically, the study found technology is an enabler of self-paced learning, supports active and interactive learning, improves integration and assessment of learning, and a catalyst to transform the learning environment. Consequently, this study validated the need for continued examination of teacher beliefs as a way to improve learning and practice through the use of technology.

Technology Integration

Literature highlights the continued spread and impact of technology, and the subsequent expectations and influence of technology for education and schools (Hur, Shannon, & Wolf, 2016; Larson &Miller, 2011). However, despite the literature and use of technology, many researchers identify the limited integration of technology to positively influence teaching and learning (Hur et al. 2016; Liu et al., 2016; Inan & Lowther, 2010). Technology integration is viewed as a complex, slow, and tedious process (Inan & Lowther, 2010). This is confirmed by Moore-Hayes (2011), who elaborated on the challenges teachers face to integrate technology. Other researchers point to technology integration as the biggest challenges for modern learning (Cennamo, Ross, Ertmer, 2010; Jääskelä et al., 2017; Miles, 2013; Roblyer & Doering, 2010). While teachers continue to feel challenged to integrate technology, some researchers found an increase in the comfort level for the use of technology because of the pervasiveness of technology in the world (Kearney & Maher, 2013; Liu et al. 2016).

Several researchers highlight teacher beliefs and teacher efficacy are predictors of technology use and positive enablers of technology integration (Anderson et al., 2011; Hsu, 2010; Inan & Lowther, 2010; Miranda & Russell, 2012; Ottenbreit-Leftwich et al., 2010). In a study conducted with 217 preservice teachers to examine the relationships among technology-related abilities, beliefs, and intentions; findings from the study reveals belief is the best predictor for the frequency of technology use and technology efficacy is the most significant predictor of technology use (Anderson et al., 2011). Furthermore, this study found a relationship between technology efficacy and technology ability. Using a purposive sample, a study was conducted in a public high school to explore the relationship between teacher pedagogical beliefs and technology integration (Chen, 2010). While findings from this study concur with findings from another study, revealing inconsistencies between perceived teacher beliefs and practice, researchers note technology efficacy not only influences pedagogy, but also increases the actual use of technology (Smarkola, 2008). In another study with 1,382 public school teachers, results reveal higher levels of technology integration when technology is perceived as a positive enabler of student learning (Inan & Lowther, 2010). In addition to the positive influence of teacher technology efficacy, results also reveal an increase in technology integration. Another study with 3,729 teachers found a relationship between teacher proficiency and usage, noting a higher instance of technology use as a result of increased technology efficacy (Hsu, 2010). Furthermore, findings from a similar study determined perceived benefits of technology directly influences technology use and integration (Hur, Shannon, & Wolf, 2016). This study examined the significance and relationship between five

intrinsic and extrinsic factors affecting technology integration through a hypothesized model of technology use. The study used a hypothesized model for technology use through two factors namely perceived benefit and perceived self-efficacy, and how these factors influence technology use. Data were collected through a survey from 223 teachers and analyzed using a structural equation modeling method. Findings from this study indicates perceived benefits positively influences technology use, teacher technology efficacy positively influences technology integration, and teacher technology efficacy positively influences perceived benefits of technology integration (Hur et al., 2016). The results of this study confirm perceived benefit directly influences teacher technology use, while teacher technology self-efficacy influences perceived benefit of technology.

Self-Efficacy

Bandura (1986) noted "people strive to exercise control over events that affect their lives" (p. 1), positing self-efficacy as an individual's ability and belief about their capabilities to achieve a desired level of performance to influence events in their lives. Bandura (1986) also postulated the need for positive vicarious opportunities and mastery experiences to raise self-efficacy. Self-efficacy determines how teachers view and reflect on their practice, while stimulating themselves through action and behavior based on cognitive, motivational, affective and selection processes (Bandura, 1977). Lee et al. (2013) notes the presence of self-efficacy in multiple contexts and cultures, stating teachers with higher levels of self-efficacy are more likely to possess confidence in their ability to improve student learning outcomes. Self-efficacy is a complex construct and requires deeper examination through a range of perspectives within practice to

understand the interactions between self-efficacy and different contextual settings (Lee et al., 2013).

Self-efficacy influences pedagogical change, which in turn influences student learning (Lee et al., 2013). Researchers identify self-efficacy is a factor to promote and improve student learning outcomes (Bakir, 2015; DeSantis, 2013; Mojavezi & Tamiz, 2012; Mourlam & Montgomery, 2015; Teo, 2009; Wang et al., 2004). While teachers are facilitators of student learning, teacher perceptions and efficacy are important factors contributing to improve to teacher effectiveness (Lee et al., 2013). A mixed-method study explored the relationship between teacher efficacy and pedagogical change (Lee et al., 2013). Findings from this study revealed significant differences between elementary and secondary teachers, concluding teacher efficacy is not a predicator of pedagogical change. Results from this study suggests the need for further research through a qualitative case study approach to support this finding. However, findings from another study confirms the positive relationship between teacher efficacy and student motivation, while also recommending more research to add to the body of knowledge (Mojavezi & Tamiz, 2012). Findings from this study supported and confirmed findings from other research, suggesting self-efficacy influences teacher practice, commitment, and behavior (Tschannen-Moran & Hoy, 2001; Wolters & Daugherty, 2007); improved student cognitive development (Bandura, 1997); and improved teacher persistence and enthusiasm for educational outcomes (Moran & Hoy, 2001). While Mojavezi and Tamiz, (2012) explored the influence of self-efficacy on student motivation and achievement, this study is limited because the researchers only examined self-efficacy through the

perspective of teachers. This study also did not take into account how teacher self-efficacy is influenced by teachers as adult learners. Consequently, the examination of self-efficacy through other perspectives and specific constructs, such as teacher technology efficacy could add to the body of knowledge.

Teacher Efficacy

Researchers identify teacher efficacy as a way to improve quality of practice to improve personal and organizational effectiveness because efficacy influences achievement levels (Bandura, 2009; Pajares, 2002; Ozder, 2011). Teacher efficacy is defined as a teacher's ability to achieve desired outcomes for student engagement and learning, even for the most challenged learners (Tschannen-Moran & Hoy, 2001). Teacher efficacy determines the level of teacher confidence and belief in their ability to accomplish a task and is considered a factor, "linked to both students' achievement and teachers' well-being" (p. 37, Bikos, Tsigilis, & Grammatikopoulos, 2011). The development of teacher efficacy is viewed as an integral part of professional growth and development, and linked to instructional effectiveness and improved practice (Bandura, 1997). Hence, researchers continue to recommend further studies to examine teacher efficacy to design effective teacher professional development to improve the quality of teaching and learning (Bikos et al., 2011; Kim, Kim, Lee, Spector, & DeMeester, 2013; Skaalvik, & Skaalvik, 2010). There is an abundance of literature related to the concept and influence of teacher efficacy on effective teaching. Teachers with higher levels of efficacy are more likely to fulfill their role and engage students regardless of their ability through effective instructional practice and strategies; with a higher sense of job

satisfaction (Bandura, 1986; Caprara, Barbaranelli, Steca, & Malone, 2006; Tschannen-Moran & Hoy, 2001). Furthermore, other researchers have found positive correlations between teacher efficacy and classroom performance (Tschannen-Moran & Hoy, 2007); job satisfaction (Klassen & Anderson, 2009); student self-efficacy (Henson, 2002); and literacy (Guo et al., 2010).

Rapid changes are visible in teaching and learning because of the widespread use of technology in schools (Liu et al., 2016). Consequently, several researchers recommend the need for further examination (Harper & Milman, 2016; Hsu & Kuan, 2013; Ifenthaler & Schweinbenz, 2016; Karamti; 2016; William & Larwin, 2016). Findings from studies point specifically for the need to examine teacher proficiency and technology efficacy through the perceptions of teachers as a factor to drive effective use of technology (Ertmer & Ottenbreit-Leftwich, 2010; Howard, 2011; Liu et al., 2016). Hord et al. (1987) indicates understanding of an individual's participating in an innovation is an important part of achieving success. Furthermore, a review of the literature confirms the importance of teacher efficacy, noting alignment with pedagogy as another important factor for successful implementation of technology initiatives. A mixed-method study was conducted by Liu et al. (2016) to examine teacher comfort level, perceptions, and use of a new technology. Results from this study revealed while teachers were generally positive about the benefits of technology, there is also a need for further research related to teacher efficacy through the perceptions of teachers for implementation fidelity and success.

Teacher Technology Efficacy

Technology efficacy is a subset of self-efficacy, which deals with an individual's beliefs, perception, and judgement about their ability and capacity to plan and perform a set of tasks or activities successfully, within the context of different situations (Bandura, 1986). On the other hand, technology efficacy is a perceived self-efficacy within a particular context, whereby an individual believes in their ability to complete a task through behaviors using a specific technology (Namlu, 2003). Findings from several studies confirm the value of examining technology efficacy because of the rapid spread and use of technology in schools (Bakir, 2015; Celik & Yesilyurt, 2013; Efe, 2015; Giles & Kent, 2016; Kalemoglu Varol, 2014; So, Choi, Lim, & Xiong, 2012; Wang et al., 2014). While technology continues to influence opportunities for teaching learning, researchers questioned if teachers are prepared and possess the efficacy needed to use technology in their teaching (Glassett & Schrum, 2009; Krutka et al., 2016; McKnight et al., 2016). While Krutka et al. (2016) supported the need to prepare teachers through the use of technology, McKnight et al. (2016) noted the changing role of teachers and students as a consequence of technology. This change in roles is attributed to the potential of technology to transform teaching and learning (Glassett & Schrum, 2009). Another researcher argues technology is a positive contributing force to improve practice through a learner-centered approach (Yarbro et al., 2016).

Findings from several studies confirm the importance of teacher technology efficacy as a driver to enhance application of technology for teaching and learning (Bakir, 2015; Compeau & Higgins, 1995; Giles & Kent, 2016; Teo, 2009; Wang et al., 2004).

Some researchers conclude heightened technology efficacy is essential for successful technology implementation and outcomes related to student learning (Bakir, 2015; Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Carol & Santori, 2015; DeSantis, 2013; Wang et al., 2004). The development of teacher technology efficacy is supported by DeSantis (2013) who notes the need "to capitalize on the educational opportunities made possible by emerging technologies" (p. 355). This researcher also identifies higher levels of technology efficacy as a predictor of an individual's confidence to perform and complete a technology task successfully. While Wegerif (2015) did not specifically touch on technology efficacy, he argues for the use of technology to shape and expand thinking. This claim is supported through the literature that individuals internalize by using cultural artifacts as cognitive tools in learning to think as they reframe their mental processes (Vygotsky, 1987). Schools that seek to raise teacher technology efficacy to support change are more likely to achieve success by maximizing the potential of technology to positively influence teaching and learning (Australian Department of Education, 2016; Digital Promise, 2018; International Society for Technology in Education, 2019c; New South Wales Department of Education and Training, 2010; U.S. Department of Education, 2016a). A study set within the context of a clinical context reveals the positive relationship between technology efficacy and use of technology, confirming that individuals with higher levels of technology efficacy are more likely to use technology (Laver, George, Ratcliffe, & Crotty, 2012). This study was conducted with 88 participants from two hospitals. Despite the context and setting, the researchers note the need for individuals to adapt and manage technology as a consequence of rapid

technological proliferation. The researchers also highlight that technology efficacy is an important predictor of technology use.

The amplified use of technology is a result of rapid technological change (Efe, 2015). Consequently, findings from a study conducted by Efe (2015) notes the need for further examination because technology efficacy is a strong predictor of technology use. The study involved 146 participants in a teacher education program at a university and data were collected using a technology educational usage scale and a computer self-efficacy perception scale. The findings of the study reveal frequent use of technology leads to higher levels of technology efficacy and higher technology efficacy leads to more use of technology. Furthermore, higher levels of technology efficacy lead to higher levels of confidence and comfort for the use of technology (Efe, 2015). Findings from another study also confirms technology efficacy is a predictor of technology use (Giles & Kent, 2016). The researchers highlight the need to prepare teachers by raising their technology efficacy to facilitate effective integration of technology. The study was conducted at a single university with 28 Elementary preservice teachers to determine teacher technology efficacy beliefs related to technology integration. The findings of the study reveal frequent use of technology leads to teachers who are more confident in the use of technology. Consequently, the researchers note teachers with a higher levels of technology efficacy are more comfortable integrating technology and are able to make better judgments for the appropriate use technology. Another study conducted by Moore-Hayes (2011) examined teacher technology beliefs in relation to technology integration (Moore-Hayes, 2011). The purpose of this study was to determine if differences in

perception for technology efficacy existed between preservice and in-service teachers. This quantitative descriptive study was conducted with 350 preservice and in-service teachers at a university in Nova Scotia. Interestingly, this study reveals there are no differences in perceptions for technology integration between the two groups. The two groups shared experiences from practice leading to lower levels of technology efficacy and includes the lack of direct experiences within a technology setting, the lack of a technology mentor, and the lack of appropriate professional development. The results of this study reveal the importance of raising teacher technology efficacy as a predictor of technology integration through appropriate and effective interventions.

Summary

Teachers who participate in a 1:1 teacher laptop program represent an understudied population within the context of adult learning (Bebell & O'Dwyer, 2010; Ditzler et al., 2016; Harper & Milman, 2016; McKnight et al., 2016; Penuel, 2006; Spires et al., 2012; Trust, 2016; Zheng et al., 2016). My study was designed to address this gap in the literature to understand the phenomenon through the perceptions and experiences of teachers who participated in a 1:1 teacher laptop program at one international school and their own technology efficacy.

A review of the literature provided insights and recommendations for further research to improve future implementation fidelity of the 1:1 teacher laptop program. While recommendations from prior research suggested deeper examination to add to the body of knowledge, recommendations also highlighted the need to include teacher voice in the implementation of technology initiatives.

Furthermore, the review of the selected literature was framed through topics such as social learning theory (Putnam & Borko, 2000), communities of practice (Lave & Wenger, 1991), and learner-centered frameworks (Mayer, 2009; McCombs, 2008; McCombs & Vakili, 2005; Reigeluth & Karnopp, 2013). While the literature review provided useful information and new understanding; there were only a few studies that examined the topic through the framework of adult learning and the lens of teachers as adult learners. Furthermore, while there were many studies about the 1:1 laptop program, there were no studies related to the 1:1 teacher laptop program within the context of an international school. While several studies examined the benefits of 1:1 laptop programs, these studies did not examine the construct of teacher technology efficacy through the perspectives of teachers as adult learners (Harper & Milman, 2016; Zheng et al., 2016). A number of studies recommended the need for further examination of technology initiatives and the influence of technology on teaching to improve student learning (Ditzler et al., 2016; Harper & Milman, 2016; Powell, 2014; Zheng et al., 2016). The review of the literature provided insights and justified the use of a qualitative research tradition to examine the topic. By grounding this study through the literature, this study could provide a unique perspective to understand the phenomenon through the perceptions and experiences of teachers who participated in the 1:1 teacher laptop program and their own technology efficacy.

In the next chapter, I present the research design, rationale, research questions, role of the researcher, methodology, and issues of trustworthiness.

Chapter 3: Research Method

Introduction

The purpose of this qualitative pragmatic study was to determine how teachers participating in a 1:1 teacher laptop program perceived and described their experiences, including identifying enabling and inhibiting factors in raising their own technology efficacy. In this chapter, I outline and justify the selection of the qualitative approach and, in particular, the rationale for the qualitative pragmatic research design, explain my role as the researcher, and describe the methodological approach I used in this study. This chapter also includes the rationale for the selection of the targeted population and the sampling strategy, in addition to details of the data collection methodology. I conclude the chapter with an outline and plan for data analysis, issues of trustworthiness, and a summary.

Research Design and Rationale

Qualitative research seeks to understand social and human issues (Kalof, Dan, & Dietz, 2008). Qualitative research is an evolving process, resulting in an adaption of the inquiry process as the researcher gains new insights and knowledge about what is being observed (Patton, 1990). Qualitative researchers do not seek to generalize findings from studies; on the contrary, the purpose is to explore and understand complex human and social issues in their natural setting (Creswell, 2007). Qualitative research provides insights and understanding of complex issues "and are most useful for answering humanistic 'why?' and 'how?' questions" (Marshall, 1996, p. 522).

Qualitative researchers attempt to understand interactions between individuals and situations, using a variety of data collection methods to identify emerging themes (Kalof et al., 2008). Qualitative research is a holistic process to examine a phenomenon through inductive analysis using descriptive data from personal experiences, collected within naturalistic settings (Patton, 1990). Qualitative inquiry includes phenomenology, grounded theory, ethnography, case studies, narrative, and other approaches as strategies to make meaning of the world through an examination of human and social issues and reality (Creswell, 2007). Qualitative research can also provide holistic views of issues and phenomena through constructivist claims to gain information-rich and thick descriptions through perceptions and experiences of participants (Fraenkel & Wallen, 2000).

Qualitative researchers work to mitigate personal and procedural bias in studies (Creswell, 2009). Patton (1990) defended the need to guard against bias, viewing each observed situation as unique to ensure data collected were accurate to increase credibility. To reduce bias and increase validity, researchers use a variety of methods, including triangulation of data sources and presenting results through comprehensive approaches (Creswell, 2007, 2009; Patton, 1990).

Because qualitative research seeks the how and why in determining how individuals make sense and meaning of their situations in relation to the world through perceptions and experiences, the qualitative approach was justified for this study (see Cohen, Manion & Morrison, 2013). Qualitative research was used as it offered an open-ended approach, allowing participants to construct meaning from experiences and

situations. Consequently, I selected a qualitative approach to collect information-rich and thick descriptions from teachers participating in a 1:1 teacher laptop program to examine, understand, and describe experiences (see Creswell, 2007, 2009; Savin-Baden & Major, 2013).

Research Questions

The central phenomena in this study are the perceptions of teachers participating in the 1:1 teacher laptop program. The research questions for this study are as follows:

RQ1: How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?

RQ2: What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

Qualitative Pragmatic Research

Qualitative researchers use an inductive approach while seeking to understand a phenomenon through the constructed nature of reality of research participants (Liu, 2016; Savin-Baden & Major, 2013). Qualitative pragmatic research, otherwise referred to as basic or generic qualitative research, is a qualitative approach used by researchers to gain a holistic picture through an in-depth understanding of a phenomenon, process, or perceptions of those involved (Auta et al., 2017; Liu et al., 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Scholars have pointed to a growing interest and wider acceptance for this method as a way to improve the quality of research as this approach provides a suitable method to answer research questions, in addition to allowing for meaningful interpretation in making sense of findings (Caelli, Ray, & Mill, 2003;

Kahlke, 2014; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Furthermore, this approach is used to understand social reality through an accurate representation of participant views based on description of themes derived from research findings (Auta et al., 2017; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013).

Qualitative pragmatic research sits on the continuum between the objective basic or generic qualitative description and the subjective interpretive descriptions (Merriam & Tisdell, 2016; Sandelowski, 2000). Researchers use the qualitative pragmatic approach to answer research questions by providing rich and low inference descriptions for how participants interpret experiences, construct reality, and make sense and meaning of the world and existence (Merriam & Tisdell, 2016; Sandelowski, 2000). Qualitative pragmatic research aligns with four paradigms, including postpositivism, constructivist, participatory, and pragmatism; qualitative pragmatic research has its origin in pragmatic philosophy (Patton, 2002; Savin-Baden & Major, 2013). However, qualitative pragmatic research does not require a philosophical stance, thereby allowing researchers flexibility to remain neutral or combine various philosophical positions (Liu, 2016; Merriam & Tisdell, 2016).

Because the purpose of this study was to understand and describe the perceptions of teachers participating in a 1:1 teacher laptop program, the qualitative pragmatic approach provided flexibility by drawing from a variety of research methodologies without aligning to any particular approach or tradition (see Kahlke, 2014; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). The qualitative pragmatic approach served this study well because I sought to answer the research questions

through rich descriptions by limiting inferences and recording data accurately and precisely collected through participant perceptions (see Kahlke, 2014; Merriam & Tisdell, 2016; Sandelowski, 2000).

I selected qualitative pragmatic research for this study because I aimed to answer the research questions through an inductive approach to derive central themes, without being limited by constrains of established qualitative research traditions (see Auta et al., 2017; Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). This approach provided methodological flexibility as I was not guided by established qualitative methods, rather I was guided by the research questions in making sense of the reality of the participants (see Savin-Baden & Major, 2013). Because the research questions were broad, this approach provided a way to answer the questions through interpretive techniques, while allowing data collection to end when data saturation was reached whereby no new data were added (see Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Furthermore, this method uses a descriptive style to connect research objectives and findings through detailed descriptions and summary of important themes derived from the reality of the participants (Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013).

Alternative Qualitative Research Approaches

There are several alternative qualitative research approaches that might have been considered as the approach for this study: phenomenology, ethnography, ground theory, case study, and narrative research (see Creswell, 2007).

Phenomenology deals with everyday social life of individuals as they navigate through a maze of experiences, while making sense and meaning of the world they live in (Creswell, 2007). According to Denscombe (2010), the phenomenological approach emphasizes subjectivity, description, interpretation, and agency in dealing with perceptions, meanings, attitudes, beliefs, feelings, and emotions. Phenomenological researchers seek to describe "how things are experienced at first hand by those involved" (Denscombe, 2010, p. 94), rather than focus on reasons for causes. Phenomenological investigations attempt to understand how people perceive phenomenon through lived experiences, while describing and presenting experiences through bias free interpretation. I did not select the phenomenological approach because the study was bounded by time and space, was more pragmatic, and was not intended to derive intense understanding through multiple and deep interviews (see Creswell, 2007).

Ethnography is a qualitative approach whereby researchers immerse themselves into the setting for long periods of time, in the hope of discovering something about people or culture through a process of detached observation (Denscombe, 2010). In an ethnographic study, the researcher is primarily interested in observing the day-to-day social, life, activities, and events with the view of making sense of how people perceive the world. Ethnography focuses on the description and understanding of people or cultures (Creswell, 2007). Ethnographers are interested in "how the members of the group/culture being studied understand things, the meanings they attach to happenings, the way they perceive their reality" (Denscombe, 2010, p. 80). I did not select the ethnographic approach because I did not study groups, cultures, processes, relationships,

and connections. Furthermore, it was not my intent to immerse myself into the setting for a long period of time in the hope of discovering something through a process of detached observation (see Savin-Baden & Major, 2013).

Grounded theory is a research methodology used to develop theory (Locke, 2001; Savin-Baden & Major, 2013). Grounded theory is discovery-based and evolves over time as the investigation reveals new leads (Savin-Baden & Major, 2013). Furthermore, grounded theory is different from other research approaches as it "emphasizes the importance of empirical fieldwork and the need to link any explanations very closely to what happens in practical situations" (Denscombe, 2010, p. 107), in the hope of generating theories. Since my intent was to add to the body of knowledge and not to develop or generate a theory, I did not consider grounded theory a suitable approach.

Narrative research is about telling a story to make sense and meaning of experiences by "focusing on studying one or two individuals, gathering data through the collection of their stories" (Creswell, 2007, p. 54). Narrative studies are framed within the context of an individual's life, experiences, culture, and historical situations (Creswell, 2007). Narratives are collected through a variety of sources and include text, speech, visual images, music, and drama. Stories help "construct the social world" (Denscombe, 2010, p. 291) and "construct a personal world" (Denscombe, 2010, p. 291). I did not select the narrative approach as my intent was not to tell a story through the life and experiences of one or more individuals.

A case study is a qualitative approach designed to study an instance or phenomenon in action (Savin-Baden & Major, 2013). Case studies are bounded, focused,

exhaustive, limited, and narrow in scope with clearly defined boundaries (Yin, 2009). Furthermore, the goal of a case study is to explore the phenomenon or issue "by looking at the particular" (Denscombe, 2010, p. 53). This study was designed to focus on the general through the perceptions of teachers who are the key informants in answering the research questions rather than the particularistic, which is a characteristic of the case study approach (see Savin-Baden & Major, 2013).

Role of Researcher

A researcher collects data considered useful and interprets this data in making meaningful conclusions (Stakes, 2010). As the sole researcher, I conducted this study under a code of ethics by following recommended guidelines for ethical approval and ethical conduct (see Savin-Baden & Major, 2013). Most recently, I moved to the study site and assumed the role of Head of Innovation and Technology. As Head of Innovation and Technology I am responsible for supporting curricular development and technical operations, and also charged to lead and advance innovation. While my role could have limited teacher participation, it was also beneficial for this study because of my proximity and understanding of the learning environment. Proximity with the site, relationship with participants, and familiarity with the topic enriches a study through deeper understanding and insights (Atkins & Wallace, 2012). I was the researcher and responsible for all aspects of the research design and methods for this study, including data collection, interpretation, analysis, and reporting. As the sole researcher, I interviewed and recorded in verbatim data through experiences of participants in the study. I developed deep

understanding of the purpose, phenomenon, and methods used in this study to mitigate bias as a result of personal relationship, proximity, and experience.

To further enhance participant comfort, I ensured data collection methods were not obtrusive or invasive. I sought to develop my rapport, responsiveness, and empathy to foster trust with participants. My role at the school was beneficial for this study because teachers value my contribution in my role at the school and respect me for the assistance I provide. While my position allowed the opportunity to better understand the participants, it might have also caused discomfort and tension during data collection. Since I was not involved in implementing the 1:1 teacher laptop program, which was implemented over 5 years ago, my position was viewed as neutral and without personal interest or bias. As a result, participants were more likely to feel at ease when responding to questions during the interviews. Furthermore, participation was voluntary and no participant was coerced into participating in this study. I also reduced possible discomfort and tension by ensuring interview questions were understandable and clear, while demonstrating a genuine interest to learn about the issue through the perceptions and experiences of the participants (see Glesne, 2011). In addition, I listened attentively, observed, and noted body language.

Qualitative pragmatic research provides information-rich and thick data though an inductive and iterative process, however scholars recommend researchers develop ability and skills to communicate, probe, and collect in-depth data (Savin-Baden & Major, 2013). Furthermore, Yin (2009) advocates researchers develop good listening skills with the ability to derive informed inferences. In my role as the only data collector for this

study I developed my knowledge and skills for data collection. I sharpened my interview and observation skills through simulations and practice. To ensure accuracy during data collection, I developed skills to improve clarity of focus and direction for improved understanding of the phenomenon by focusing on the research questions to mitigate personal bias and increase reliability of the study. By working on my interpretation skills, I enhanced my ability to analyze data accurately through reading and practice, in deriving conclusions.

Privacy and confidentiality of participants and data are of paramount importance during research and considered non-negotiable (Creswell, 2007; Denscombe, 2010; Savin-Baden & Major, 2013). As the sole researcher, I was sensitive to participant and data privacy and confidentiality as required by the code of ethics. Consequently, all data collected was kept private and confidential at all times. I reassured participants that none of the data would be shared, stored, or transferred in any form without their explicit knowledge and permission. Furthermore, I ensured the data would not be traceable to guarantee anonymity by using pseudonyms.

Scholars recommend qualitative researchers act reflectively and with intent to guard against personal bias to strengthen validity and reliability of research (Creswell, 2012; Savin-Baden & Major, 2013). While I attempted to reduce personal bias, my experience with the topic might have had some influence during data collection and analysis. To mitigate personal bias, I used transcript validation by double-checking with participants for accuracy of transcripts. I guarded against expressing personal opinions as a consequence of my preconceived assumptions, ideas, beliefs, and feelings to ensure

objectivity and neutrality (see Savin-Baden & Major, 2013). Reflexivity through documentation in reflexive journals of position, perspective, influences, and assumptions strengthens data collection (Savin-Baden & Major, 2013). To reduce bias creep, I used a reflective journal to record my reflections by documenting my beliefs, attitudes, and assumptions. One additional step I took to minimize bias included reporting my role and revealing personal experiences in the results of the study (see Savin-Baden & Major, 2013).

In conclusion, using qualitative pragmatic research as my research methodology for this study I remained an outsider while looking inwards to examine the phenomenon within the natural setting of the participants (see Savin-Baden & Major, 2013). I maintained a stance with a low degree of personal beliefs, attitudes, and assumptions through my positionality and reflexivity (see Savin-Baden & Major, 2013). I stated my position through a positionality statement in my letter of willingness to partner, and declared my relationship with the participants and the topic (see Savin-Baden & Major, 2013). Furthermore, I maintained a journal to document my beliefs, assumptions, and biases, while reflecting on how my experiences might have influenced the study and how the study might have influenced me (see Savin-Baden & Major, 2013).

Methodology

This section describes the context and setting, site description, sampling strategy, recruitment procedures, data collection, and data analysis plan.

Context and Setting

The purposeful selection of context, site, and participants within their natural settings is a characteristic of qualitative research (Creswell, 2009). I purposefully selected a single site situated at an international school in Germany to gather perceptions of teachers from the primary and secondary school as participants, using interviews as the data collection method. The study was conducted in the natural setting of the participants and located within their professional work situations.

Site Description

The International School X is a co-educational, non-sectarian school for children ages 3-19. It was established in 1996 and is a registered non-profit school in Germany. The school is governed by a supervisory board. The leadership team is responsible for guiding day-to-day activities and operations of the school. ISX serves the educational needs of expatriate and local children who seek an international education. Current enrollment is over 600, comprising students from nearly 55 countries. ISX is accredited by The New England Association of Schools and Colleges and the Council of International Schools. The school is also an International Baccalaureate World School and provides all three International Baccalaureate programs.

ISX provides a safe learning environment and promotes a well-balanced perspective on life through a mix of curricular and co-curricular activities. ISX engages learners in a rigorous balanced international education, prepares them to realize their full potential, and inspires them to be successful and responsible global citizens. ISX is a multicultural and international learning community, offering students the best of

international educational traditions, as well as benefits derived from the rich culture and heritage of Germany. The curriculum is based on the International Baccalaureate primary years, middle years, and diploma programs.

ISX offers the primary years framework in the primary school, focusing on international perspectives, inquiry-based approaches, integrated subjects, and student-centered learning. The middle school offers a rigorous curriculum based on the middle years program, with the aim of preparing students for entrance to the International Baccalaureate diploma program. The middle years program is designed specifically for students in grades 6 to 10 and strives to develop citizens who embody the International Baccalaureate learner profile through a holistic approach for learning. ISX is committed to the International Baccalaureate philosophy of creating a better world through education. The International Baccalaureate program is a comprehensive course of studies designed for the last 2 years of high school. ISX also offers a comprehensive after-school activities and community service program, which is an integral part of student life.

ISX has a total of 110 certified teachers from a range of countries with diverse cultural, national, and international backgrounds. There are approximately 50 male and 60 female faculty members. Faculty age ranges between 22 and 63, with approximately 50% holding a master's degree. In addition, there is an average yearly turnover of less than 2% of the faculty.

Sampling Strategy

A review of the literature provided pertinent information in guiding the selection of the sampling strategy for this study (see Cohen & Crabtree, 2006; Creswell, 2007;

Harper & Milman, 2016; Marshall, 1996; Savin-Baden & Major, 2013; Yin, 2009). Marshall (1996) indicates, while "there is no perfect way to sample" (p. 524), the sampling strategy is determined through the research questions and data analysis methods, and grounded through participant characteristics and "the context of the study" (p. 524). There are two primary categories of sampling approaches: probability and non-probability sampling (Cohen & Crabtree, 2006; Creswell, 2007). Qualitative research uses a non-probability sampling strategy since qualitative studies are not intended and designed to find a representative sample of the population to generalize results (Savin-Baden & Major, 2013). The sample is a subset of the population from which participants are selected and is an evolving process in qualitative studies, starting with a convenient selection of a small sample of participants (Creswell, 2007). Sampling is a deliberate process of purposefully selecting what is examined during the study (Cohen & Crabtree, 2006; Harper & Milman, 2016). Since qualitative studies are focused on complex humanistic issues it is difficult and nearly impossible to obtain a normally distributed representative sample of a known population (Marshall, 1996). Unlike samples in quantitative research, samples in qualitative studies are small, resulting in researcher bias and subjectivity (Savin-Baden & Major, 2013).

Furthermore, participants in a qualitative pragmatic research study are selected through purposeful sampling (Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). To ensure deep understanding for reality, purposive sampling is an appropriate sampling strategy to select participants who are most likely to provide in-depth insights and experiences to answer the research questions for a qualitative

pragmatic study (Liu, 2016; Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). While purposefully selected participants are representative of the population, sample size and representation could be limited due to constraints of time, resources, and to minimize disruption (Merriam & Tisdell, 2016; Savin-Baden & Major, 2013).

I used purposive sampling, also called judgement sampling, as it was an appropriate and applicable sampling method; in relation to the research tradition, nature, and purpose of my study (see Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Purposive sampling is a widely used qualitative nonprobability sampling technique "because they can purposefully inform an understanding of the research problem" (Creswell, 2007, p. 125) by selecting and including a range of individuals who are aware and knowledgeable of the problem or phenomenon through their experience. While purposive sampling has limitations because of its subjective nature, it can also provide information-rich and thick descriptions (Patton, 2002). Homogeneous sampling is a specific purposive sampling method focused on individuals sharing similar traits, characters, or experiences (Cohen et al., 2013). The emphasis is on similarity when selecting a sample from a given population (Cohen et al., 2013). I used homogeneous sampling to identify participants who shared similar experiences through their participation in the 1:1 teacher laptop program. I used this approach to identify and select participants based on their knowledge and willingness to share experiences (see Bernard, 2002). Furthermore, Bernard (2002) highlighted the importance of participant ability to share and communicate experiences with clarity. I justified the selection of purposive

sampling because this study was not intended or designed for generalization (see Creswell, 2012).

Besides the sampling strategy, qualitative researchers consider sample size (Savin-Baden & Major, 2013). I determined the sample size to minimize disruption during the study, and worked within the constraints of limited time and resources (see Savin-Baden & Major, 2013). Sampling size can be determined when data saturation is reached whereby no new information is derived through successive data collection and analysis (Savin-Baden & Major, 2013). However, researchers noted, decisions based on findings can be incorrectly interpreted because sampling size is too small or results are not rich enough or researchers are unable to probe deeper (Cohen & Crabtree, 2006; Savin-Baden & Major, 2013). While there are no specific rules in determining sample size for qualitative pragmatic research, I purposefully selected eight participants for my study (see Savin-Baden & Major, 2013). The selection of this sample size was based on the characteristics of the participants and their familiarity with the 1:1 teacher laptop program. As a result, data collected through the perceptions of the selected participants resulted in data saturation (see Glaser & Strauss, 1967). Furthermore, constrains of time, resources, and study targets also determined the sample size for my study (see Savin-Baden & Major, 2013). However, if data saturation was not reached I had preplanned to recruit more participants to increase the validity of the study.

Recruitment Procedures

I shared details of my study with the Director of ISX and sought approval through a letter of willingness to be a partner. Furthermore, I sought approval from Walden's

Institutional Review Board (IRB) for approval to conduct the research. After I received the approval from ISX and Walden's IRB, I sent a letter to the faculty to inform and invite participants through the internal electronic mail system. I shared details of the selection criteria and indicated the need for a sample of eight volunteer teachers to represent both primary and secondary school. Selection of participants was based on the number of years teachers had participated in the program, with 2 years as the minimum.

Selected participants were invited to sign the informed consent form, which was archived as part of the required documentation for my study. The informed consent form included the purpose of the study, benefits of the study, what participants were expected to do, how they would participate, risks involved, voluntary nature of the invitation, right to withdraw at any time, privacy and confidentiality of data, and contact information (see Savin-Baden & Major, 2013). I also provided participants with a copy of the signed informed consent form. I started data collection only after receiving IRB approval. IRB approval number: 12-19-18-0289973, dated 19th December 2018.

Data Collection

While research questions provide focus for a study, data collection compromises strategies and includes details for the kind of data to collect and the plan for how to collect data (Cohen et al., 2013; Creswell, 2009; Patton, 2002; Savin-Baden & Major, 2013). Consequently, I developed a data collection strategy to gather relevant data to answer the research questions. I collected responses from participants to gain insights through their experiences to examine the phenomenon (see Wolcott, 1994).

While there are a variety of data sources and data collection methods, for the purposes of this study I collected data through interviews (see Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). I used in-depth interviews to collect perception data situated within the natural settings of the participants until data saturation was reached. The intent of in-depth interviews is to allow participant to respond freely, while not limiting responses through prior categorization (Savin-Baden & Major, 2013). I also shared the data with participants to double-check and improve the accuracy of transcription (see Savin-Baden & Major, 2013). In addition to recording the interviews, I took notes during each interview in an unobtrusive manner (see Savin-Baden & Major, 2013). I had also planned follow-up interviews in the event I needed to clarify something.

I thanked participants for volunteering and their participation in the study before the start of each interview. I located the interviews in a quiet room with a table and chairs, along with drinking water during the interviews. Furthermore, after each interview was completed I thanked the participants once again and reassured them the data would be kept private and confidential. I also reassured participants the data would be secured in a locked cabinet and used only for the intended purpose for which it was collected. Furthermore, the data collected will be destroyed at the end of a 5-year archival period as per IRB guidelines. Participants were reminded of their right to request and see the data at any time, including the transcripts to ensure accuracy and correctness (see Savin-Baden & Major, 2013).

Interview Strategy

Interviews are described as "any person-to-person interaction, either face to face or otherwise, between two or more individuals with a specific purpose in mind" (Kumar, 2011, p. 144). Since this study was designed to gain perceptions and insights directly from participants, the interview method was viewed as an appropriate method to collect information-rich and thick data. Furthermore, interviewing is a feasible method for collecting data to examine "complex and sensitive areas" (Kumar, 2011, p. 149), while allowing the interviewer to explain and clarify interview questions in person. Interviews will allow for collection of in-depth information from participants through open-ended questioning (Savin-Baden & Major, 2013). I also used follow-up questions to probe deeper in response to answers from participants. In addition, follow-up questions will enable me "to supplement information obtained from responses with those gained from observation of non-verbal reactions" (Kumar, 2011, p. 150). Interviews also provide participants opportunity to clarify questions (Savin-Baden & Major, 2013). I framed the interview protocol through a code of ethics to guide what happened before, during, and after the interviews. The interview protocol included a set of questions and sub-questions designed to encourage the participants to describe their perceptions and experiences. See Appendix A for the interview protocol. As part of the interview protocol I obtained the required permissions from participants (see Creswell, 2007). The interview protocol helped me build rapport to increase the confidence of participants by putting them at ease through clarification of their role, the process, and the purpose of the study (see Savin-Baden & Major, 2013).

The approach used in this study was indicative of qualitative research as I used a sequence of open-ended questions to guide the interviews, while encouraging participants to freely express their perceptions through detailed descriptions of lived experiences. I collected interview data from the participants by recording interviews using a laptop as an audio recorder. In addition, to being an unobtrusive form of data collection, audio recording captures the spoken word without misinterpretation (Savin-Baden & Major, 2013). However, data collected through audio-recording can be voluminous and harder to transcribe (Creswell, 2009).

Reflective note-taking provides for documenting assumptions, feelings, and personal biases during the study (Janesick, 2010). I used reflective notes to cross-check and cross-reference data during data analysis and interpretation (see Miles, Huberman, & Saldaña, 2014). In addition, reflective journaling improved reflexivity through personal reflection about my position and influence during the study (see Savin-Baden & Major, 2013). Reflexivity also provided critical self-examination, inspection, and introspection when constructing and interpreting meaning, in ensuring I remained objective to mitigate personal bias (see Savin-Baden & Major, 2013).

Data Analysis Plan

Data analysis plans are described as “how you process and analyze data” (Kumar, 2011, p. 277) and “depends upon how you plan to communicate findings” (Kumar, 2011, p. 277). I used thematic analysis to analyze the data collected for this study (see Savin-Baden &Major, 2013). Thematic analysis is an analytic method used to identify, analyze, and report themes found in the data (Savin-Baden & Major, 2013). Themes go beyond

organizing and describing data in rich and thick detail, but also provide deeper insights for the research topic through interpretation of data to reveal the reality of participants (Braun & Clarke, 2006). The thematic analysis process I followed involved a stepwise process and included reading and re-reading to familiarize with the data, identifying segments of text to generate initial codes, searching for themes, reviewing themes, defining and labeling themes, and creating a list of themes to produce the report (see Braun & Clarke, 2006). Furthermore, data were interpreted at a low-level to ensure fidelity (see Merriam & Tisdell, 2016). To remain true to the data in ensuring accuracy and precision, codes were derived from recorded data, using the language of the participants (see Neergaard, Asbjoern, Olesen, Andersen, & Sondergaard, 2009). I used a template for coding through bracketing, significant statements, meaning units, textual descriptions, and structural descriptions to organize transcripts and generate initial codes (see Creswell, 2007). I analyzed the data through multiple readings of transcripts to identify significant words and sentences to search for emerging themes (see Colaizzi, 1978).

Thematic analysis is an appropriate method to analyze data collected through qualitative pragmatic research because themes reveal patterns found through the data in relation to the phenomenon, providing a way to make sense and answer the research question (Braun & Clarke, 2006). To ensure rigor of thematic analysis I took care in transcribing the recording data accurately, avoiding anecdotal descriptions (see Braun & Clarke, 2006). Themes were checked carefully for truthfulness and exactness through careful analysis and multiple readings (see Braun & Clarke, 2006). Since I was the sole

researcher and data collector, this provided a good fit to use thematic analysis as I played an active part in the study (see Braun & Clarke, 2006). Furthermore, I made sure to conduct a thorough analysis of themes and not just use the descriptions of the participants (see Braun & Clarke, 2006).

Issues of Trustworthiness

Issues of trustworthiness address a variety of concerns and questions researchers address to ensure consistency and legitimacy of findings (Savin-Baden & Major, 2013). While validity and reliability are standards of rigor used in quantitative research, qualitative researchers also use standards to improve the rigor of a study (Savin-Baden &Major, 2013). The goal of my study was not to generalize findings, but to gain a deeper understanding of the issue through the perceptions and experiences of the participants. Consequently, I applied four constructs as the criteria to address issues of trustworthiness to increase rigor and integrity of my study. The four constructs include credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985; Guba & Lincoln, 1989).

A study that lacks reliability and validity will serve no purpose and result in wasted effort (Creswell, 2009). Researchers check accuracy through recommended practice to ensure qualitative validity, while qualitative reliability tests use standardized procedures to produce consistent and replicable results, regardless of how and who conducts the study (Creswell, 2009). While I took steps to ensure reliability and validity of the study, the volume and complexity of qualitative data posed a daunting task. Furthermore, vague and unclear participant statements posed additional challenges.

Transcription, coding, and categorization of qualitative data was not easy and could have resulted in misinterpretation. While the volume of data collected from qualitative studies improves credibility, it is also a source of error and bias (Creswell, 2009). I attempted to guard against bias by using bias free methods for data collection, coding, analysis, interpretation, and reporting.

In addition, I used the following methods as recommended by Fraenkal and Wallen (2000) to improve validity and reliability by checking the descriptions to identify possible discrepancies; checking that terms and meanings were not misunderstood; documenting my questions and assumptions; documenting the context and setting; documenting inferences; recording interviews, and testing my conclusions.

Credibility

Credibility is a reflection of reality through the accuracy of data for the truthfulness of findings (Savin-Baden & Major, 2013). It is the "attempt to demonstrate that a true picture of the phenomenon under scrutiny is being presented" (Shenton, 2004, p. 1). I attempted to accurately represent and reflect the reality of the context and participants. To enhance credibility, I used peer debriefing, member checks, and controlled researcher bias. I cross-checked recorded and transcribed the data to ensure I had captured the data accurately. I also used member checks by allowing participants to review the transcripts to ensure I had accurately recorded, described, and interpreted the data. I also scheduled adequate time for the interviews to collect detailed data. To mitigate bias, I guarded against selective interpretation by using reflexivity to document what I heard in verbatim. I also recorded observations and assumptions in my reflective

journal. I also explained unexpected and contradictory data in my journal (see Savin-Baden & Major, 2013).

Transferability

Transferability refers to generalizability and the degree findings can be applied to other similar populations or settings (Savin-Baden & Major, 2013). Transferability provides "sufficient detail of the context of the fieldwork for a reader to be able to decide whether the prevailing environment is similar to another situation" (Shenton, 2004, p. 1) and if the "findings can justifiably be applied to the other setting" (Shenton, 2004, p. 1). As indicated previously, this study was not intended or designed for generalizability, however to increase rigor and validity I collected detailed, thick, and information-rich descriptions. I also listed as a limitation of the study that comparisons were not possible. Furthermore, I documented my assumptions and observations through detailed reflective statements and my association with the study site and participants.

Dependability

Dependability refers to the accuracy, similarity, and consistency of the data if the study was replicated (Savin-Baden & Major, 2013). While it is impossible to replicate a qualitative study, I focused on the truthfulness of my study by being honest with the participants, the collection and interpretation of the data, and the final reporting of the study (see Savin-Baden &Major, 2013). I documented and described changes made during the study and how these changes might have influenced the study. While it was challenging to ensure dependability, I attempted to improve replication through data saturation. Consequently, I collected sufficient data and determined sufficiency when

data saturation was reached. To strengthen dependability, I used detailed notes to describe participant selection, sampling methods, data collection procedures, and the data analysis method I used for the study. My notes and other related documentation were also made available to all participants.

Confirmability

Confirmability is concerned with the degree to which results are substantiated and derived through objectivity, neutrality, and mitigation of researcher bias (Savin-Baden & Major, 2013). To fulfill the criteria for confirmability "researchers must take steps to demonstrate that findings emerge from the data and not their own predispositions" (Shenton, 2004, p. 1). While qualitative research made it difficult to remain objective and neutral as a result of the subjective nature of this research tradition, I maintained detailed notes, reflections, and rich descriptions to remain objective and neutral (see Savin-Baden &Major, 2013). In addition, recordings of interviews and transcripts were kept in a secure location. I also used reflexivity to control bias and debriefing to corroborate the data and findings to improve confirmability (see Savin-Baden &Major, 2013).

In addition to the four constructs, I used other strategies to address and improve trustworthiness such as familiarizing early with participants, purposefully selecting knowledgeable individuals, maintaining transparency through openness and honesty, using targeted questioning, debriefing and feedback, using reflective commentary, conducting member checks, collecting thick and rich descriptions, and align research methods with practice (Shenton, 2004).

Rigor of the Study

Researchers recommend using the following methods and strategies to improve the rigor of qualitative research such as evaluating cohesiveness of evidence; examination of inconsistencies, looking for negative cases, identification of contradictions, seeking alternate explanations; ensuring accuracy of transcription, and correctness of descriptions (Daniel & Onwuegbuzie, 2002). As a result, I attempted to apply these methods and strategies to enhance the rigor of the study.

Ethical Procedures

Research studies are conducted under a code of ethics through explicitly stated guidelines for ethical approval and ethical conduct (Savin-Baden & Major, 2013). I took the necessary and appropriate actions and steps to ensure the rights of participants were protected and respected during the study. This study was conducted only after receiving approval of Walden University's Institutional Review Board (IRB). IRB approval number: 12-19-18-0289973, dated 19th December 2018. In addition, the research proposal was presented to the Director of ISX for approval. Once approval was received from the IRB and the Director of ISX, the study was shared with the faculty through the school's internal electronic mail system. I addressed concerns and answered questions in a responsive manner. I also shared details of the participant selection rationale and process. I secured the data collected to ensure confidentiality and privacy. Furthermore, I allowed participants to review their transcripts to adhere to the ethical guidelines. I also allowed participants to review the findings from the study. I will destroy the data collected during the study after the stipulated period.

Summary

The purpose of this qualitative study was to determine how teachers participating in a 1:1 teacher laptop program described their experiences and their own technology efficacy. This study added to the body of knowledge and could benefit the educational community through a deeper understanding of the phenomenon to improve student learning. In this chapter, I described the qualitative research tradition and the framework used to examine the topic. The chapter also included the research questions, the research approach, and a comparison of alternative research approaches. The latter part of the chapter included and described the role of the researcher, the context and setting, the site description, the sampling strategy, the recruitment procedures, the data collection method, the interview strategy, the data analysis plan, issues of trustworthiness, and ethical procedures. In the next chapter, I present a brief introduction with details of the settings, demographics, data collection, data analysis, and evidence of trustworthiness. The latter part of the chapter contains a detailed presentation of the findings from the study, ending with a summary.

Chapter 4: Results

Introduction

The ongoing process of change brought about by the spread of digital technology continues to engage schools in finding meaningful ways to use technology to advance teaching and learning (Digital Promise, 2018). One such technology is the 1:1 laptop program, which continues to receive attention and investment (Harper & Milman, 2016; Stanhope & Corn, 2014). While there is a vast body of literature on the 1:1 student laptop program, research about the 1:1 teacher laptop program through the lens of teachers as adult learners is scant or nonexistent (Bakir, 2015; Giles & Kent, 2016; Kalemoglu Varol, 2014; Mourlam & Montgomery, 2015). The purpose of this qualitative pragmatic study was to understand and describe experiences through the perceptions of teachers who participated in a 1:1 teacher laptop program for at least 2 years and their own technology efficacy.

The research questions for this study were as follows:

RQ1: How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?

RQ2: What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

This study was framed through the conceptual model of adult learning proposed by Knowles et al. (2015) and the construct of teacher technology efficacy (Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016). In this chapter, I describe the context, settings, and demographics of the participants; the data collection process; the data

analysis method; evidence for trustworthiness, and results from the data analysis of participant responses.

I selected thematic analysis as the method to analyze and identify codes and themes from the data (see Braun & Clarke, 2006). Thematic analysis provided a flexible approach to derive codes and themes, going beyond verbal responses to gain a deeper understanding of perceptions and experiences of participants (Braun & Clarke, 2006). I used a six-step process, as suggested by Braun and Clarke (2006), to familiarize myself with the data and generate initial codes, followed by review and reporting of identified themes. I transcribed recorded interviews using an online service, read the transcripts several times, listened to the recordings, highlighted statements and phrases in different colors, and documented additional side notes and comments.

After the initial review, I identified and generated initial code to answer the research questions using open coding, capturing the essence of participant responses. I applied a technique suggested by Bree and Gallagher (2016) using Microsoft Excel to list, color-code, and organize codes. After arranging codes, I searched for broad themes related to the research questions and listed them as short descriptive statements. I reviewed and narrowed the broad themes using color-coding to help me derive meaning for the selected themes. I reviewed the data in alignment with the selected themes to ensure I did not miss other themes, while also checking for redundancy. After the final themes were identified, I focused on each theme and developed a schematic to illustrate relationships between themes and research questions (see Braun & Clarke, 2006). The final stage in the process was to produce a detailed report of the results.

Settings

The study was conducted at an international school in Germany. Nine teachers from primary and secondary who participated in the 1:1 teacher laptop program for 2 or more years was selected as participants for the study. One participant was left out because at the time of the interview, it was determined she had not met the selection criteria, as she had only participated in the program for 1 year. Though I conducted the interview with this participant, the data collected were not used for the study. During the data collection phase, no changes were made to the 1:1 teacher laptop program that could have influenced the study. The 1:1 teacher laptop was implemented in stages and was first introduced 8 years ago in the secondary school because the secondary school was also planning to introduce a laptop program for students. Consequently, this and budgetary constraints delayed the implementation of the 1:1 teacher laptop program by a few years in the primary school.

The invitation to participate in the study was sent in January 2019 via the school's internal email system in accordance with the approved interview protocol. Teachers confirmed participation through email and, in some cases, in person. Because the school was in session, there were no challenges to schedule interview dates and times. Eight interviews were conducted and completed over a period of 2 months. The first of four interviews were completed in January, and the next four were done in February. Each of the interviews was conducted in a private space, with the blinds closed for additional privacy. Interview dates and times were based on participant convenience and to respect participants' time, in ensuring minimal disruption to schedules. One participant requested

a change, and this was accommodated by rescheduling the interview. The collaborative planning to schedule interviews contributed to participant comfort in the study. The private and comfortable physical setting also facilitated open communications to mitigate possible anxiety of participants. Ample seating space and distance between myself and the participant were arranged, and a glass of water was offered.

Demographics

As previously indicated, the study was conducted at the international school where I am currently working. However, I joined the school in August 2017, many years after the implementation of the 1:1 teacher laptop program. I know all participants as professional colleagues. However, I took steps to reduce bias, which included informing participants their responses were confidential, recording interviews, and using the recordings to transcribe data accurately. In addition and to reiterate again, I am not in a position or responsible to supervise or evaluate any of the study participants.

Participants were selected purposefully and included teachers from primary and secondary school who participated in the 1:1 teacher laptop program for 2 or more years to collect broad and rich descriptions. Four of the participants were female and four were male. All participants were qualified full-time teachers with a range of teaching experiences. The youngest participant had 3 years working experience at the study site, while six participants had 10 or more years of teaching experience. Participants held a range of titles, roles, and responsibilities, including positions of midlevel leadership. All participants were experienced teachers with relevant teaching qualifications and certifications. One participant held a doctoral degree. Some participants taught in both

primary and secondary school, and some taught across a number of curricular areas. One participant was previously the Information and Communications Technology (ICT) integrator at the study site. While one participant had prior experience working in a 1:1 teacher laptop program at another school, other participants had no prior experience, confirming that this was their first experience. One participant confirmed use of the laptop only in school and not at home. While participants engaged in the 1:1 teacher laptop for at least 3 years, three participants were involved since the implementation of the program, 8 years ago.

Data Collection

I used face-to-face interviews of participants who were full-time teachers at an international school and participated in a 1:1 teacher laptop program for 2 or more years to collect data. After receiving confirmation from each participant, I assigned pseudonyms to ensure anonymity, privacy, and confidentiality. Prior to the start of each interview, I described the setting of the interview location and reviewed the informed consent form. I expressed my sincere thanks to each participant for their time, effort, and willingness to contribute to the study. I shared that the value and uniqueness of their responses would enrich the study and the body of existing knowledge. I reminded participants that open-ended interview questions were designed to gain insights through descriptions of lived experiences, as best as they could recall. This was intended to encourage participants to feel at ease and to promote rapport between the participant and myself, in improving interview conditions. I explained and demonstrated how the interview would be conducted and recorded using a laptop. I tested the recording prior to

the start of each interview. This helped participants to feel at ease, in making the recording of the interview less obtrusive. Throughout the interview I maintained a comfortable posture of acceptance and interest in the responses of participants, while keeping eye contact. I did look down at the laptop to check if the recording was functioning and prior to the start of each interview, I informed each participant that I would be doing this.

Nikhil and Jessica work in the primary school, while Janice, Elizabeth, Jacobi, Mathew, and Ashok work in the secondary school. Catherine worked in both primary and secondary school. Nikhil worked as the Primary Years Program (PYP) coordinator to facilitate curriculum development and implementation and also supported primary teachers. Nikhil participated in the 1:1 teacher laptop program for "maybe 4 years." Jessica was a fifth-grade teacher and worked at the school for 6 years, holding a variety of positions from literacy leader to action coordinator. She participated in the 1:1 teacher laptop program for 3 years. Janice is a secondary teacher with 3 years teaching experience. She taught a range of subjects from Modern Languages to Humanities, sharing her prior laptop experience, saying "there was no need for a real in-depth introduction." Elizabeth was the head of the Secondary Science Department and taught Biology. She participated in the 1:1 teacher laptop since the "inception of the program," noting "we got the laptops in 2011…so 8 years." Jacobi is a secondary teacher and also held roles as the language acquisition leader and learning leader. Jacobi was the part-time ICT integrator until June 2018 and viewed himself as an "enthusiastic proponent" of the 1:1 teacher laptop program "since before its inception." Mathew was a secondary school

teacher, describing himself as a nerd. He participated in the 1:1 teacher laptop program since he joined the school in 2014. Ashok worked as a secondary teacher for 13 years. He taught a range of subjects from Languages, Theory of Knowledge, Humanities, and English Literature. Ashok also participated in the 1:1 teacher laptop "since its inception." Catherine worked in both primary and secondary school. She taught German and English in the primary school, before moving to the secondary school as the drama teacher. Catherine participated in the 1:1 teacher laptop for 4 years.

I reviewed the informed consent form and interview protocol at the start of each interview to allow participants to share concerns or ask clarifying questions. None of the participants expressed any concerns before or after the interviews. Most importantly, I emphasized at the start and end of each interview the purpose of the study. We discussed the confidentiality standards and expectations related to collection, use, and storage of data, while confirming their responses were based on experiences and to recall those experiences as best as they could. Each interview was scheduled for a maximum of 60 minutes. During the interview, I followed the interview protocol and used my follow-up questions as needed to ensure there was sufficient detail to the discussion. Furthermore, probing questions were used to clarify or elicit more information for deeper understanding. I allowed time for participants to recall experiences to collect rich and thick descriptions. In some cases, participants paused and asked clarifying questions. I kept the list of interview questions in sight to ensure flow of questioning, while keeping tracking of time.

During the interview, I was conscious to remain neutral and non-judgmental by listening closely and paying attention to participant responses. I provided time for participants to share other experiences and asked questions to gain additional information and insights. I observed body language, gestures, and expressions during the interview. I also noted the atmosphere and setting of the interviews were relaxed. My overall observations were participants felt at ease and comfortable during the interview. I observed participants did not hesitate with their responses and answered the interview questions with confidence. Some participants occasionally paused to recall an experience or to rephrase their answer. Some participants also asked to have a question repeated for clarification and understanding. I was intentional about maintaining eye contact with all participants during each interview. At no point were any of the participants interrupted when they were answering the interview questions.

I noted participants left the interviews feeling and expressing they were happy to have had the opportunity to contribute to the study. To ensure accuracy and confirmability, right after each interview I documented my impressions, thoughts, and observations in a reflective journal. Each interview was recorded using a digital recording application on a laptop for accuracy of transcription. At the end of each interview, the audio recording was encrypted, password protected, and stored on an external storage device. The recorded audio file on the local laptop was permanently deleted, once the file was stored offline and archived.

Data Analysis

I used thematic analysis to identify and record codes and themes through the data collected (see Savin-Baden & Major, 2013). Because I was the sole researcher, the first step I followed was to familiarize myself with the data. I listened to the audio recordings of interviews several times and also read the transcripts multiple times. Following the approach of inductive analysis, I used first round open coding with no preconceptions of themes to allow codes to emerge from the data. I compared and contrasted words, phrases, and sections of text to identify initial codes. As I identified codes I recorded the identified codes and related them to words and sentences, using the language of the participants. During each reading of the transcript, I kept the purpose of the study and research questions in full view as a reminder to maintain my focus and attention. I used different colored highlighter pens to draw attention on relevant sections and segments of text. I also wrote notes on the side of the highlighted sections and key phrases. I used a Microsoft Word table to list the initial codes, linking initial codes to highlighted sections of textual descriptions in the transcript to identify and confirm accuracy of coding.

I took care to transcribe the recorded data accurately, avoiding anecdotal descriptions to ensure rigor and accuracy of data analysis (see Braun & Clarke, 2006). An online transcription service was used to transcribe the audio recordings to text. Before I started the online transcription I listened to each recording to ensure there were no glitches in the recording. The online transcription service provided useful timestamps and easy identification of respondents. Data markers in the online transcription also helped during the data analysis stage. Additional manual checks and edits were done to confirm

accuracy of the online transcription. To ensure truthfulness and exactness of transcription, I read the transcripts multiple times (see Braun & Clarke, 2006). I had the online transcription reviewed and corrected by a second individual. Once the second review was completed, I downloaded the transcribed text as a Microsoft Word document.

I entered the initial codes in a Microsoft Word table and continued to find more text segments and phrases, pasting each segment or phrase into the table using formatting and color-coding features for easy identification. I repeated these steps several times, while reading the transcript over again and listening to relevant sections of the audio recording. While this was a long process, I found it useful and helpful to keep a duplicate of the transcript open on a second computer, while copying and pasting segments of text from the original transcript into the Microsoft Word table. This not only helped me familiarize and gain a deeper sense and understanding of the data, but ensured I did not miss other significant codes and segments of text. At the end of this process, I copied the completed Microsoft Word table to Microsoft Excel to analyze the data further.

I continued with axial coding to explore relationships between initial codes, while making links between the identified codes. To help with this, I used Microsoft Excel and applied a technique suggested by Bree and Gallagher (2016) to organize and reduce the number of initial codes. I created individual worksheets for the raw data, color coded data, categorized the data by themes, and reviewed the worksheets to identify broad and overarching themes. During the process of organizing the data in the different worksheets, I reread the transcripts several times for deeper understanding and insights. Responses were organized and collated in the worksheets by interview questions for each

of the research questions. Broad themes were identified from the codes and after multiple reviews of the data, broad themes were reduced to identify overarching themes. The conceptual framework used in the study helped at this stage to identify themes. In addition, I used my reflective notes to corroborate what participants had said to enhance my overall understanding. The reflective notes from my journal helped derive deeper meaning through the body language, gestures, and reactions of participants. While my observations, impressions, and assumptions provided an additional data point to examine the data, it also helped to mitigate personal judgment and bias.

I chose to categorize and present the identified themes by the research questions. The themes for the first research question were access to the teacher laptop, change in practice, support structures, and concerns and barriers. The themes for the second research question were attitude towards technology, self-directed learning, and perceived value.

Evidence of Trustworthiness

To confirm evidence of trustworthiness, I followed research recommendations stipulated in the literature as presented in Chapter 3 and guidelines provided by Walden University's Internal Review Board. I applied the four constructs of credibility, transferability, dependability, and confirmability to ensure trustworthiness, in increasing the integrity of the study (see Guba & Lincoln, 1989).

Credibility

I ensured credibility by collecting sufficient data through the descriptions and experiences of the participants (see Creswell 2009). As described in Chapter 3, I guarded

against and reduced bias by accurately transcribing recorded interviews, collecting participant feedback, and using an appropriate analysis method. While I ensured all participants met the selection criteria, I also vetted the interview protocol and interview questions in advance to confirm understanding. I used a reliable digital recording program to collect data and transcribed the recorded data using an online transcription service, while doublechecking accuracy through several manual reviews. During the process of reading transcripts I checked for possible discrepancies to ensure terms and meanings were not misunderstood. I allowed participants to provide feedback to confirm the accuracy of the transcription. I noted and documented the context and the settings of the interviews. I applied reflexivity to mitigate bias by noting observations, impressions, and assumptions after each interview using a reflective journal. During data analysis, I used my notes and the transcript, while constantly comparing and contrasting with the literature to increase credibility.

Transferability

While this study was not intended or designed for generalization, the goal was to collect broad and rich descriptions through experiences of participants for transferability. In addition, I provided "sufficient detail of the context of the fieldwork for a reader to be able to decide whether the prevailing environment was similar to another situation," (Shenton, 2004, p. 1) documenting detailed notes related to my association with the site, participants, interview questions, and methods used. This was deliberately done to enhance potential transferability of results by providing baseline data to support future research (see Savin-Baden & Major, 2013).

Confirmability

To ensure confirmability I took steps to ensure findings emerged from the descriptions of the participants and not from their personal biases or assumptions. I used different strategies including documenting my observation, impressions, and assumptions through reflective notes. During data analysis, I also linked the identification of codes and themes to the literature, research questions, and the conceptual framework. I conducted the study in the natural settings of the participants and used the descriptions and words in vivo during data analysis (see Savin-Baden & Major, 2013). I recorded and archived the interviews using a digital recorder, for future recovery. Furthermore, I preserved all data collected from the study for a period of 5 years, as required by Walden University's Internal Review Board.

Dependability

To ensure dependability, I applied steps for accuracy, similarity, and consistency of the data, if the study were replicated (see Savin-Baden & Major, 2013). To improve dependability of the study I used a code and recode strategy during the data analysis stage and returned to recode the data after a few days. I compared and contrasted the two identified sets of codes to confirm accuracy by noting similarities and differences. Furthermore, I collected sufficient data and documented details related to participant selection, sampling methods, and data collection strategies. I also used my reflective journal during data analysis to compare and validate study findings to increase replicability. I shared with participants that they could contact me at any time for clarifications, and they could request to view their transcripts at any time.

Findings

Participant responses were examined to answer the research questions through identification of initial codes, which were further analyzed to ascertain overarching themes. Four overarching themes emerged from the data for research question one and three overarching themes emerged for the second research question. Consequently, I chose to organize this section by the two research questions to present the identified overarching themes. While themes were presented separately to answer each research question, sources of perceptions overlapped through descriptions of participant experiences related to the 1:1 teacher laptop program and their own technology efficacy. The research questions for this study were:

> RQ1: How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?
>
> RQ2: What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

Research Question 1: Perceptions and Experiences of Participants

In the following section, I present findings through the perceptions and experiences of participants for the 1:1 teacher laptop program. The overall perceptions for the 1:1 teacher laptop program was positive and derived through broad and rich descriptions of lived experiences, resulting in the following overarching themes, access to the teacher laptop, change in practice, support structures, and concerns and barriers. General findings suggested participants viewed the 1:1 teacher laptop program as a positive enabler of school improvement, supporting teaching and learning. Responses

from participants also indicated teachers valued participation in the 1:1 teacher laptop program because it enhanced personal productivity and supported professional practice. Most significantly, the participants perceived, participation in the program improved student learning through augmentation of pedagogy.

Access to the Teacher Laptop

Participants viewed access to the teacher laptop as a significant and positive contributing factor in supporting teachers and their practice. Furthermore, all the participants perceived access to the laptop fostered change, facilitating school improvement. Participant responses also indicated access to the teacher laptop was perceived as an important addition to the instructional toolkit, supporting student learning. Participants described how access to the teacher laptop contributed towards enhancing personal productivity and advancing professional practice. Participants shared several workplace and personal experiences to support how access to the teacher laptop had influenced personal productivity and professional practice. Those experiences, set within individual contextual situations provided insights for the overall positive perceptions expressed by all participants for the 1:1 teacher laptop program.

One source of positive perceptions was that the teacher laptop was viewed as a significant change for how the school supported teachers. Participants from both primary and secondary school indicated access to the laptop contributed to positive perceptions because teachers appreciated the school providing a valuable instructional resource to enrich the learning environment. Historically, the school was always conservative and limited with its budget and resources because of its low school fees. Consequently, when

the 1:1 teacher laptop program was introduced, it was well received and also a welcomed addition to the salary and benefits package. Several participants expressed they felt "happy" and "valued" because they were provided with a teacher laptop, leading participants to not only perceive the laptop as a bonus, but a commitment of the school to support teachers with appropriate technology to improve teaching and learning.

Another source of perceptions and experiences was related to how access to the teacher laptop supported and changed practice and pedagogy. When participants were asked to describe their overall experiences for the 1:1 teacher laptop program, they used words like "transformative," "revolutionary," "positive," "convenient," "beneficial," and "empowered." Jacobi attributed a change in his pedagogy to the "transformative power" of the laptop to enhance practice, resulting in improved student learning. He also noted participation in the 1:1 teacher laptop program and access to the laptop was a "positive development" because it encouraged more teachers to engage and explore modifications to pedagogy and practice. Like Jacobi, Mathew shared he was "very enthusiastic about" the 1:1 teacher laptop program and was "very excited" to have access to a teacher laptop because it helped him discover alternate instructional strategies to further engage and motivate students. Jessica provided a similar response, noting access to the teacher laptop facilitated working with peers "collaboratively when their classrooms are being used" to continue development of instructional strategies. Jessica also commented access to the teacher laptop was "invaluable" and described her experiences as "fantastic," indicating access to the laptop was "a big step in the right direction" to improve practice. This sentiment was shared by another participant who noted access to the teacher laptop was

"beneficial" because it was not only an indication of the school's commitment to "support learning in different ways," but encouraged teachers to "augment learning" by examining pedagogy and practice through the development of their own technology proficiency and technology efficacy.

Another contributing factor for positive perceptions was influence on instructional delivery as a result of access to the teacher laptop. Participants shared experiences related to how access to the teacher laptop influenced instructional delivery. Catherine summarized the sentiments of participants when she described the laptop as a "digital tool" and "the center of our teaching," with potential to transform instructional delivery. Elizabeth and Ashok, who were part of the 1:1 teacher laptop program from its inception went further to describe the program as "positive" because the teacher laptop unlocked new learning opportunities for teachers to explore and apply technology in meaningful ways to alter instructional delivery. Elizabeth discovered ways to use her laptop to supplement instructional delivery by evaluating software to improve student learning. She noted it was "good having a laptop" to "experiment on some of the programs." Elizabeth also shared how the laptop changed her instructional delivery through interactions with colleagues, stating "it has been easy to cooperate with colleagues and learn." Responses from other participants also indicated changes in instructional delivery, leading Ashok to say "I no longer present in front of the class" and "I suppose my pedagogy has changed as a result." Like Ashok, Mathew also shared how he used his laptop to transform his instruction through "flipped learning." He smiled and explained "you learn how to better use your device" through those experiences, acknowledging how

access to the laptop "changed the way that I teach." Mathew not only attributed changes in his instructional delivery, but "for the large majority of my colleagues" because he felt teachers could do "more and more things" with the laptop. Similarly, Janice who was fairly new to teaching noted, "I think (pause) the laptop has definitely allowed" and "really aids in a lot of what I teach." She added the teacher laptop facilitated interesting ways to "present ideas," making her instructional delivery "more realistic for students" and "learning fun." While access to the laptop supported instructional delivery, Catherine commented on mindful use of technology to mitigate dependency. She stated "you notice how much you depend on it (laptop)," sharing the need to remain "flexible enough to do alternative teaching."

Greater equality among teachers was an outcome of access to the laptop and was perceived as another factor shared by participants, leading to positive perceptions. While overall perceptions were positive, primary and secondary teachers shared different experiences when the 1:1 teacher laptop program was initially implemented. Nikhil provided historical insights by describing the background and how the 1:1 teacher laptop program was implemented. He explained laptops were only provided to secondary teachers because the school was limited financially due to an economic downturn, leading to a "demoralizing effect" on primary teachers. However, while two participants from the primary expressed feeling less important, they also shared how other primary teachers felt less valued. A third participant who worked previously in the primary school did not share the same sentiment because she was provided with a laptop as a result of not having a classroom. However, the primary school participants acknowledged when

teachers in primary were included in the program, it led to a noticeable and significant change in morale. Nikhil stated he observed a "real increase in teacher morale" because teachers felt they were "treated much more, in a much more professional way." Access to the teacher laptop for all teachers resulted in a sense of "greater equality," leading Nikhil to conclude "people do feel that the school values them within the PYP because they are also participating in the 1:1 laptop program." Jessica echoed Nikhil's sentiment, sharing access to the laptop made primary teachers feel valued and important.

Improvement in personal productivity and professional practice as a result of access to the laptop was perceived as another contributing factor for positive perceptions shared by the participants. Descriptions of participant experiences related to productivity and practice indicated access to the teacher laptop significantly influenced positive perceptions about the 1:1 teacher laptop program. This sentiment was shared by all the participants, leading Janice to state she "could not imagine teaching without it (laptop)," while Elizabeth noted "it's been good having a laptop," and continued to explain the laptop "helped me quite a lot in the way I teach." Participants also commented on their productivity and how access to the laptop supported them to continue working, despite constrains of time and space. Nikhil went further to describe how he was able to reallocate time to work on meaningful tasks, rather than spend time on meaningless and mundane task because he had access to the laptop. Several participants shared examples for how access to the teacher laptop influenced their classroom practice and this was noted through comments like "my pedagogy has changed" and "more purpose" for the use of the laptop. One participant went on to compare his experience at another school,

which did not offer the 1:1 teacher laptop program, stating "you are limited in what you can do."

Access to the teacher laptop was perceived by participants to have facilitated opportunities to improve collaboration through enriched collegial interaction. Several participants shared how they not only used their laptop to strengthen collegial interaction, but also enhance interactions with students. As a self-acknowledged novice user, Nikhil noted the significance of access to the laptop influenced his collaboration and interaction with colleagues. He shared how he used his laptop to engage with the teachers he supported, while availing of opportunities to learn from peers, explaining,

> A lot of the conversations that we used to have with pencil and paper…now…we have…instant access…we can pull up an article to research and discuss…we can in real-time bring out resources…we can in real-time use a Google Doc to develop an assessment…so it's really enhanced the depth and the quality and the speed of collaboration amongst the teachers.

In summary, access to the teacher laptop emerged as an overarching theme, contributing to positive perceptions for the 1:1 teacher laptop program. Study participants perceived access to the laptop was a bonus, demonstrated the school's commitment to support teachers, fostered greater equity among teachers, raised faculty morale, improved personal productivity and practice, increased collaboration through enriched collegial interactions, and enhanced instructional delivery.

Change in Practice

Change in practice emerged as another overarching theme and was perceived by all participants as a contributing factor for positive perceptions about the 1:1 teacher laptop program. Participants acknowledged the influence on professional practice by sharing how they moved from a teacher-centered to a student-centered approach, reduced the use of paper, provided timely feedback, collaborated with colleagues, transformed their instructional delivery, and used online resources to support student learning.

Ashok noted his practice had changed from a teacher-centered to a student-centered approach as a result of participation in the 1:1 teacher laptop program. He shared time spent in front of the class teaching students had significantly decreased, claiming "I suppose my pedagogy has changed as a result." Ashok went on to explain,

> The nature of my interactions with students has changed quite considerably…I am not in front of the class. Teaching has been significantly reduced. An awful lot of the materials that I would have presented from the front of the class, I no longer present in front of the class.

Similarly, Mathew noted how the 1:1 teacher laptop program helped to "augment" and "support learning" because it facilitated "access to a lot more media and data and information." Mathew explained participation in the program "dramatically changed" practice, inspiring him to adopt a more student-centered approach by using technology to flip his classroom. He elaborated on his practice by explaining

> I do a flipped learning…I have created over 50 videos on YouTube…my first two videos were me filming myself and my PowerPoint presentation, and talking over

> it…through work with colleagues and with students, they showed me how to use QuickTime to do that more effectively.

Participants from both primary and secondary shared how practice changed as a result of reducing the use of paper for teaching and learning. Participant noted a shift from using paper to digital resources, when teachers recognized the potential of technology to share teaching and learning materials with each other and students through online platforms. Ashok shared "a lot of the paper has disappeared" as result of using technology. He noted he had observed teachers using online platforms like Google Classroom to "intervene in a way that was not possible…via paper," in supporting student learning. Ashok mentioned as a result of substituting paper with technology to deliver assignments, he was able to compare and contrast student work in real-time. Consequently, Ashok monitored student performance to gain an "overview of the progress of the class as a whole." Janice summarized the sentiments of other participants, explaining she was concerned and "always looking for ways to reduce paper usage." This led her to explore alternative ways to reduce reliance on paper by using the laptop to access online collaborative platforms, saying

> Definitely allowed me to explore new programs…like…Google Docs and Google Slides…makes things…easy. I would not have even known to go to Google beforehand.

Timely feedback was a perceived change in practice as a result of participation in the 1:1 teacher laptop program. Several participants shared examples for how participation in the program facilitated timely feedback for teachers and students. Nikhil

shared his experience for how data were collected and analyzed using a paper-based system in the past for a primary Math assessment. Subsequent to the introduction of the 1:1 teacher laptop program, the assessment was administered using an online system. Nikhil described the change in practice as follows:

> A few years ago we were running a book-based Maths assessment…teachers would enter the data on sheets of paper and I would analyze it all and feed it back to the teachers as a Maths coordinator. Now, because we have these laptops…the quality and the depth and the information…is at a much greater level.

While Nikhil appreciated how this change in practice took "away a lot of the repetitious sitting work." He also noted the speed with which data were analyzed and the timeliness of feedback, allowing teacher to design appropriate learning interventions to improve student learning. Like Nikhil, Ashok, and other participants also noted how use of the laptop not only facilitated tracking of student progress and performance, but also enhanced the speed and quality of feedback students received. Several participants shared their use of online collaborative tools and Google Classroom in particular to provide students on-going formative assessments and real-time feedback. Jacobi summarized his experiences by sharing, if he wanted to provide feedback to students he would use an online collaborative tool like Google Docs. He went on to say,

> If a student needs to reach me and it's not within classroom time, then he or she will do it…requesting feedback on Google classroom or directly on a piece of work in Google Docs…I believe this is an advantage.

As the ICT coach, Jacobi mentioned how he used an online platform to not only share learning resources with teachers, but provide timely feedback. Jacobi described how he provided feedback, sharing

> For instance…placing comments…on a Google Doc…as a sort of coach…collaboratively and in real time…this is a process which would not have been possible had we not been using this technology…I could monitor…in real time…without having to move around…looking over people's shoulders…I can interject comments and feedback.

While Mathew did not provide specific details, he shared how he used software-based data analytics and tools to track student progress and achievement data to provide timely feedback to teachers, students, and parents. Mathew noted he was unaware he could use his laptop to track student performance data until he learned how to do this. Mathew described his experience, explaining

> I do a lot…I design curriculum…game revision…track student progress…all driven by the laptop…there is more and more things that I do with a laptop.

Collaboration with colleagues was another perceived change in practice as a result of participation in the 1:1 teacher laptop program. Nikhil, Elizabeth, Janice, and Jessica all shared how collaboration with colleagues changed over time as result of using technology. They highlighted use of online platforms to engage with peers through synchronous and asynchronous interactions. Jessica noted, she not only used her laptop to document and share minutes of weekly meetings, but at times used the laptop to facilitate

collective discussion and development of instructional materials with colleagues, explaining,

> I think it allows teachers to be able to continue to work and especially work collaboratively…because I have the laptop it allows me to work when I cannot be in my classroom…with like Google Docs…when we are all in meetings, we are all able to document and add to the minutes.

Similarly, Nikhil shared his use of the laptop during meetings to plan, document, and post follow-up actions through an online space to improve collaboration and access. Furthermore, Nikhil provided a recent example for how he used his laptop to learn from a colleague, sharing

> Teachers are now at the point where they are starting to teach each other…I was with a teacher this morning who was showing me how he uses his laptop to set up and run reading groups for his class. Now without having the laptop, that just would not have taken place.

Janice shared a different experience for how she co-planned a presentation for a conference with a colleague. She explained because of time and other constrains, she could not create the presentation face-to-face with her colleague. However, using the laptop and an online platform, Janice was able to collaborate with her colleague to create the presentation. Janice described her experience by sharing "seems like Google Slides made it that much easier because we did not have to…sit together" to create the presentation.

While several participants noted real-time collaboration would have been difficult or limited without the teacher laptop, Ashok did not share the same sentiment. Despite acknowledging he could not do without his laptop for work, he was reluctance to use technology to collaborate because he had no interest in using the laptop beyond his work, explaining

> Whilst my laptop is extremely important for me to do my work…could not really work anymore without it. Once my work is done, my interest in computers…I have pretty close to zero interest in them outside my working life.

Adaptation of instruction was another source of perceived change in practice as a result of the 1:1 teacher laptop program. Elizabeth explained how the use of the laptop augmented her instructional practice. She noted she was no longer talking as much to her students from the front of the class, but engaged them through autonomous learning using a host of technology-based resources such as online videos, interactive simulations, and animations to improve quality of instruction. She shared her use of online resources to support student learning was a change in her practice. While Elizabeth indicated she had made progress with the use of technology, she admitted could have explored and used technology more to supplement her instruction. Similarly, Mathew shared he was less reliant on textbooks and noted how this transformed his instructional practice, stating technology had "overtaken their (students) need for a textbook." Like Mathew, Catherine was encouraged to explore alternate ways to deliver instruction. While she initially used her laptop only to project text-based instructional materials, Catherine explained with increased confidence and skill she started to use the laptop as an interactive learning tool.

She found interesting alternatives for instruction through the use of videos and software to teach grammar. While Catherine did not provide specific details, she explained how she used the laptop to create a "fun lesson" that "involved either doing a grammar game on the computer or showing films on the computer." She described the outcome of the change, explaining

> I started to use it technically very much to show most of the time…educational films in German…a specific program to teach grammar and now remember…especially in Primary, the kids enjoyed it a lot when we used the computer.

Unlike Catherine, Janice used her laptop to create interactive lessons and slide shows to enhance instruction in more interesting ways to motivate "students to be that much more engaged in the language learning." She shared how she used a software program called Quizzlet to create interactive quizzes and her laptop to read text to improve student reading comprehension, explaining

> Instead of having me read because with a class of 20 you don't have time to read to one student. It (laptop) allowed students and allowed me to have that opportunity…to have the text read to them so that they can have full understanding.

Use of online resources to support learning was perceived as another change in practice by participants. Ashok shared the outcome of his use of online resources, explaining

> The use of the laptop has enabled me as a classroom teacher…to share with my students resources electronically as opposed to hard copy…this has cut down enormously in the amount of time I have to spend and has made access to the curriculum.

Like Ashok, Elizabeth noted how using online resources helped her organize and share work with peers and students. Similarly, Jessica explained her use of the laptop to keep "current on our documentation" by sharing and collaboratively co-creating documentation. On the other hand, several participants including Nikhil and Jessica referred to real-time and immediacy of access to resources, which encouraged teachers to explore and use online collaborative platforms. As a learning leader, Jessica shared her use of online resources, stating she felt "more prepared" before meetings. Like others, Nikhil shared online resources changed the way he interacted with teachers, leading to more "real-time conversations" as a result of his "ability to instantly access" information. Nikhil also commented by saying, online resources saved "an awful lot of work," allowing better use of time for increased engagement with teachers. He went on to say "we are actually having conversations…you can get much more quickly into the heart and the depth of the conversations…which is about learning."

In summary, change in practice emerged as an overarching theme and contributed to overall positive perceptions for the 1:1 teacher laptop program. There were several factors and sources of experience that contributed to perceived change in practice and these included shifting from a teacher-centered to a student-centered approach, reduction in the use of paper, timely feedback, collaboration with colleagues, adaptation of

instruction, and use of online resources. One participant summarized the outcome of perceived changes in practice by stating, participation in the 1:1 teacher laptop program "has really added value to the learning of the students" and this "matters the most."

Support Structures

Support structures emerged as another overarching theme. Overall, findings indicated participants viewed support structures as a significant contributing factor towards positive perceptions and experiences for the 1:1 teacher laptop program. Participants shared experiences through different sources of workplace structures and these included ICT technical support, instructional support, professional development, informal collegial interaction, and shared resources.

Several participants acknowledged the technical support they received from the ICT department and recognized the value of this support to address and resolve technical challenges. Participants highlighted the timeliness and quality of support and shared how ICT support structures helped smooth transition into the program, leading to comfort for the use of the teacher laptop. Like other participants, Nikhil mentioned the ICT department and noted the support he received from the ICT personnel as an important contributing factor for the development of his own technology proficiency and the successful implementation of the 1:1 teacher laptop program. Nikhil summarized his experience, sharing

> We have a strong ICT tech department…they have been constantly available and any questions are instantly answered. So having that, those (ICT) personnel available whenever there is a question is really important.

Similarly Ashok shared,

> We have quite a large and very supportive ICT team and whenever I have needed any technical assistance it has been provided almost immediately by colleagues, if circumstances allowed immediate intervention.

Jessica also commented on how ICT department support raised her comfort level for the 1:1 teacher laptop program. Like Nikhil and Ashok, she explained she could avail of ICT support when needed, noting in particular the timeliness of support. While Jacobi and Mathew shared they needed little support from the ICT department because of their comfort level with technology and prior experience, they acknowledged the importance of ICT technical and other support structures. Mathew noted support was needed for teachers "as we become more reliant on laptops," especially for teachers "where there was more of a learning curve."

Several participants mentioned the need and importance of instructional support to use technology effectively for teaching and learning. Participants shared how they received instructional support from peers, the head of department and ICT coaches. Participants from Primary and secondary shared the value of the instructional support they received from the ICT coaches to improve teacher technology proficiency and technology efficacy. Jessica described timely instructional support was significant and "really helpful." While she perceived herself as "self-taught," Jessica also attributed increase in her comfort level for technology to the support she received from the ICT coach, sharing

> I met with (ICT coach) and he taught me to use Google Docs … that was really helpful … he also showed us like Google Classroom and Google Calendar.

Like Jessica, Elizabeth also appreciated the support from the ICT coach to advance her own technology proficiency. On the other hand, Janice attributed increase in her comfort level for technology to the support from her head of department, who was also the ICT coach, explaining

> In my second year here, we introduced Google and I worked closely with my Head of Department. I was able to see the importance of Google even before we had officially introduced it…did not know much about Google Docs and the Google system…since then I am a complete convert…I feel like it has just been so productive.

While most participants noted the value of instructional support from peers, the head of department, and ICT coaches as significant in improving technology proficiency; Ashok said he had to "fend for" himself for the most part. Ashok attributed his progress with learning about technology and changes in practice to "learning by doing." He stated "I have felt very much on myself as an individual to find ways to make ICT work." He went on to stress the need for departmental ICT instructional support, sharing

> At times I would have appreciated a little bit more of a hands-on approach. (Pause) There are some extremely technically able colleagues in my various subject areas and I think it's fair to say all of my heads of department in the last 6 or 7 years have been technically much more able than I have and have not necessarily helped me individually to become a more efficacious user of ICT.

Participants identified professional development as another important source of support and contributing factor for the successful implementation of the 1:1 teacher laptop program. However, some participants expressed different experiences related to the format and focus of professional development workshops. Like most participants, Nikhil shared how attending professional development workshops offered by the ICT team and members of faculty raised his technology proficiency, commenting

> There was a good series of professional development opportunities…by a couple of members of the (IT) team…going through various programs, learning about different things and that was very good.

Nikhil also commented on the learning during workshops by working with peers to experiment with software, explaining

> The ability to just sit and experiment as well…with different people…what will happen now is somebody will…look at something like, oh, look at this. Fantastic, let's send it out to everybody.

Similarly, Catherine availed of workshops offered by the ICT team, commenting professional development workshops helped her find "more purpose" and ways to use the laptop as an instructional tool. She also explained how workshops enabled teachers to learn from each other, revealing how she shared prior experience and the use of an online student support diagnostic tool at a book publishing company. Catherine noted the reason she felt confident to share was because professional development workshops fostered building relationships with "specific people that I could talk to if I had a problem." While Catherine appreciated formal workshops, she found personalized sessions more useful in

addressing her needs “because you get what you need specifically” and “because…I quickly saw, oh, this is good.” She also commented personalized sessions did not overwhelm her, but encouraged her “to use (the laptop) actively rather than learning too many things.” While Catherine shared she felt overwhelmed at formal workshops, Elizabeth and other participants expressed a preference for personalized sessions because they were focused and targeted. Elizabeth summarized this sentiment, sharing

> We had little workshops…I think those are some of the things that have really, really helped make my, uh, teaching a lot more progressive, a lot more effective.

While participants appreciated the professional development workshops, several participants expressed the need for focused workshops to target specific areas and ICT proficiency levels. Janice said “the school has offered a lot of professional development,” and Nikhil commented he noticed “there has been less last year and this year.” He shared he would like to see more professional development workshops offered on a more frequent basis. Participants noted the importance of frequent workshops for successful implementation of the 1:1 teacher laptop program. Both Elizabeth and Catherine suggested considering format and style of workshops to maximize learning. Jessica and Elizabeth also suggested rearranging meetings to accommodate professional development workshops, in overcoming limitations and constrains of time and schedules.

Informal collegial interaction was perceived as another source of support identified through participant responses. Participants shared experiences for how informal collegial interaction nurtured comfort for technology through increased technology proficiency. Jacobi perceived himself as a “self-guided” learner, attributing most of his

"learning by doing or exploring new things," and also acknowledged learning through "word of mouth and hearing of specific apps or strategies or ideas from other colleagues." He commented, he found informal collegial interaction provided teachers "very valuable" peer-to-peer learning support. Like Jacobi, Nikhil shared his insights and experiences by describing a situation where he interacted with peers to review online learning resources. During this interaction, Nikhil revealed he was introduced to a website called Cult Pedagogy. He went on to explain how his peers demonstrated the usefulness and functionality of this online resource to improve student learning. Nikhil remarked he found this interaction provided valuable learning, stating

> Somebody has now sent the link out (Cult Pedagogy) and it forms a part of our collaborative planning discussions, so teachers are now at the point where they are starting to teach each other.

Nikhil continued with another more recent experience for how he collaborated with a teacher who showed him how to create reading groups, noting

> Certainly in terms of the technology applications, I was with a teacher this morning who was showing me how he uses his, uh, his laptop to set up and run reading groups for his class. Now…without having the laptop, that just would not have taken place.

Like Nikhil, Janice also shared she valued informal collegial interactions because it advanced the development of her technology proficiency. Consequently, Janice's positive experiences led to support colleagues in her new department through informal

interactions. She explained how she share her technology skills across curricular areas and departments, stating

> I have been able to as well pass some of that knowledge on, moving from the Language Acquisition Department this year to the Humanities Department. Definitely sold them on the importance of Quizlet…across curriculums.

Shared resources were another source of support identified through participant responses. Several participants commented about the value of shared resources hosted by their colleagues. Participants noted shared resources not only provided useful support, but mitigated constrains of time and need for direct interaction. Other participants shared Ashok's perception for the value of shared resources when he stated "resources have been shared and that has provided me with insights into what other colleagues have done." Janice provided another perspective for how she used shared resources to support student learning, explaining

> A lot of it was done with book…writing things down, having students copy, having students use things like flashcards…nowadays very outdated and very difficult to sell to students…allowing them (students) to have that extra level (online shared resources) makes it easier for them to access.

Janice went further to share how she used shared resources to provide student feedback, stating

> It is completely just opened a whole new world…multiple methods of feedback…one of the things I like to use is not only Google Docs feedback, but Screencast is great, especially when you are doing a longer text and let's be

> honest, the students don't read all your comments anyway…to allow them the option to listen to comments…give some feedback.

Like Janice, Elizabeth also described a similar experience using shared resources with her students, stating

> When Google Classroom came in I realized how effective it was to get through to students…this was more direct and I could see that they could access the work and it was easy to communicate with them and that's what I liked about it.

Nikhil shared how he used shared resources to support teaching by posting the analysis of data and results from an online assessment within 24 hours, allowing teachers to focus on the quality and depth of learning, rather than "doing silly work." He provided details for how he used online shared resources to plan and collaborate with colleagues, noting the ease and speed of access, sharing

> Now…we have instant access…we can pull up an article to research and discuss…we can in real-time bring out resources…it's really enhanced the depth and the quality and the speed of collaboration…depth of collaboration…depth of learning we can offer the students is much greater.

Like Nikhil, Jessica found shared resources supported her personal productivity because she could access resources anytime and anyplace. Furthermore, she noted access to shared resources allowed her to actively collaborate with her colleagues, in overcoming constrains of time and schedules. She went on to explain,

> It allows me to work when I cannot be in my classroom…and with Google Docs…when we are all in meetings, we are all able to document and add to the minutes…I think it's invaluable.

Other participants shared similar experiences related to flipping their classroom. They described the use of the recording feature on the laptop to create learning materials, which were subsequently posted to an online shared resource. Mathew explained how he recorded his presentations and posted them to YouTube for students to access. On the other hand, while Jacobi described similar experiences, he also commented on his use of shared resources to create volumes and collections of bookmarks because he viewed himself as a "hoarder of information." He explained he was able to easily add and share this resource with colleagues to support their learning. On the other hand, Elizabeth smiled and noted she had not maximized the use of shared resources in her teaching, explaining

> Using this feature of recording the lesson and then making it available to students, which I have not been able to do and the other one is flipped classroom where I can record what I want to teach and then they could go through it.

In summary, support structures emerged as an overarching theme from multiple sources and included ICT technical support, instructional support, professional development, informal collegial interaction, and shared resources. While levels of perceptions and experiences differed, all the participants acknowledged the value of support structures for the development of their own technology proficiency and efficacy, leading to positive perceptions for the 1:1 teacher laptop program.

Concerns and Barriers

Concerns and barriers emerged as another overarching theme. While overall perceptions for the 1:1 teacher laptop program were positive, participants also shared workplace and personal experiences that contributed to perceived concerns and barriers. General areas of concerns and barriers shared by the participants included professional learning, instructional support, time, shared resources, transition into the program, purpose, value, autonomy, appropriate use, balance, dependency, learning curve, personal motivation, impact on students, and equal access. However, the most significant and recurring concerns were related to professional learning and instructional support, while time was perceived as a barrier.

While study participants shared they valued and appreciated the support they received through professional learning opportunities, several participants were also concerned. The participants commented on the importance of on-going professional learning, and also raised concerns about focus and format of workshops, suggesting the need for more targeted professional learning. Catherine provided details of her experiences by saying while she valued professional learning, she felt overwhelmed during workshops and did not personally find them useful. She expressed feeling exhausted at the end of workshops because of the number, duration, and range of topics covered, explaining

> I appreciated the workshops we did at the beginning to kind of get a feeling for what I could do with IT or what school wants me to do with IT. But at the same time…I always felt overwhelmed when we had like five workshops for 50

> minutes each day. It's like I'm not going to remember any of this because it's just too much.

Catherine went further to describe why she felt intimidated during workshops, explaining

> Sometimes I find the workshops intimidating because you see so much that you feel like you are not going to handle it or you think I don't need this? I don't know how to use it. I don't know where it fits in for me.

On the other hand, Janice explained "being a much younger teacher, I tend to not struggle as much with technology." However, she expressed concern by saying "trying to stay a step ahead of students is somewhat difficult" and "learning from them and not being afraid to learn from the students" was not easy for some teachers. While Janice noted value in attending workshops to overcome the "learning curve" and "learning of different programs," she shared teachers who did not attend workshops or were reluctant to seek help "from the IT department" was a concern. Jacobi noted the proportion of teachers engaging in IT-related professional learning was "very small."

Janice commented on the lack of targeted workshops as a concern for some teachers, especially the teachers who were less technology proficient or new to the 1:1 teacher laptop program. She went further to explain how this led "to become very complacent with the technology." Jacobi expressed concern for the need to offer more learning opportunities, stating "if there is any aspect where I think as an institution we have not done as well as we could, it is precisely the area of professional development." Similarly, Ashok's perception was "at the moment that support at an institutional level is not there." He went further to say if the expectation of the school was for all teachers to

integrate technology, he said “they should be supported” through professional learning opportunities. Several participants shared similar sentiments, stating “I think that could be helpful.” However, Nikhil was the only participant who explicitly commented he missed the workshops, commenting on the need to “bring back the professional development sessions” to move along the technology learning continuum and “go to that next level.”

Other concerns related to professional learning were shared by other participants. As much as participants perceived professional learning would help better prepare teachers, Janice expressed her concern for the need to remain less reliant, finding “balance and ways to work without technology,” sharing

> What happens if my computer breaks down tomorrow, what happens if the Internet's out…you have to figure out how to make, make that work not only for you but also for student learning.

While Nikhil and Jessica noted equal access to a teacher laptop helped mitigate “resentment” among teachers, they shared access to the laptop supported and enhanced participation and engagement in workshops. Jessica also commented on the value of equal access to maximize outcome of workshops, stating “I think it (laptop) empowers people, it (laptop) makes them feel valued and, and helps them to stay current.”

The second major concern expressed by all participants was related to the importance of instructional support, in gaining knowledge and skills to use technology for instructional change. While participant suggested a variety of ways for how instructional support facilitated learning, Ashok summarized the need for “more subject

related, input and assistance." He shared perceptions of feeling "very much left to my own devices," describing subject-specific support was "piece meal." Ashok was the only participant who expressed the need for "teacher appraisal" related to technology integration as a way to overcome lack of systematic implementation of instructional support, explaining

> If a school is going to commit as an institution to a laptop program that involves all teachers and all students…then it needs to be much more systematic in its approach to pedagogy.

While Ashok mentioned the need for a systematic approach, Jacobi made a recommendation through his prior experience as an IT coach, stating

> If we made learning time…available to be on-going in a structured manner but also flexible manner where they (teachers) could decide what things to learn and how to tackle them…perhaps enable people to learn from each other…I think this could be really transformative for us as an institution and for the individual.

Similarly, Elizabeth expressed the importance of instructional support to change practice through application of technology, saying "I would like to see a little more proactive, you know, progress with using" my laptop to improve student learning.

Participants also shared the value of instructional support to address the "negative implications" of teaching and learning within a 1:1 program. While Mathew viewed technology as an enabler of learning, he expressed the need for balance by exploring "distraction" caused by technology. He suggested instructional support could address issues related to "attention spans" and how "laptops might be impacting" and redirecting

"our attention." On the other hand, Janice shared a different perspective for the importance of instructional support, stating "new teachers who maybe have not taught using a 1:1" might find it difficult to "transition into a 1:1 program." She went further to say, she did not face challenges during her transition into the program because of prior experience. She explained, "I feel like there are some people who really struggle with the 1:1" and "they do not maybe want to admit" they lacked knowledge and skills for technology. Janice suggested on-going instructional support as a way to understand and address "some of those difficulties," in supporting teachers, especially teachers who "tend to struggle a little bit more" with the use of technology.

Jessica provided more insights by describing herself as a "creature of habit," sharing she only used software applications she was comfortable with. However, she felt she "could be probably instructed more about programs" she did not know and "how they (software applications) could help." She acknowledged, she was "very stuck in like what works for me and what I know," recognizing the need for on-going instructional support through engagement with teachers. Jessica also suggested instructional support could provide strategies to overcome "dependency" on technology and balance with the use of technology.

While participants perceived professional learning and instructional support as concerns, time emerging as the most significant barrier. Several participants shared directly or indirectly how lack of time limited learning or opportunities to explore technology within their practice. Some participants noted lack of time was a consequence of poor planning. Other participants suggested ways to overcome this barrier through the

use of online collaborative platforms, shared resources, and better organization of meetings. Study participants also suggested informal collegial interaction and personalized workshops could help overcome constrains of time. When asked how the 1:1 teacher laptop program could be improved, several participants indicated shorter and focused workshops could not only help optimize use of time, but facilitate improvement in technology proficiency. Elizabeth claimed learning about technology "has become voluntary" and teachers have to "find the time to go." Like Elizabeth, Jessica shared how meeting times were not planned to boost productivity, suggesting "a bit of our time that we spend on our usual meetings could be used to develop the 1:1 program." Jacobi summarized perceptions related to the use of meeting time, saying

> If some of the meeting time were to be devoted more and explicitly for our learning then I think that it would be really valuable…I am quite sure that the majority of our staff would subscribe to what I'm saying now.

He summarized sentiments of other participants by stating

> Sometimes we are so overburdened with somewhat menial tasks that are regretfully required of us that we don't really have the time to explore and learn new things, which would allow us to make better use…productive use of the resources…I think we could do this a lot better by devoting more time…raising the visibility of the importance of learning…I think it really would be appropriate and beneficial to devote more time to something that we know is going to have…positive ramifications.

Besides the two concerns related to professional development and instructional support and lack of time as a barrier, participants shared other concerns because they were eager to help improve the program. Consequently, another concern shared by a participant was the lack of appropriate learning resources. Janice suggested the need for subject-specific learning resources such as relevant software lists and websites. On the other hand, Ashely commented having a list of subject-specific learning resources would not only support teachers, but mitigate limitations of time. Jacobi went further to say how structured and organized resources "would benefit everybody" and "I do mean everybody, teachers, nonteaching staff, and students."

Another concern raised by Elizabeth was transition, explaining her transition into the 1:1 teacher laptop program was "quite daunting" because she was unable to determine purpose and value. This led Elizabeth to express, "I still don't think I have achieved maybe 50 percent of what I could have potentially achieved." Her perception of underachievement was a result of feeling technology being "shoved down my throat." However, Elizabeth was open to admit with a smile, saying

> I am not somebody who gets extremely excited about…this kind of technology. I'm happy to use it and I'm happy when somebody shows me something that is good, but I'm not somebody who would go explore (laughs).

Jessica was the only participant who mentioned the need for autonomy. She perceived if teachers had permission and capacity to install software and system updates in a timely manner without "having to contact the IT people," it would increase productivity. Jessica was also the only participant who shared availability of "charging

stations within the school" as a barrier. She noted when her laptop was out of charge she was constrained, saying it "inhibits things from getting done."

Appropriate use, dependency, and balance were other concerns shared by some participants. Jessica commented on the importance of appropriate use of laptops, especially during meetings. She shared her observations of teachers sometimes going off task during meetings because they were distracted, suggesting the need for "computer etiquette" by saying

> Use your computer in meetings where it is needed, and if it's not needed then we need to have some type of essential agreements that say you close down your computer.

Learning curve and personal motivation were two other concerns shared by a few participants. Nikhil indicated he was "on a massive learning curve." Like Debbie, he commented he was comfortable with what he knew because he was unaware of all the possibilities, sharing

> I sometimes forget that when I am working on my own because it does everything that I personally needed to do and it's only when you are exposed to the newness that you realize there's a whole other world and you're just scratching the surface of it.

Nikhil described himself as "old-fashioned teacher," since he preferred the traditional non-technology approach to teaching. He explained how his preference might have influenced his initial motivation to use technology, raising questions about "using the right tool for the job…and still never quite sure." It also led him to question if schools

were “using technology for all the right reasons or are we using” technology “because it's there or because we have them.” On the other hand, Elizabeth shared she felt inhibited because

> I'm not somebody who can play along with the computer and come up with applications and those kinds of things. So that has been a factor that has influenced me to move forward.

Elizabeth went further to say,

> But the other factor that has inhibited me from moving forward is simply, I'm not a technical person and I would rather read a book (laughs) than play around with a laptop.

Elizabeth was the only participant who shared motivation to learn was influenced by perceptions of students’ ability to use technology. She said “students definitely know a lot more than we do,” resulting in feeling embarrassed because she lacked the “skills in using computers,” despite being the subject expert.

While all participants acknowledged the potential of technology to improve student learning, Elizabeth was the only participant who expressed concerns for the “impact on children.” She shared her perceptions for how learning had shifted and “how their (student) interaction with us has changed.” This led her to question if student “language skills, their writing skills” were declining, remarking “maybe it's not important for students, children to know the spelling.” Elizabeth was also concerned if “our jobs would become redundant” and “computers will take over education and children will no

longer come to school," questioning "Is it good or bad? It's something we've created, but whether it's going to be good or bad, (laughs) time will tell."

Despite the implementation of the 1:1 teacher laptop program in both primary and secondary, two participants shared through prior experience the importance of availability and equal access to the technology for all. While Jessica mentioned staff morale was a concern if teacher assistants were not provided a laptop, Nikhil summarized the sentiment by saying

> I think it would be good to have full 1:1 laptop coverage…I think if we're going to go down this route…then it needs to be full coverage for all staff members regardless of position within the school, which means…all teaching assistants should have a one…because you do see that affecting them…their morale…some of them feel they are just not worth it.

In summary, findings through analysis of the data collected for the first research question revealed participants generally held positive perceptions for the 1:1 teacher laptop program. The three overarching themes contributing to positive perceptions emerged from multiple sources of experiences and included access to the teacher laptop, change in practice, and support structures. While a fourth theme emerged related to concerns and barriers, responses indicated participants were willing to share their perceptions and experiences to help improve the outcomes of the 1:1 teacher laptop program. Access to the teacher laptop was identified as an overarching theme through lived experiences and included perceptions of the teacher laptop as a bonus and the school's commitment to support teachers, promotion of greater equity among teachers,

increase in personal productivity, improvement of faculty morale, enhancement of performance, increase in collaboration, support for learning, and augmentation of instructional practice. On the other hand, change in practice emerged as an overarching theme as a result of experiences in the following areas and included shift from teacher-centered to student-centered learning, reduction in the use of paper, facilitation of timely feedback, collaboration with colleagues, transformation of instruction, and use of online resources to support student learning. The third overarching theme was support structures, which emerged through experiences related to IT technical support, instructional support, professional development, informal collegial interaction, and use of shared resources. While concerns and barriers emerged as an overarching theme through two significant sources of concerns, namely professional learning and instructional support; lack of time was perceived as a barrier. Findings also revealed the overarching themes overlapped with each other because of interrelated experiences.

Research Question 2: Factors Enabling or Inhibiting Technology Efficacy

In the following section, I present factors enabling or inhibiting technology efficacy through an analysis of perceptions and experiences of participants in the 1:1 teacher laptop program. Literature on technology efficacy suggests belief in an individual's ability to complete a technology task is based on the individual's perceptions, attitudes, and judgements; rather than on skill (Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016). While there are multiple sources of experiences, literature on self-efficacy indicated four factors influence self-efficacy and included experience, modeling, social persuasion, and physiological responses (Bandura, 1977).

Literature on adult learning suggests adult learners have a need to not only know the why and what of learning, but how learning occurs (Knowles et al., 2015). Furthermore, adults develop self-concept through ownership and autonomy to direct their own learning (Knowles et al., 2015). The adult learning model used as the conceptual framework for my study indicated prior experience, readiness to learn, orientation to learn, and motivation to learn were factors related to how adults learn (Knowles et al., 2015). The three overarching themes that emerged from this study were attitude towards technology, self-directed learning, and perceived value.

Attitude Towards Technology

Attitude towards technology emerged as an overarching theme and perceived as an enabling factor, in raising participant technology efficacy. Overall, responses indicated participants shared positive attitudes towards technology as a result of their participation in the 1:1 teacher laptop program. While findings derived from responses to the first research question indicated the study participants were generally positive about the 1:1 teacher laptop program, the most significant enabling factors leading to positive attitudes were perceptions of improved personal productivity and change in practice. Participants indicated engagement in the 1:1 teacher laptop had provided opportunities to use technology in constructive ways to enhance personal productivity. Furthermore, several participants shared how their practice had changed over time as a result of the 1:1 teacher laptop program, influencing attitudes towards technology. Evidence of changes in instructional practice and pedagogy were shared by primary and secondary teachers through their experiences. Regardless of the degree of change, study participants

perceived change was a positive outcome of participation in the 1:1 teacher laptop program. Ashely described her teacher laptop was an “invaluable” tool, enhancing her productivity and instruction. She commented “I think we really need to have it.” Ashley’s attitude towards technology was also reinforced because she perceived technology as a catalyst for school improvement, referring to the 1:1 teacher laptop program by saying “I think it's a big step in the right direction.”

Two primary teachers referred to morale and explicitly stated how the 1:1 teacher laptop program boosted faculty morale when all primary teachers were provided with a teacher laptop. The references to faculty morale indicated how the teacher laptop was a significant contributing factor in nurturing positive attitudes towards technology. While participant attitude towards technology changed because the teacher laptop was perceived to have equalized access to learning resources, attitude towards technology also changed when teachers realized the potential of technology to support and enrich the learning environment.

While Nikhil considered himself more of a traditional teacher because of his conservative views about technology, he shared his attitude towards technology changed significantly after he found different ways to use his laptop to increase personal productivity. He also mentioned his attitude towards technology shifted when he overcame his “fear of the unknown” by learning to use technology through professional development workshops. This resulted in more effective use of the laptop, leading to confidence and development of his own technology efficacy. Like Nikhil, other participants from primary and secondary revealed how attitude towards technology

changed as a consequence of informal collegial interactions and personalized workshops. Catherine explained how her use of technology changed from just using the laptop to project instructional materials to using interactive resources to engage students in learning. Similarly, both Janice and Elizabeth commented on their innovative use of technology, including providing students with timely feedback. Each of these experiences reinforced the potential of technology to support teaching and learning, which in turn resulted in influencing positive attitudes towards technology.

While Catherine was the only participant who rated her comfort level with technology, she summarized the perceptions of several participants by explaining when she first joined the program she was not very technology proficient. She rated her comfort level at a "two out of 10." However, like other participants, with support and continued learning her comfort level changed, leading to positive attitudes towards technology and increased technology efficacy. Subsequently, she rated her comfort level "at a seven to an eight, now." Catherine's change in attitude towards technology led her to share how her role had transformed from a teacher to "facilitator or mediator." She perceived this was a positive change as she was emboldened to "go around and learn and try to support" student learning with confidence, which increased her technology efficacy. Ashok who harbored initial reservations, summarized the perceptions of other participants when he said, "My teaching has changed arguably for the better" as a result of change in attitude towards technology.

While all the participants shared changes and how attitude towards technology influenced productivity and practice, two participants from the secondary revealed how

attitude towards technology negatively influenced their progress with the use of technology. Ashok shared his reluctance and reservation to use the laptop during the first year of implementation was a result of his attitude towards technology. Ashok described how he put the laptop in a corner of the classroom and opened it occasionally. He also shared he had "zero interest" in using technology "outside my working life." Ashok acknowledged he "could have engaged more readily" and recognized this was "bound to have some sort of impact I think on perceptions and attitudes." However, with support from the IT department his attitude towards technology changed, encouraging him to explore and learned how to use the laptop. Furthermore, through observations of teachers Ashok shared how he replaced paper-based learning materials with online shared resources, leading to a change in instructional practice towards a more student-centered approach. His attitude towards technology continued to change positively as he discovered ways to use the laptop to monitor student progress and provide timely feedback. Each new experience led Ashok to further develop his comfort with technology, directing him to remark,

> More and more, I came to appreciate the advantages of using the laptop and became more comfortable using by doing with the laptop…to the point now where I feel very comfortable.

Like Ashok, Elizabeth had initial reservations about the 1:1 teacher laptop program. She described her experience when she first joined the program as "daunting." However, through personalized support from the IT coach her attitude towards technology changed. This change also resulted in her willingness to learn from students, saying "I am quite

comfortable compared to when we first started." Elizabeth acknowledged her reservations were based on her initial attitude towards technology, explaining she was not "somebody who gets extremely excited about this kind of technology" and not "somebody who would go explore" technology. She acknowledged lack of confidence also influenced her attitude, sharing "it's got to a stage where our students definitely know a lot more than we do."

Findings from my study indicated, positive attitudes towards technology was an enabling factor to raise participant technology efficacy. Jacobi and Mathew were always positive towards technology. Jacobi's attributed the reason for his positive attitude was because he perceived himself an "enthusiastic proponent" and "uniquely predisposed" to technology. Jacobi believed in the "transformative power" of technology and acknowledged through his experiences as an IT coach that technology had not only helped him, but supported teachers to transform practice and pedagogy. Like Ashok, Jacobi shared his use of an online collaborative platform to track student performance and provide timely feedback to improve student learning. While Jacobi acknowledged positive attitude toward technology was an enabling factor in raising teacher technology efficacy, he went on to say "this has been a really transformative experience and I think it has really benefited the students." Like Jacobi, Mathew's positive attitude towards technology resulted in "a high degree of comfort" and "a high degree of efficacy" for the use of technology. This led him to perceive a higher level for his own technology efficacy. Mathew described himself as a "nerd" and feel "pretty Gung Ho" with the use of technology, as a result of his positive attitude. Furthermore, his positive attitude

towards technology led him to an area he was not familiar with, encouraging him to use strategies to flip his classroom practice. While Mathew expressed possible negative implications of technology, his positive attitude towards technology led him to say, “It’s very likely that the negatives don’t outweigh the positives.” Like both Jacobi and Mathew, Janice was comfortable with the use of technology because of her prior experience. While she noted she was “pretty comfortable working the laptop,” Janice shared “there was a learning curve when it came to using the computers in the classroom.” However, she attributed positive attitude towards technology helped raise her own technology efficacy, overcoming challenges she faced with the use of technology.

While some participants described their learning style, responses from other participants provided insights for how the teacher laptop supported their learning styles, which in turn led to a change in attitude towards technology. When Ashely learned she could use the laptop to support her auditory and visual learning style, it encouraged her to use technology to find appropriate digital media and resources. She explained “listening to podcasts have really increased my educational know how and understanding,” while noting if it had not been for technology she would have been limited with her learning. This in turn influenced her attitude towards technology, leading her to also say “I think it's really helped my comprehension of new educational practices.” Other participants shared similar experiences for how they used technology to facilitate their own learning styles, leading to change in their attitude towards technology. While Ashok indicated he was not entirely sure if the laptop supported his learning style, his preference for auditory learning led him to use the recording function of the laptop to improve student

vocabulary. This experience influenced Ashok's attitude towards technology when he realized the potential of technology to advance learning. Like Ashok, Elizabeth described herself as an independent and self-paced learner, sharing how she had experimented with technology and used shared online resources to support her learning style. She not only shared learning at her own pace was "less threatening" and "comfortable," but this also helped overcome limitations of time and pressure to attend IT workshops. Her realization for how technology facilitated her learning style positively influenced her attitude towards technology.

On the other hand, Janice described herself as a "very visual learner" and shared how the laptop supported her learning style. Beyond using the laptop for her own learning, Janice shared she used technology in the Learning Enrichment class to improve student learning. One of the examples she shared was how she used the laptop's text-to-speech function to support different student learning styles, explaining she had the "text read to them (students) so that they can have full understanding of the text without having the worry about having to read." While Janice was always positive about technology, her experience related to supporting student learning styles further reinforced her attitude towards technology, raising her own technology efficacy. Like Janice, Nikhil commented on how he used the laptop to support his kinesthetic learning style. He explained how the laptop helped him to summarize and synthesize his reading by using digital note-taking and sketching tools. Consequently, his attitude towards technology changed when he realized the potential of the laptop to support his "manipulative kind of learning." While Jacobi did not specifically address his learning style, he revealed he was an avid reader

and access to the laptop "has been really, really helpful" to organize and share his "massive collection of resources" with both students and peers. On the other hand, while Mathew shared technology had not influenced his learning style, he acknowledged technology supported student learning styles.

In summary, multiple sources of experiences contributed to influencing attitude towards technology. Findings indicated positive experiences related to the use of the laptop contributed to positive attitude towards technology, leading to positive perceptions for the 1:1 teacher laptop program. Furthermore, findings suggested positive attitude towards technology positively influenced and advanced participants' own technology efficacy. Findings also indicated some participants perceived technology facilitated their learning styles. This was evidenced through the descriptions provided by study participants, revealing the use of the teacher laptop not only supported individual learning styles, but positively influenced attitude towards technology and technology efficacy.

Self-Directed Learning

Participant responses indicated engagement in self-directed learning about technology and use of technology contributed to positive perceptions for the 1:1 teacher laptop. Furthermore, findings from my study indicated engagement in self-directed learning had not only positively influenced attitude towards technology, but was perceived by participants as a factor in increasing technology efficacy. Participants described different situations for how they engaged in their own learning through peer-to-peer collaboration, informal collegial interactions, group conversations, and formal workshops. Participants also shared what motivated them to self-direct their learning was

the perception of technology as a catalyst to improve student learning. Furthermore, despite differences in technology proficiency levels, all participants acknowledged they were also motivated to learn when they observed other teachers using technology as a tool to enhance their practice. Consequently, study participants were motivated to direct their own learning to maximize the potential of technology, in advancing practice and improving student achievement. Several participants described motivation to direct their learning resulted from a desire to improve personal productivity, while a few participants shared how self-directed learning facilitated discovery of new applications of technology.

While several participants highlighted engagement with more knowledgeable colleagues fostered self-directed learning, Nikhil shared how self-directed learning motivated him to collaborate with teachers to learn how they used their laptop. This resulted in Nikhil taking ownership of his learning through personalized interactions. This also encouraged him to explore the use of an online platform on his own to collaboratively plan and share resources with peers. Through self-directed learning, Nikhil found technology made it "very easy" to improve productivity and practice because of the "speed of collaboration" and the "depth of collaboration." Similarly, Janice shared while she was not new to technology, she self-directed her learning by engaging with her Head of Department, who was also the ICT coach. Janice was motivated to direct her learning because she perceived technology "opened a whole new world to allow for multiple methods of instruction." This in turn encouraged her to explore a variety of software applications to facilitate student learning.

While all participants valued the support they received from colleagues, some participants shared how they self-directed their learning by engaging with students. Janice revealed, she sought help from students and was "not afraid to learn from (students)" because she was open and recognized students could provide insights to help modify practice. On the other hand, Elizabeth expressed she was reluctant to self-direct her learning because she lacked confidence. She also had reservations about learning from students because she felt as a teacher she had to have all the answers. She shared her discomfort in seeking help, stating

> It's also embarrassing sometimes to think that…the person who has experience, who has good knowledge of the subject with so many years of experience…cannot use IT fully because of a lack of skills in using computers.

Despite her challenges, Elizabeth took ownership of her learning when she was encouraged to use technology by the ICT coach, who she reached out to for support, saying

> I have learned a lot more from XXX (ICT coach) in the last two or three months that I have learned for so many years because I think what he teaches is just what the kids need…he shows me something I relate to…I think it's been extremely positive.

Through prior experience as the ICT coach, Jacobi shared how engagement with teachers contributed to his own learning because this steered him to self-direct his learning to discover and share new ways of using technology. He noted engagement with teachers also motivated him to manage his learning, in further developing knowledge and

skills to better serve teachers as the ICT coach. Jacobi noted as teachers engaged in self-direct learning, they shared more through "word of mouth," which not only mitigated limitations of time but led to more self-directed learning, saying

> I think we are all constantly learning from each other…it's a sort of organic growth…where people are not afraid to talk to each other and share ideas…I think has contributed to this organic growth.

Like Jacobi, Jessica held a position of additional responsibility as the Literacy Learning Coordinator, leading her to explore ways to improve instructional planning and delivery.

Consequently, she found herself engaging in more self-directed learning to improve her own technology proficiency by learning to use technology to support her peers. While Jessica appreciated the value of collaborative learning, she preferred learn by doing, describing herself as "self-taught." She also noted how self-directed learning better prepared her as a teacher. Jessica's perception as a self-directed learner led her to say she could manage her learning because of her confidence and heightened sense of technology efficacy, remarking

> I can self-teach myself quite well and I think most programs out there right now are very intuitive, so it's, it's very easy to figure out how to do things.

However, while Jessica was comfortable learning on her own, she also acknowledged the value of learning from more knowledgeable others, saying

> I think I could be probably instructed more about programs I don't even know about and, and I don't even know how they could help me…I think this is an area

> that would be helpful to have people come in and teach us like…there's always room for improvement.

As much as Janice attributed her technology proficiency was a result of the support she received from the Head of Department, she explained if she had not self-directed her learning, it might have taken longer to reach her current level of technology efficacy. Janice's acknowledgement for how self-directed learning raised her own technology efficacy, directed her to encourage other teachers to take ownership of their own learning. However, she also shared the need to support teachers who were new to the 1:1 teacher laptop program and less inclined to engage in self-directed learning, saying

> I feel like there are some people who really struggle with the 1:1. They don't maybe want to admit it…a couple of older teachers tend to struggle a little bit more in using the 1:1 in the best way possible.

Catherine shared she was encouraged to learn on her own after personalized sessions with the ICT coach to explore ways to use technology, in improving her practice. She remarked how personalized sessions were not only helpful for her to learn quickly, but were "really good and encouraged me to use IT actively."

Jacobi suggested self-directed learning as way to overcome "the lack of structured time." However, Janice and Mathew highlighted the "generational gap" and the steep "learning curve" for some teachers, noting the need for a variety of professional learning opportunities beyond self-directed learning. Ashok confessed because of his initial skepticism about technology, he had not taken ownership for his learning. He admitted this negatively influenced his attitude towards technology, which in turn limited his use

of technology and the development of his technology proficiency and technology efficacy. However, he acknowledged the value of self-directed learning. While Ashok said he would "have appreciated a little bit more of a hands-on approach" from his "extremely technically able colleagues," he shared most of his learning was self-directed because over time he recognized the benefits of technology. Mathew shared self-directed learning increased his confidence to explore innovative ways to flip his classroom by using technology. While Nikhil stressed the need for professional development, he shared the value of self-directed learning to overcome fear of using technology, leading to the development of confidence and technology efficacy. He described his experience for self-directed learning, saying when something new comes by "you just deal with it straight away…you become much more confident…it just builds and it builds and it builds."

In summary, self-directed learning emerged as an overarching theme through the perceptions and experiences of study participants. Participation in the 1:1 teacher laptop program motivated study participants to engage in self-directed learning. Furthermore, self-directed learning positively influenced attitude towards technology, leading in turn to positive perceptions for the 1:1 teacher laptop program. Participants also indicated self-directed learning was an enabling factor, contributing to raising their own technology efficacy. Participants shared that they engaged in self-directed learning through peer-to-peer collaboration, informal collegial interactions, group conversations, and formal workshops. Participant also noted they were motivated to take ownership of their learning because they perceived technology was an enabler of learning. This motivated

participants to own and direct their learning to maximize the use of technology to improve personal productivity, practice, and student learning.

Perceived Value

Perceived value of technology emerged as another overarching theme from my study Participant responses were examined through the model of adult learning (Knowles et al., 2015) and the construct of technology efficacy (Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016) to determine factors contributing to technology efficacy. Findings indicated perceived value of technology contributed to positive perceptions for the 1:1 teacher laptop program. Furthermore, findings also suggested perceived value of technology was an enabling factor and contributed in raising teacher technology proficiency and technology efficacy.

While multiple sources of experiences contributed to identifying perceived value as an overarching theme, participation in the 1:1 teacher laptop program emerged as a significant contributing factor. Study participants shared how participation in the 1:1 teacher laptop supported them as adult learners by providing autonomy and choice, in addition to the benefits resulting from the use of technology for teaching and learning. The literature on adult learning indicates autonomy and choice are enabling factors motivating adults to learn (Knowles et al., 2015). Jessica and Janice shared experiences for how they changed their practice by choosing to use the teacher laptop instead of paper for instruction. Similarly, Ashok explained he was a strong advocate of the environment. When he realized he had a choice to reduce the use of paper, this motivated him to learn to use the laptop for instruction. Ashok also acknowledged perceived value of technology

encouraged him to use an online collaborative platform to share instructional resources with students. Furthermore, perceived value also motivated Ashok to use technology to monitor student progress, leading him to "compare, contrast the work of one student with another," which he shared was "not possible before." Through those experiences, Ashok noted his pedagogy changed from a teacher-centered to a student-centered approach, describing the change as "really quite revolutionary."

Catherine described her experiences with the laptop changed her perceived value of technology, motivating her to learn more about technology to improve student learning. While she shared changes such her use of digital media to reduce dependency on printed materials were important to her, the most significant perceived value of technology was the use of technology to augment "formative assessment and formative feedback." She explained while she relied on paper-based assessments in the past, the use of technology facilitated timely and real-time feedback for students. Catherine perceived this as a positive outcome of using technology because "they (students) work more conscientiously this way," influencing how students learn. Catherine was positive about the change in her role from teacher to facilitator as a result of using technology and also highlighted the need for ethical and balanced use of technology.

Perceived value of technology led other participants to share their experiences for how technology facilitated personal productivity. Nikhil explained how he used the laptop in "removing the silly side of things, the manual labor" because of the time saved time collating assessment data. He described the change from a paper-based Math

assessment to an online system improved "quality and the depth" of feedback, while "taking away a lot of the repetitious sitting work," sharing

> The children are doing the assessments…the information is coming back within 24 hours…rather than spending hours and hours I need to collate everything…doing silly work.

The change in personal productivity allowed Nikhil to reallocate his time to engage more with teachers, leading him to say we are "into the heart and the depth of the conversations you should be having, which is about learning…actually having conversations about what the data says."

Like the other primary school participant, Nikhil noted another perceived value of technology was access to the teacher laptop through participation in the 1:1 teacher laptop program because the laptop was the equalizer for teacher, leveling the playing field. Nikhil went on to say, this resulted in not only changing practice and improving personal productivity, but raising faculty morale. While Elizabeth did not mention faculty morale, she shared how participation in the 1:1 teacher laptop program improved her technology proficiency, resulting in changes to her personal productivity and practice. She explained her perceptions for the value of the laptop shifted because she was able to

> Experiment on some of the programs…it has been easy to…cooperate with colleagues and learn…I think it's helped me quite a lot in the way I teach and in the way I do my work.

Elizabeth also shared experiences for how she used the laptop to improve instruction, stating

> It was a lot easier to prepare ahead of time, get the videos, get the worksheets…and use MacBook (the laptop) to beam something…it's not just chalk and talk, it's become more interactive…being able to do a lot more things…everything looks neat…delivering the lesson…some interactive ones…simulations…are some of the things that have really helped me.

On the other hand, Mathew held strong views for the value of technology because he considered technology a game changer for student learning, describing himself as proponent of technology. He shared his observations for how students accessed information through a range of online and offline media, helping them to complete assignments they would have otherwise found challenging. He compared his experience at a previous school, sharing how the lack of the 1:1 teacher laptop program limited learning opportunities for teachers and students. He explained how he used the laptop to change practice by flipping his classroom through the creation of instructional videos. Mathew went on to express he found this change was "beneficial" to "augment learning or support learning in different ways." He also shared how technology supported the design of his curriculum, describing the use of technology-based gamification techniques to enhance study revision and track student progress. He summarized his experiences by saying, "The adoption of the 1:1 program has led to an improvement for myself and for the large majority of my colleagues." Mathew went on to share insights into his own technology efficacy, explaining

> My experience with Excel and Google Sheets was very limited. I knew…the very basics…through seeing…the effective use of this application…especially in

> tracking student data…and correlating data…I was able to…master…(raising) my degree of efficacy with this software.

Ease of use of technology contributed to another perceived value of technology, leading Jacobi to reveal how he organized, classified, and shared large collections of information with teachers and students. Similarly, Elizabeth commented about the ease of use of technology, describing how she organized her instructional materials so "everything looks neat and orderly." Ashok provided another example by describing how he used technology to monitor "a whole class in real-time," gaining an "overview of the progress of the class as a whole, as well as individuals." He admitted, without the support of technology he would have found it difficult to monitor his class. Catherine also shared a similar experience, using technology-based "activities to improve in the areas where they (students) still have weaknesses." She noted the ease to set up online process journals for students as a collaborative resource and to provide timely feedback. Janice described how easy it was to use the text-to-speech feature on the laptop for her Learning Enrichment students "to have the text read to them so that they can have that full understanding of the text." Like other participants, Jessica also noted her use of technology to create and organize files and folders for "constant access." She shared how easy it was to interact with peers despite the limitations of time through the use of online collaborative tools. Nikhil shared similar experiences for how he used online collaborative tools to engage with teachers, noting the ease of use and access to information in real-time to improve the "quality and the depth" of collegial interactions.

While study participants shared perceived value of technology was a contributing factor for continued interest and motivation to use technology, some participants indicated they did not share this view when they initially joined the 1:1 teacher laptop program. Elizabeth commented she was unable to assess the value of the program because she was not sure how participation in the program would help with productivity and practice. She acknowledged lack of technology proficiency and experience using technology contributed to lack of understanding and appreciation for the value of technology. Likewise, Ashok expressed he was skeptical about the value of the program, while acknowledging skepticism was a consequence of lack of interest to use technology beyond the workplace. On the other hand, Nikhil's initial perception for the value technology was influenced by dissatisfaction because primary school teachers were not included in the preliminary implementation of the program, leading to a "demoralizing effect" among faculty. While acknowledging this affected initial perceptions for the 1:1 teacher laptop program, it also prompted Nikhil to say if the goal was to get the most out of the program, the school should have considered providing all faculty and staff with a laptop to maximize the value and benefit. Jessica summarized the sentiment by stating

> It's (teacher laptop) empowered teachers and I also feel like it makes them feel important…I think for the morale of the staff…it's really positive. Since Secondary teachers had them (laptops) and Primary teachers did not…I think that there was some resentment towards the Secondary…once Primary got them (laptops)…it made the Primary feel a little bit more valued, which I think is really important.

On the other hand, while Mathew recommended examination of negative implications, he summarized by stating, “It’s very likely that the negatives don’t outweigh the positives.”

The literature on adult learning indicates adult learners are motivated to learn because they want to be successful (Knowles et al., 2015). Findings from my study suggested perceived value encouraged participants to use technology because productive use of technology left teachers feeling successful. Jacobi’s perceived value of technology, not only influenced his own technology efficacy positively, but left him feeling successful. He went on to describe himself as “a believer” of technology because he experienced the transformative power of technology and the “profound effect both on students and on teachers.” Like Catherine, Jessica reflected how her role had changed as a result of the 1:1 teacher laptop program. She felt successful as a teacher because engagement in the program motivated her and advanced her practice. She also indicated how engagement not only developed her technology proficiency and technology efficacy, but left her feeling good about herself as a learner.

In summary, perceived value of technology emerged as an overarching theme from my study. Findings revealed participants considered participation in the 1:1 teacher laptop program contributed to perceived value of technology because of improved productivity and practice. Furthermore, perceived value of technology motivated participants to engage in professional learning opportunities and take ownership of their learning. Findings also indicated perceived value contributed positively to influence teacher technology proficiency and technology efficacy. Finally, findings from my study confirmed findings from other studies and the literature, suggesting teachers as adult

learners are motivated to learn if they perceive value in their learning (see Knowles et al., 2015; Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016).

Discrepant Cases

No discrepant cases were identified through the findings from my study. While there were an equal number of female and male participants in the 1:1 teacher laptop program, no reference was made to gender or how gender might have influenced teacher technology efficacy or perceptions for program. However, one participant suggested age as a possible factor influencing learning about technology. Janice shared "being a much younger teacher, I tend to not struggle as much with technology." She went further to share perceptions about older teachers by saying "a couple of older teachers tend to struggle a little bit more in using the 1:1." She also mentioned regardless of age, teachers might still have some difficulties transitioning into the 1:1 teacher laptop program if they lacked prior experience. However, findings indicated younger participants were generally more positive about technology and more enthusiastic about technology use than older participants, who had expressed initial reservations about the 1:1 teacher laptop program when it was first implemented.

Summary

I used thematic analysis to examine and analyze the data to answer the research questions, which led to the identification of the overarching themes. The study was framed through an adult learning model (Knowles et al., 2015) and the construct of teacher technology efficacy (Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016). The overarching themes emerged through the descriptions of perceptions and

experiences of teachers who participated in the 1:1 teacher laptop program. Notes from my reflective journal were also used during data analysis.

The themes that emerged in response to the first research question for how teachers who participated in the 1:1 teacher laptop program described their perceptions and experiences were access to the teacher laptop, change in practice, support structures, and concerns and barriers. In response to the second research question for factors enabling or inhibiting the participants' own technology efficacy, the themes that emerged included attitude towards technology, self-directed learning, and perceived value. In addition to describing the context, setting, demographic, data collection, and data analysis method used, I explained issues of trustworthiness related to the study.

In the next chapter, I present a summary of the findings and discuss the interpretations of the findings through the review of the literature and the frameworks used for the study. I also describe the limitations of the study, propose recommendations for future research, discuss the implications for social change and practice, and end with a conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this qualitative pragmatic study was to understand and describe experiences through the perceptions of teachers who participated in a 1:1 teacher laptop program and their own technology efficacy. This study was framed through the conceptual model of adult learning proposed by Knowles et al. (2015) and the construct of teacher technology efficacy (Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016). Few researchers have examined perceptions and experiences of teachers who participated in a 1:1 teacher laptop program. Furthermore, there was limited literature and evidence for how similar programs influenced teacher technology efficacy through the lens of teachers as adult learners. Consequently, I designed and conducted a study at an international school in Germany to strengthen social change among teachers seeking to use technology to improve student learning, while adding to the body of knowledge. In this chapter, I present a summary and discuss interpretations of the findings from data collected through this study. In addition, I describe limitations, suggest recommendations for future research, and reveal implications for social change and practice, ending with a conclusion.

Summary of Findings

The key findings from this study were organized in two sections to answer each of the research questions. In total, seven overarching themes were identified. While these themes were grouped and presented separately to answer each research question, overlapping sources of perceptions were noted between themes related to participant

experiences for the 1:1 teacher laptop program and their own technology efficacy. The overarching themes identified for the first research question related to perceptions about the 1:1 teacher laptop program was access to the teacher laptop, change in practice, support structures, and concerns and barriers. The overarching themes identified for the second research question related to perceived factors enabling or inhibiting participants' own technology efficacy were attitude towards technology, self-directed learning, and perceived value proposition. Overall findings suggested participants were generally positive about the 1:1 teacher laptop program because they perceived the 1:1 teacher laptop program supported and improved morale, personal productivity, practice, and student learning. In addition, findings revealed participants perceived participation in the 1:1 teacher laptop program positively influenced their own technology efficacy.

Interpretations of the findings also revealed raising teacher technology efficacy was a complex process. Furthermore, while findings revealed technology initiatives such as the 1:1 teacher laptop program influenced teacher technology efficacy, examination of participant perceptions and experiences provided deeper insights and understanding to improve implementation fidelity. In addition, examination of teacher perceptions and experiences provided understanding for enabling and inhibiting factors to raise teacher technology efficacy for successful implementation, leading to improved practice and student learning. While participants spoke supportively and described positive outcomes of the program, they also suggested the need to address concerns and barriers to improve the program. Participants noted concerns and barriers related to professional learning, pedagogical support, teacher appraisal, purpose and value, time, interest, confidence,

impact on student learning, future skills, competency, learning curve, complacency, balance, and dependency. However, the most significant and recurring concerns were related to professional learning and pedagogical support, and time as a barrier. Study findings also revealed that professional learning and support structures were factors that contributed to positive perceptions of the 1:1 teacher laptop program. Study participants perceived access to the teacher laptop supported change in practice, contributing to positive attitudes towards technology. Furthermore participants acknowledged the value of technology, which contributed to raising their own technology efficacy. Participants described how participation in the 1:1 teacher laptop program influenced their learning style, which also contributed to shaping perceptions about the program.

Interpretation of Findings

Data collected through interviews provided answers to the two research questions:

RQ1: How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?

RQ2: What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

The overarching themes identified were access to the teacher laptop, change in practice, support structures, concerns and barriers, attitude towards technology, self-directed learning, and perceived value. These themes aligned with findings from prior research, literature on adult learning and technology efficacy. While themes were organized and grouped in response to each research question, findings also revealed overlapping and intersecting points between themes.

In this section, I present an interpretation of findings, connecting each theme to existing literature. In addition, I interpret findings through the selected conceptual framework on adult learning (see Knowles et al., 2015) and the construct of technology efficacy (see Bandura, 1977; Kalemoglu Varol, 2014; Tilton & Hartnett, 2016).

Access to the Teacher Laptop

Access to the teacher laptop was an overarching theme identified in this study. Interpretations of the findings through participant responses revealed access to the teacher laptop was perceived as a significant benefit of engaging in the 1:1 teacher laptop program. Findings from several prior studies and related literature confirmed access to technology was a contributing factor towards positive perceptions about technology (Ertmer et al., 2012; Grundmeyer & Peters, 2016; Hew & Brush, 2007; Kay, 2006; Mouza, 2011; O'Neal et al., 2017; Warschauer et al., 2014). Furthermore, Kay (2006) conducted a literature review of 64 journal articles, examining the introduction of technology to preservice teachers and identified access to technology as a significant predictor and enabler of technology integration. Findings from other studies revealed access to technology influenced how teachers used technology in teaching and learning (Grundmeyer & Peters, 2016; Mouza, 2011; O'Neal et al., 2017). In addition, results from prior studies indicated that schools continue to provide access to technology because access to technology was perceived to improve teaching and learning (Liu et al., 2016). Hew and Brush (2007) identified lack of access to technology as a barrier for technology integration, leading to a recommendation to further examine and determine how access to technology contributed to teacher comfort and use of technology. While

extrinsic or first-order barriers had less of an impact on teacher use of technology, access to technology as a first-order barrier was identified to influence teacher beliefs for the value of technology (Ertmer et al., 2012). However, findings from literature also revealed availability and access to technology posed new challenges and demands on policy makers, schools, teachers, students, and parents (Warschauer et al., 2014). Results from this study concurred with findings from prior studies and literature, indicating that while participants valued access to technology through the teacher laptop, teachers were also faced with new challenges and demands. Literature on adult learning indicated prior experiences influenced learning because learning cannot be separated from the context of the learner and adults as learners need to make sense and meaning of their learning experiences (Knowles et al., 2015). Consequently, findings from my study also revealed that participants were challenged and described demands as a result of participation in the 1:1 teacher laptop program.

Interpretations of the findings revealed that access to the teacher laptop was perceived as an enabler and facilitated change in pedagogy and practice. Findings indicated that study participants perceived the teacher laptop was an invaluable instructional tool and an integral part of teaching and learning, contributing to positive perceptions and attitudes towards technology. Participants described participation in the 1:1 teacher laptop program as “transformative,” “revolutionary,” “positive,” “convenient,” and “fantastic” as a result of access to the teacher laptop. Findings also revealed that participants felt valued because they were provided with a teacher laptop. This was further confirmed by primary teachers who expressed they felt treated as

professionals because of greater equality, leading not only to improved teacher moral but also change in practice. Furthermore, one participant described the transformative power of the laptop and how it helped enhance instructional practice, while another participant shared how he flipped his classroom practice as a result of the teacher laptop. Other participants noted the value of the laptop to support collaborative work, enhancing not only depth and quality but also speed of collaboration among teachers. Literature on adult learning has indicated adults are willing to learn if they believe they can learn something new and that learning will help them with a problem or task (Knowles et al., 2015). Furthermore, adults are motivated to learn if there is intrinsic payoff and if the learning is important in their life, leading to success (Knowles et al., 2015). Findings from my study revealed that study participants perceived access to the laptop empowered them as learners, motivating and leading them to learn to use technology to improve productivity and change practice. One participant noted a change in how colleagues did more and more with the laptop, while two participants expressed dependency for the teacher laptop to change practice. Findings confirmed overall perceptions were positive, indicating it was beneficial to have access to a laptop because it facilitated both improvement in personal productivity and change in practice, while developing their own technology efficacy.

The literature on self-efficacy has indicated experience of mastery is a source of self-efficacy (Bandura, 1977). Furthermore, experiences related to prior successes raise self-efficacy, while prior failures diminish self-efficacy (Bandura, 1977). The literature on adult learning also identifies prior experiences as a source for how adults learn

(Knowles et al., 2015). Prior experience leads to self-directedness and autonomy for learning through experiences (Knowles et al., 2015). Consequently, prior experience provides a foundation for mastery, and this was revealed through findings from my study where participants described a heightened sense of confidence and efficacy to use technology as a result of positive experiences and successes with the use of technology. Furthermore, interpretations of the findings from my study revealed that prior experience with a laptop also significantly and positively contributed in raising teacher technology efficacy, influencing both attitudes towards technology and comfort for the use of technology. At least three participants indicated they had no challenges transitioning into the 1:1 teacher laptop program because of prior experience and access to a laptop. These participants shared that they were comfortable with the use of technology and did not require in-depth introductions to the program.

In summary, interpretations from findings from this, other studies, and the literature have confirmed that access to the teacher laptop not only contributes to positive perceptions about technology but also positively influences teacher technology efficacy. Access to the teacher laptop through prior experience also confirmed that prior experience of the learner supported teachers as adult learners, leading to mastery experience and motivation to learn. Interpretations of the findings from my study also confirmed that experiences shaped learning and individual mental schemas, leading to ownership for learning (see Knowles et al., 2015). In addition, as much as positive prior experiences motivate teachers to learn, prior experiences are also a barrier for learning when new learning challenges (Knowles et al., 2015). This was revealed through findings

from my study when participants described challenges related to students knowing more about technology than the teacher and feelings of being overwhelmed during professional development workshops.

Change in Practice

Results from my study identified change in practice as an overarching theme, supporting findings from prior studies and literature on the topic (see Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Yarbro et al., 2016). Furthermore, findings from my study also confirmed recommendations from another study for the need to examine factors leading to change in practice as a result of using technology (see Trust, 2016). Furthermore, findings from my study concurred with results from other prior studies and the review of literature that technology is an enabler and catalyst of change in practice (see Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Digital Promise, 2018; Ditzler et al., 2016; Glassett & Schrum, 2009; U.S. Department of Education Office of Educational Technology, 2016a; Yarbro et al., 2016). A study conducted by The Digital Promise's League of Innovative Schools found variations in use of technology to modify practice (Yarbro et al., 2016). Recommendations from this study included investigating the influence of technology use on practice by examining specific contextual situations and settings. Another study conducted by McKnight et al. (2016), examined the influence of technology initiatives on practice within the context of different learning situations and included how technology enhanced student learning through perceptions of teachers. While results from my study revealed there was a change in practice, interpretations of the findings from my study also indicated the need for further research to examine

specific contextual learning situations and factors because change in practice is a complex process.

A review of literature indicates continued interest from schools and teachers to explore technology to change practice (Trust, 2016). This was further supported through other literature, which notes opportunities were available to teachers to change practice through application of technology to improve student learning (U.S. Department of Education Office of Educational Technology, 2016a). While results from my study confirmed teachers perceived change in practice was a positive outcome and consequence of participating in the 1:1 teacher laptop program, they also indicated the need for on-going and targeted support to advance and improve practice. Findings from my study revealed changes in practice and that these changes aligned with findings from a prior study designed to investigate the use of technology to improve practice (see Yarbro et al., 2016). One study participant expressed change in practice led to her feeling more prepared, while another participant indicated interactions between teachers significantly changed his use of technology, leading to increased productivity. The same participant also indicated a significant change in practice was a consequence of instant access to information and learning resources as a result of technology. Like this participant, other participants acknowledged that participation in the 1:1 teacher laptop increased their personal and professional productivity, leading not only to change in practice but in raising their own technology efficacy. Another participant expressed the same sentiment by sharing change in practice was a consequence of participation in the 1:1 teacher laptop program, resulting in raising his own technology efficacy. Findings from my study

supported the literature on adult learning, which notes readiness to learn is situational and adults are ready to learn if the situation creates a need to know (see Knowles et al., 2015).

A review of the literature indicates rapid evolution of technology, leads teachers to try and apply technology within their practice (Unruh et al., 2016). Results from my study indicated and confirmed that participants were willing and open to exploring use of technology to change practice. Furthermore, the literature on adult learning indicates adults were willing and motivated to learn if they perceived intrinsic value or personal payoff. Findings from my study revealed change in practice was perceived with intrinsic value, motivating study participants to learn to use technology, while raising their self-concept as adult learners (see Knowles et al., 2015). Findings from prior studies and a review of the literature indicates technology influences changes in teaching and learning (Bledsoe & Pilgrim, 2016; Clarke & Hollingsworth, 2002; Krutka et al., 2016; Ditzler et al., 2016; McKnight et al.,2016; Yarbro et al., 2016). Interpretations of the findings from my study also confirmed that technology influenced change in practice. Some of these changes in practice included change from a teacher-centered to a student-centered approach, timeliness of feedback, collaboration with colleagues, and change in instructional delivery through the use of online resources.

Other prior studies reveal that technology not only influences practice, but also improves practice (Mourlam & Montgomery, 2015; Osman, 2014; Trust, 2016; Yarbro et al., 2016; Zheng et al., 2016). Findings from a prior study also reveals that improvement in practice is a consequence of positive perceptions and experiences through the participation in 1:1 learning environments (Storz & Hoffman, 2013). One participant

from my study shared how engagement in the 1:1 teacher laptop program helped in a significant way to improve teaching and "the way I do my work." Other study participants also shared improvement in practice, stating their "pedagogy changed as a result." One participant went as far to say, as a result of the perceived improvement in practice, she "could not imagine teaching without" technology. She also acknowledged that technology transformed her practice from paper-based to digital, leading to a significant reduction in the use of paper for her instructional delivery.

Findings from prior studies indicates student learning improves as a consequence of 1:1 technology (Bebell & O'Dwyer, 2010; Harper & Milman, 2016; Lei & Zhao, 2008; Penuel, Stanhope & Corn, 2014). Findings from my study indicated participants viewed technology as an enabler of student learning, as a result of change in practice. While one participant noted positive changes in practice, she also shared participation in the 1:1 teacher laptop program enabled her to explore alternative approaches for instructional delivery within the context of her Foreign Language classes and how this improved student learning. Another participant shared a similar viewpoint, highlighting change in her practice led to improvement in student learning. Another participant revealed improvement in student learning was because technology provided access to a wider range of teaching and learning resources, overtaking the need for a textbook. Participants also indicated improvement in students learning was a result of increased interactions between colleagues and sharing of teaching resources through online collaborative platforms. These findings from my study aligned with the literature on adult learning, which indicates adults are more inclined to learn if there is value in learning and if the

learning is pleasurable and leads to positive and success experiences and outcomes (see Knowles et al., 2015). Furthermore, results from my study concurred with the literature on self-efficacy, which states success raises self-efficacy, while failure lowers self-efficacy (see Bandura, 1977). Furthermore, findings from my study also aligned with the literature on self-efficacy because participants revealed vicarious experiences resulting from seeing another teacher use technology successful, led to raising their own self-efficacy (see Bandura, 1977).

Harper and Milman (2016) conducted an extensive review of the literature, recommending more research to understand the influence of 1:1 laptop programs on practice. Findings from my study supported this recommendation and confirmed while study participants noted technology influenced and improved teaching and learning, change was slow and happened over time. One study participant noted he was slow to avail of the opportunity at first because of skepticism, but over time his participation increased leading to his change in practice. A review of the literature also highlights the complexity of change in practice and the further need to examine contextual factors influencing practice (McKnight et al., 2016; Newhouse, Cooper, & Pagram, 2015; Trust, 2016). Results from my study also indicated change in practice was a complex process and included a wide range of experiences. While some researchers confirm positive change in practice as a result of using technology (Harper & Milman, 2016; Levin & Schrum, 2013; Mourlam & Montgomery, 2015), other researchers recommend further examination of limiting factors and impediments (Bakir, 2015; Trust 2016). While participants in my study were generally positive about change and improvement in

practice as a result of their participation in the 1:1 teacher laptop program, participants noted the importance of remaining mindful with the use of technology. Results from my study also revealed the need to examine concerns and barriers related to use of technology within the context of the 1:1 teacher laptop program. One study participant expressed the need for "more subject related, input and assistance", while another stated "I still don't think I have achieved maybe 50 percent of what I could have potentially achieved." Other participants highlighted balance with the use of technology and the need to address "negative implications for teaching and learning." While balance was noted as a concern, participants also shared the need to stay ahead of students, which was identified as another concern. In conclusion, while interpretations of the findings from study concurred with the literature on adult learning, noting teachers as adult learners need to know the why, what and how of learning, they also have challenges and concerns that need to be addressed to feel successful (see Knowles et al., 2015).

Support Structures

Support structures emerged as another overarching theme from my study. Findings from my study concurred with findings from prior studies, indicating the need and importance of support structures for successful implementation of technology initiatives (see Bakir, 2015; Richardson et al., 2012; Trust, 2015). A review of the literature also revealed teachers continue to feel insufficiently prepared to use technology despite the availability of support structures (Grunwald & Associates, 2010; Hsu, 2012; Kay, 2006; Periathiruvadi & Rinn, 2012; Richardson et al., 2012). Findings from other prior studies indicated the need for better preparation of teachers as adult learners to use

technology to improve students learning in the technological age (Ntombela, 2015; Sogunro, 2015; Vilkonis et al., 2013). Results from my study found support structures was an important enabler for successful implementation of the 1:1 teacher laptop program. Study participants identified sources of support structures and these included technical support, technology related instructional support, professional learning opportunities, informal peer-to-peer learning, collegial interactions, and access to shared resources. Despite access to these support structures, study participants expressed the need for ongoing and targeted support to improve the use of technology for teaching and learning. This confirmed despite the availability of support structures, adult learning was a complex process and task. A review of the literature and findings from prior studies also recommended the need to continue examining the influence of support structures to facilitate technology use for student learning (Bledsoe & Pilgrim, 2016; Clarke & Hollingsworth, 2002; Krutka et al., 2016; Trust, 2015).

Technology support was categorized as an extrinsic barrier and an enabler to facilitate and influence teacher use of technology (Ertmer et al., 2012). Results from a prior study identified technology support as a major theme related to preparing teachers to use technology for teaching and learning (Bakir, 2015). The researcher of this study recommended the need to purposefully design professional learning opportunities as a way to change attitudes towards technology and raise technology efficacy to improve learning outcomes. Results from my study also identified technology support was an enabling factor in shaping positive perceptions about the 1:1 teacher laptop program and influencing teacher technology efficacy. A review of the literature indicated, modeling or

vicarious experiences with a more knowledgeable other was a source of self-efficacy because watching another individual complete a task successful strengthens self-efficacy (Bandura, 1977). Findings from my study revealed modeling and learning from knowledgeable peers helped raise participants' own technology efficacy. Furthermore, study participants described how interactions with other teachers helped them to use technology through a variety of experiences. This finding from my study aligned with the literature on adult learning, which indicates adults value learning by collaborating with other adults (see Knowles et al., 2015).

A study conducted by Kay (2006) identified modeling, collaboration, mentoring, and technical support as significant themes related to the use of technology for teaching and learning. One participant in my study described the support she received from the IT Department and the ICT integrator, helping to raise her comfort level for the use of technology. This participant attributed an increase in her technology efficacy as a consequence of receiving timely technical support, stating it was "really helpful." While another participant also acknowledged the value of technical support, she highlighted collegial interactions was another source of support. Other study participants shared their experiences through peer-to-peer interactions with colleagues, describing both informal learning interactions and collegial support were "very valuable."

A study conducted by O'Neal et al. (2017) found that while teachers appreciated the benefits of technology, they shared the need for continued support to integrate technology to prepare students with 21st Century skills. Recommendations from this study also highlights the need to support teachers to develop positive beliefs for the use

of technology. While a participant in my study shared he needed minimal support because of prior experience, he recognized the importance of support structures to foster positive attitudes and beliefs towards technology. Furthermore, this participant stressed the need to support teachers who were challenged to use technology because of the learning curve. He went on to suggest the need for "tailored" professional learning opportunities to develop relevant skills to integrate technology. Recommendations from prior studies also confirmed the importance of supporting teachers because of the rapid adoption of technology through timely support structures within the context of practice (Bledsoe & Pilgrim, 2016; Clarke & Hollingsworth, 2002; Krutka et al., 2016; Ditzler et al., 2016; McKnight et al.,2016; Yarbro et al., 2016). A participant in my study described how the support he received from the ICT department within the context of his practice helped develop his technology efficacy. He went further to identify timely technical support was an enabling factor to support teachers who were challenged by technology for successful implementation of the 1:1 teacher laptop program.

Several participants in my study confirmed the value of collegial interactions, explaining how participation through the 1:1 teacher laptop fostered collaborative engagement among teachers and personalized learning experiences. Findings from my study also determined teachers valued learning through online professional platforms and networks (see Krutka et al., 2016), and collaborative interactions within the context of their learning situations (Giannoukos et al., 2015). A review of the literature also identified collegial interactions as an enabling factor for technology integration (Liu et al., 2016). Other researchers also identified collaborative and peer-to-peer interactions

helped teachers effectively use technology for teaching and learning (Ertmer et al., 2012; Hew & Brush, 2007). This was confirmed through findings from my study, which revealed ICT support at the departmental level was a significant enabling factor in learning to use technology. Some study participants indicated the lack of departmental support was an inhibiting factor for the successful use of technology, expressing the need for more support within the context of the individual department. While study participants noted access to shared resources was another source of support, one participant remarked her greatest source of support was from the Head of Department who worked closely to change her practice.

Findings from a prior study reveals teachers need more support as they continue to integrate technology (O'Neal et al., 2017). Recommendations from another study suggests professional learning increases the frequency of technology use and supports teachers with the use of technology (Hur et al., 2016). Several researchers also identified professional learning as an enabling factor for the use of technology; in addition to access to technology, technical support, and attitude towards technology as other enabling factors to improve technology integration (Grundmeyer & Peters, 2016; Mouza, 2011; O'Neal et al., 2017). Despite their prior experience and comfort with the use of technology, some study participants also shared how formal professional learning influenced their technology efficacy. In addition, personalized interactions with the ICT integrator and the Head of Department were invaluable sources of support for other study participants. One study participant attributed her motivation to use technology was a consequence of her engagement in professional learning with her peers, which resulted in

finding “more purpose” for the use of the teacher laptop as an instructional tool. Other participants in my study also acknowledged professional learning sessions with the IT technical team and the ICT integrators were significant enabling factors, leading to an increase in their technology efficacy and motivation to use technology to improve student learning.

Concerns and Barriers

While results from my study indicated participants were generally positive about the 1:1 teacher laptop program, findings also revealed participants had concerns and challenges. Findings from prior studies also confirmed teachers continue to face challenges, expressing concerns for the use of technology (Carol & Santori, 2015; Clark et al., 2015; Moore-Hayes, 2011; Periathiruvadi & Rinn, 2012; Richardson et al. 2012). A review of the literature indicates concerns and barriers related to the use of technology for teaching and learning are well researched topics (Harper & Milman, 2016; Storz & Hoffman, 2013; Williams & Larwin, 2016). Despite overall positive perceptions, findings from my study also identified concerns related to professional learning, instructional support, transition into the program, appropriate use, motivation to learn to use technology, impact on students, accessibility of technology, dependency on technology, value of the program, time, learning curve, and time was a barrier. Several studies conducted by researchers within the context of 1:1 laptop environments also identified similar concerns and barriers (Bakir, 2015; Donovan & Green, 2010; Mourlam & Montgomery, 2015; Warschauer, Zheng, Niiya, Cotton, & Farkas, 2014; Zheng, Arada, Niiya, & Warschauer, 2014; Zheng, Warschauer, Lin, & Chang, 2016). A study

conducted by Donovan and Green (2010) to examine teacher concerns during implementation of a 1:1 learning program at a large state university identified concerns such as teacher readiness, preparation, and differences with technology adoption. While findings from my study concurred with findings from prior studies, the two most significant concerns from my study were related to professional learning and instructional support, while time was perceived as a barrier.

Participants from my study suggested the need to address concerns and barriers to improve the use of technology for successful implementation, confirming recommendations from other studies (see Ditzler et al., 2016; Grundmeyer & Peters, 2016; Holen et al., 2017; Kurt, 2014). One participant in particular noted the "generational gap" as a challenge and the need to address this "deficit" through ongoing support and training. A phenomenological research study conducted by Storz and Hoffman (2013) at a Midwestern urban middle school to examine teacher perceptions for a 1:1 program, recommended examining concerns to gain deeper insights and understanding to improve implementation fidelity. This was supported by another study conducted by Mourlam and Montgomery (2015) who confirmed the value of giving teachers a voice to improve implementation fidelity.

Several prior studies examined factors directly or indirectly inhibiting teachers in their use of technology for teaching and learning (Ertmer et al., 2012; Giles & Kent, 2016; Hur et al., 2016; Inan & Lowther, 2010; Jääskelä, Häkkinen, & Rasku-Puttonen, 2017; Liu et al., 2016; Miranda & Russell, 2012; Moore-Hayes, 2011; Mourlam & Montgomery, 2015; Ottenbreit-Leftwich et al., 2010; Perrotta, 2013; Tilton & Hartnett,

2016). While a study conducted by Hew and Brush (2007) identified attitude towards technology was a frequently addressed concern for technology use, findings from my study did not find attitude towards technology was perceived as a significant concern by the study participants. However, study participants concurred with findings from prior studies, revealing technology proficiency and access to technology were important considerations to overcome concerns and barriers. Several study participants confirmed access to the teacher laptop was a significant enabling factor, which contributed to positive perceptions about the 1:1 teacher laptop program because equitable access to the teacher laptop not only increased productivity but also raised staff morale.

Findings from prior studies indicates concerns and barriers can negatively influence the benefits of technology integration, technology use, and efficacy for technology integration (Ertmer et al., 2012; Hur et al., 2016; Peterson & Scharber, 2017). A review of the literature reveals intrinsic factors or second-order barriers have a greater influence over extrinsic factors or first-order barriers (Ertmer et al., 2012; Kopcha, 2012). While intrinsic factors such as personal experiences, practices, and readiness to learn contributed to concerns, extrinsic factors such as support and access were also identified as concerns through my study. A qualitative case study conducted by Peterson and Scharber (2017) highlighted the importance of providing reliable, timely, and targeted technical support to overcome concerns. While one study participant stressed the need for continued technical support to overcome concerns, she shared the lack of access to laptop charging stations was a concern. However, this viewpoint was not shared by other study participants. Some study participants noted access to the teacher laptop was a concern if

teachers did not have access to a laptop, leading to “resentment” and feeling “less important” than teachers who had a laptop.

While study participants shared access to the laptop improved personal productivity, several participants highlighted the importance of professional learning interactions to not only raise teacher technology efficacy, but also improve program implementation fidelity. Results from my study revealed professional learning contributed to positive perceptions about the 1:1 teacher laptop program. However, professional learning was also identified as a concern. Study participants shared the need for professional learning and in particular specific and targeted instructional support, while noting lack of teacher appraisal was a concern. Participants confirmed findings from prior studies for continued professional learning and instructional support to develop teacher technology efficacy, especially teachers who lacked prior experience and teachers with a steeper learning curve. (see Bakir, 2015; Carol & Santori, 2015; Hur et al., 2016; Peterson & Scharber, 2017). While study participants highlighted the importance of professional learning, some participants expressed feelings of being overwhelmed because of the duration and volume of information shared during professional learning sessions. In particular, participants expressed concerns for the lack of focus, sharing the need for targeted learning to address specific challenges related to the use of technology to improve student learning. One participants articulated the need for “tailored” and ongoing professional learning to overcome concerns through “continuing education for teachers.” While study participants noted concerns related to

professional learning, they also acknowledged professional learning positively influenced their own technology efficacy.

Results from my study identified one significant perceived barrier for successful implementation of the 1:1 teacher laptop program. While participants shared several concerns influencing perceptions for the program, time was identified as the significant barrier. This finding from my study concurred with findings from prior studies and the review of the literature (see Ertmer et al., 2012; Giles & Kent, 2016; Hur et al.; Peterson & Scharber, 2017), which also identifies time as a barrier for successful implementation fidelity. Interpretations of the findings from my study also revealed time was perceived as an inhibiting factor because participants observed time was not used productively to support teachers and the development of their technology efficacy. Lack of time was also perceived as a limiting factor to access professional learning opportunities because of competing work demands. Study participants shared the need to allocate more time to develop teacher technology competency and technology efficacy to improve implementation fidelity for successful implementation of the 1:1 teacher laptop program.

Attitude Towards Technology

Interpretations of the findings from my study revealed positive attitudes towards technology contributed to overwhelming positive perceptions for the 1:1 teacher laptop program. Several researchers also confirmed positive attitudes towards technology influenced positive perceptions about technology for teaching and learning (Ditzler, Hong, & Strudler, 2016; Ifenthaler & Schweinbenz, 2016; Yarbro, McKnight, Elliott, Kurz, & Wardlow, 2016). Findings from other studies revealed attitudes and beliefs

towards technology was a predictor for successful implementation and use of technology (Ertmer, & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Lee, Cawthon, & Dawson, 2013; Mourlam, & Montgomery, 2015; Richardson et al., 2012; Tilton, &Hartnett, 2016). Results from my study also indicated participant attitudes were influenced because of positive experiences with the use of technology within the context of their practice. A review of the literature on self-efficacy, indicates positive and successful experiences contributes to raising self-efficacy (Bandura, 1977). Furthermore, literature related to adult learning also notes positive prior experiences shapes learning experiences, motivating and increasing readiness to learn (Knowles et al., 2015). This was confirmed through the findings from my study because participants revealed motivation and readiness to learn were linked to positive attitudes, experiences, and outcomes as a result of successful use of technology.

An extensive synthesis of the literature by Penuel (2006) validated the findings from my study, confirming positive attitude towards technology contributed to positive perceptions for the 1:1 teacher laptop and predicted the use of technology. This was evidenced through the various descriptions shared by study participants related to their experiences in the 1:1 teacher laptop program. Most importantly, findings from my study revealed attitude towards technology was influenced because of positive changes in personal productivity and practice. One participant acknowledged his initial "old-fashioned" and traditional view of teaching limited and inhibited his perception of technology. However over time and with increased use of technology, he described how his attitude changed positively towards technology. Furthermore, while he attributed

increase in his own technology efficacy was due to the support he received, personal experiences related to the use of the laptop also contributed positively to influence both attitude towards technology and his own technology efficacy. Consequently, this led to confidence and willingness to explore other uses of the laptop to further advance personal productivity and practice. Other participants shared similar perceptions and experiences, attributing participation in the 1:1 teacher laptop program promoted positive attitudes towards technology, leading to participants describing the laptop as "invaluable" and the 1:1 teacher laptop program as "a big step in the right direction."

Researchers who examined the value of 1:1 laptop programs, confirmed attitude towards technology influences pedagogical change (Mayo, Kajs, & Tanguma, 2005; Tanguma, Underwood, & Mayo, 2004; Willis, 2006). Findings and recommendations from prior studies indicates the need to further examine teacher attitudes towards technology to improve technology integration (Grundmeyer & Peters, 2016; Heath, 2017; Mouza, 2011; O'Neal et al., 2017; Ottenbreit-Leftwich et al., 2010; Unruh et al., 2016). Unlike most participants, one study participant acknowledged his initial attitude towards technology impacted his use of technology for teaching and learning. However, through support and experience, his perceptions and attitude towards technology changed, leading to increased comfort for the use of his laptop. Despite the positive change, the same participant shared he was still not convinced to use technology beyond his professional work. He went on to express his reservations and concerns about technology by describing himself as somebody who does not get excited about using technology in his personal life.

A study conducted by Infenthaler and Schweinbenz (2016) identified acceptance technology influenced attitude towards technology Interpretations of the findings from my study also found positive change in attitude towards technology when study participants accepted technology as an enabler of teaching and learning. One study participant in particular noted lack of acceptance of technology limited use of technology in his personal life. Findings from my study aligned with findings from another study conducted in three middle schools with 120 students, revealing acceptance of technology influenced attitudes towards technology (see Infenthaler & Schweinbenz, 2016). Furthermore, acceptance of technology also predicted frequency of technology use and this was confirmed through findings from my study as participants described increased use of technology and variations in the use of technology in their practice. A study conducted by Drayton et al. (2010) found acceptance of technology determines willingness and frequency of use of technology. Findings from my study also revealed acceptance of technology resulted in positive attitudinal changes and willingness to use technology; leading to implementation fidelity, higher levels of teacher technology efficacy, and positive perceptions about the 1:1 teacher laptop program.

A study conducted by Unruh et al. (2016) to examine the influence of technology on student engagement found teachers who used technology frequently held more positive attitudes towards technology, leading to higher levels of technology efficacy. Several other researchers determined teachers who used technology actively are more likely to develop positive attitudes towards technology through improvement in their own technology efficacy (Chen; 2010; Ertmer & Ottenbreit-Leftwich, 2010; Hsu, 2010;

Holden & Rada, 2011; Li, 2010). Findings from my study confirmed frequent use of technology led to increased willingness, comfort, and confidence for the use of technology, leading to higher levels of technology efficacy. One study participant acknowledged his initial skepticism for the 1:1 teacher laptop program limited his use of technology, impacting his attitude towards technology and his technology efficacy. Furthermore, this participant also expressed his lack of interest in using technology outside work also influenced his attitude and inhibited the development of his technology efficacy. However, over time and with experience, the same participant described how his comfort and confidence for the use of technology changed, leading him to explore and use technology more in his practice.

A study conducted by Bakir (2015) revealed appropriate professional learning and modeling real-life experiences influences attitude towards technology. Findings from my study confirmed modeling real-life experiences not only influenced attitude towards technology, but was an enabler of technology efficacy because teachers were more willing to learn from their peers through collegial interactions. A review of the literature on adult learning confirms adults are more inclined to learn if they receive direction, encouragement, and support from other adults because adults prefer to engage with adults as learning partners (Knowles et al., 2015). However, a multiple-case study conducted by Bakir (2015) reveals inconsistencies during technology implementation, indicating the need to address other challenges adults face. This was confirmed through a study conducted by DeSantis (2013), which recommends the need to design effective professional learning to overcome challenges and to raise teacher technology efficacy.

Findings from my study confirmed teachers who participated in effective and targeted professional learning were generally more positive towards technology and more inclined to explore and use technology for teaching and learning.

Furthermore, interpretations of the findings from my study revealed teacher attitude towards technology influenced their own technology efficacy and comfort with the use of technology. Several researchers identified attitude towards technology influences teacher use of technology as a result of higher technology efficacy (Grundmeyer & Peters, 2016; Mouza, 2011; O'Neal et al., 2017). A phenomenological study conducted by Grundmeyer and Peters (2016) found positive attitude towards technology improves teacher technology competency and teacher technology efficacy. While one study participant described her initial impression about the 1:1 teacher laptop program as "daunting," she expressed how change in attitude towards technology resulted in increased technology efficacy and confidence for the use of technology. Another study participant attributed her initial concerns stemmed from her attitude towards technology, resulting in the lack of comfort for the use of technology. On the other hand, another study participant shared prior experience with the use of a laptop contributed to her positive attitude towards technology, noting this helped her quickly overcome her initial learning curve.

A review of the literature revealed the relationship between attitude towards technology and technology efficacy (DeSantis, 2013; Efe, 2015; Guo et al., 2010; Holden & Rada, 2011; Kalemoglu Varol, 2014; Lee et al., 2013; Niederhauser & Perkmen, 2010). In a study conducted by Kalemoglu Varol (2014) with physical education

teachers, findings from this study indicates a significant and positive relationship between attitudes towards technology and efficacy. Other researchers confirm teacher efficacy influences teacher attitudes and beliefs (Guo, Piasta, Justice, & Kaderavek, 2010; Moore-Hayes, 2011; Tilton, &Hartnett, 2016). Several participants in my study described increase in their own technology efficacy was a consequence of positive attitudes towards technology. Study participants who described themselves as enthusiastic supporters of technology, demonstrated and confirmed higher levels of technology efficacy. One participant who perceived he was "uniquely predisposed" towards technology also demonstrated higher levels of confidence through the "transformative power" of technology. Another study participant attributed positive attitude towards technology resulted in increased comfort for the use of technology, leading to "a high degree of efficacy" for technology. Other participants acknowledged attitude towards technology improved their technology efficacy, resulting in changes in their role as a teacher to a facilitator. On the other hand, study participants who were not as positive and enthusiastic about technology shared some reluctance and lack of confidence for the use of technology.

While some researchers identified attitude towards technology is an enabling factor for increased technology use (Ertmer et al., 2012; Howard, 2011), other researchers note attitude towards technology is a possible barrier for technology integration (Hew & Brush, 2007). Findings from my study concurred with findings from prior studies, confirming positive attitude towards technology can overcome barriers for technology integration and implementation fidelity (see Ertmer et al., 2012; Heath, 2017; Howard,

2011; Hur et al., 2016; Liu et al. 2016; Ottenbreit-Leftwich et al., 2010; Tilton & Hartnett, 2016). Findings from my study also revealed while implementation of the 1:1 laptop program was a complex process, positive attitudes towards technology resulted in positive perceptions about the program and overcame potential concerns and pitfalls (see Heath, 2017). Participants in my study noted staff morale was a concern because of inequitable access to the teacher laptop, negatively influencing attitudes towards technology. However, when all teachers were provided with a laptop, faculty morale and attitude towards technology changed significantly.

In summary, results from my study revealed positive attitude towards technology positively influenced overall perceptions about the 1:1 teacher laptop program. Furthermore, findings also confirmed positive attitude towards technology influenced and contributed to raising teacher technology efficacy. In addition, positive attitude towards technology led to willingness, frequent use, and comfort with the use of technology, resulting in higher levels of teacher technology efficacy. On the other hand, negative attitude towards technology limited technology use, lowered comfort for the use of technology, and inhibited levels of teacher technology efficacy.

Self-Directed Learning

Self-directed learning emerged as another overarching theme from this study. Interpretations of the findings revealed while self-directed learning was a consequence of positive perceptions, it also contributed to positive perceptions for the 1:1 teacher laptop program. Furthermore, the findings indicated self-directed learning not only positively influenced attitudes towards technology, but was an enabling factor in raising teacher

technology efficacy. These findings concurred with the literature on adult learning, which noted adults preferred to take control of their learning for independence, ownership, and autonomy (see Knowles et al., 2015). Findings from my study also revealed adults were more inclined and motivated to learn when they were able to self-directed their learning (see Sogunro, 2015). Study participants described different experiences for how they engaged in self-directed learning and included peer-to-peer collaboration, informal collegial interactions, group conversations, and formal workshops. Participants also shared what motivated them to direct their learning was the perceived value of technology as an enabler of teaching and learning. A review of the literature on adult learning also suggested adults are motivated to learn if learning has value and helps them solve problems with intrinsic payoffs (Knowles et al., 2015).

The literature on adult learning also supports the claim that adults have a need to learn and direct their own learning (Knowles et al., 2015; Merizow, 2007; Sogunro, 2015; Vilkonis, Bakanoviene, & Turskiene, 2013). A further review of the literature reveals adults prefer to self-direct their learning based on their needs and experience (Cassidy, 2004; Curry, 2000; Rayner, 2000; Tennant, 2006). Findings from my study supported findings from another study which found adults were ready to learn based on their experiences with technology (Vilkonis et al., 2013). This was further confirmed through findings from a study, which noted the need to support adult learners within the context of their learning situation (Giannoukos et al., 2015). Several study participants noted how their self-concept as a learner changed as a result of participation in the 1:1 teacher laptop program because access to the laptop allowed them to pace and manage their learning.

Furthermore, study participants indicated the ability to direct their own learning resulted in increased comfort with the use of technology because this helped them overcome limitations of time and pressure to attend workshops.

An extensive synthesis of literature conducted by Penuel (2006), reveals professional learning contributes to successful implementation of 1:1 laptop programs. While several researchers examined contextual factors and recommended teacher preparation through professional learning for successful implementation (Grundmeyer & Peters, 2016; McKnight et al., 2016; O'Neal et al., 2017), findings from my study identified self-directing learning was a significant contributing factor in raising teacher technology efficacy. This was also supported through a study conducted by Bakir (2015), which found teachers who engage in directing their own learning are more likely to increase their own technology efficacy. Findings from my study confirmed findings from this study conducted by Bakir (2015), revealing study participants valued directing their own learning because this was perceived as an enabling factor to raise their technology efficacy. However, findings from my study also found self-directed learning was a slow process, supporting findings from a study conducted by Mourlam and Montgomery (2015) because learning to integrate technology is a complex process and takes time. This was further confirmed through findings from other prior studies, which reveals learning is a complex process and requires timely and relevant support (Bakir, 2015; Trust, 2015). Several study participants confirmed self-directed learning not only contributed positively to increase their technology efficacy, but also promoted collaborative conversations, leading to new learning opportunities. Consequently, one study participant

highlighted the value of self-directed learning as a way to remove the "fear of the unknown," while raising confidence and comfort with the use of technology.

Findings from my study indicated the need to offer appropriate learning opportunities to better prepare teachers with higher levels of technology competency as recommended by other researchers (see Grundmeyer & Peters, 2016; Grunwald & Associates, 2010; Hsu, 2012; Kay, 2006; Kennedy, 2005; Periathiruvadi & Rinn, 2012; Richardson et al., 2012). While a review of the literature identifies modeling, collaboration, and mentoring are significant ways to improve technology proficiency, findings from my study found self-directed learning was also an enabling factor to raise teacher efficacy (see Kay, 2006). Furthermore, findings from my study concurred with findings from another study, which concluded teachers who participated in their own learning were more likely to develop self-efficacy, leading to positive attitudes (see DeSantis, 2013). Findings from this study supported findings from my study, revealing efficacious teachers are more likely to direct their own learning to use technology. Several study participants confirmed engagement in directing their own learning led to increase in their own technology efficacy, which in turn led to increased confidence, comfort, and use of technology. Findings from a study conducted by Hur et al. (2016) indicates teachers who possess higher levels of technology efficacy and direct their own learning are more likely to use technology more frequently. Findings from a prior study reveals collaborating with technologically proficient mentors leads to better learning outcomes (Moore-Hayes, 2011). Findings from my study confirmed participants who self-directed their learning and engaged with more knowledgeable others felt better

supported, resulting in increased technology efficacy. However, one participant noted self-directed learning alone was not sufficient to address the "generational gap" to prepare teachers who were less confident with the use of technology.

Despite differences in technology proficiency levels, all study participants acknowledged they were also motivated to direct their learning when they observed others using technology to enhance practice. A review of the literature notes modeling or vicarious learning by observing others complete a task successfully is a source of self-efficacy, which in turn fosters self-directed learning (Bandura, 1977). Study participants revealed they engaged in self-directed learning because they wanted to maximize the potential of technology to improve practice and student learning. In addition, study participants highlighted they were motivated to direct their learning to find new ways to use technology to enhance personal productivity.

While several participants shared engagement with more knowledgeable colleagues fostered self-directed learning, one participant in particular described several experiences for how he collaborated with teachers and directed his learning. This also led him to not only explore the use of an online platform for collaborative planning, but share resources with peers to improve productivity and practice. Another participant described while she was not new to technology, directing her learning through her Head of Department "opened a whole new world to allow for multiple methods of instruction." This in turn encouraged and strengthened her resolve to direct her learning by exploring a variety of software applications to facilitate student learning. These findings concurred with the literature on self-efficacy, which states experience of mastery is the most

significant source of self-efficacy (see Bandura, 1977). The literature on adult learning also notes adults learn by collaborating with other adults to share, manage, and plan their learning (Knowles et al., 2015).

While study participants indicated they directed their learning through engagement with colleagues, some participants shared they also engaged with students to direct their learning. Some participants revealed they were open to learning from students, however, one participant expressed her lack of confidence and reservation to learning from students as she felt uncomfortable asking students for help or support. Nevertheless, this study participant was encouraged to direct her learning by engaging with the ICT coach because she found her learning interactions with the ICT coach were extremely positive. The literature on adult learning reveals adults prefer to learn from their peers and within the context of their learning situation (Knowles et al., 2015).

A study participant who also had experience as an IT coach shared how engagement with teachers contributed to his learning because this encouraged him to direct his learning to discover and share new ways of using technology with teachers. This participant also described engagement with teachers motivated him to manage his learning and to further develop his knowledge and skills to serve teachers as the IT coach. The literature on adult learning indicates adults are motivated to learn and direct their own learning because they need to feel successful, take control, and own the locus of control for their learning (Knowles et al., 2015). Findings from my study also revealed study participants were motivated to learn to use the teacher laptop because this resulted in a sense of accomplishment after successful completion of a task. These findings

concurred with findings from a prior study conducted by Osman (2014), which determined adults are more likely to direct their learning when the learning context is relevant and the learning leads to successful outcomes.

Study participants perceived self-directed learning as a way to overcome "the lack of structured time" for learning. Several study participants shared self-direct learning mitigated constrains of time because it helped them improve their personal productivity, leading to better use of time. Some participants who described themselves as "self-taught," preferred learning on their own to manage time and learning by doing. This is turn resulted in increased confidence and comfort for the use of technology, leading to higher levels of technology efficacy. The literature on adult learning notes adults want to guide their learning and prefer to take ownership of learning because this fosters a sense of independence (Knowles et al., 2015). However, some study participants also acknowledged the need to learn from more knowledgeable others. One participants in particular attributed development of technology proficiency was a result of the support she received from the Head of Department, explaining if she had only engaged in self-directed learning, it might have taken longer to achieve the level of technology efficacy. Furthermore, while this participants expressed the need for teachers to engage in self-directed learning, she also shared the need to support teachers who were new to the 1:1 teacher laptop program and reluctant to engage in self-directed learning. Some participants highlighted the "generational gap" and the steep "learning curve" for some teachers, noting the need for a variety of learning opportunities beyond self-directed learning. This finding from my study concurred with both the literature on self-efficacy

and adult learning, indicating adults engage with other adults as learning partners (see Knowles et al., 2015) and prefer to learn through vicarious experiences and modeling with other adults (see Bandura, 1977). Other participants shared they were encouraged to learn on their own because self-directed learning not only facilitated personalization of learning, but led to quicker and timely learning outcomes. This in turn encouraged some participants to use technology more actively and frequently. The literature on adult learning suggests adults prefer to take ownership of their learning to control what they learn (Knowles et al., 2015).

A review of the literature on adult learning indicates learning is situational and differs from situation to situation (Knowles et al., 2015). Findings from my study concurred with the literature on adult learning, revealing readiness to learn to use technology was driven by the participants' desire to learn something useful, appropriate, and relevant through authentic experiences (see Knowles et al., 2015). Several study participants shared their readiness to learning was motivated by the desire to use technology effectively. Participants described different experiences resulting in positive outcomes, including collaborative interactions and timely access to learning resources as factors contributing to readiness to learn. Some study participants indicated effective use of technology appealed to them because of intrinsic payoffs, which contributed to readiness to learn.

Readiness to learn results in improving self-concept of adult learners (Knowles et al, 2015). Findings from my study concurred with literature on adult learning, indicating self-directed learning improved self-concept of learners (Knowles et al., 2015).

Interpretations of the findings from my study revealed improved self-concept encouraged study participants to self-teach and self-guide their learning, while assuming ownership and control of their learning. Furthermore, this not only allowed independence, but change in attitude towards technology because participants were empowered to contextual their learning by freely asking questions about the learning (see Knowles et al., 2015).

Findings from my study also revealed participation in the 1:1 teacher laptop program helped shape mental models through authentic experiences, relevancy, and timely access (see Knowles et al., 2015). While one participant revealed his initial skepticism about technology led him to disengage from learning, he recognized how this negatively influenced his attitude towards technology and his technology efficacy. However, over time he shared how he took ownership and directed his learning, which increased his confidence and willingness to explore ways to use technology to improve his practice.

A review of the literature reveals peer learning interactions is an enabling factor to improve technology proficiency and technology efficacy, leading to effective technology integration (Mouza, 2012; Perotta, 2013; U.S. Department of Education Office of Educational Technology, 2016b). Findings from a prior study identified engagement and sharing among peers are significant factors contributing to preparation of teachers to use technology (Krutka et al., 2016). Several study participants described how self-directed learning interactions with peers and in particular with the ICT integrator and the Head of Department not only helped them raise their own teacher

technology efficacy, but encouraged them to explore the use of technology within the context of their practice. In addition, self-directed learning with peers mitigated anxiety and feeling overwhelmed because learning experiences were personalized. Consequently, several study participants found self-directed learning valuable and contributed to the development of their own technology efficacy.

In summary, self-directed learning emerged as an overarching theme through the perceptions and experiences of participants. Interpretations of the findings revealed participation in the 1:1 teacher laptop program motivated teachers to engage in self-directed learning. Furthermore, self-directed learning positively influenced attitudes towards technology, leading to positive perceptions for the 1:1 teacher laptop program. Findings from the study also indicated self-directed learning was an enabling factor in raising teacher technology efficacy. Study participants described engagement in self-directed learning through peer-to-peer collaboration, informal collegial interactions, group conversations, and formal workshops. Interpretations of the findings also revealed participants were motivated to direct their own learning because of the perceived value of technology as an enabler of teaching and learning. Consequent, this motivated participants as adult learners to take ownership of their learning to maximize the potential of technology to improve personal productivity, practice, and student learning.

Perceived Value

Perceived value of technology was identified as an overarching theme from my study. Several other researchers also identify perceived value as a theme and a contributing factor for increased use of technology in teaching and learning (Mayo, Kajs,

& Tanguma, 2005; Tanguma, Underwood, & Mayo, 2004; Willis, 2006). However, a review of literature indicated perceived value was not examined through the perspective of teachers as adult learners (Harper & Milman, 2016). Furthermore, researchers recommend the need to examine how perceived value of technology influences teacher technology efficacy (Bakir, 2015; DeSantis, 2013; Mourlam & Montgomery, 2015; Zheng et al., 2016). While descriptions of experiences were unique because of situational differences of study participants, perceived value emerged as a significant contributing factor for positive perceptions about the 1:1 teacher laptop program. In addition, participants confirmed perceived value contributed to increased use of technology and willingness to learn about technology. Interpretation of the findings concurred with the literature on adult learning, which suggests perceived value influences adults to engage in their own learning (see Knowles et al., 2015). Furthermore, adults are motivated to learn if they value what they are learning and if the learning helps and results in solving problems (Knowles et al., 2015). Adults also want to feel successful and if they perceive learning something valuable leads to success, they are more inclined to learn (Knowles et al., 2015). Findings from my study revealed how study participants perceived value and this included improved personal productivity and practice, which resulted in motivating participants to continue exploring and learning more about technology.

A review of the literature on adult learning suggests adults have a need to know the why, what and how learning occurs and the value of the learning within a particular context (Knowles et al., 2015). Furthermore, adults are motivated to learn through intrinsic payoffs and personal gratification (Knowles et al., 2015). Findings from my

study revealed perceived value was an intrinsic payoff, motivating study participants to engage in their own learning about technology because they perceived the value in technology to positively influence teaching and learning. Perceived value is also identified as a second-order barrier for acceptance of technology (Ertmer et al., 2012). A study conducted by Chen (2010) revealed perceived value contributes to influencing use of technology for teaching and learning. Other researchers also confirmed perceived value influences use of technology (Grundmeyer & Peters, 2016; Mouza, 2011; O'Neal et al., 2017). This was confirmed through the findings from my study, which indicated perceived value was a significant factor contributing to positive perceptions, attitudes, and the use of technology. Findings from my study also revealed perceived value contributed to continued interest and engagement with technology through the 1:1 teacher laptop program. This in turn led increased confidence and comfort for the use of technology, resulting in positive perceptions and experiences. Interpretations of the findings from my study also concurred with findings from prior studies, confirming perceived value contributes to higher levels of technology efficacy (see Bakir, 2015; 2016; Grundmeyer & Peters, 2016; Mourlam & Montgomery, 2015; O'Neal et al., 2017; Zheng et al., 2016). Descriptions of participants' experiences indicated learning from more knowledgeable peers was also a perceived value and a source of technology efficacy (see Bandura, 1977).

A review of the literature indicates schools continue to invest in technology because of the perceived value of technology to enhance practice and improve student learning (Ditzler, Hong, & Strudler, 2016; Ifenthaler & Schweinbenz, 2016; Yarbro,

McKnight, Elliott, Kurz, & Wardlow, 2016). This was further confirmed through the literature, which suggests that perceived value is a significant contributing factor for the continued adoption of technology for teaching and learning (Bakir, 2015 ; Harper & Milman, 2016; Krutka, Carpenter, & Trust, 2016; McKnight, O'Malley, Ruzic, Horsley, Franey, & Bassett, 2016; Trust, 2016; Wegerif, 2015; Williams & Larwin, 2016). Findings from my study also revealed positive perceptions and interest for the 1:1 teacher laptop program was a result of the perceived value of technology to enhance practice, improve student learning, and support school improvement. Perceived value encouraged study participants to describe the 1:1 teacher laptop as "revolutionary" because they noticed improvement in their productivity and change in their practice, as a result of participation in the 1:1 teacher laptop program. Study participants described several experiences for how they perceived value, including increased collaborative engagement, reduction in use of paper and printed materials, increased informal and collegial learning, improved monitoring of student work, timely support and feedback to students, and improved instructional delivery. Some participants went as far as to describe the teacher laptop as an invaluable tool and the "center of our teaching", while another participant described the laptop as "as an extension of the body." While study participants revealed attitudes and use of technology changed as a result of the learning support they received, perceived value was also a significant factor contributing to change in attitudes and willingness to use technology. Interpretations of the findings from my study also revealed positive experiences also contributed to raising the perceived value of technology, leading to positive perceptions for the 1:1 teacher laptop program and higher levels of

technology efficacy. These findings concurred with the literature on self-efficacy, which suggests success raises self-efficacy (Bandura, 1977). Furthermore, the literature on adult learning also notes positive experiences contributes to shaping mental models and increasing the self-concept of the learner because adults seek success and a feeling of accomplishment (Knowles et al., 2015).

A review of the literature indicates teachers who developed positive beliefs based on perceived value through their experience are more likely to efficaciously integrate technology (Heath, 2017). Findings from a phenomenological study examining experiences and beliefs of two teachers who initiated a 1:1 program, indicates technology implementation is a complex process (Heath, 2017). However, findings from this and other studies also revealed perceived value leads to positive perceptions and mitigates potential concerns and challenges (Donovan, Hartley, & Strudler, 2007; Ertmer et al., 2012). Furthermore, findings from these studies reveals that perceived value is a significant contributing factor to positive beliefs, leading to increased interest in technology initiatives and motivation to use technology. These findings supported findings from my study because study participants expressed their interest and willingness to continue participating in the 1:1 teacher laptop program.

A mixed-methods study conducted by Liu et al. (2016) to examine teacher perceptions and comfort level during a 1:1 technology implementation, indicates that perceived value influences teacher comfort and acceptance of technology. Findings from this study supports findings from other prior studies, indicating that perceived value not only influences use, but comfort for the use of technology (Grundmeyer et al., 2011;

O'Neal et al., 2017; Heath, 2017; McKnight et al., 2016; Newhouse et al., 2015). Furthermore, findings from these studies identifies that perceived value is a potential contributing factor to overcome technology implementation challenges, concerns, and barriers (Ertmer et al., 2012; Hew & Brush, 2007); acceptance; and increase use of technology (Anderson, Groulx, Maninger, 2011; Giles & Kent, 2016; Moore-Hayes, 2011; Tilton & Hartnett, 2016). Findings from my study also revealed participants were more accepting of technology because of the perceived value of technology. Furthermore, study participants who held stronger perceptions for the value of technology through prior experience viewed themselves as proponents of technology and possessed higher levels of technology efficacy. This finding from my study concurred with the literature on adult learning, where prior experiences not only provided a source for higher levels of efficacy, but improved self-concept and confidence (see Knowles et al., 2015). However, interpretations of the findings from my study revealed participants without prior experience acknowledged the perceived value of technology also positively influenced their own technology efficacy. While one participant noted that perceived value improved personal productivity and practice, another participant described increase in staff morale was a result of the 1:1 teacher laptop program, which was viewed as a perceived value. Other participants viewed "quality and the depth" of interactions and use of time by "taking away a lot of the repetitious sitting work" as a perceived value of technology. This was because of observing teachers who were more engaged in meaningful conversations and interactions about teaching and learning as a result of using technology.

While findings from a study conducted by Peterson and Ray (2013) identifies life experiences as a catalyst of adult learning, findings from my study confirming adults perceived value in learning through collaborative engagement with other adults. Study participants revealed participation in the 1:1 teacher laptop was a perceived value because it facilitated and increased collaboration and interaction among peers. Findings from another study conducted by Hur et al. (2016) confirms results from other prior studies, indicating technology integration is influenced by perceived value (Ertmer et al., 2012; Miranda & Russell, 2012). A study conducted by Anderson et al. (2011) indicates technology efficacy is a predictor of technology use and perceived value is the best predictor of frequency of technology use. Findings from my study also revealed increase and frequency of use of technology were a consequence of perceived value, which also contributed to change in practice and increased interactions with teachers and students. Study participants went as far to describe the perceived value of technology as "fantastic", noting the "profound effect both on students and on teachers." One study participant summing up the perceived value of technology by stating, "we need to have it. I think it's a big step in the right direction."

While researchers note ease of use of technology as a perceived value of technology, it is also an enabling and inhibiting factor (Ertmer et al., 2012; Hew & Brush, 2007; Howard, 2011). Findings from my study concurred and revealed that ease of use of technology was a perceived value of technology, and an enabler and inhibiting factor. Study participants shared positive experiences and challenges related to the ease of use of technology. In some cases, study participants indicated that ease of use contributed to

positive perceptions and change in attitude towards technology; while in other cases study participants described anxieties and concerns related to the use of technology. Positive experiences included using technology to organize and share information and resources, collaborating with peers, facilitating timely feedback, and improving instructional delivery. Challenges included developing technology proficiency to keep up with students, rapid changes in technology, and the need for on-going and targeted learning. However, in most cases study participants acknowledged the ease of use of technology contributed positively to the perceived value of technology, leading a study participant to describe technology as "really quite revolutionary." Study participants noted the ease of use and the perceived value of technology encouraged teachers to explore ways to adopt innovative uses of technology. This included increased collaboration through the use of online platforms and the use of the text-to-speech feature on the laptop to improve student learning. The literature on self-efficacy notes physiological factors are a source of self-efficacy, where stressful and difficulties influences and lowers self-efficacy (Bandura, 1977). Consequently, interpretations of the findings from my study revealed that ease of use resulted in less stressful situations, leading to a sense of feeling better prepared to use technology, which in turn resulted in higher levels of teacher technology efficacy.

Limitations of the Study

This study was limited by the choice of the research design and constrained as a result of purposeful sampling of participants, selected from a single study site located at one international school. While data saturation was reached, the number of participants

selected for the study could have limited interpretations of the findings. Due to variations and differences between international and other schools, the findings from this study may not be applicable to all situations. In addition, assumptions limited this study because I presumed study participants understood the purpose of the study and interview questions, were willing to respond honestly, and able to recall experiences accurately. Furthermore, I assumed responses included rich and thick descriptions through the perceptions and experiences of the study participants.

I followed the IRB and other ethical guidelines to mitigate researcher bias, and the study site was familiar to me since I am working at the school where the study was conducted. In addition, while I do not have direct responsibility to supervise or evaluate any of the study participants I was familiar with all the study participants. Consequently, this might have influenced some of the responses and the data collected. However, this study was not design for generalizability, and insider research had advantages to overcome limitations because it provided familiarity with the culture, understanding of the practice, and access to the participants through trust relationships for better interpretation of the narrative (Atkins & Wallace, 2012).

I attempted to ensure that the study participants understood the research and interview questions by asking clarifying questions, but some questions might have been misunderstood or misinterpreted. Furthermore, the study participants might not have disclosed information because they could not recall experiences or were reluctant to disclose because they felt uncomfortable. However, the study participants responded to all the research questions and demonstrated little to no hesitation in answering any of the

questions. As the sole researcher, I was responsible for the design, collection, analysis, interpretation, and conclusions of the study. I did everything I could in accordance with the ethical guidelines to mitigate personal influence on the study, but there was always a possibility my personal experience, bias, and assumptions could have influenced the results of my study. However, to mitigate influence on the study I guarded against bias and judgment by remaining intentional and focused on the purpose of the study and the research questions during the stages of data collection, transcription and analysis. I also used the conceptual framework to guide the design of the interview protocol and the coding during data analysis. While the research questions might have limited the study, to improve clarity and quality of the research questions, I not only reviewed the research questions with my methodologist, but I also conducted trial interviews with four individuals to improve the research questions. However, I might have failed to ask relevant questions, which could have limited the findings of my study.

I kept detailed observation and other notes in my reflective journal to document my thoughts after each interview and I referred to these notes during data analysis. Finally, I guided interpretations of the findings for my study by referencing the literature on the conceptual frameworks used in my study and the findings from the research studies discussed in the literature review section. There were no constrains or limitations related to finding participants, time, setting or scheduling interviews for this study.

Recommendations for Future Research

While my study provided insights and new understanding through the perceptions and experiences of the participants of the 1:1 teacher laptop program and their own

technology efficacy, further research is recommended because the review of the literature revealed this was an understudied topic. Future research could include questions beyond the two research questions to deepen understanding and to enrich the quality of data because the adoption of technology "continues to change and influence research and practice." (Bakir, 2015, p. 127).

Future research could consider using both quantitative and mixed-method approaches to investigate experiences of teachers who participated in a 1:1 teacher laptop program and their own technology efficacy. Combining quantitative and qualitative data could reveal concealed and buried information this study did not find, leading to more comprehensive insights and understanding to augment the body of existing knowledge. Quantitative analysis could further examine learning outcomes as a result of participation in the 1:1 teacher laptop program with relation to factors such as technology attitudes and technology acceptance.

It could be beneficial to include other stakeholders such as students and school leaders to gain a broader understanding of the topic. Extending the scope of data collection through inclusion of other stakeholders could help identify missing information and gaps this study did not find to improve the quality of findings and the value of research. Furthermore, inclusion of students and school leaders in future studies could not only benefit from richer data through broader experiences, but also provide all stakeholders a voice in the implementation of technology initiatives to improve teaching and learning.

Since this study was limited by the setting at one international school, it is recommended to locate future studies through a wider context of similar and dissimilar settings. This could allow for replication, while providing deeper insights and understanding to add to the body of knowledge by identifying other overarching themes which were not identified from this study. Future studies could enhance my study t by including a larger number of participants with a broader range of experiences. Furthermore, this could provide more teachers with a voice in the implementation of future 1:1 related mobile technology initiatives, such as smartphones and tablet programs. Conducting future research through multiple sites and a wider range of settings with more participants could also improve the quality and value of my study, contributing to deeper understanding to improve implementation fidelity and influence of technology on teaching and learning.

Future research could also examine other current and emerging technologies beyond the 1:1 teacher laptop program to determine interconnections and influence on teaching and learning. Expanding future research through other technologies could provide further insights, making findings even more useful by potentially enriching understanding of changes as a result of the rapid proliferation and continued adoption of technology in schools. It could be important to examine the influence of the 1:1 teacher laptop program on teacher technology efficacy by designing studies to determine the influence on technology integration and student learning. Further research could also explore interconnections between the 1:1 teacher laptop program and specific adult learning principles such as readiness to learn, orientation to learning, and motivation to

learn; and how these influence teacher technology efficacy. This could provide deeper understanding for how teachers as adults learn, leading to improved professional learning opportunities to better prepare teachers to use technology to enhance productivity and practice. Furthermore, knowledge about how teachers as adults learn and develop their own technology efficacy could further improve design of learning situations and outcomes, leading to innovative uses of technology for teaching and learning.

While volumes of research are available about the 1:1 student laptop program, little is known about interconnections between the 1:1 student laptop and the 1:1 teacher laptop programs. Further research could focus on investigating and examining factors, if any, between these two programs to maximize the potential of the two initiatives to further improve teaching and learning.

Implications

The purpose of this qualitative pragmatic study was to describe perceptions and experiences of teachers who participated in a 1:1 teacher laptop program at an international school and their own technology efficacy. Setting the study site at an international school broadened the scope of this research and the body of empirical data collected about a 1:1 teacher laptop program, which is an understudied topic. Furthermore, the existing body of knowledge related to 1:1 laptop programs was related and examined through the perspective of students. My study expanded on the topic by including teachers and teachers as adult participants in a 1:1 teacher laptop program situated at an international school. Findings from my study provided insights through the responses of a purposefully selected group of teachers from the primary and secondary

school, who had participated in the program for at least 2 years. In addition, this study examined the phenomenon through the lens of an adult learning model and the construct of self-efficacy. Findings from my study could add to the body of existing knowledge and contribute to deeper understanding about the topic.

Implications for Social Change

This study contributed to social change because it examined the phenomenon through the lens of teachers, who are considered as significant predictors of student achievement and success. This study uncovered seven overarching themes through the perspective of teachers as adult learners and also identified factors influencing their own technology efficacy.

The inclusion of an international school and a selected group of experienced teachers from an international school broadened the significance of my study, adding an international perspective that would have otherwise limited the findings from the study. This was not only significant because it enriched descriptions for deeper understanding about the topic, but it also provided insights to better prepare teachers to use technology for implementation fidelity, leading to school improvement.

This study was also significant for social change because it involved a contextual and in-depth examination of a specific phenomenon through thick and rich descriptions based on the perceptions and experiences of teachers (Merriam & Tisdell, 2016; Savin-Baden & Major, 2013). Furthermore, my study identified overarching themes, contributing new insights and understanding through the perspective of teachers as adult learners. While this added to the body of knowledge, it also validated assumptions related

to adult learning and how teachers as adults learn. Since teachers are viewed as significant predictors of student achievement, my study supported and provided a voice for teachers in the implementation and improvement of technology initiatives. Findings from my study also provided insights through the perspective of teachers as adult learners to maximize the potential of the 1:1 teacher laptop program to positively influence teacher technology efficacy.

My study also contributed to social change because the findings could inform schools leaders, decision-makers, and other key stakeholders involved in the implementation of technology initiatives. While this can help to better prepare teachers to use of technology for teaching and learning, it can also contribute to school improvement by including teachers in decisions. The identification of enabling and inhibiting factors influencing teacher technology efficacy can also contribute to enhancing acceptance and comfort for the use of technology.

Implications for Practice

This study can help to improve the use of technology in practice because it described the perceptions and experiences through the perspective of teachers and their use of technology. While this study was not designed for generalizability, the overarching themes identified through the interpretations of the findings can be used to guide future implementation of 1:1 teacher laptop programs because this is an understudied topic. Furthermore, my study has implications for practice because technology implementation is a complex process and the rapid adoption of technology in schools. Consequently, more research is needed to understand the implications and application of technology to

improve teaching and learning. Findings from my study can help to improve practice through the experiences of teachers as significant predictors of student success. This study also contributed to the body of existing knowledge about teacher technology efficacy and how technology initiatives such as the 1:1 teacher laptop program can influence teacher technology efficacy. Contributions to the body of scholarly literature can enhance understanding of teacher technology efficacy to improve practice and the use of technology to promote student learning.

School improvement is also dependent on how schools implement technology initiatives and provide related professional learning opportunities. My study can contribute to improve practice by helping to design appropriate professional learning through the perspectives of teachers to maximize the use of technology for teaching and learning. Findings from my study can also contribute to understanding the limitations of and challenges of using technology to improve practice. My study also provided insights by giving teachers a voice to share their experiences with technology and how technology influenced their personal productivity and practice.

My study was also significant and had implications for practice because the findings underscored the importance for deeper examination of the topic to not only add to the body of knowledge, but to determine other unidentified factors to influencing implementation fidelity and teacher technology efficacy Furthermore, the findings from my study confirmed there are unanswered questions related to teacher technology efficacy and the preparation of teachers to use technology to transform practice and

improve student learning. Finally, my study provided recommendations for future research to support the research related to this topic.

Conclusion

The purpose of this qualitative pragmatic study was to describe the perceptions and experiences through the perspective of teachers who participated in a 1:1 teacher laptop program for at least 2 years and their own technology efficacy. The overarching themes that emerged from my study in response to the two research questions included access to the teacher laptop, change in practice, support structures, concerns and barriers, attitude towards technology, self-directed learning, and perceived value.

Access to the teacher laptop emerged as an overarching theme because teachers perceived access to the laptop was not only viewed as a bonus, but the school's commitment to support teachers, fostered greater equity among teachers, raised faculty morale, improved personal productivity and practice, increased collaboration through increased collegial interactions,; and enhanced instructional delivery. Several sources of experiences contributed to identifying change in practice as an overarching theme and included change in instructional methodology from teacher-centered to a student-centered approach, reduction in the use of paper, timely feedback, collaboration with colleagues, modification of instruction, and use of online resources. On the other hand, support structures emerged as an overarching theme through experiences related to ICT technical support, instructional support, professional development, informal collegial interactions, and shared resources. A fourth theme, which emerged in response to the first research question was related to concerns and barriers, and included professional learning and

instructional support as significant concerns and time as a barrier. While positive experiences contributed to identifying attitude towards technology as an overarching theme, perceptions related to the teacher laptop and learning styles was also an influencing factor. Self-directed learning emerged as an overarching theme because participants perceived they were motivated to engage in and direct their learning to raise their own technology efficacy and maximize the potential of technology to improve personal productivity, practice, and student learning. The final overarching theme was perceived value of technology, which emerged because the participants viewed participation in the 1:1 teacher laptop program improved their productivity and practice, and motivated them to take ownership of their learning, raising their own technology efficacy.

In conclusion, while this study had limitations, findings confirmed teachers were generally positive about the 1:1 teacher laptop program and value of technology as an enabler of teaching and learning. Furthermore, participants also perceived participation in the 1:1 teacher laptop not only improved attitude towards technology, personal productivity and practice, but also raised teacher morale and their own technology efficacy. Consequently, this led to increased confidence and willingness to explore and use technology to improve student learning. Participants also acknowledged increased confidence and comfort with the use of technology led to willingness to take ownership of their own learning. However, while teachers perceived improvement in their own technology efficacy, they also noted the need for continued and focused professional learning opportunities to improve implementation fidelity. Findings from my research

can help inform school leaders and other key stakeholders and decision-makers as they implement future 1:1 teacher laptop programs and other new technology initiatives. Future research can focus on other areas and issues, including the influence of the 1:1 teacher laptop program on technology integration through the lens of teachers to add to the expanding body of knowledge on the topic.

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Appendix A: Interview Protocol

The interview protocol will start with an opening welcome statement and an introductory script. The script will reiterate the purpose of the study and the format and goal of the interview. In addition, the participant will be reminded about the confidentiality agreement and the signed informed consent. This will be followed by interview questions and two closing questions, ending with a concluding statement.

Interview Questions

RQ1. How do teachers participating in a 1:1 teacher laptop program perceive and describe their experiences with the program?

1. Can you tell me a little about yourself and what you do at the school?
2. Can you share your involvement and role in the 1:1 teacher laptop program?

   Probe: How long have you participated in the 1:1 teacher laptop program at the school?
3. Can you describe your overall experiences with the 1:1 teacher laptop program?

   Probe: Can you share how you use your 1:1 teacher laptop by illustrating a typical teaching day?

   Probe: Can you describe some other uses and experiences with the 1:1 teacher laptop on an atypical day?
4. Based on your overall experience, has anything supported you in raising your comfort level participating in the 1:1 teacher laptop program?

   Probe: Can you share some details of professional learning opportunities related to the 1:1 teacher laptop program you were provided, if any?

5. Can you tell me how the 1:1 teacher laptop program might have changed your instructional delivery?

    Probe: Can you identify and share factors and professional development related to the 1:1 teacher laptop program that might have influenced and contributed to changes in your instructional delivery?

RQ2. What do teachers participating in a 1:1 teacher laptop program identify as factors enabling or inhibiting their own technology efficacy?

6. Can you tell me how you perceive your own technological efficacy?
7. Has participation in the 1:1 teacher laptop program changed your uses and application of technology in teaching and learning? If so, in what ways?
8. Can you describe your comfort level for the use of the 1:1 teacher laptop when you first joined the program as best you can recall?

    Probe: How do you feel now and can you tell me more by sharing details of how you use various hardware and software?
9. Are there ways in which the 1:1 teacher laptop program has supported your style of learning? If so, can you tell me about them?
10. Has the 1:1 teacher laptop program advanced the development of your own technology efficacy? If so, can you tell me how?

    Probe: What factors, if any, could have or did enable the development of your own technology efficacy?

    Probe: What factors, if any, could have or did inhibit the development of your own technology efficacy?

11. Do you have any suggestions for how to improve the 1:1 teacher laptop program? Please share them.

Closing Questions

12. Are there any questions I should have asked that I did not about the 1:1 teacher laptop program?
13. Do you have any other experiences or information you want to share related to the 1:1 teacher laptop program?