PERSONALIZED PROFESSIONAL LEARNING EXPERIENCES AND TEACHER SELF-EFFICACY FOR INTEGRATING TECHNOLOGY IN K-12 CLASSROOMS

by

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The following individuals read and discussed the dissertation submitted by student Allison Barsnica Hall, and they evaluated her presentation and response to questions during the final oral examination. They found that the student passed the final oral examination.

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DEDICATION

This dissertation is dedicated to my family and friends that supported me throughout the doctoral process. To my husband, Mike, for his limitless love and support. To my parents, Paul and Barbara Barsnica, for a lifetime of encouragement and inspiration. To my mentors, Nathan Myers and Tracy Yslas, for seeing potential and taking a chance on me. To my coworkers, for listening to and encouraging my crazy ideas. To my friends for forcing me to keep my life balanced. And finally, to my dogs, Buddy and Teddy for their unconditional love, companionship, and distraction during long writing days.

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ABSTRACT

The studies in this dissertation were designed to develop an understanding of the impact of personalized professional learning experiences for K-12 teachers. These studies took place in a large, preK-12, public school district in the Southwest region of the United States. Through a combination of quantitative and qualitative methodology, these studies measured the growth of teachers' perceptions of their ability to work with technology tools and their self-efficacy towards integrating technology purposefully to improve the learning experiences of their students, as well as delving into the personal experiences of select teachers in the program. The Core Conceptual Framework for teacher professional development (Desimone, 2009), theories of personalized learning (Pane, Steiner, Baird, & Hamilton, 2015), and self-efficacy theory (Bandura, 1997) served as the theoretical framework for examining these experiences.

The quantitative results of both studies showed a significant improvement in teachers' technology skills and self-efficacy toward integrating technology in the classroom after the personalized professional learning program. The interview findings of the second study revealed that the elements of personalization that produced the most positive learning experiences for the teachers interviewed were choice, coherence, and support. The challenges that were revealed in the interview process were an increased need for content specific courses demonstrating technology integration, a desire for increased community of practice among teachers in the program, and the overarching

struggles of teaching as a practice. Based on the findings of these studies, recommendations were developed to support increased personalization and improved teacher learning experience.

Descriptors: personalized professional learning, professional development, technology integration, self-efficacy, personalized learning

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LIST OF ABBREVIATIONS

1:1	One-to-one
CoP	Community of Practice
CPD	Continuous Professional Development
DFI	Designing for Innovation
ELA	English Language Arts
ESL	English as a Second Language
IBL	Introduction to Blended Learning
ICT	Internet Communications and Technologies
ITI	Integrating Technology into Instruction
LCPD	Learner-Centered Professional Development
LMS	Learning Management System
NETP	National Educational Technology Plan
oTPD	Online Teacher Professional Development
PBL	Project Based Learning
PD	Professional Development
PL	Personalized Learning
PLC	Professional Learning Community
PLT	Personalizing Learning through Technology
PPL	Personalized Professional Learning

SAMR	Substitution Augmentation Modification Redefinition
TPCK	Technology Pedagogy Content Knowledge

CHAPTER ONE: INTRODUCTION

The integration of Internet Communications and Technologies (ICT) in K-12 classrooms imposes not only logistical and technological changes to learning environments but, most importantly, pedagogical changes. Media comparison studies have shown that delivering information through technology shows no significant difference when compared to non-technological methods (Clark, 1994; Warnick & Burbules, 2007). However, when the implementation of technology shares a symbiotic relationship with the evolution of pedagogical methods there is the potential for a more positive impact than either environment on their own (Albion et al., 2015; Kozma, 1994). As ICT becomes increasingly ubiquitous in education, the role of the teacher is shifting from a vessel of knowledge to a facilitator of inquiry (Dall'Alba & Sandberg, 2006). This movement to learner-centered education highlights the importance of supporting overall teacher quality and professional development (PD), not just in the realm of technology (Albion et al., 2015). As the expectations and roles of teachers are evolving, the nature of PD must adapt as well. While PD has traditionally been viewed as the acquisition of skills and knowledge, the focus has shifted to models that facilitate sustained change in understanding and practice (Dall'Alba & Sandberg, 2006).

As an educational technology trainer for a K-12 school district that was beginning to deploy a large number of devices, my role was to find a scalable, sustainable, and replicable way to provide professional development for educators. As I began small-scale pilot testing, it became clear that traditional methods of professional development would

not be sufficient to meet the diverse needs of almost 4,000 teachers located at 86 school sites. The two studies described in this dissertation intended to examine a personalized PD experience to support teachers' ICT integration. Quantitative study and mixed-methods studies were conducted over two years in a preK-12 public, unified school district.

Context

These studies took place in a preK-12 public school district in Arizona serving approximately 72,000 students, 3,700 teachers, and 5,200 support staff. At the time of the studies, there were 86 schools and programs offered in the district including six high schools, nine junior high schools, 55 elementary schools, eight choice schools, four success schools, three preschools, and one online school program. Approximately 62% of students receive free or reduced lunch services. Roughly 4,500 students receive English as a Second Language (ESL) services representing students from sixty-four countries and twenty-eight languages.

In 2012, voters approved a $230 million bond to upgrade the district's transportation, facilities, and technology infrastructure. Between 2012 and 2018 one-to-one (1:1) devices were distributed to six comprehensive 9-12 high schools and two preK-6 elementary schools. Nine 7-8 junior high schools received device carts in all math and English language arts (ELA) classrooms. At the K-6 grade levels, the remaining 53 elementary schools received a minimum of three device carts for classroom use. A pilot 1:1 elementary school program began in the 2013-2014 school year followed by a second 1:1 elementary school pilot in the 2014-2015 year. Starting in the 2015-2016 school year two high schools received 1:1 devices each year. Figure 1 shows the full scope of the

device distribution timeline. This phased distribution process increases the already complex nature of PD for ICT integration.

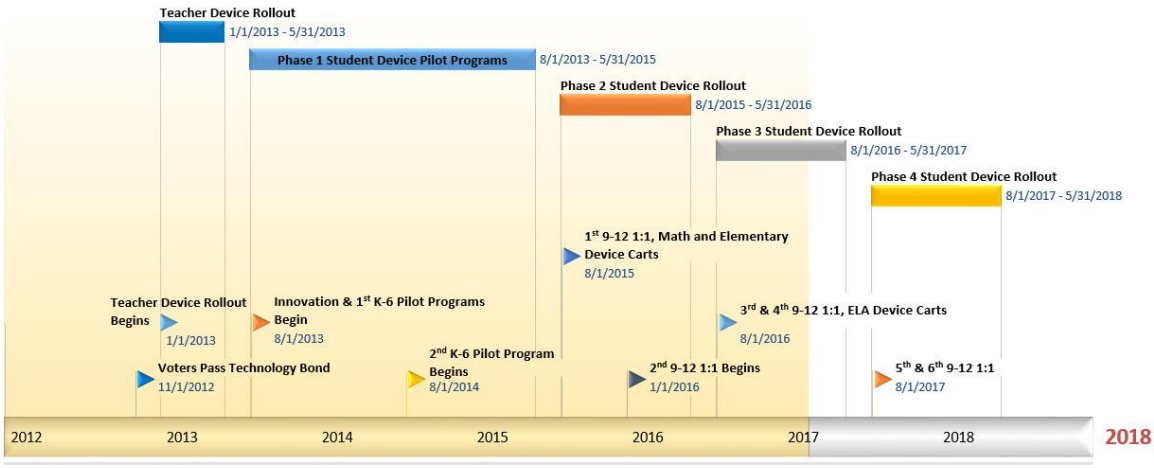

Figure 1. Device Distribution Timeline

As the number of teachers receiving technology increased, the needs of the teachers diversified due to differences in technology skill, educational philosophy, and self-efficacy towards teaching with technology. The PD for the initial 1:1 implementation in 2013, provided by the educational technology department, mirrored traditional PD formats including in-person training classes, guided planning time, and in-class observation and coaching. For the innovation and elementary pilot programs at the beginning of the implementation, this model was sufficient due to the low teacher-to-trainer ratio and somewhat homogeneous ability and content of the teachers. However, as the implementation continued this model became neither sustainable nor scalable.

The gradual distribution of technology to the 86 schools and programs throughout the district was a contributing factor to the necessity of personalized professional learning experiences for teachers. For the purpose of this dissertation, personalized learning includes flexible learning environments and content that are learner-centered (Pane,

Steiner, Baird, & Hamilton, 2015; U.S. Department of Education, 2017). A learner-centered design serves to meet teachers at their level of learning and provide them with "just-in-time" training and support in which learning can be accessed when it is needed most. Personalizing learning for teachers serves as a model for personalizing learning in the classroom which is the goal of district technology integration. The programs of study that are the focus of this study sought to assist teachers who had already begun implementing 1:1 device programs and simultaneously prepare additional groups of teachers to enter 1:1 learning environments. As resources were consulted to identify professional learning models that would contribute to the success of such a program (i.e. Abdelmalak & Trespalacios, 2013; Gravani, 2007; Janssen et al., 2013; Koellner & Jacobs, 2015; Mouza & Barrett-Greenly, 2015; Spires et al., 2012), there were none that mirrored this implementation in scale and scope.

Prior to this ICT initiative, the educational technology department conducted an annual summer institute series of classes focusing on technology skills and software training. Teachers were expected to apply the skills that they learned in the training sessions to their own context. The 1:1 implementations required additional support to help teachers become more familiar with not only how to use, manage, and troubleshoot technology but, how to adapt pedagogy for the purposeful integration of ICT. To meet this need, a '1:1/Blended Learning Workshop' was offered twice the summer before the first 1:1 high school distribution. This was a 24-hour, face-to-face workshop over three days that covered troubleshooting, classroom management, learning management system (LMS) training, best practices of ICT integration including the Technological Pedagogical Content Knowledge (TPCK) model (Mishra & Koehler, 2006) and

Substitution Augmentation Modification Redefinition (SAMR) model (Puentedura, 2010), as well as, various web 2.0 tools and software programs.

Teachers completed an evaluation of Likert scale and open-ended questions at the end of the experience rating if they enjoyed the session and if they thought it was valuable. While these results were overwhelmingly positive, teachers had recommendations for improvement. One of the requests was for increased flexibility in regard to time, location, and content. Some teachers reported experiencing cognitive overload at the amount of content delivered while some were only able to attend a portion of the workshop and some were not able to attend at all. Those that were unable to attend requested online offerings so that they could participate from their location of choice such as working from their classrooms to have easy access to their curriculum materials. Some of the participants found the content overwhelming and moving too fast while others were already familiar with the content and felt things were moving too slow. Teacher learning outcomes and student achievement were not measured in the evaluations. In response to this feedback, a program of study, founded on research-based best practices for PD, was developed with input from teacher leaders, administrators, and district professional development and a content specialist was created by the educational technology department. This program of study is the focus of both studies in this dissertation.

Statement of the Problem

Existing literature on teacher PD for ICT integration emphasizes a need to bridge the gap between research and practice (Albion et al., 2015), the need to use reflective practices to guide future practice (Avalos, 2011), and a need to address the complexity of

teacher PD design (Borko, 2004; Dall'Alba & Sandberg, 2006; Lawless & Pellegrino, 2007). While progress has been made to shift ICT PD from sporadic, isolated events to continuous, highly adaptive learning experiences (Atwell, 2007; Bliss & Bliss, 2003; Brand, 1998), there is a lack of rigorous studies thoroughly describing PD that is highly personalized and focused on work-based learning (Cochran-Smith & Villegas, 2015; Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Desimone, 2009; Hill, Beisiegel, & Jacob, 2013; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Webster-Wright, 2009).

Personalized learning (PL) is a highly visible concept at this time due in part to its inclusion in the National Education Technology Plan (U.S. Department of Education, 2017), support from organizations such as RAND, the Bill and Melinda Gates Foundation, and the Chan Zuckerberg Initiative, and numerous educational technology companies that focus on creating personalized learning software (Pane, Steiner, Baird, & Hamilton, 2015). These outlets propose that PL is the best way to educate today's students and close the achievement gap (Pane et al., 2015). However, the success of any technology implementation hinges on appropriate instructional and pedagogical support. Teachers are the ones who provide this support base. Research shows that teachers tend to teach the way that they have been taught (Borko, 2004; Spires et al., 2012). If we continue to provide educational technology training to teachers that focus on the tool, how will they know how to apply them in effective and humanistic ways that will impact their students?

Personalizing professional learning (PPL) gives teachers the opportunity to experience PL through the eyes of a student. Allowing teachers to share in the experience

that they are charged to implement has the potential to provide them with insights and understandings that will allow them to create successful PL experiences for their own students. The PPL programs that are the focus of the studies of this dissertation are unique within the literature on the topic. They combine elements of both PPL and best practices in PD reform. Examining the experiences of teachers who have participated in a PPL experience of this scale has the potential to contribute to existing research literature and provide PD program recommendations for practitioners.

Purpose of the Studies

The overall purpose of these studies is to enhance understanding of teachers' experiences in PPL programs. Within that purpose, these studies explore the relationship between PPL and the development of ICT skills and teacher self-efficacy towards ICT integration. Data collected during these studies provide evidence towards the effectiveness of PPL programs for supporting teacher ICT integration.

While both of the studies presented in this dissertation adhere to the overall purpose, the design of the PPL programs and the methodologies of the studies differ. The program design became more personalized between the first and second studies. This included increased choice in regards to flexibility of content, assessment, and pace. The first study followed a pre-post quantitative research design and analyzed data from surveys measuring teacher self-perceptions of their skills for using specific technologies and their self-efficacy towards teaching with technology based on a survey created by Wang, Ertmer, and Newby (2004). The second study focuses on the second year of the PPL program and delves deeper into teachers' experiences. It follows an explanatory mixed method research design, utilizing the same survey methods from the first study and

adding a series of semi-structured interviews with purposefully selected participants based on the pre-program survey information.

Significance of the Studies

Technology in the classroom is becoming increasingly ubiquitous yet many of the applications are simply substitutions to traditional classroom practices (Mouza & Barrett-Greenly, 2015). In order to support the vast pedagogical shift that is required to make technology integration effective and increase student achievement, teacher learning needs to provide a model for what is expected in the classroom (Spires et al., 2012). One of the key factors to successful learning environments is teacher self-efficacy (Bandura, 1997). Teachers' instructional efficacy determines how they manage their classrooms, plan their lessons, and address challenges in the learning environment. Technology can be intimidating and if teachers have low self-efficacy towards using it and don't see how it will benefit their students, they won't (Bandura, 1997; Yeşilyurt, Ulaş, & Akan, 2016; Zmuda, Curtis, Ullman, 2015). Traditional technology training programs tend to focus on how to use a tool and do not address the pedagogical implications or real-world application of the tool (Lawless & Pellegrino, 2007). This can result in teachers understanding how to use a tool but never applying it because they do not see the pedagogical benefits or how it will improve their students' learning experience (Ertmer, 2005). PL is about meeting students on their level and helping them improve towards goals that they define and are interested in (Pane et al., 2015). It seems that we should extend this same care to the continuous learning and growth of teachers. The studies in this dissertation contribute to identifying factors that improve teachers' professional

learning experiences to improve both their ability to use technology and to apply it in meaningful ways in their classrooms.

In regard to current literature on PD and PL, there are few studies that examine a PPL program of this complexity and scope (Albion et al., 2015; Avalos, 2011; Borko, 2004; Dall'Alba & Sandberg, 2006; Lawless & Pellegrino, 2007). The findings of the first study support that the program resulted in improved perceptions of technology skills and self-efficacy toward technology integration. The findings of the second study mirror the improved survey results of the first study but then delve deeper into identifying the most impactful experiences for teachers of different backgrounds.

Definition of Terms

Explanatory Sequential Design: "The explanatory sequential design is a mixed methods design in which the researcher begins by conducting a quantitative phase and follows up on specific results with a subsequent qualitative phase to help explain the quantitative results." (Creswell & Plano Clark, 2018)

Internet Communications & Technologies: "ICTs refer to hardware and applications that help people to access, retrieve, process, and exchange information." (Wang, Hsu, Reeves, & Coster, 2014)

1:1: "a one-to-one ratio of mobile learning technology devices with Internet access to teachers and students." (Spires, Wiebe, Young, Hollebrands, & Lee, 2012).

Professional Development: "equal opportunities for these educators to gain and improve the knowledge and skills important to their positions and job performance" (National Education Association, 2018).

Personalized Learning: “It is the individualization of learning through use and mastery of modern digital tools and collaborative strategies among teachers, students, and peers who utilize the unique possibilities of the digital environment.” (Grant & Basye, 2014)

Personalized Professional Learning: "ongoing, job-embedded, and relevant professional learning designed and led by teachers with support from other experts." (U.S. Department of Education, 2017)

Self-Efficacy: “Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments.” (Bandura, 1997).

Theoretical Framework

K-12 education in the United States is rapidly increasing the adoption of ICT tools and wireless technology (Snyder, de Bray, & Dillow, 2019). In order for increased access to technology to result in positive learning outcomes, teachers are encouraged to engage in blended and personalized learning models in their teaching practice (Spires, Wiebe, Young, Hollebrands, & Lee, 2012; Schrum, 1999; Zmuda, Curtis, & Ullman, 2015). To support these changes that are happening in the classroom, teacher PD must also change to model and reflect these changes (Borko, 2004; Desimone, 2009; Lawless & Pellegrino, 2007; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). PD models that are highly adaptive and personalized have been shown to support the complex variety of needs that are present in teachers’ technology skills and self-efficacy towards using technology in the classroom (Bliss & Bliss, 2003; Gravani, 2007; Koellner & Jacobs, 2015; Schnackenberg & Still, 2014). This dissertation was built upon the

theoretical frameworks for modern PD, PL, and self-efficacy. These three concepts form the basis of both studies as they represent the core elements of investigation. These are outlined here briefly and will be discussed in greater detail in chapter two.

Core Conceptual Framework

As K-12 education has continued to adapt to evolving pedagogical best practice and ITC integration, PD for teachers should be reflective of these changes. PD reform for educators has been explored in recent years to envision how this can be done (Avalos, 2011; Borko, 2004; Lawless & Pellegrino, 2007). Desimone's (2009) core conceptual framework identifies active learning, content, duration, coherence, and collective participation as characteristics of best practices throughout PD research.

- Active learning means seeking PD purposely and interacting with the knowledge teachers are gaining.
- Content focus means a better understanding of content and how best to communicate it to students.
- Duration is the length of continuing support following the initial training (or exposure to concepts) in order to assist implementation.
- Coherence is the consistency with which the professional development coincides with a teacher's personal beliefs and the administrative policies.
- Collective participation means that teachers from the same school, grade, or department that have participated in the same PD support each other's implementation.

These characteristics of PD have been found to have a positive impact on not only how the PD is perceived by the participants, but on the teacher learning and student

achievement outcomes. These elements were integrated with the formation of the PD experiences that are the focus of the studies and provide a guidepost for program improvement.

Personalized Learning Framework

While the definition of PL is as diverse as the methodology itself, in this context it is closest to the definition set forth by The Personalization Consortium: "(1) encourage learners to learn by anticipating needs; (2) make the interaction efficient and satisfying for both the organization and the participants; and (3) build a relationship that stimulates learners to return for consistent and progressive learning" (Fok & Ip, 2006). Personalizing professional development is imperative to providing the five elements of the core conceptual framework for each educator involved in a PD program. Aside from the diversity of content areas, target age groups, and site goals, each teacher has their own learning goals, needs, and experiences. The focus on ITC integration contributes additional variables of technology skills, pedagogical philosophies, and an understanding of 21st-century teaching and learning. A personalized learning framework was employed in the creation and implementation of the PD programs in these studies to meet the basic needs of a complex scenario.

It is acknowledged that a one-size-fits-all approach to PD does not provide teachers with the specific knowledge and support necessary to meet their individual learning goals but even with this knowledge there has been little movement towards changing how PD is delivered (Webster-Wright, 2009). The setting of this study offers teachers PL options by providing choice in modality, content, timeframe, and application. By creating a learning plan that is personalized to their own needs, teachers are provided

with a model for how to personalize learning for students. This supports the diffusion of PL models in the classroom by demonstrating the potential for educational technology to enhance, not replace traditional learning experiences (Karmeshu, Raman, & Nedungadi, 2012; Malone, 2008; Mouza & Barrett-Greenly, 2015).

Self-Efficacy Theory

The effects of professional learning experiences on teacher's self-efficacy is a key component of technology integration (Avalos, 2011; Moore-Hayes, 2011; Schnackenberg & Still, 2014; Wang, Ertmer, & Newby, 2004). Bandura's (1997) extensive research into self-efficacy draws connections to the importance of strong academic, instructional, and technological efficacy in order for teachers to successfully engage in the educational shift described in the following quote.

> "The availability of electronic media to deliver the more traditional instruction shifts the emphasis in teachers' pedagogical efficacy from rote instruction to training in how to think creatively, evaluate the deluge of information with which people are being overdosed, and use available knowledge productively. The efficacy issue of interest concerns teachers' beliefs in their abilities to integrate these pedagogical practices successfully within a broad perspective of education." (Bandura, 1997, p. 241)

Moore-Hayes' (2011) study of pre and in-service teachers' self-efficacy attitudes showed that once it is established, it is difficult to change. Her study found that with both pre and in-service teachers their lack of technological preparation prevented them from seeking out continuous professional learning on their own. She noted that high self-efficacy is essential to successful technology integration. This is also supported by Schnackenberg and Still's (2014) study of teacher preparation programs and technology integration which found a significant, positive correlation between positive perceptions of

ability to integrate technology and technology skills that encourage more meaningful interactions.

While some suggestions for teacher PD research methods de-emphasize the importance of teacher self-reporting, self-assessment influences self-efficacy beliefs and in turn affects future decisions about teaching (Avalos, 2011). To only focus on the learning outcomes of technology skills would present a reductive perspective on the impact of this PD experience. Bandura's (1977) extensive studies of self-efficacy support this concept as a part of creating successful change and learning as a part of human nature. As we are asking master teachers to change their pedagogical methods it is important that we support their mental state to fully embrace this change and achieve successful results (Cassidy, 2015; Orrill, 2001). As Yeşilyurt, Ulaş, and Akan (2016) discuss, there are limited studies related to teacher self-efficacy in relation to ICT integration. Including self-efficacy theory in studies of ICT integration adds an important dimension to understanding the impact of the PD design and its contribution to existing literature.

Research Questions

Study 1:

- Did the personalized professional development program significantly improve teachers' perceptions of their ICT skills?
- Did the personalized professional development program significantly improve teachers' self-efficacy toward the integration of ICT?

Study 2:

Central Question

- To what extent and in what ways personalized professional learning program served to support teachers' self-efficacy toward integration of ICT in their classrooms?

  Sub-Questions

  1. Did the personalized professional learning program significantly impact teachers' self-efficacy toward the integration of ICT?
  2. How do participants describe their experiences in the personalized professional learning program?

Limitations

These studies have the following limitations:

1. Data were collected from a single preK-12 public school district in one state. Results may not be generalizable to other schools based on funding, population, demographics, technology infrastructure, teacher evaluation, certification, or incentivizing systems.
2. The primary researcher was a developer of the program of study and educational technology trainer in the district.
3. The teacher participation in the professional development program was predominantly voluntary. This may impact the generalizability to teachers engaging in required professional development.

Delimitations

The delimitations used by the researcher in these studies were determined to gain a better understanding of teacher PD for ICT integration. In order to gain an understanding of a specific PD model, the researcher only sought participants who were

K-12 public school teachers within a specific school district. This excludes teachers in private and charter school systems.

Within the context of the second study, maximum variation sampling was used to select a cross-section of participants. Due to the in-depth interview process, this method was selected to represent a variety of perspectives. While there were additional PD opportunities occurring in the district at the time of these studies, data were only collected from teachers participating in the program of study. This excludes teachers engaged in PD offered by departments outside of the educational technology department.

Assumptions

These studies included the following assumptions: (a) teachers responded to the survey accurately in response to their PD experience, (b) the teachers understand the terminology and nature of the questions asked in the survey, (c) the survey questions asked in the study accurately collect data regarding technology skills and self-efficacy towards ICT integration, (d) the questions asked in the interview process were unbiased and purposeful to formulating an understanding of the participants' experiences, (e) the interpretation of the data accurately reflects the experiences of the participants.

Organization of the Document

This document is organized in five chapters. Chapter I includes the background of the studies, statement of the problem, the purpose of the studies, the significance of the studies, theoretical framework, research questions, limitations, delimitation, and assumptions. Chapter II presents a review of the literature including methods, models, and best practices of PD for ICT integration and personalized professional learning. Chapter III presents the first study including the rationale, contributions to literature,

methods, participants, instrumentation, data collection, analysis, results, and recommendations for the second study. Chapter IV presents the second study including connection to the first study, how it will contribute to the literature, methods, participants, instrumentation, data collection, analysis, results, and discussion. Finally, chapter V summarizes the findings of both studies including a discussion of finding, implications for future research and practice, and conclusions.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

The use of Information and Communications Technologies (ICT) in the classroom is becoming increasingly pervasive yet there is still a gap between how teachers are expected to enrich their teaching with technology and how they are prepared to teach with technology (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). The 2017 National Education Technology Plan includes calls to expand growth opportunities for all students, in part, through personalized learning for students and teachers. While personalized professional learning (PPL) is a recommended practice (US Department of Education, 2017) it is challenged by the complexities of creating personalized learning experiences for teachers at scale and by traditional ICT training practices (Borko, 2004; Desimone, 2009; Opfer & Pedder, 2011).

In order for increased access to technology to result in positive learning outcomes, teachers are being encouraged to reflect blended and personalized learning models in their teaching practice (Spires, Wiebe, Young, Hollebrands, & Lee, 2012; Zmuda, Curtis, & Ullman, 2015). To support the changes that are happening in the classroom, teacher professional development (PD) must also change to model and reflect the shift from teacher-centered to learner-centered pedagogy (Borko, 2004; Desimone, 2009; Lawless & Pellegrino, 2007; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). PD models that are highly adaptive and personalized have been shown to support the complex variety of needs that are present in teachers' technology skills and self-efficacy

towards using technology in the classroom (Bliss & Bliss, 2003; Gravani, 2007; Koellner & Jacobs, 2015; Schnackenberg & Still, 2014).

In this chapter, I will examine the literature related to preparing teachers to personalize learning with the assistance of ICT. We will begin by exploring the importance of self-efficacy as a factor in teacher adoption and successful implementation of ICT. This will be followed by an examination of models of ICT integration frameworks and professional development to identify best practices for ICT integrations. The final section will explore the definition of personalized learning and how it can be merged with PD best practices to assist teachers in preparing to create their own personalized learning environment.

Self-Efficacy

Teacher self-efficacy has a direct impact on students' achievement and their own self-efficacy (Bandura, 1997). Bandura (1997) noted that as technology rapidly evolves, teachers' abilities evolve with these changes is largely dependent upon their self-efficacy on multiple levels. Since information is now readily available through ICT, the instruction is shifting from rote memorization to creative thinking, source evaluation, and using information as the basis for problem solving (Bandura, 1997). These skills, which must now comprise the majority of instruction, were once considered "higher-order" thinking skills. Teachers must have strong pedagogical self-efficacy to adapt their beliefs to this new paradigm. Their instructional activities, classroom management, methods of assessment, and how they build student connections are all impacted which necessitates strong instructional self-efficacy. Finally, they must have strong technological self-efficacy to believe that they can keep up with the ever-changing evolution of technology.

In the course of identifying the support systems necessary for teachers implementing 1:1 technology, there is a clear need to meet teachers at their current efficacy level and encourage growth in ways that are appropriate to their individual needs.

While current school reform policies are removing some of the external barriers to classroom technology integration such as access, policy, and resources, the internal barriers of teacher technology skills and their self-efficacy towards using technology remain (Ertmer et al., 2012). Ertmer et al.'s (2012) study found that while most teachers report feeling adequately prepared to use technology for things like grading or taking attendance, there were differences between their pedagogical beliefs toward technology integration and their practices. When teachers who had won awards for technology integration were asked what they felt was the greatest difference between themselves and teachers that struggled with technology integration, they identified attitudes and beliefs as the greatest factors (Ertmer et al., 2012). However, changing one's attitudes and beliefs is not an easy feat and that process is not going to be the same for every individual. Thus, it is important to consider the multiple facets of self-efficacy in educational settings. Since the occurrence of this study, others have continued to support these findings.

Sadaf, Newby, and Ertmer's (2016) study of preservice teachers' intentions and actualized integration of web 2.0 tools continued to support the connection between efficacy and practice. They found self-efficacy to be a strong indicator of teachers' intentions to integrate technology specifically in the areas of their ability to use ICT tools and their instructional efficacy in their ability to manage the classroom and instruction. These factors bring to the foreground the complexities of preparing large groups of educators for ICT integration yet traditional methods of PD in which all teachers receive

training on the same subjects at the same pace is still pervasive (Albion et al., 2015; Schnackenberg & Still, 2014).

Professional learning experiences have the potential to influence teachers' self-efficacy toward technology integration (Albion & Ertmer, 2001). Yeşilyurt, Ulaş, and Akan's (2016) study found that the intersection of teacher self-efficacy, academic self-efficacy, and self-efficacy toward computers shaped their overall attitudes toward computer supported education. They also found that developing positive attitudes towards ICT strengthened the connections to their understanding of the importance and effectiveness of integrating technology in their professional lives (Yeşilyurt et al., 2016). These connections could be fostered through PD experiences. Moore-Hayes' (2011) study of pre- and in-service teachers found that PD needs to be tailored to the experience levels of teachers in order to meet their learning needs. Pre-service teachers often struggle integrating technology while balancing the demands of the first years of teaching. In-service teachers often hesitate to integrate technology often due to their confidence with their technology abilities or hesitations to ask for help. Once their level of self-efficacy was established, it was difficult to change and prevented them towards seeking out continuous professional learning on their own (Moore-Hayes, 2011). Creating inclusive opportunities for teachers to be successful at whatever level they are at could help to promote the continuous improvement of skills and self-efficacy.

Exposing pre-service teachers to high-quality, vicarious observations of master teachers integrating technology resulted in improved self-efficacy and potential for utilizing technology in their own classrooms (Wang, Ertmer, & Newby, 2004). Their 21-question Likert scale survey of participants' perceptions of self-efficacy towards

technology integration was used for both of the studies in this dissertation. Participants rated statements on a scale from 1 - strongly disagree to 5 - strongly agree to focus on how confident they felt about different aspects of technology integration such as, “I feel confident that I understand computer capabilities well enough to maximize them in my classroom.”, “I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.”, and “I feel confident that, as time goes by, my ability to address my students’ technology needs will continue to improve.” (Wang et al., 2004, p. 245). For both research studies in this dissertation, this survey was administered pre- and post-program. While this survey provided data on teacher experience and their perceptions of self-efficacy, it also assisted in establishing a mental framework about efficacy and confidence for program participants.

Since high self-efficacy is essential to shifting practice (Bandura, 1997), it is important to explore ICT integration models that are currently in practice. Multiple frameworks have been developed to support this cause with varying results in practice. In the next section I will discuss the frameworks that are most pertinent to the studies in this dissertation.

ICT Integration Frameworks

While there are multiple ICT integration frameworks being implemented in the education ecosystem, three were deployed in the PD programs in this dissertation: Mishra and Koehler’s (2009) Technological Pedagogical Content Knowledge (TPCK) framework, Puentedura’s (2010) Substitution Augmentation Modification Redefinition (SAMR) model, and learning design (Norton & Hathaway, 2015). These frameworks were used to develop teachers’ understanding of how to implement one-to-one

technology in ways that were pedagogically beneficial to their students and themselves. They were used at different points in the educators' learning programs to support and scaffold their understanding and awareness of how education can be transformed (or not) with the infusion of technology. The goal was not just to have teachers use the devices in their classrooms but to foster the growth of learner-centered, personalized learning environments.

TPCK Framework

The TPCK framework recognizes the symbiotic relationship between technology, pedagogy, and content that Bandura (1997) discussed as being vital to the development of teacher self-efficacy towards ICT integration. Mishra and Koehler (2006) developed the TPCK framework after identifying a trend for teachers and teacher educators to approach ICT integration from a "technocentric" point-of-view. This resulted in a gap between the envisioned usage and results of ICT integration with the reality of many implementations. By overlapping the focal points of technology, pedagogy, and content knowledge, they created a diagram defining the multiple, complex ways that these areas intersect in classroom instruction (Mishra & Koehler, 2006).

Harris and Hofer's (2017) qualitative study of TPCK use cases resulted in a variety of benefits resulting from implementations of the model for professional development. This included the ability to improve school culture, connect multiple PD initiatives, provide applied instead of theoretical knowledge training, and, most pertinent to this dissertation, meet teachers where they are at and improve their practice at their level in the ways it is needed most (Harris & Hofer, 2017). TPCK can assist in focusing teachers' attention on the factors that matter most when integrating technology, such as

developing active learning experiences and improving instruction, when it is tempting to focus on logistical concerns of integration (Ling Koh, Chai, & Tay, 2014).

Within the PD program that is studied in this dissertation, TPCK was used to anchor the learning pathways meant for teachers who were new to using technology in the classroom or felt uncomfortable doing so. Even though Brantley-Dias and Ertmer (2013) found that the TPCK framework may be too complex and not yield the intended results of ICT integration, the educational technology trainers leading the programs found, through anecdotal experiments implementing multiple frameworks, that teachers with little technology experience or efficacy responded to the TPCK framework. By having an anchor to high self-efficacy in at least one area, it gave them more confidence to add on components that were outside their comfort zone. However, the experiences in the studies did mirror Brantley-Dias and Ertmer's (2013) determination that TPCK was not conducive to encouraging teachers to pursue the larger pedagogical shifts that lead to personalized, deeper learning experiences. Once teachers were able to overcome their initial fears, reservations, or concerns about technology integration they were introduced to models such as SAMR and design thinking, that encourage the shift from technology integration to "technology-enabled learning" (Brantley-Dias & Ertmer, 2013, p. 120).

SAMR Model

The SAMR model was developed by Puentedura (2006) in partnership with the Maine Department of Education to define the life cycle of ICT implementation. This model serves to guide teachers through the process of using ICT as a substitution for traditional methods to redefining education in ways that were previously inconceivable

(Puentedura, 2010). There are four parts to the model that are divided into two sections: Enhancement and Transformation which can be seen in Figure 2 below.

Transformation	Redefinition
	Modification
Enhancement	Augmentation
	Substitution

Figure 2. SAMR Model

Substitution and augmentation are grouped in the enhancement section since in those parts, traditional classroom practice is being enhanced by the addition of ICT but not drastically altered (Hilton, 2016). In substitution, the technology acts as a direct replacement with no additional benefits. Reading an ebook instead of a paper book is one example of substitution in action. Augmentation means that the technology is enhancing the experience in some way if, for example, students could look up words in the ebook or include links that lead them to internet resources or additional readings (Kihoza, Zlotnikova, Bada, & Kalegele, 2016). The transformation section consists of modification and redefinition. In the modification stage, technology is used in a way to alter a pre-existing task in a way that could not be done without the use of technology, such as having a writing assignment take the form of a blog in which the student can receive comments and feedback from a global audience to improve their writing (Hilton, 2016; Walsh, 2015). Redefinition is the creation of a new learning task that was previously inconceivable (Puentedura, 2010) such as using Google Tour Builder and Google Virtual

Reality to create and share virtual field trips and digital stories that allow them to reach locations that were previously inaccessible.

While SAMR visually appears as a hierarchy, it is meant to be a continuum that increases the awareness of what is possible and provides a source of self-reflection (Kirkland, 2014). The PD programs explored in this dissertation introduced teachers with previous experience and medium to high self-efficacy with integrating ICT tools to the SAMR model to encourage them to think beyond initial basic applications and transition to redefining education through personalized, deeper learning experiences (Puentedura, 2010). Research studies have found that for teachers new to ICT integration, using the SAMR model as a guide placed too much emphasis on the technology tools and was too abstract for those with low self-efficacy that were seeking step-by-step instruction (Glover, Hepplestone, Parkin, Rodger, & Irwin, 2016).

Learning Design

In the second study of this dissertation, a third ICT integration framework was employed to guide teachers in their growth towards leveraging ICT tools to create deeper, personalized learning experiences. Design thinking and learning design help to focus teacher technology education on solving problems of practice within their classrooms (Norton & Hathaway, 2015). If the use of technology is to lead to transformational educational change, it is important for teachers to ideate how this change will take effect in their own classrooms. Norton and Hathaway (2015) proposed that when it comes to addressing the complexities of each classroom and all teachers through professional development, then teachers should be treated and supported as learning designers. Approaching ICT PD from a design thinking perspective pulls focus away from the use

of technology to the improvement of learning outcomes (Norton & Hathaway, 2015). It allows teachers to select an intervention that fits the needs of their students and sets a learning goal for themselves that they feel confident they can achieve (Bower, Hedberg, & Kuswara, 2010). The process of designing a learning experience for purposeful practice has far greater potential to engage teachers in creating transformational learning experiences than if they were trained to use ICT tools using hypothetical exercises (Miao & Hoppe, 2011). Finally, ICT PD through the development of learning design provides a way for teachers to determine if the intervention was effective and what might be needed to improve the next iteration (Toetenel & Rienties, 2016).

Treating teachers as learning designers provides them with practice-based training (MacLean & Scott, 2007) and work-based learning (Miao & Hoppe, 2011). This type of real-world, active learning practice is the type of transformational change that ICT integration should elicit in the classroom (Albion et al., 2015). The benefits of modeling best practice through teacher PD is why designing for learning was a focus of the PD program explored in the second study. The next section will further explore how PD models are evolving to adapt pedagogical best practices to the education of teachers.

Professional Development Models

As the integration of ICT has become increasingly prevalent in K-12 education, how educators are prepared to purposefully adapt their teaching methods to incorporate ICT has become the topic of research and debate (Albion et al., 2015; Avalos, 2011; Dall'Alba & Sandberg, 2006; Fishman, Konstantopoulos, Kubitskey, Vath, Park, Johnson, & Edelson, 2013, 2014; Hill, Beisiegel, & Jacob, 2013; Moon, Passmore, Reiser, & Michaels, 2014). One point that is unquestionable is the need for an increase in

high-quality professional development (PD) to meet the rapid dissemination and evolution of ICT to improve educational experiences and outcomes (Albion et al., 2015; Borko, 2004). When studied separately, teacher PD and ICT integration are rife with complexity. Together, they present a unique array of challenges and promises that, despite the best research recommendations, are unlikely to meet the needs of all participants (Avalos, 2011; Fishman et al., 2014).

The integration of ICT in K-12 classrooms imposes not only logistical and technological changes to learning environments but, most importantly, pedagogical changes (Bandura, 1997). Media comparison studies have shown that delivering information through technology shows no significant difference when compared to non-technological methods (Clark, 1994; Means, Toyama, Murphy, & Baki, 2013; Warnick & Burbules, 2007). However, when the implementation of technology shares a symbiotic relationship with the evolution of pedagogical methods there is the potential for a more positive impact than either environment on their own (Albion et al., 2015; Kozma, 1994). As ICT becomes increasingly ubiquitous in education, the role of the teacher is shifting from a vessel of knowledge to a facilitator of inquiry (Dall'Alba & Sandberg, 2006). This movement to learner-centered education highlights the importance of supporting overall teacher quality and professional development, not just in the realm of technology (Albion et al., 2015). As the expectations and roles of teachers are evolving, the nature of PD must adapt as well. While PD has traditionally been viewed as the acquisition of skills and knowledge, the focus has shifted to models that facilitate sustained change in understanding and practice (Dall'Alba & Sandberg, 2006). The stages (Dreyfus & Dreyfus, 1986), design-based (Lawless & Pellegrino, 2007), train-the-trainer (Avalos,

2011), and core conceptual framework (Desimone, 2009) models in this section represent this evolution and were explored in the creation of the PD programs that are the focus of the studies in this dissertation.

Stages Model

The stage model of skills acquisition, developed by Dreyfus and Dreyfus (1986), has been applied to a variety of fields including nursing, business, and teaching. This model is composed of five layers: novice, advanced beginner, competent, proficient, and expert. It was posited that those at the entry levels of learning involve more rule-based, direct instruction while more advanced levels are marked by "experienced-based know-how" that was not easily quantifiable. Dall'Alba and Sandberg (2006) explored the relationship of the stage model as a method of teacher professional development. They found the stage model to be a reductionist approach. By diluting the learning process to one of leveled skill acquisition it does not take into account the fundamental understanding of practice. In other words, the stage model focuses on the cognitive aspects of learning, discounting the importance of the affective domain in reaching levels of expertise (Rovai, Wighting, Baker, & Grooms, 2009).

This model represents the traditional ICT training that was in-place in the organization that is the focus of the studies in this dissertation. As the program evolved to more learner-centered, personalized professional learning (PPL), stages began to become less evident. In the first study, stages are clearly delineated to assist teachers in choosing a learning pathway for their level. In the second study, the coursework began to blur the lines between stages to allow for more flexible learning experience.

Design-Based Model

A contrast to the stage model of PD is the design-based model. The design-based model of PD allows teachers to integrate their learning with their curriculum and professional practice to meet their individual needs (Lawless & Pellegrino, 2007). This is of particular importance when combined with the integration of ICTs. Learning how to manipulate technology in isolation prevents teachers from envisioning how they can implement these resources in purposeful, pedagogically appropriate ways within their own classrooms. Orrill's (2001) study found that design-based PD that integrates collaborative practices between the professional developer and educator, as well as, educator-to-educator collaboration has the potential to improve ICT integration for the purpose of learner-centered education. O'Hara, Pritchard, Huang, and Pella's (2013) design-based model of PD engaged teachers in sustained, active learning to improve student outcomes by modeling best practices and embedding the practice in the school culture through professional learning communities. They found the continuous, progressive planning of ICT integration including expert instruction, explicit modeling, and ongoing support had positive implications towards the transformation of teaching and learning (O'Hara et al., 2013).

Design-based models empower teachers with ownership of their learning and their ability to effect sustained improvement within their classroom, school, and community (Lawless & Pellegrino, 2007). Merging PD with practice leads to the embodiment of understanding and activates the cognitive, psychomotor, and affective domains of learning (Dall'Alba & Sandberg, 2006; Rovai et al., 2009). This model combined with the learning design for ICT integration framework is encouraged in the first study in this

dissertation and is fully actualized in the second study. While these studies focus on a summer professional development program, it is important to note that the design-based practices continued throughout the school year with the assistance of educational technology trainer and teacher partnerships. Even though the school year is not a focus of the studies, this continued work promotes sustained duration and cohesion which are key points of the design-based model.

Coaching/Train-the-Trainer Model

Two models that share similar components and impact are the mentor/coaching model and the train-the-trainer model (Avalos, 2011; Lawless & Pellegrino, 2007). These models are based on the idea of using teachers to support each other in the learning and innovation process. Both of these models support the situative theory in which learning is viewed not only as an individual practice but as one of enculturation (Borko, 2004). In Avalos' (2011) review of PD research, she discusses the importance of mediation to support the situated nature of changing school culture. She describes this as, "the horizontal sharing of ideas and experiences" (p. 16) that are pivotal to teacher PD. When teachers collaborate in their own learning and the design and evaluation of their teaching experiences it can help to bridge the gap between the status quo and suggested practices. This can help to prevent the creation of "islands of innovation" (Albion et al., 2015, p. 658) in which the landscape of educational systems are merely dotted by successful implementations of individual teachers instead of experiencing an entire systemic change.

The mentor/coaching model posits that placing colleagues, graduate students, virtual mentors, etc. that are comfortable with educational technology in mentor/mentee relationships can help to provide ongoing support and comfort with ICT integration

(Lawless & Pellegrino, 2007). This model supports the idea of teacher co-learning which can take the form of communities of practice (CoP) (Wenger, 2011), professional learning communities (PLC) (Albion et al., 2015), lesson study (Lawless & Pellegrino, 2007), or peer coaching methods (Avalos, 2011). Sharing best practices, evaluating student achievement data, and problem-solving professional practice has the ability to effect positive change in practice (Avalos, 2011). Desimone and Pak (2017) explored how this type of instructional coaching addresses the five features of effective professional development: content focus, active learning, coherence, duration, and collective participation. Each of these areas is supported through instructional coaching by encouraging teachers with the same goals (content focus, coherence) to work together (collective participation) to develop plans that they will implement and evaluate (active learning) over time (duration) (Desimone & Pak, 2017). While they clearly outline the possible benefits, they note that additional studies are needed to identify the specific benefits and drawbacks to instructional coaching.

The train-the-trainer model creates an exponentially growing system of PD in which groups of teachers are trained to be able to train other teachers, who could then be trained to be trainers themselves. This has been shown to be effective at scaling PD efforts and cultivating an organizational cultural mindset towards ICT integration (Lawless & Pellegrino, 2007). Including these models of mentorship in PD has also been shown to improve self-efficacy towards ICT integration and the success of converting learning into practice (Wang, Ertmer, & Newby, 2004).

Coaching and peer mentorship are important components of the programs that are studied in this dissertation. Along with the assistance of educational technology trainers

and professional development specialists, teachers were encouraged to collaborate through the course of their program with their school specific professional learning communities and cross-institutionally with other teachers of their subject matter across the district. Both types of collaboration elicited positive responses from participants in the more in-depth interviews of the second study.

Core Conceptual Framework

Desimone (2009) supported the idea of researching and evaluating PD based on outcomes through a core conceptual framework. This proposed framework is based on characteristics that were found to be consistent definers of PD. Five core features were identified as components of professional learning that could positively impact student achievement: active learning, content focus, coherence, duration, and collective participation. This was based in part on an empirical study of 1,027 math and science teachers to measure the effects of components of PD (Garet, Porter, Desimone, Birman, & Yoon, 2001). The core features of the framework are then used to examine the relationships between professional development, teacher knowledge and beliefs, classroom practice, and student outcomes.

- Active learning is seeking professional development purposely and interacting with the knowledge they are gaining.
- Content focus is the idea that the better a teacher understands their content and how to communicate it to students, the more likely it will lead to improvements in practice.
- Duration is the length of support following the initial training or exposure to concepts to support implementation.

- Coherence is the consistency with which the professional development coincides with a teacher's personal beliefs and the administrative policies.
- Collective participation having teachers from the same school, grade, or department that have participated in the same professional development to support each other's implementation.

These characteristics of PD have been found to have a positive impact on not only how the PD is perceived by the participants but the teacher learning and student achievement outcomes. They are all threads that weave through all of the previously discussed PD models and methods.

Active learning is pivotal to the three themes of PD identified by Avalos (2011): the learning of practicing teachers, the embedded or situated nature of PD, and the role of mediations in teacher learning. It is a natural occurrence when teachers are engaged in design-based learning and research (Albion et al., 2015; Dall'Alba & Sandberg, 2006; Fishman et al., 2014; Hill et al., 2013; Lawless & Pellegrino, 2007; Reeves, 2011) as they are involved in developing, implementing, assessing, and redeveloping their plans for ICT integration. This process naturally involves teacher self-assessment which guides them to identify and construct a greater understanding of their own learning process. While self-assessment methods are viewed as not being the most rigorous of data collection methods (Albion et al., 2015; Avalos, 2011; Borko, 2004; Dall'Alba & Sandberg, 2006; Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Desimone, 2009; Lawless & Pellegrino, 2007; Reeves, 2011), they are a key element of bridging the gaps between research and practice, belief and suggestion, and increasing teacher self-

efficacy towards teaching with technology. These are all key components for the ability of PD to inspire purposeful and sustainable integration of ICT.

Content focus assists the presence of active learning by increasing teacher investment in their learning experience and the likelihood that they will apply their learning to their practice. In the early iterations of ICT integration, PD was focused on the learning of technology tools and software independently of the content-based curriculum (Albion et al., 2015; Avalos, 2011; Dall'Alba & Sandberg, 2006; Lawless & Pellegrino, 2007; Moon et al., 2014). This is symptomatic of fragmented, one-shot PD that does not result in outcomes that impact practice (Dede et al., 2009). When ICT PD does not integrate a content focus it places the onus on the teachers to determine how to merge the two elements together (Fishman et al., 2013). For teachers that lack belief in the validity or benefits of ICT integration this barrier can prevent them from translating what they have learned in a PD experience into practice (Fishman et al., 2013; Lawless & Pellegrino, 2007; Moon et al., 2014).

One of the results of design-based, coaching, and train-the-trainer models is that the duration of the PD experience is going to continue past an initial training experience. When PD experiences are not continued beyond the initial experience and supported by classroom coaching there is only a 10-15% chance of sustained implementation in practice (Zmuda, Ullman, Curtis, 2015). Opfer and Pedder (2011) found in their literature review of teacher professional development practices that the conversion to professional learning practices results in the improved application of learning only if change was continuous throughout system, learning, and practice. By continuing support into the

classroom, teachers are supported in their efforts to reconcile their previous practices and beliefs with research suggested practices (Avalos, 2011).

Like duration, coherence is supported by the implementation of design-based, coaching, and train-the-trainer models of PD. Brand (1998) cautioned against "one-size-fits-all" ICT PD and urged addressing individual strengths and differences. By integrating ICT PD with curriculum and individual needs, teachers can better envision how ICT tools and pedagogy can be cohesively integrated into their regular classroom practice. Cochran-Smith and Villegas' (2015) review of over 1,500 studies on teacher preparation found quality teaching to be a cornerstone to successful student learning outcomes. In the second part of their study (Cochran-Smith, Villegas, Abrams, Chavez-Moreno, Mills, & Stern, 2015) recognize the importance of connecting coursework and fieldwork. This bridge between quality teaching and learning experiences to practice and fieldwork has direct application to the supporting the coherence of ongoing teacher PD (Desimone, 2009). Teachers need high-quality direct instruction but also the autonomy to directly apply and practice their new skills purposefully.

Collective participation, collaboration, communities of practice, professional learning communities, these are all terms that emerge when discussing the interactive nature of high-quality PD. Orrill's (2001) study found the integration of collegial meetings to be an important support system for teachers as they transition to learner-centered classrooms as a part of ICT integration. In addition, Albion et al.'s (2015) review of four case studies identified the "human factor" (p. 666) as a key thread running through the examples of technology-enabled learning. Through the integration of CoP and PLC models, teachers were able to reach a shared vision of the role of ICT for

teaching and learning. The prevalence of CoP and PLC models as an educational movement represents the importance of collective participation to continuous growth in practice.

Evaluating PD using the core conceptual framework allows for equal examination of the impact of formal and informal learning opportunities (Desimone & Pak, 2017). Desimone (2009) justifies the necessity of the use of a core conceptual framework in research methods as supporting the characteristics that have been identified as best practices throughout PD research, providing consistency of study in the field, build a foundation of understanding, establish a timeline of evolution, and help the field to continue to intelligently evolve based on prior knowledge and research. These components will be further referenced as we explore how these best practices of PD are expressed in personalized learning environments in the next section.

Personalized Professional Learning

Espoused by researchers, administrators, and educational technology companies, personalized learning (PL) has become a pervasive term recently but it is by no means a new concept. Sharing characteristics with student-centered learning, constructivism, differentiated learning, personalized learning has existed in some form since the late 1800s (Dishon, 2017). The increase in frequency of personalized learning methods and terminology can be connected to the ability of ICT to improve the feasibility and scalability of PL (Redding, 2013). Applying PL to educator PD for ICT integration helps to model for teachers how their own practice in the classroom will adapt. The following exploration of PL will cover the definition of personalized learning and how is applied to professional learning in multiple formats including personalized professional learning

(U.S. Department of Education, 2017), continuous professional learning (Webster-Wright, 2009), Communities of Practice (Wenger, 2011), learner-centered professional development (Polly & Hannafin, 2010), and online professional development (Dede et al., 2009).

Definitions of Personalized Learning

The way personalized learning is defined among educators varies widely and is often dependent on the roles in the classroom, administration, or product representative (Abamu, 2017; Walker, 2017). This can lead to the goals of PL being conflated with other teaching methods such as adaptive or deeper learning. This confusion makes it essential to start by clearly defining the term when examining PL implementations.

In 2014, a group composed of the Bill & Melinda Gates Foundation, Afton Partners, the Eli and Edythe Broad Foundation, CEE Trust, the Christensen Institute for Disruptive Innovation, Charter School Growth Fund, EDUCAUSE, iNACOL, the Learning Accelerator, the Michael & Susan Dell Foundation, Silicon Schools, and educators collaborated to create a working definition of PL. They proposed four pillars of PL: competency-based progression, flexible learning environments, personal learning paths, and learner profiles (Education Week, 2014). Following this, the Bill & Melinda Gates Foundation continued research by collaborating with the RAND Corporation to examine how schools funded by the foundation are personalizing learning (Pane, Steiner, Baird, & Hamilton, 2015). In this study, they acknowledged that while there was no universally agreed upon definition of PL, practitioners generally identified the following traits:

> "(1) systems and approaches that accelerate and deepen student learning by tailoring instruction to each student's individual needs, skills, and interests; (2) a

> variety of rich learning experiences that collectively prepare students for success in the college and career of their choice; and (3) teachers' integral role in student learning: designing and managing the learning environment, leading instruction, and providing students with expert guidance and support to help them take increasing ownership of their learning." (Pane et al., 2015, p.2-3)

In 2016, the U.S. Department of Education's Office of Educational Technology released the Future Ready Learning: Reimagining the Role of Technology in Education, National Educational Technology Plan (NETP). Due to the rapidly changing landscape of educational technology, this plan is revised annually. In the 2017 edition, PL was noted as an important factor in the first goal of the plan, Engaging and Empowering Learning Through Technology (U.S. Department of Education, 2017). PL is cited as being a contributing factor to the ability of technology to assist students and educators to connect with a global audience of expertise and to improve student access to high-quality learning materials. In this plan, PL is defined as the following:

> "Personalized learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may all vary based on learner needs. In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated." (U.S. Department of Education, 2017, p. 9)

These definitions share a focus on the creation of flexible, learner-centered environments that place equal emphasis on the cognitive, affective, and conative domains. Programs that align with these definitions generally include self-directed learning experiences combined with the guidance of an instructor to help the learner simultaneously create their own learning pathway and meet specific educational goals. This approach is most frequently studied in K-12 settings despite the strong connections

to the basic principles of andragogy. In the next section, we will explore the application of personalized learning in adult learning experiences.

Elements of Personalized Professional Learning

Current best practices for professional development, including Desimone's (2009) core conceptual framework and design-based PD (Lawless & Pellegrino, 2007; Wang et al., 2014), share many of the same characteristics as high-quality personalized learning. This is emphasized in the movement from mindset and framework of professional development to one of continuous professional learning (CPL) (Webster-Wright, 2009) and learner-centered professional development (LCPD) (Polly & Hannafin, 2010, 2011). Examining use cases where these concepts intersect provides a basis for the concept of personalized professional learning (PPL) that is implemented in the two studies described in this dissertation by developing a common understanding of the term and its characteristics (U.S. Department of Education, 2017). The concepts described in this section contain elements of personalization and contribute to the development and understanding of the relatively newer field of PPL.

Continuous Professional Learning

Discussing continuous professional learning (CPL) begins by answering the question; What is the difference between professional *development* (PD) and professional *learning*? Webster-Wright (2009) called for a reframing of professional development (PD) into CPL. PD is generally considered to be a finite series of pre-planned steps and activities to achieve predetermined results. CPL emphasizes the experience of learning through the continuous exploration of concepts that correlate to the specific needs of the of the learner. The implementation of PD for professionals implies there are deficiencies

that have been identified by the organization as needing to be rectified. CPL implies that all professionals are expected to continue their learning journey beyond formal training to meet their individual needs. Programs implementing CPL are designed to support the continuous growth of self-directed, autonomous learners (Webster-Wright, 2009). This aligns with the previously discussed components of the core conceptual framework (Desimone, 2009) and the definitions of personalized learning.

PD and CPL are reflective of the pedagogical concepts of direct instruction versus constructivism (Dishon, 2017) within an andragogical context. Together they meet the heart of the definitions of PL. PD represents the competency-based progression that serves to track learning in a PL model, while CPL addresses the learners needs for flexibility and control over content, duration, and coherence. By combining both into a PPL model, the benefits of direct instruction and constructivism can be attained.

Communities of Practice (CoP)

CoP consist of people with like interests who work together on a regular basis to continuously improve in their chosen focus area (Farnsworth, Kleanthous, & Wenger-Trayner, 2016; Wenger, 2011). This model consists of three components: the domain, the community, and the practice. The domain is a specialty that ties a group together in a way that is unique to them, for example, content area or experience (Wenger, 2011). The community provides the space for regular interactions or activities that enable the members to learn from each other. The practice is the work the members engage in as they offer solutions, test, and share results of their experiences implementing the solutions (Farnsworth et al., 2016). High-quality CoP are an example of CPL in which the elements of the core conceptual framework are natural by-products.

Green, Hibbins, Houghton, and Ruutz (2013) explored a way to meet the needs of continuous professional learning through communities of practice. Their study focused on a school engaged in restructuring. A core group of faculty proposed CoP as a way to facilitate change in a way that would result in an inclusive environment for consistent teaching and learning growth. Groups of new and experienced teachers fluidly formed and reformed based on their needs and interests. Both groups reported positive growth based on their collaborations with teachers from different experience groups. Among the findings, subjects reported "a synthesis of not only one's professional self-image, but also of knowledge and practice." (Green et al., 2013, p. 257). This CoP implementation is a use case of CPL in which the components of the core conceptual framework and PL actively contribute to improving the growth environment for teachers.

Learner-Centered Professional Development

Learner-centered professional development (LCPD) was developed based on the American Psychological Association's *Learner-Centered Principles* and a review of empirical studies on school reform conducted by Polly and Hannafin (2010). They posit that in order for teachers to shift their instructional practices from teacher-centered to learner-centered, their PD also needs to be learner-centered. This serves to model best practices and to give teachers an opportunity to experience the learner-centered model from a student's perspective. The main characteristics that are evident in LCPD are a focus on student learning, teacher-ownership of their learning experience, knowledge of content and pedagogies is developed, and that the experience is collaborative, ongoing, and reflective (Polly & Hannafin, 2010). These traits embody the principles of both PL and the core conceptual framework.

LCPD is based on the understanding that the true measure of PD is to determine if it affects change in student learning outcomes and teacher practice. To explore if the proposed LCPD framework accomplished these goals, Polly and Hannafin (2011) conducted a study of LCPD to shift teachers towards learner-centered mathematical practices. The results found that differences between teachers' espoused and enacted practices remained. However, workshops that resulted in activities that could be directly applied in the classroom resulted in more high-quality learner-centered experiences with students. Of the possible reasons for the lack of learner-centered experiences transitioning into the classroom was the absence of ongoing support after the workshops. While the workshops may have included active learning, content focus, and collective participation, they lacked the duration and coherence to elicit change in practice.

Online Professional Development

Flexible learning environments and personal learning paths are two elements of PL that have not been examined in the previously presented models. With the integration of ICT into the classroom, online PD offerings are becoming an increasingly common addition to traditional face-to-face methods of delivery as a way to support teachers' busy schedules and provide just-in-time access to learning materials. They are also a way to offer teachers greater choice over content, duration, and coherence of their learning experience.

Dede et al. (2009) explored the collection of research on online teacher professional development (oTPD). They found a strong relationship between the lack of PD support that teacher receive and the attrition rate of teachers in their first five years of teaching. Teachers' busy schedules and lack of access to local PD opportunities

contributed to this absence. For these reasons, they put forth that oTPD increases access without sacrificing quality based on their examination of 40 empirical studies of oTPD.

Fishman et al.'s (2013) comparison of online to face-to-face professional development supports the idea that oTPD can provide similar quality to face-to-face PD in that they found no significant difference when comparing the results of learning outcomes. Their study compared teachers engaged in 48 hours of face-to-face PD spread over 6 days to the same content presented in an online learning model of a 16 hour/2-day face-to-face orientation with an estimated 20 hours of online PD. While the outcomes of teacher learning and student achievement showed no significant difference between the two models, there were anecdotal differences that were noted. One of these was the variation of "seat time" within the online coursework. While this could be seen as an administrative struggle in regard to crediting teachers for the amount of work that was completed, it is also an advantage of online learning. Teachers were able to take as much or as little time as they needed to comprehend the material based on their experience and application, review materials when needed providing for "just-in-time" learning, and work in smaller chunks of time. Those participating in the face-to-face sessions reported more in-depth discussions, exchanges of information, and active collaboration. When Moon et al. (2014) responded that these findings should not be the focus when selecting online or face-to-face PD models, Fishman et al. (2014) agreed that their model was not representative of all online PD. They also agreed that future PD models should be based in the continuous evaluation of research-based PD designs.

Chapter Summary

None of the frameworks, models, or methods explored in this section are labeled as PPL experiences, yet all are reflective of both best practices for PD and PL. The research associated with CPL, CoP, LCPD, and oTPD reinforce the benefits of providing teachers with active, meaningful learning experiences that they can tailor to meet the needs of themselves and the students that they teach. However, none of these are inclusive of all of the components that have been identified to best support teachers engaged in professional learning for ICT integration.

The two studies in this dissertation focus on professional learning experiences that follow the recommendations for models, methods, and best practices found in the literature. Reflecting on the research behind these components of PD is imperative to develop an understanding of the field in order to design PD and research around existing best practices. These practices were integrated into the design of the PD programs that are the focus of my two studies and in to the research methods for collecting and analyzing data with the purpose of contributing to the compendium of literature.

Teachers are professionals that need the autonomy to make the learning choices that will be the most beneficial to their individual situation. Within the context of ICT integration, the learning needs of teachers vary widely depending on their pedagogical, technological, and content knowledge (Spires, Wiebe, Young, Hollebrands, & Lee, 2012). A PPL environment that contains the elements of the core competency framework (active learning, content focus, duration, coherence, collective participation) and of PL (competency-based progression, flexible learning environments, personal learning paths, learner profiles) would provide maximum learning fluidity to be inclusive of all teachers'

needs. That is the goal of the learning design for the programs that are studied in this dissertation.

This chapter presented a review of the relevant literature related to preparing teachers for ICT integration. First, the complex challenges of developing teacher self-efficacy towards ICT integration were examined. This included research on the support of academic, instructional, and technological self-efficacy and their importance in evolving teachers' practice. The next section, explored current methods and models of professional development reform. This included ICT integration frameworks and models of professional development. The chapter concludes with an examination of personalized learning and its role in professional development. Specifically, the methods in which professional development can be personalized.

CHAPTER THREE: STUDY ONE

Abstract

The purpose of this study was to investigate the impact of personalized professional learning in teachers' comfort level and their self-efficacy towards ICT. 418 teachers completed the program of study in its entirety and 247 (59%) of them completed both pre- and post-program surveys. Results showed that the personalized professional learning improved significantly teachers' perceived comfort level with ICT skills and their self-efficacy towards integrating ICT.

Keywords: one-to-one, personalized learning, technology integration, self-efficacy, blended learning, professional learning, professional development

Introduction

Teacher professional learning has undergone many iterations over time, especially in the area of educational technology. Studies have shown a need for professional development to transition from isolated and highly specific experiences to adaptive ongoing learning experiences (Koellner & Jacobs, 2015). However, the ways teachers are being educated and trained is not reflective of these practices (Borko, 2004; Cochran-Smith & Villegas, 2015; Cochran-Smith, Villegas, Abrams, Chavez-Moreno, Mills, & Stern, 2015; Schnackenberg & Still, 2014). As one-to-one, mobile technologies are deployed, teachers are asked to re-examine the way management, planning, content delivery, and assessment are structured in their classrooms (Schrum & Schrum, 1999; Spires, Wiebe, Young, Hollebrands, & Lee, 2012; Zmuda, Curtis, & Ullman, 2015).

While some teachers are excited to venture into the realm of possibilities that come with the integration of information and communications technology (ICT) tools, not all teachers are interested in integrating devices due to the massive number of considerations and expectations that come with them such as changes to classroom management and pedagogical practice (Bandura, 1997; U.S. Department of Education, 2017; Zmuda et al., 2015).

When the integration of ICT occurs on a large scale in a preK-12 school system, it must be thoughtfully planned and organized in order to result in positive pedagogical change (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015; Borko, 2004; Spires et al., 2012; Zmuda et al., 2015). Research has shown that one of the most significant contributors to the acceptance and success of ICT to improve student achievement is the preparation that teachers receive when facing this pedagogical shift (Lawless & Pellegrino, 2007; Schrum & Schrum, 1999; Spires et al., 2012; Zmuda et al., 2015). To meet the changing needs of continued education and training for teachers, the structure of traditional 'sit-and-get' professional development (PD) is evolving from isolated, in-service models to sustained, active professional learning (PL) experiences with immediate and direct application in the classroom (Garet, Porter, Desimone, Birman, & Yoon, 2001; Gravani, 2007; Koellner & Jacobs, 2015; Opfer & Pedder, 2011; Schnackenberg & Still, 2014; Spires et al., 2012). While there has been progress shifting ICT PD from sporadic, isolated events to continuous, highly adaptive PL experiences (Atwell, 2007; Bliss & Bliss, 2003; Brand, 1998), rigorous studies thoroughly describing highly personalized professional learning (PPL) focused on work-based experiences are lacking (Cochran-Smith & Villegas, 2015; Dede, Ketelhut, Whitehouse, Breit, &

McCloskey, 2009; Desimone, 2009; Hill, Beisiegel, & Jacob, 2013; Webster-Wright, 2009).

Teachers often teach how they have been taught (Greeno, Collins, & Resnick, 1996). The way their professional learning is delivered can provide the framework, experience, and understanding that they need to feel comfortable implementing a new type of learning design themselves (Karmeshu, Raman, & Nedungadi, 2012; Park & Ertmer, 2007). If the goal of a technology implementation is to personalize student learning, teacher professional learning must be personalized as well. While personalized learning has acquired multiple definitions for the purpose of this study, the definition of personalized learning most closely identifies with the following from the U.S. National Education Technology Plan:

> "Personalized learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may all vary based on learner needs. In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated." (U.S. Department of Education, 2017, p. 9)

The personalized professional learning (PPL) experience described in this study was designed to account for the core conceptual framework components of coherence, duration, active learning, collaborative participation, and content focus as defined by Desimone (2009). These attributes of professional learning have been identified as key to transforming learning into practice.

- Active learning engages teachers in taking a leadership role in their own learning.
- Content focus provides teachers to connect what they have learned to their own subject matter.

- Collective participation allows teachers to work collaboratively and support each other in their learning.
- Coherence bridges the gap between training and practice by providing teachers with opportunities to directly apply their learning.
- Duration encourages learning to extend beyond a single learning experience to continue to learn and grow in practice.

Technology in the classroom is becoming increasingly ubiquitous yet many of the applications are simply substitutions to traditional classroom practices (Mouza & Barrett-Greenly, 2015). In order to support the vast pedagogical shift that is required to make technology integration effective and increase student achievement, teacher learning needs to provide a model for what is expected in the classroom (Spires et al., 2012). Thus, the purpose of this quantitative study was to investigate the impact of personalized professional learning in teachers' comfort level and their self-efficacy towards ICT. This study was guided by the research questions:

- Did the personalized professional learning program significantly improve teachers' perceptions of their ICT skills?
- Did the personalized professional learning program significantly improve teachers' self-efficacy toward the integration of ICT?

Literature Review

Personalized Professional Learning (PPL)

Existing literature on teacher PL for ICT integration emphasizes addressing the following needs: (1) bridge the gap between research and practice (Albion et al., 2015), (2) use reflective practices to guide future practice (Avalos, 2011), and (3) address the

complexity of teacher PD design (Borko, 2004; Dall'Alba & Sandberg, 2006; Lawless & Pellegrino, 2007). It is clear that a part of what defines a successful implementation is the conversion from a teacher-centered to learner-centered, inquiry-based environments (Malone, 2008; Orrill, 2001; Schrum & Schrum, 1999; Wang, Hsu, Reeves, & Coster, 2014). Spires et al. (2012) specifically studied the necessity of adapting teacher's professional development to accommodate the pedagogical shifts accompanying one-to-one technology implementations. As teachers move from instructor-centered to student-centered learning environments, their PL and preparation programs should reflect this shift (Attwell, 2007). To this point, Dall'Alba and Sandberg (2006) discussed the idea that PL has 'horizontal' and 'vertical' dimensions with skill development defining the horizontal and an embodied understanding of practice defining the vertical. Similarly, Brand (1998) encouraged caution regarding the 'one size fits all' model when training teachers for using technology, and instead recommended addressing individual differences and supplementing individual strengths. The idea is that no two people will engage the same learning process at the same time and as such PL needs to be highly adaptive to the needs of the individual.

In a literature review on PL, Stoll, Bolam, McMahon, Wallace, and Thomas (2006) argued that "professional learning is widely believed to be more effective when it is based on self-development and work-based learning" (p. 232). This finding speaks to the core of PPL by allowing teachers to identify their own learning goals (self-development) and develop the technological skills within the context of their own content area and classroom (work-based learning). By building upon the framework of PPL, educational technology coaches are able to accommodate the vast diversity of technology

experience in the teaching staff. What is less clear is how to design PPL experiences for a large population with a wide range of technological and educational understandings.

Self-Efficacy Towards Technology Integration

The effects of professional learning experiences on teacher's self-efficacy is a key component of technology integration (Gonzales, 2013; Moore-Hayes, 2011; Schnackenberg & Still, 2014). For instance, Moore-Hayes's (2011) study of pre and in-service teachers' self-efficacy attitudes showed that once established, these attributes are difficult to change. Thus, when teachers do not feel confident in their abilities to work with technology, they are reluctant to continue their education further and are less likely to attempt using technology with students.

One factor shown to improve teacher self-efficacy towards technology use is to allow development of personalized learning plans (Mouza & Barrett-Greenly, 2015). When teachers had little voice or choice in their learning experience or development of learning plans, they felt the learning was dictated rather than led by them which impacted their efficacy towards implementing their plans (Janssen, Kreijns, Bastiaens, Stijnen, & Vermeulen, 2013). Existing research on teacher self-efficacy and technology integration makes it clear that PL experiences that engage teachers in translating learning into practice are important for the success of large-scale technology implementations (Desimone, 2009; Janssen et al., 2013; Schnackenberg & Still, 2014; Spires et al., 2012). Designing a professional learning experience that culminates with a self-created implementation plan gives teachers the autonomy to integrate technology and personalize learning for their own students. This is essential when developing PPL to ensure that the knowledge and skills gained through research and coursework translate into practice.

Bandura's (1977) extensive studies on the development of self-efficacy support that it is an integral part of creating successful change and learning as a part of human nature. As we are asking master teachers to change their pedagogical methods, it is important to support their mental state to fully embrace this change and achieve successful results making the self-reported, self-assessment of this study valuable information (Cassidy, 2015; Orrill, 2001). Despite the important role of self-efficacy towards positive technology integration experiences, Yeşilyurt, Ulaş, and Akan (2016) found there to be limited studies related to teacher self-efficacy in relation to ICT integration.

Methods

Learning that is adaptive, personalized, and continuous is shown to produce significant results in both learner achievement and enjoyment of the learning process (Abdelmalak & Trespalacios, 2013; Desimone, 2009; Koellner & Jacobs, 2015; Mouza & Barrett-Greenly, 2015; Spires, et al., 2012). The PPL experience for this study was accomplished through the integration of adaptive learning environments (Spires et al., 2012), personalization of learning content and assessment materials (Abdelmalak & Trespalacios, 2013), and the creation of long-term plans to promote continuous learning (Mouza & Barrett-Greenly, 2015) into the design of the professional learning program. The authors of this study seek to provide a detailed example for professional developers of a practical program design application built on these principles. Therefore, a longitudinal, cohort survey methodology was utilized to track teachers' perceptions of their technology skills and self-efficacy towards using technology before and after the program (Creswell, 2015).

Context of the Study

The educational system in which this study occurs is a preK-12 public school district located in Arizona. It is one of the largest districts in the United States serving approximately 72,000 students, 3,700 teachers, and 5,200 support staff. In 2012, voters approved a bond to upgrade the district's transportation, facilities, and technology infrastructure. Between 2012 and 2018 one-to-one (1:1) devices were distributed to six comprehensive 9-12 high schools and two preK-6 elementary schools. Nine 7-8 junior high schools received device carts in all math and English language arts (ELA) classrooms. At the preK-6 grade levels, 53 elementary schools received a minimum of three device carts for classroom use. This phased distribution across multiple grade level and subject areas increased the already complex nature of PL for ICT integration.

The PPL program that is the focus of this study was a summer institute learning experience composed of required and elective courses culminating in a capstone project to be implemented with the support of educational technology trainers during the following school year. Teachers had two months to complete the program at their own pace and then the following year to implement their plan with the support of educational technology trainers. Since this program took place outside of teachers' regular nine-month contract, they were compensated $300 for completion of the program. The district educational technology team created over 65 classes that could be delivered online or face-to-face. Each course was estimated to be 75 minutes in length for the learners dependent on experience and teachers received recertification hours for each class completed.

Teachers self-assigned and selected their courses by first choosing between two main learning pathways offered within the program, with additional choices embedded into the creation of each teacher's learning plan which are outlined in Table 3.1 below. Both pathways included an anchor course, a series of courses on the district's learning management systems (LMS), and focus area elective choices. As teachers completed the individual courses composing the program of study they contributed to a capstone document that was shared with the educational technology trainer assigned to assist them through the program and in their implementation during the school year. The goal of the capstone project was to provide teachers, trainers, and school administration with a single document in which the teacher reflected on their ability to improve student achievement through the design, implementation, and assessment of learning activities.

Table 3.1 PPL Program Structures

ITI Program	PLT Program
Required Anchor Course (ex. classroom management, TPACK, digital citizenship)	Required Anchor Course (ex. personalized learning, mastery learning, digital citizenship)
3 - Learning Management System courses	3 - Learning Management System Courses
4 - Electives (ex. Kahoot, Google Docs, LanSchool)	3 - Focus Area courses (station rotation, PBL, gamification, flipped classroom)
Capstone	Capstone

The first learning pathway was titled, Integrating Technology into Instruction (ITI). The ITI program was designed for teachers new to integrating technology in their

classroom or those that did not feel confident doing so. The required anchor course of the ITI program included information on digital citizenship, the TPCK technology integration model, best practices and procedures for managing technology in a blended learning environment, and district policies and procedures. For elective courses, teachers chose four courses from a catalogue of over 60 courses focused on a variety of ICT tools for presenting, collaborating, creation, personalization, etc. The capstone was composed of a series of guided questions to assist teacher in creating a plan for adapting their classroom procedures and pedagogy to incorporate ICT. A teacher in this program would view themselves as new to or uncomfortable with using technology in their classrooms. Even though each teacher personalized their own plans, a sample program included the required anchor course, three required courses chosen from a suite of options focused on a learning management system (LMS) which would be Canvas for 7-12 or Google Classroom for K-6. They would then choose four elective courses which might include Web 2.0 tools that focus on pedagogical areas such as assessment, presentation, and collaboration.

The second learning pathway was titled, Personalizing Learning through Technology (PLT). The PLT program was meant for teachers that were already implementing technology successfully in their classroom and were comfortable doing so. The required anchor course of the PLT program included continued exploration of digital citizenship, the SAMR model, concepts of mastery learning, and how to manage, plan for, and assess in personalized learning environments. The elective choices were concentrated into course series that focused on a particular model of ICT integration. These categories were project-based learning (PBL), gamification, flipped classroom, or

station rotation. The capstone project focused on completing a personalized learning plan adapted from Zmuda, Curtis, and Ullman (2015). A teacher in this program would describe themselves as comfortable managing technology in the classroom and ready to do more. Their sample program would include the required anchor course, the required LMS courses, and an elective focus area in PBL, gamification, flipped classroom, or station rotation.

While the anchor courses were only offered online, all other courses were offered both face-to-face and online to allow teachers to choose the modality that they were most comfortable with. The anchor courses were only offered online so that teachers would have the opportunity to experience a LMS as a student before integrating the platform into their own curriculum delivery. Optional face-to-face, guided practice sessions were offered to support anyone that needed assistance with online content or their capstone project. These unstructured, sessions were monitored by educational technology trainers who provided individual or small group assistance. Google+ communities were created based on learning strands that emerged from the course collection and every course was connected to a community to encourage collaborative participation. Teachers were encouraged to plan with their established professional learning communities (PLC) to support the connection of learning with practice.

Instrumentation

Data were collected through the use of a voluntary Likert scale self-assessment survey of self-efficacy questions which are found in Appendix A. Identifying features such as name and username were removed from the data after being used to track program and survey completion. Ten questions on the survey were developed in order to

understand teachers' comfort level with technology skills such as learning management systems, word processing, spreadsheets, presentation tools, assessment tools, digital portfolios, digital note taking tools, study aids, screencasting tools, and mobile technologies. These technology skills were selected as they are the main components of the elective course options that were offered as a part of the program. Participants ranked their current comfort level using these technology tools for instruction as very uncomfortable, uncomfortable, neutral, comfortable, or very comfortable.

A 20-question survey developed by Wang, Ertmer, and Newby (2004) was used to measure self-efficacy in regard to integrating technology for learning. Alpha coefficients of .94 (for pre-survey) and .96 (for post-survey) indicated that the instrument was reliable. Dr. Wang granted permission to use and modify the instrument for this study. One question was added to the original survey: 'I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.' This question was added to the survey as it was identified as an important issue to address with the participants both as a measurement of their mindset as well as to support the idea that their students are a resource. Teacher self-efficacy towards technology has shown to be an indicator of willingness and ability to successfully integrate technology in order to create blended and personalized learning environments for students (Bandura, 1977; Gonzales, 2013; Malone, 2008; Moore-Hayes, 2011; Wang et al., 2004). These questions serve to measure teacher self-efficacy, allowing us to determine the relationship between the professional learning experience and self-efficacy towards technology.

Participants

The program of study was developed to target teachers currently implementing or approaching the implementation of one-to-one devices for blended learning. This program included 19 schools, the distribution of which is shown in Table 3.2. 418 teachers completed the program of study in its entirety with 247 (59%) of participants completing both pre- and post-program surveys. Of the participants that completed both surveys, 50.4% were enrolled in the ITI program and 49.6% were enrolled in the PLT program. Table 3.3 provides a more in-depth examination of participants' years of teaching experience. Table 3.4 provides a list of the academic subject areas taught by the participants and the percentage of each subject area for the total population. This diversity of device distribution, age of students, teaching experience, and subject areas serves to highlight the complexity of the learning needs of teachers involved in the program.

Table 3.2 School Device Distribution

Types of Implementation	# of Schools	Grade Level
1:1	2	preK-6
1:1	4	9-12
Math Device Carts	2	9-12
Math Device Carts	11	7-8
ELA Device Carts	11	7-8

Table 3.3 Participants' Years of Experience

Years	Frequency	Percentage	Cumulative Percent
0-3	60	24.2	24.2
4-8	42	16.9	41.1
9-14	59	23.8	64.9
15+	87	35.1	100.0
Total	248	100.0	

Table 3.4 Academic Subject Areas Taught by Participants

	Frequency	Valid Percent	Cumulative Percent
Elementary	15	6.0	6.0
ELA	55	22.2	28.2
Math	61	24.6	52.8
Science	23	9.3	62.1
Social Studies	21	8.2	70.6
Fine/Performing Arts	8	3.2	73.8
PE	5	2.0	75.8
SPED	21	8.5	84.3
CTE	11	4.4	88.7
ROTC	1	4.0	89.1
World Language	13	5.2	94.4
Other	14	5.6	100.0
Total	248	100.0	

Data Collection & Analysis

Teachers that participated in a summer 2016 program of study were asked to voluntarily complete pre- and post-surveys concerning their technology skills and self-efficacy towards using technology in the classroom. Both surveys were distributed via a Google Form in the Canvas LMS as one of the first components in the anchor course of the ITI and PLT programs. The survey data that were collected as a part of the participants' regular work duties as a component of regular professional learning survey. The district gave permission of this existing data to be reviewed and anonymized for use in this study. Descriptive statistics and paired-samples t-tests were performed to measure the differentiation, if any, in ICT skills and self-efficacy towards ICT integration from the beginning to end of the program.

Results

Tests results showed that there was a significant difference in the pre- and post-test in the technology skills scores $t(247)=-16.106$, $p < 0.05$; and in the self-efficacy technology integration scores $t(247)=-10.539$, $p < 0.05$, as shown in Table 3.6 (See table 3.5 for a summary of means and standard deviations). These results suggest that PPL helped participants to increase significantly both their technology skills and their self-efficacy level for technology integration in the classroom.

Table 3.5 Summary of Means and Standard Deviations for Scores on the Four Different Tests

		Mean	N	Std. Deviation
Pair 1	Pre-test Tech Skill	3.3926	247	.8008
	Post-test Tech Skill	3.8997	247	.6639
Pair 2	Pre-test Self-efficacy	3.9535	247	.6369
	Post-test Self-efficacy	4.2460	247	.5344

Table 3.6 Overall Paired Samples T-Test

	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pre-test Tech Skill- Post-test Tech Skill	-.508	.496	-16.106	247	.000
Pre-test Self-efficacy - Post-test Self-efficacy	-.293	.437	-10.539	247	.000

Examining the ITI and PLT programs specifically also demonstrates positive increases in mean scores for both technology skills and self-efficacy towards technology integration. The ITI scores (skills=0.71, comfort=0.36) show higher post-pre means than the PLT scores (skills=.30, comfort=0.23) which is reflective of the baseline experience level of participants encouraged to enter the programs (Tables 3.7 and 3.8). Those entering the ITI program were less experienced with the use of technology and the

integration of technology for teaching and learning while those in the PLT program were expected to be comfortable with the skills introduced in the ITI program.

Table 3.7 Descriptive Statistics for Each One of the Two Programs for Technology Skills

Program	Pre-Test		Post-Test		Pre-Post Mean
	Mean	SD	Mean	SD	
ITL (N=125)	2.92	0.68	3.63	0.66	0.71
PLT (N=123)	3.87	0.60	4.17	0.55	0.30

Table 3.8 Descriptive Statistics for Each One of the Two Programs for Self-Efficacy

Program	Pre-Test		Post-Test		Pre-Post Mean
	Mean	SD	Mean	SD	
ITL (N=125)	3.69	0.65	4.05	0.53	0.36
PLT (N=123)	4.22	0.50	4.45	0.46	0.23

Mean differences were also conducted for each of the survey items in order to determine the shift of participant perceptions for each element of the survey from the beginning to end of the program. These results, show in full in Appendix B, illustrate the comparison of teachers' perception of their skills with multiple technologies and their self-efficacy levels for integrating technology. From these results, we are able to examine in greater detail the assessment components to identify strengths and weaknesses needed to guide the formation of future program design.

The greatest gains in technology skills were in the areas of assessment tools (-.798), learning management system (-.730), and study aids (-.715). These areas correlate

with the majority of courses offered. Both programs of study consisted of a required set of courses on the learning management system (LMS) of the teachers' choice. LMS coursework included utilizing the teachers LMS of choice to deliver assessment tools and study aids. In addition to the LMS courses, the majority of the elective courses focused on assessment tools and study aids such as Kahoot, Formative, Zaption, OneNote, Nearpod, and Quizizz. Word processing (-.133), spreadsheets (-.202), and presentation tools (-.238) demonstrated the least amount of growth which can be attributed to high initial pre-survey mean scores and, in the case of spreadsheets, a lack of course offerings.

The questions concerning self-efficacy that demonstrated the greatest growth in post-pre means were:

- Q14 (-.468) 'I feel confident about assigning and grading technology-based projects.'
- Q13 (-.419) 'I feel confident about selecting appropriate technology for instruction based on curriculum standards.'
- Q15 (-.391) 'I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.'

These questions focus on areas that were identified as particularly significant to the success of integrating technology into curricula. Coursework was designed to target the concepts of selecting appropriate technology resources to support learning, utilizing technology for assignments and assessment, and utilizing data to improve instructional practices. These also align with the growth demonstrated in the technical skills.

The questions concerning self-efficacy that demonstrated the least growth in post-pre means were:

- Q21 (-.137) 'I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.'
- Q19 (-.133) 'I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.'
- Q3 (-.177) 'I feel confident that I can successfully teach relevant subject content with appropriate use of technology.'

The lack of growth in questions 19 and 21 could be attributed to the high level of pre-survey mean score responses. These questions had the highest pre-survey mean scores of all of the self-efficacy questions (Q21=4.27, Q19=4.37). This could indicate that the teachers entered the program feeling comfortable with the idea of allowing students to demonstrate their own technology skills and using them to assist their teacher. The lack of growth for question 3 is an area that teachers communicated a desire for continued support as they participated in the program. While the content of the program was differentiated to support teachers from a variety of subject areas, none of the courses focused on content specific technology integration ideas. Teachers were required to adapt the skills and knowledge provided in the technology courses to their own curriculum. This is a point of consideration for the next iteration of the program of study.

Discussion

Highly-adaptive, learner-centered models of PD allow teachers to focus on learning experiences that will improve their learning outcomes, professional practice and model how to create similar learning environments to improve student learning outcomes (Desimone, 2009; Koellner & Jacobs, 2015; Lawless & Pellegrino, 2007; Spires et al., 2012; Webster-Wright, 2009). The modularized delivery of content via multiple

modalities combined with teacher created, trainer supported personalized learning pathways that are the basis of this PPL experience allowed teachers to significantly increase their perceptions of their ICT skills and self-efficacy towards ICT integration. Within this model teachers were able to meet their learning needs at their own stage of development (Dall'Alba & Sandberg, 2006), design their own learning plan (Lawless & Pellegrino, 2007), collaborate with other educators throughout their experience (Albion et al., 2015; Avalos, 2011), and explore learning materials at their own pace and place via online PD opportunities (Fishman et al., 2014).

The personalized learning design of the program in this study included increasing the modality of course delivery (online, in-person, or combination), extending the disbursement of learning materials (participants had two months to complete all program components), increasing course content (over 60 course offerings), and empowering teachers' choice of learning location and collaboration (participants could work alone or with professional learning communities, partner teachers, department, etc.). Learning was encouraged to continue beyond the summer program through the creation and implementation of a capstone project which established a way for educational technology trainers to provide 'just-in-time' training for teachers once the school year began. These elements correlate with Desimone's core conceptual framework components of duration, cohesion, collective participation, and active learning (2009). When registering for the program, teachers were able to customize their professional learning plan according to their content, learning needs, and teaching goals through the creation of their program of study. The results of the overall paired samples t-test (Table 4) shows that the teachers that participated in the program of study felt that their technology skills and their self-

efficacy towards teaching with technology improved from the beginning of the program. Examining the technology skills and self-efficacy scores more specifically (Appendix B) served to highlight that the areas of the program that exhibited the most and least improvement. For technology skills, those areas included the LMS, assessment tools, and study aids which aligned with the majority of course offerings. The areas of self-efficacy that experienced the most improvement included assigning and grading technology-based projects, selecting appropriate technology for instruction based on curriculum standards, and keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.

In a follow-up survey given in the fall after the first semester of the school year, 96.5% of participants reported that the program of study helped prepare them for integrating or personalizing learning that school year. Thus, the results of this study provided additional evidence that personalized professional learning can be leveraged for the benefit of teachers to improve their perceptions of their technology skills and self-efficacy towards the use of technology in the classroom.

Conclusion

It has been shown that professional development experiences that are 'one-shot,' 'sit-and-get' professional development experiences do not result in improving the teaching and learning experiences of participants (Brand, 1998; Lawless & Pellegrino, 2007; Opfer & Pedder, 2011; Spires et al., 2012; Stoll et al., 2006; Webster-Wright, 2009). Personalizing professional learning creates the opportunity for teachers to make choices in how they invest their professional learning time. Through the creation of learner-centered models of PL, teachers are able to focus on how their own learning can be

utilized to improve and support student learning experiences (Desimone, 2009; Schnackenberg & Still, 2014; Spires et al., 2012).

Future studies would benefit from a more thorough examination of the specific elements that contribute to the relationship between PPL and teachers' technology skills and self-efficacy. The research questions in this study explore if PPL experiences significantly improved teachers' self-perceptions but not why. The addition of qualitative data, such as interviews, could help to add depth and understanding to the survey results. Another possible future area of study is to examine the impact into the following school year to assess if improved self-efficacy translates into classroom practice. Furthermore, to examine if classroom integration of ICT tools pedagogically based on the TPACK and SAMR frameworks that are taught in the program of study impact student achievement. These recommendations would elevate the understanding of the impact of this PPL experience beyond the measurement of significant change.

Limitations

Limitations of this study include self-reported data and researcher bias. As previously discussed, the data collected were based on teachers' self-perceptions of their ability and self-efficacy towards ITC integration. Since the measurement is to gauge the confidence levels of the teachers, their perceptions of their skills are a valid measurement. Researcher bias is present as one of the authors was involved in the creation of the PPL program. To accommodate this the second author and peer review process has provided feedback to identify and eliminate possible bias arguments and ensure the validity of results.

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APPENDIX A

Technology Comfort Level SurveySample

Survey:

Name

Years Teaching

School

Subjects currently teaching

Program of Study selection

Technology Skills

How would you rank your current comfort level using the following technology tools for instruction? (Very Uncomfortable, Uncomfortable, Neutral, Comfortable, Very Comfortable)

1. Learning Management System (Canvas, Google Classroom)
2. Word Processing (Google Docs, Word)
3. Spreadsheets (Google Sheets, Excel)
4. Presentation Tools (Google Slides, PowerPoint, Nearpod, SMART Notebook)
5. Assessment Tools (Google Forms, Canvas quizzes, Formative, Quizizz, Socrative)
6. Digital Portfolios (OneNote, Google Drive, Google Sites, Weebly)
7. Digital Note Taking Tools (OneNote, Google Docs, Google Drawing)
8. Study Aids (Quizlet, Khan Academy, Newsela, ReadWriteThink)
9. Screencasting Tools (PowerPoint Mix, Educreations, Screencast-o-matic)
10. Mobile Technologies (cell phones, tablets, convertible laptops)

Technology Comfort Level

The purpose of this portion of the survey is to determine how you feel about integrating technology into classroom teaching. For each statement below, indicate the strength of your agreement on the scale. (Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree). Used with permission of Dr. Ling Wang, Nova Southeastern University.

1. I feel confident that I understand computer capabilities well enough to maximize them in my classroom.
2. I feel confident that I have the skills necessary to use the computer for instruction.
3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.
4. I feel confident in my ability to evaluate software for teaching and learning.
5. I feel confident that I can use correct computer terminology when directing students' computer use.
6. I feel confident I can help students when they have difficulty with the computer.
7. I feel confident I can effectively monitor students' computer use for project development in my classroom.
8. I feel confident I can motivate my students to participate in technology-based projects.
9. I feel confident I can mentor students in appropriate uses of technology.
10. I feel confident I can consistently use educational technology in effective ways.

11. I feel confident I can provide individual feedback to students during technology use.
12. I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.
13. I feel confident about selecting appropriate technology for instruction based on curriculum standards.
14. I feel confident about assigning and grading technology-based projects.
15. I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.
16. I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.
17. I feel confident that I will be comfortable using technology in my teaching.
18. I feel confident I can be responsive to students' needs during computer use.
19. I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.
20. I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.
21. I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.

APPENDIX B

Individual Survey Question Results

Mean Differences for all Items Measuring Technology Skills

Technology Skills	Mean Differences
Learning Management System	-.730
Word Processing	-.133
Spreadsheets	-.202
Presentation Tools	-.238
Assessment Tools	-.798
Digital Portfolios	-.597
Digital Note Taking Tools	-.656
Study Aids	-.715
Screencasting Tools	-.688
Mobile Technologies	-.302

Mean Differences for all Items Measuring Self-Efficacy

Question	Mean Differences
1. I feel confident that I understand computer capabilities well enough to maximize them in my classroom.	-.319
2. I feel confident that I have the skills necessary to use the computer for instruction.	-.198
3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.	-.177
4. I feel confident in my ability to evaluate software for teaching and learning.	-.335
5. I feel confident that I can use correct computer terminology when directing students' computer use.	-.246

6. I feel confident I can help students when they have difficulty with the computer.	-.238
7. I feel confident I can effectively monitor students' computer use for project development in my classroom.	-.387
8. I feel confident I can motivate my students to participate in technology-based projects.	-.238
9. I feel confident I can mentor students in appropriate uses of technology.	-.294
10. I feel confident I can consistently use educational technology in effective ways.	-.335
11. I feel confident I can provide individual feedback to students during technology use.	-.355
12. I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.	-.331
13. I feel confident about selecting appropriate technology for instruction based on curriculum standards.	-.419
14. I feel confident about assigning and grading technology-based projects.	-.468
15. I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.	-.391
16. I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.	-.403
17. I feel confident that I will be comfortable using technology in my teaching.	-.234
18. I feel confident I can be responsive to students' needs during computer use.	-.270
19. I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.	-.133
20. I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.	-.234

21. I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.	-.137

CHAPTER FOUR: STUDY 2

Abstract

The purpose of this mixed-methods study was to investigate the impact and experiences of teachers who had engaged in a personalized professional learning program to promote ICT integration in preK-12 classrooms. Survey results showed that teachers' perceptions of their ability to use technology tools and their self-efficacy towards using technology in the classroom improved significantly. Interview results indicated support, choice, and coherence as positive aspects of the program with content support, community, and the overarching struggles of teaching as challenges to improvement. Overall, being able to have their individual needs met empowered teacher progress towards their learning goals despite their initial teaching, academic, and technology self-efficacy levels (Bandura, 1997; Moore-Hayes, 2011; Yeşilyurt, Ulaş, & Akan, 2016).

Keywords: personalized professional learning, personalized learning, professional development, technology integration, self-efficacy, one-to-one.

Introduction

One-to-one technology implementations are increasingly commonplace in K-12 education. This form of technology integration is thought by many to be a panacea of righting the balance of equity and access for students in public education. However, research has found that when these programs are implemented without appropriate support and training, there may be little to no impact on student learning (Borko, 2004; Dishon, 2017; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). As a result, researchers

have begun to examine the changes needed to transform classroom models of education that are reflective of the industrial era, to models that support skills sets required of a 21st-century society. Among these are blended and personalized learning models which have been noted as both key trends and significant challenges (Johnson, Adams Becker, Estrada, & Freeman, 2015). To accompany this shift in pedagogy, research suggests there must also be a change to personalized professional learning models for teachers (Borko, 2004; Desimone, 2009; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). The intention of this study was to explore teachers' change in technology skills and self-efficacy towards using technology after engaging in a personalized professional learning experience. Viewed through the structure of Desimone's Core Conceptual Framework (2009), learning experiences examined in this study will be compared against standardized professional learning best practices.

While there are studies on personalized learning (PL) (Grant & Basye, 2014; Karmeshu, Raman, & Nedungadi, 2012) and professional development (PD) (Borko, 2004; Desimone, 2009, Lawless & Pellegrino, 2007; Wei et al., 2009), there are a limited number of studies concerning personalized professional learning (PPL) for educators (Fok & Ip, 2006; Webster-Wright, 2009). This study contributes to the canon of existing literature by providing an in-depth exploration of a PPL experience from the perspective of K-12 educators. The experiences of the educators in a professional learning program of this design and scope could provide professional learning specialists with considerations for future program development.

Literature Review

Personalized Professional Learning (PPL)

The definition of PL is as individualistic as the concept itself which can lead to a variety of opinions on the validity of the method (Abamu, 2017; Walker, 2017). Some may view PL purely as adaptive technology programs in which the learner engages with an elearning program that guides their learning (Attwell, 2007). For the purpose of this study, PL is viewed through the following definition:

> "Personalized learning refers to instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may all vary based on learner needs. In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated." (U.S. Department of Education, 2017, p. 9)

It is acknowledged that a one-size-fits-all approach to traditional PD does not provide teachers with the specific knowledge and support necessary to meet their individual learning goals, but there is little movement towards changing how PD is delivered (Webster-Wright, 2009). The setting of this study offers teachers PL options by providing choice in modality, content, timeframe, and application. By creating a learning plan that is personalized to their own needs, teachers are provided with a model for how to personalize learning for students. This supports the diffusion of PL models in the classroom by demonstrating the potential for educational technology to enhance, not replace traditional learning experiences (Karmeshu, Raman, & Nedungadi, 2012; Malone, 2008; Mouza & Barrett-Greenly, 2015).

Typical measurement of PD is based on the type of activity or seat time (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015), but Desimone's (2009) review of the literature on teacher PD suggests instead evaluating the desired outcomes. She proposes

the examination of the relationships between PD, teacher knowledge and beliefs, classroom practice, and student outcomes as a way of developing a complete understanding of what constitutes successful PD. This method supports the idea of transforming one-time, sit-and-get PD into the just-in-time, continuous growth process of PPL. She identified five components as key to successful PD: content, coherence, duration, collective participation, and active learning (Desimone, 2009; Desimone & Pak, 2017). This Core Conceptual Framework is a foundational component of designing PPL experiences and is used to describe teachers' experiences in this study. While the majority of PPL studies focus on the need for further investigation and continued program development rather than teachers' perceptions or impact on learning, the elements of personalization that have been identified such as choice, relevance, and active learning align with the elements of the Core Conceptual Framework (Biehn & Rice, 2016; DeMonte, 2013; Gamrat, Zimmerman, Dudek, & Peck, 2014; Gynther, 2016; Parks, Oliver, & Carson, 2016).

Self-Efficacy

Bandura (1997) addressed the necessity of supporting teachers' pedagogical, academic, and technology self-efficacy growth in order to ease them through the educational shifts that are necessary with the technology-enhanced classrooms of the 21st-century. When teachers feel confident and competent in their ability to use technology, they are more apt to initiate utilizing technology when teaching (Bandura, 1997; Sadaf, Newby, & Ertmer, 2016). However, when professional learning for educational technology is focused purely on learning how to manipulate the technology, teachers are not as inspired to shift their practice as when there is a specific focus on

pedagogy and how appropriate technology integration can benefit themselves and their students (Bandura, 1997; Ertmer, 2005; Mishra & Koehler, 2006). This can be a challenging task due to the variety of content, age levels, curricular focus, and experience both as an educator and with using technology that is present in any group of teachers. The creation of PPL can make the process of accommodating the needs of individuals logistically feasible for professional developers (Koellner & Jacobs, 2015).

While there are limited studies measuring the impact of PPL on self-efficacy for teachers, studies on PD that include elements of personalization indicate a positive correlation between teacher self-efficacy and technology integration (Gonzales, 2013; Moore-Hayes, 2011; Schnackenberg & Still, 2013). Gonzales (2013) emphasized the importance of directing PD experiences to support teacher's weaknesses and enhance their self-efficacy towards their technology usage. Schnackenberg and Still's (2013) study of preservice teachers found a significant, positive correlation between positive perceptions of ability to integrate technology and the use of technology tools that encourage more meaningful, pedagogical interactions. Moore-Hayes's (2011) study of pre and in-service teachers' self-efficacy attitudes showed that once it is established, it is difficult to change. This study found that with both pre and in-service teachers their lack of technological preparation prevented them towards seeking out continuous PD on their own. She noted that high self-efficacy is essential to successful technology integration. These studies support the connection between teacher self-efficacy and technology integration but are largely quantitative in design and do not include the presence of teacher voice reflecting on their experiences as is included in this study.

Context of the Study

This study was set in a K-12 public school district located in the southwest. The school district is one of the largest in the United States serving 86 schools and programs including six high schools, nine junior high schools, 55 elementary schools, eight choice schools, four success schools, three preschools, and one online school program. In 2012, voters approved a bond for the purpose of upgrading facilities, transportation, and technology infrastructure. A portion of this bond was earmarked to support a multi-year distribution of one-to-one (1:1) and mobile classroom cart models of devices to facilitate wireless teaching and learning. Between the 2013 and 2018 school years, 1:1 devices were distributed to each of the six comprehensive high schools and two elementary schools. Mobile classroom sets of devices were distributed to the Math and English departments at each of the nine junior high schools and all of the elementary schools received a minimum of three carts. The goal of the device distribution was to transition traditional classroom learning to blended and personalized learning environments.

The first year all teachers received new devices and wireless projection systems and training was rolled-out as a unified learning experience. However, due to the time-release distribution of devices, the professional learning needs of teachers rapidly began to diversify. Over the course of six years, 72 schools received 1:1 devices or mobile device carts. Teachers that were receiving classroom devices required intensive training to prepare for teaching in blended or PL environments. Those that were not receiving classroom devices had no context or perceived use for receiving training to prepare them for blended or PL environments. Thus, PPL was explored as a potential model to both differentiate instruction to meet the needs of all teachers and to allow teachers to

experience a PL environment themselves before constructing such a learning environment in their own classrooms.

The PPL experience called the *Program of Study* mirrored a university degree program and included both required and elective components culminating in the creation of a capstone project that was unique to each teacher. Teachers were assigned an educational technology trainer to be their program guide and to assist them in the implementation of their capstone project in the classroom once the school year began. The program was open for two months allowing participants to adjust their learning time frames according to their personal schedules and learning preferences. Courses, created by the district educational technology department under the guidelines of the Quality Matters Standards, were offered online and in-person to allow for increased choice in learning modalities. A sample selection of course titles can be viewed in Appendix A. Optional "guided practice" sessions were offered to support those struggling with online learning components and to allow participants to meet with their assigned educational technology trainer. The capstone project was a plan for implementing blended or PL during the school year. This plan was shared with the site-based educational technology trainers, as well as school administration to help support teachers in the implementation of their technology integration plan once the school-year began. Since the program took place outside of the regular school year contract, teachers were compensated $300 for completion of the program.

The 2017 Program of Study was designed as a PPL experience inclusive of the components of the Core Conceptual Framework (Desimone, 2009). Teachers initially chose between two learning pathways: Introduction to Blended Learning (IBL) and

Designing for Innovation (DFI). While there was required content targeted to the foundational needs and understandings, the program contained over 75 million possible combinations ($_{60}C_{10}$) as long as the required number of primary anchor courses, LMS courses, and focus area courses were met (see Table 4.1).

Table 4.1 PPL Program Structures 2017

	IBL Program		DFI Program
# of required courses	Type of Course	# of required courses	Type of Course
1	Required Anchor Course (ex. classroom management, TPACK, digital citizenship)	1	Required Anchor Course (ex. personalized learning, mastery learning, digital citizenship)
3	Learning Management System courses	3	Learning Management System Courses
4	Electives (ex. Kahoot, Google Docs, LanSchool)	4	Focus Area courses (any combination of electives that support the design plan including station rotation, PBL, gamification, flipped classroom)
1	Content Area Course	1	Content Area Course
	Capstone		Capstone

This allowed teachers to adapt their course selections as they progressed through the program and choose the courses that best met their needs improving coherence. However, this volume of choice and flexibility can be overwhelming. To assist teachers

in the selection of their coursework, two learning pathways were provided geared towards teachers new or uncomfortable with ICT integration and another pathway for those who were ready to attempt more blended and personalized forms of learning.

The Introduction to Blended Learning (IBL) pathway for teachers new to ICT integration included required courses that covered topics such as classroom management of devices, the TPCK framework, growth mindset, and learning management system courses, as well as over 60 elective choices. The electives for both pathways included courses in how to leverage ICT tools for pedagogical purposes such as, presentation, assessment, collaboration, and active learning through Web 2.0, Google, and Microsoft educational tools. All products produced in these courses were intended to be used in the classroom, which, in turn, promoted active learning for the teachers since they were engaged in creating artifacts to immediately use in their classrooms.

The pathway for more advanced teachers, Designing for Innovation (DFI), assisted teachers in identifying a problem of practice within their classroom or curriculum, developing a plan to integrate an innovative instructional practice to address the problem of practice, and then determining how they would assess that plan to identify next steps for improvement. By mirroring the concept of design-based research in the classroom, teachers were prepared to apply the skills from these anchor courses, not just in the area of education technology, but indefinitely as they improved their practice over time. All of the same elective courses available to the IBL cohort were also available to the DFI cohort but they were encouraged to select one learning innovation to focus their plan around. Support for this included courses in gamification, flipped classroom, station rotation, project based learning, and the SAMR model. The goal of this approach was to

integrate design-based models of PD into classroom practice and attempt to bridge the gap between research and practice (Lawless & Pellegrino, 2007). Helping teachers to design their own learning plan within their classroom supports coherence, duration, content focus, and active learning by encouraging teachers to apply what they learned during the summer training to their classroom practice once the school year began and applying the needs of their students directly to the creation of lesson plans and resources (Desimone, 2009).

Method

In order to thoroughly consider the main research question of this study: "To what extent and in what ways did personalized professional learning program serve to support teachers' technology skills and self-efficacy toward integration of ICT in their classrooms?", a mixed-methods, explanatory sequential design (Creswell & Plano Clark, 2018) was selected to guide the methodology of this study. The case-selection variant of this method was chosen as the initial quantitative survey was used to purposefully select the participants for the qualitative portion (Creswell & Plano Clark, 2018). The quantitative survey provided a large-scale overview of participant's demographics, self-perceptions of their technology skills, and self-efficacy towards using technology in the classroom before and after their work in the PPL. The qualitative interviews provided a more in-depth view of participant's perceptions of their learning experience. This method provided a constructivist ontology and epistemology combined with a pragmatic methodology (Creswell & Plano Clark, 2018).

A longitudinal, cohort survey methodology was adopted to measure the quantitative portion of this study. A Likert scale survey created by Wang, Ertmer, and

Newby (2004) was adapted for use in this portion of the study with their permission. It was delivered pre- and post-program to measure teachers' self-perceptions of their technology skills and self-efficacy towards using technology in the classroom. The original survey contained twenty questions focused on teachers' self-efficacy towards ICT integration. One additional question was added to the self-efficacy section, as well as ten questions focusing on technology skills. The distributed survey can be viewed in its entirety in Appendix B. This was a voluntary survey containing Likert scale and open-ended questions serving to answer research sub-question 1: Did the personalized professional learning program significantly impact teachers' self-efficacy toward the integration of ICT?

Phenomenology was the chosen method for the qualitative portion of the study in order to "describe(s) the common meaning for several individuals of their lived experiences or a concept or phenomenon" (Creswell, 2015, p. 76). This study aligns with phenomenology in the examination of the phenomenon of PPL through the descriptions of the lived experience of the teachers involved. Through a series of interviews with selected participants, a thorough description detailing the essence of what the teachers experienced in the PPL program was constructed. Specifically, a hermeneutic lens was employed in the interpretive process due to the idea that "...all understanding is connected to a given set of fore-structures, including one's historicality, that cannot be eliminated" (Laverty, 2008). Given the first author's involvement with the development of the program and the possibility that some of the subjects may have engaged in this program more than once, it is unlikely either could view the phenomenon as if for the first time as is needed in transcendental phenomenology. The act of tracking educator experience

through multiple points in the program and the influence of past experiences with professional learning in any form also contributed to the selection of a hermeneutic phenomenological method. The three-interview series model was selected in order to establish rapport with the subjects, focus on the details of the PPL experience, and reflect on the meaning behind the experience (Seidman, 2013). Once data was collected, it was assessed "to reflect on the content to discover something 'telling', something 'meaningful', something 'thematic'" (Sloan & Bowe, 2013, p. 1292) in order to answer research question 2: How do participants describe their experiences in the personalized professional learning program?

Participants

All teachers involved in the program were asked to voluntarily complete pre- and post-program surveys. Within the program 344 teachers responded to both the pre- and post- program surveys with 228 participating in the IBL program and 116 in the DFI program. Additional information about subject areas and teaching experience are found in Tables 4.2 and 4.3. The years of teaching experience was fairly evenly distributed from 0 to 15+ years of teaching as is reflected on Table 4.2. While Table 4.3 initially reflects that elementary teachers had the highest frequency, the remaining subjects were all secondary (7-12) grade level teachers making that group the majority of respondents.

Table 4.2 Participant's Years of Experience

	Frequency	Valid Percent
0-3 Years	74	21.5
4-8 Years	79	23.0
9-14 Years	84	24.4
15+ Years	107	31.1
Total	344	100.0

Table 4.3 Academic Subject Areas Taught by Participants

	Frequency	Valid Percent
Elementary	83	24.1
English Language Arts	57	16.6
Math	43	12.5
Science	38	11.0
Special Education	37	10.8
Social Studies	32	9.3
World Language	14	4.1
Physical Education	13	3.8
Career and Technical Education	13	3.8
Fine/Performing Arts	10	2.9
Other	3	.9
ROTC	1	.3
Total	344	100.0

Maximum variation sampling was utilized to identify interview participants from the pool of teachers involved in the program. The criteria sought to include multiple school sites, grade levels, content areas, and incoming teacher experience in terms of

years in the classroom, technology skill level, and self-efficacy towards using technology in the classroom. Prior to the start of the program all teachers completed a survey measuring the previously mentioned criteria. An email was sent to respondents of the survey inquiring into their interest towards participating in the study. Based on the responses of those interested in participating in the study, six teachers were initially selected to represent a diverse cross-section of the population. Upon the initial interview, one participant was found to no longer qualify. A summary of the interview participant demographic information is shown in Table 4.4.

Table 4.4 Overview of Interview Participants

Participant Pseudonym	Grade Level	Content Area	Years Experience	ICT Skills	Self-Efficacy	Participated in 2016 Program	Years teaching with devices
Ann	9-12	Math	15+	High	High	Yes	2
Brenda	9-12	Math	0-3	Low	Moderate	No	1
Charlotte	9-12	World Language	15+	Low	Low	No	0
Denise	K-6	Kinder-garten	9-14	High	High	Yes	3
Erika	7-8	Art	0-3	Moderate	Low	Yes	3

At the time of this study, Ann was entering her 22nd year teaching math at the same high school she had taught at for her entire career. She was the department head and also taught Advancement Via Individual Determination (AVID) classes which is a

program focused on closing the achievement gap by preparing all students for college and postsecondary education. She participated in both the 2016 Program of Study and the 2015 1:1/Blended Learning Workshop. She had a high self-perception of ICT skills and self-efficacy towards integrating ICT in her classroom. As department head she strongly encouraged her department to integrate ICT and regularly organized her own ICT trainings and observational rounds. She was entering the third year of having 1:1 devices in her classroom.

Brenda was also a high school math teacher but taught at a different school site from Ann. She had a class set of devices in her classroom for two years prior to the study but used them infrequently. Her school site was receiving 1:1 devices in the 2017-2018 school year and all teachers were strongly encouraged to participate in the *Program of Study*. She did not have much experience with ICT tools but felt moderately confident about being able to incorporate them into her teaching at the beginning of the program. This was her first time participating in the *Program of Study*.

Charlotte has been teaching for over fifteen years as both an English Language Arts (ELA) and World Language teacher, but was only teaching World Language classes at the time of the study. She was not comfortable with ICT tools or her ability to use them in the classroom but her high school was also receiving 1:1 devices in the 2017-2018 school year and was strongly encouraged to participate in the program. This was her first time participating in the Program of Study.

Denise was a kindergarten teacher at the district's first 1:1 school that served as a pilot program for future implementations. She participated in the 2016 Program of Study and served on her school's Teacher of Teachers Technology committee (TOTT) which is

a train-the-trainer PD model for ICT at her school. She has both high skill and self-efficacy levels for ICT integration going into the program.

Erika previously taught K-6 art at the same school as Denise but was moving to teach art at a 7-8 junior high for the 2017-2018 school year. She participated in past PD including the 2016 Program of Study but self-assessed herself as having low to moderate skills and self-efficacy at the beginning of the study. Her new school did not have a 1:1 device program but device carts and Erika wanted to prepare to apply her skills to a new grade level and curriculum.

Data Collection

The data collection process included two parts. One part is regarding the quantitative data collection process to measure change in teachers' perceptions of their skills to integrate technology and their self-efficacy. The second part is collecting qualitative data from interviews with the purpose of understanding their experiences in the PPL that prepare them to integrate technology in their classrooms.

Quantitative Data

Pre- and post-program data were collected through the use of a voluntary Likert scale survey collecting demographic information as well as participant self-perceptions of ICT skills and self-efficacy towards technology integration. Demographic information that was collected included name, username, number of years teaching, teaching subject, school location, and in which program that they participated in. Identifying features such as name and username were removed from the data after being used to track program and survey completion.

Determining if teachers' perceptions of their technology skills improved during the course of the program is an important measure of program success and source of information to guide future program design. Ten questions on the survey collected information on teachers' comfort level with technology tools such as learning management systems, word processing, spreadsheets, presentation tools, assessment tools, digital portfolios, digital note taking tools, study aids, screencasting tools, and mobile technologies. These technology tools were selected as they are the main components of the elective course options that were offered as a part of the program. Participants ranked their current comfort level using these technology tools for instruction as very uncomfortable, uncomfortable, neutral, comfortable, or very comfortable.

Twenty-one questions on the survey concerned teacher self-efficacy towards integrating technology for classroom teaching. Teacher self-efficacy towards technology has shown to be an indicator of willingness and ability to successfully integrate technology in order to create blended and personalized learning environments for students (Bandura, 1977; Gonzales, 2013; Malone, 2008; Moore-Hayes, 2011; Wang et al., 2004). These questions serve to measure teacher self-efficacy, allowing us to determine the relationship between the professional learning experience and self-efficacy towards technology. In the process of examining current studies of professional learning models, a 20-question survey developed by Wang, Ertmer, and Newby (2004) was identified as a proven, valid instrument through which to measure self-efficacy in regard to integrating technology for learning. Dr. Wang granted permission to use and modify the instrument for this study. One question was added to the original survey: 'I feel

confident letting students explain how to use or troubleshoot technology, even if I don't understand it.' This question was added to the survey as it was identified by the educational technology department as an important issue to address with the participants both as a measurement of their mindset as well as to support the idea that their students are a resource.

Qualitative Data

Five participants engaged in three semi-structured interviews before and after participating in the program of study over a period of six months. These interviews followed the three-interview series model described by Seidman (2013). The first interview occurred at the beginning of the PPL experience and served to establish rapport and collect information on past teaching and PD experiences. The second interview took place after summer coursework was completed and focused on the PPL experience. A third interview was conducted at the end of the first nine weeks of the school year to explore the conveyance of learning from the summer into the school year and the utilization of the capstone project. Interviews were recorded, transcribed, and reviewed to identify common themes that emerged from the participant's experiences. The framework for the initial structure of the interview questions can be viewed in Appendix C.

While the initial, common questions formed the core of the interviews, additional questions were asked throughout the process to help clarify and elaborate the responses of the participants. At times, these new questions were unique to the individuals and their experiences, but some would also become recurring questions asked of all participants based on emerging themes. The process of theoretical sampling was used between interview sets to guide the identification of themes and potential question strands (Boeije,

2002). Theoretical sampling served to not only focus and guide the interview and data collection process but the analysis of data as well.

Interview Methods & Analysis

The first in the series of interviews occurred at the beginning of the program and focused on establishing rapport and learning about the experiences of the teachers in regard to their overall teaching experience, past experiences with professional learning, and experience integrating ICT into their classroom practice. Since a diverse group of teachers was purposefully selected, their experiences in their areas varied widely. The teaching experience ranged from 28 years to four with some having great consistency in regard to their subject matter, grade level, and school placement while others had changed positions over time. When discussing past PD experiences, all participants had different internal and external factors driving their participation, but all agreed that, for the most part, they were unlikely to gain information that was useful for their application in their own classrooms and less likely to apply what they learned. Ann, Denise, and Erika had previously participated in the 2016 program, but Brenda and Charlotte were new to the 2017 program. Those that participated in the 2016 program had more experience integrating ICT, but Erika still did not feel comfortable applying it purposefully in a way that enhanced her curriculum. Of the two that were new to the program, Brenda had devices in her classroom the previous year but used them minimally and had little previous training in how to do so. Charlotte had just received her first cell phone and was not comfortable with technology in general but very excited about the possibilities for her students.

The second round of interviews took place after the completion of the program. This round focused on the teachers' experiences in the courses, working with their trainers and peers, and overall successes and challenges in completing the program. Brenda and Charlotte had some issues initially navigating the program but were able to gain their footing by working with their assigned trainer. The presence of a designated trainer seemed to be a source of support and comfort for all teachers throughout the program. The teachers that were less experienced used their trainers for questions about the learning materials and completing assignments. The more experienced teachers used the trainers less overall but when they did engage them it was to discuss aspects of their plan and brainstorm possibilities.

The third interview followed up with the teachers after the first nine weeks of school to see how they fared implementing their capstone projects and to capture their reflections on the learning experience now that some time had passed and they were applying what they learned. While Brenda was unable to participate in the final round of interviews, only Denise reported implementing her plan as it was conceived. Ann entered the program with a plan in mind but the teaching assignment that she was planning for changed during the program. She did still implement a plan based on the principles she learned in the DFI program but simultaneously planned and taught in the fall. Charlotte experienced the most skill and self-efficacy growth during the program but was overwhelmed once the school year began. She implemented some of the lessons she had created in classes and established classroom management with the devices but did not feel like she would be ready to implement her plan until the 2nd or 3rd quarters of the school year. Erika did not think she would be implementing her plan at the end of the

program and also did not start the year with devices in her classroom. At the time of the third interview, her trainer was still working on obtaining her devices to keep in her room but the teacher had moved on with her curriculum planning to anticipate not having them during the year.

Analysis of the interviews began during the transcription process by noting recurring topics and ideas as well as points that intersected with the elements of the Core Conceptual Framework (Desimone, 2009). During the second round of analysis each participants' interview series was reviewed to develop an understanding of each individual's experience throughout the program. In the third round of analysis, the interviews were reviewed in sequential order (ie. first round interviews of all participants, 2nd, 3rd) to view the experiences from each moment in the program timeline. Throughout each round of analysis color coding and annotation were made to the transcripts to identify emerging themes in addition to the elements of the core conceptual framework. At the conclusion of this process, a spreadsheet was created containing sheets for each of the key themes that had been identified. To each sheet quotes were collected to confirm the frequency and strength of the theme. A sample of this can be viewed in Appendix D. Based on this final analysis some of the themes were combined to arrive at the ultimate list of results presented in the next section.

Results and Discussion

This section is organized by the research questions. The first research question was answered based on the results from the survey data, the second research question was answered based on the findings from the interview data. The overarching research question is answered at the conclusion of this section.

Research sub-question 1: "Did the personalized professional learning program significantly impact teachers' technology skills and self-efficacy toward the integration of ICT?"

To answer this question, quantitative data was collected through a pre and post survey as described in the methods section. The survey results portrayed a significant difference between the pre- and post-surveys for both technology skills $t(344)=-20.207$, $p<0.05$; and self-efficacy towards technology integration $t(344)=-14.164$, $p<0.05$, as shown in Table 4.5. When examining the IBL and DFI mean scores separately, there is also significant increases in pre-post technology skills and self-efficacy scores as shown on Tables 4.6 and 4.7. Results from the analyses indicate that the program had a positive impact on teachers' skills and self-efficacy, answering research sub-question 1 and providing a basis for a more in-depth exploration into the experiences of those in the program through the interview portion of the study.

Table 4.5 Overall Paired Samples T-Test

	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pre-test Tech Skill- Post-test Tech Skill	-.615	.565	-20.207	343	.000
Pre-test Self-efficacy - Post-test Self-efficacy	-.362	.474	-14.164	343	.000

Table 4.6 Descriptive Statistics For Each One of the Two Programs for Technology Skills

Program	Pre-Test		Post-Test		Post-Pre Mean
	Mean	SD	Mean	SD	
IBL (N=228)	2.99	0.70	3.63	0.71	0.64
DFI (N=116)	3.60	0.72	4.15	0.51	0.55

Table 4.7 Descriptive Statistics For Each One of the Two Programs For Self-Efficacy

Program	Pre-Test		Post-Test		Post-Pre Mean
	Mean	SD	Mean	SD	
IBL (N=228)	3.59	0.65	3.98	0.55	0.39
DFI (N=116)	4.16	0.59	4.46	0.53	0.30

Research sub-question 2: "How do participants describe their experiences in the personalized professional learning program?"

To answer this question, qualitative data was collected through interviews as described in the methods section. By tagging and code mapping the interview transcripts a constant comparative analysis methodology was used to identify themes surrounding the teachers' experiences in the PPL program (Anfara, Brown, & Mangione, 2002). The initial tagging process began by identifying instances of references to technology skills, self-efficacy and the components of the core conceptual framework: active learning, coherence, collective participation, content, duration (Desimone, 2009). Additionally,

trainer support, learning modality, pacing, and general struggles of teaching also emerged as key concepts. By comparing these codes among participants and interview rounds teachers' positive experiences in the program were attributed to:

P1. Support from both trainers and other teachers in the form of collective participation

P2. Enhanced coherence, duration, and content focus compared to traditional PD

P3. Choice in regard to pacing, modality, and courses

The challenges that emerged from the interviews focused on:

C1. The minimal offering and inconsistent format of content specific courses

C2. A desire for increased community among the teachers participating in the program

C3. The overarching struggles of teaching with and without technology

P1: Support from both trainers and other teachers in the form of collective participation

The first theme of support indicated that the relationship that developed between teachers and their assigned educational technology trainers aided with program completion as well as increased technology skills and self-efficacy. Ann expressed this in her second interview, "I always felt supported and I felt like what I had was valuable." This aligns the findings of Desimone and Pak (2017) that indicated the effectiveness of instructional coaching to encourage teachers to work collectively to create actionable plans for their classrooms. Additionally, this contributes to the findings of Lawless and Pellegrino (2007) that strong mentor/mentee relationships encourage continuous growth of comfort with ICT in the classroom. The support of other teachers was also prevalent

and instrumental to the participants' success in the program upholding previous research in professional learning communities (Albion et al., 2015) and communities of practice (Wenger, 2011). As Brenda shared in her second interview, "What it [the program] did do as well was expose us to all the people, a lot more people, that are there to help us, so we understand the support system we have behind us."

P2: Enhanced Coherence, Duration, And Content Focus Compared to Traditional PD

The ability to apply learning directly to the teachers' specific content areas and student populations contributed to the strong presence of coherence as well as active learning strategies that resulted in the creation of learning assets to be used directly in the classroom. The learning artifacts that the teachers were asked to produce were designed to allow teachers to adapt what they were learning and tailor it directly for use in their classrooms to provide coherence and as Ann put it, "There's nothing worse than sitting through a class on reading or writing and being a math teacher." The use of authentic assessment design proved to increase coherence and personalization of the learning experience which in turn supports the self-efficacy of teachers' use of ICT tools (Albion et al., 2015). This supports Polly and Hannafin's (2010, 2011) findings that place coherence as a key element of learner-centered PD. Providing teachers the opportunity to plan and create resources that they need is paramount to encouraging the application of learning during the school year (Mouza & Barrett-Greenly, 2015). While many of the teachers involved in the study did not implement their full learning plan, they all were able to use elements of what they learned and created during the summer program.

P3: Choice in Regard to Pacing, Modality, And Courses

The elements of choice that were integrated throughout the program in teachers' ability to have autonomy over course selection, learning modality, and how they applied and demonstrated their learning arose from the interview analysis to support previous research on the elements of PD (Pane et al., 2015; U.S. Department of Education, 2017). While Pane et al.'s (2015) research focused on PL for K-12 students, the elements that they recognized as being integral to PL included "tailoring instruction to each student's individual needs, skills, and interests" (p. 2) which are key elements of the PPL program. These findings support Webster-Wright's (2009) call to action for PD to evolve into continuous professional learning models in order to address the complexities of today's educational ecosystem. As the teachers involved in the study share, their needs would not have all been met had they received the same training, at the same time, in the same manner. As Denise noted, "Like everyone's familiar with just sitting in a classroom and just listening and then you have those jaded people that just leave angry because they feel like you just wasted three hours of my time and I gained nothing. Like if you don't gain something from this blended learning opportunity that's on you." Even with the elements of choice and personalization built into the program, the greatest asset was the autonomy given to the teachers to determine and plan for their own teaching and learning needs (Webster-Wright, 2009). The integration of online and blended learning served to provide access to those that would not have otherwise been able to participate in the program, support for learners that wanted to move at their own pace, and references for all teachers to refer back to when needed in the future. Ann and Charlotte took advantage of these choices in opposite ways. Ann had multiple personal and family commitments that

summer preventing her from attending in-person courses and took all of her classes online. “I prefer that I can do it at my own pace, at my own time, start and stop it when I wish because my life was kind of crazy.” Charlotte soon found herself overwhelmed by the online coursework. “Everything they wanted me to do I had to learn how to do it. I had to go to all these tutorials. Snip..snipping tool? I gotta watch that tutorial. You want me to download something, you want me to upload something, you want me to cut and paste? I literally did not budge from the computer for three hours.” She quickly revised her schedule to take as many in-person classes as possible and made use of the guided practice sessions to have personal support for the online classes she did have to take. The fact that these online learning experiences did not result in lesser results than the face-to-face learning experiences supports previous comparison research (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Fishman, Konstantopoulos, Kubitskey, Vath, Park, Johnson, & Edelson, 2014).

C1: The Minimal Offering and Inconsistent Format of Content Specific Courses

Unfortunately, the multiple modality offerings did not extend to all classes offered in the program. The majority of the content specific courses were only offered face-to-face which limited the ability for participants to access the courses that they needed to fulfill their learning goals. Ann was unable to take any in-person courses due to personal circumstances and noted, “I do think that the content course, I did pick the easiest path rather than the one I was interested in just because of the mode in which it was given.” It is not a question of a single modality being offered as is emphasized in the exchange between Moon, Passmore, Reiser, and Michaels’ (2014) and Fishman et al. (2013, 2014) questioning the validity of online PD. The rough 50% split of the interview participants’

modality preferences between online and face-to-face, reflect the arguments of both Moon et al. (2014) and Fishman et al. (2013, 2014) as to the appropriate deployment of online PD. Brenda worked with another teacher in her department and while they took the same courses, they did not take them together, "I did all the in-person ones which worked better for me and she did all online because it worked better for her." Offering multiple modality options for all coursework would enhance the PPL experience of participants with varying self-efficacy.

C2: A Desire for Increased Community Among the Teachers Participating in The Program

Another area in which participants were divided on their PPL experience was in regard to community. Participants were able to engage in the level of collective participation that best suited their need, but this impacted the level of collective participation they felt was present (Desimone, 2009). In general, the participants reached out to others to achieve the level of community that they desired even though that took a different form for each member.

Erika did feel like there were limited options for her to achieve the level of community she desired due to her content area. She found her largest support system outside of the program and the district. While she appreciated the help that was offered and knew that the district trainers would help her if they could, she wanted to connect specifically with other art teachers integrating technology. She was able to do this primarily through online resources and forums not connected to the program which raises the question of how these support systems can be integrated into the coursework to ensure all teachers are supported, no matter their content area to avoid the

“disenfranchisement” that Erika felt, “I guess it's been sort of frustrating for me because I think as an art teacher there's a lot of professional development that's offered through the school district that's directed towards your standardized test curriculum like English and math and social studies all those sort of things but they don't provide any professional development that's specifically related to visual art. And yeah that just really bothers me.”

Denise felt she was able to achieve the level of engagement she desired but sought greater transparency among teachers in the district in regard to practice. She requested an easier method for teachers to exchange ideas, resources, and discoveries as a form of collective participation and practice, “Yeah, I think that would be good and kind of encourage people to share. I know everyone's competitive and they want to be the best at everything, but I think if we moved towards more of an approach of sharing and opportunity to easily connect that doesn't require a lot of extra time like I would be willing to share a lot of things I have.” The creation of a global community in which teachers could easily interact with those in their domain and share elements of practice would contribute to the PPL experience.

C3: The Overarching Struggles of Teaching with and Without Technology

The single greatest challenge for all teachers was the overarching struggles of teaching in the current educational ecosystem. Charlotte expressed that, “Just about as much as I can handle is what's going to happen in the next day or two.” Brenda shared that her greatest concern was, “the 150-180 students' learning curve is what I see as the biggest challenge.” Interview participants expressed that the PPL experience improved their technology skills and increased their self-efficacy towards using technology in the classroom for the upcoming school year, but it could not allay the consistent flow of

change and increasing expectations. As Ann put it, "...every profession changes but ours has changed exponentially and our kids have changed exponentially and every variable in our career has changed exponentially so it's a lot to keep up with." While Sadaf, Newby, and Ertmer's (2016) study found self-efficacy to be a strong indicator of teachers' intentions and ability to integrate technology, this can be offset by overwhelming additional elements of change. For the teachers interviewed in this study, in addition to the complex change of implementing 1:1 technology for the purpose of blended and PL they also contended with a lack of access to technology, a delay of updated technology infrastructure, required implementation of additional pedagogical and instructional changes, and increased managerial responsibilities. The goal of PPL is to create learning environments that are "optimized for the needs of each learner" (U.S. Department of Education, 2017) but it is important for PPL designers and academic administrators to be empathetic to the requirements being placed on teachers in order to create truly effective PL experiences.

The data collected from both of the sub-questions served to support the overall understanding of the central research question: "To what extent and in what ways did the personalized professional learning program served to support teachers' technology skills and self-efficacy toward the integration of ICT in their classrooms?" The PPL experience was able to help teachers significantly improve their use of technology tools and self-efficacy towards using technology in the classroom. The interview participants' description of their experiences in the PPL program revealed six focus areas: support, choice, coherence, content, community, and overarching struggles of teaching which intersect with the components of the Core Conceptual Framework (Desimone, 2009).

While all areas contained positive and negative comments, support, choice, and coherence were noted as strengths of the PPL experience while content, community, and teaching struggles were noted as challenges. These elements inform the evolution of PD and PPL practices to better support teachers' technology integration and pedagogical practices (Ertmer et al., 2012; Koellner & Jacobs, 2015).

Conclusion

Throughout the analysis, the core conceptual framework components of active learning, content, collective participation, coherence, and duration (Desimone, 2009) were used to guide presence of PPL best practices and how the elements of the framework supported the growth of teachers' perceptions of their technology skills and self-efficacy. From this base emerged additional elements of PL that supported teacher learning growth such as choice over pace, place, modality, and content (Pane at al., 2015). This suggests that perhaps a sixth element, choice, should be considered as an addition to the core conceptual framework. The combined presence of these elements resulted in an environment in which teachers of varying teaching experience, technology skill level, subject matter, and grade level were able to have their individual learning goals met within a single, cohesive, PPL experience. Through a mix of constructivism and direct instruction teachers were provided with the scaffolded support to become learning designers for their own students by designing their own learning environments (Bower, Hedberg, & Kuswara, 2010; Norton & Hathaway, 2015; O'Hara, Pritchard, Huang, & Pella, 2013). Being able to have their individual needs met empowered teacher progress towards their learning goals despite their initial teaching, academic, and

technology self-efficacy levels (Bandura, 1997; Moore-Hayes, 2011; Yeşilyurt, Ulaş, & Akan, 2016).

Limitations

To establish trustworthiness in the results of this study we have attempted to be transparent in the areas of credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Since phenomenology is the art of describing the lived experience, a credible reconstruction of the participants' experience is essential to demonstrate the "truth value". We have attempted to ensure credibility by recognizing that one of the researchers was involved in the creation of the PPL program that may potentially taint the perspective of the participants' experience. This potential bias was addressed in the form of member checking of the data analysis by the other researchers. The applicability and transferability of this study is supported by the selection of participants. By utilizing maximum variation sampling we hope to provide readers with a wide variety of experiences within the personalized professional learning phenomenon that could apply to multiple contexts. Dependability was attempted to be established throughout the interview process by retaining focus on the core interview questions and central questions of the study. While neutrality might be impossible due to researcher involvement with the construction of the program and previous work experience with the participants, we continuously sought to support all descriptions with raw data taken from the transcripts.

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APPENDIX A

Sample Course List (not complete listing of course offerings)

Course Title	Course Title
Blended Learning Program of Study Anchor Course: Introduction to Blended Learning	Collaborative Lesson Planning with Google Docs
Blended Learning Program of Study Anchor Course: Designing for Innovation	Using Your Lenovo Thinkpad Helix: OneNote Class Notebook
Blended Learning Program of Study: In-Person Guided Practice	Using Your Lenovo Thinkpad Helix: Annotation Tools for Presenting
Canvas 101: Intro to Canvas & Modules	Using Your Lenovo Thinkpad Helix: Planning and Meetings
Canvas 101: Introduction to Discussion Design	Professional Learning Networks: How to Harness Social Media
Canvas 101: Introduction to Quiz Design	Getting Started with Screencasting
Canvas 101: Introduction to Assignment Design	Interactive Blended Learning Tools with Student Devices: Using Nearpod
Canvas 202: Engaging Students in Canvas	PBL 1: What is PBL?
Canvas 202: Outcomes and Rubrics	Technology in the ELA Classroom
Google Classroom: An Introduction	Digital Citizenship: Internet Safety
Canvas 202: Structuring Modules for Differentiation	Digital Citizenship: Helping Students Find Credible Online Resources
Gamification 1: Theory	Google Forms for Student Data Collection

APPENDIX B

Technology Comfort Level Survey

Sample Survey:

Name

Years Teaching

School

Subjects currently teaching

Program of Study selection

Technology Skills

How would you rank your current comfort level using the following technology tools for instruction? (Very Uncomfortable, Uncomfortable, Neutral, Comfortable, Very Comfortable)

1. Learning Management System (Canvas, Google Classroom)
2. Word Processing (Google Docs, Word)
3. Spreadsheets (Google Sheets, Excel)
4. Presentation Tools (Google Slides, PowerPoint, Nearpod, SMART Notebook)
5. Assessment Tools (Google Forms, Canvas quizzes, Formative, Quizizz, Socrative)
6. Digital Portfolios (OneNote, Google Drive, Google Sites, Weebly)
7. Digital Note Taking Tools (OneNote, Google Docs, Google Drawing)
8. Study Aids (Quizlet, Khan Academy, Newsela, ReadWriteThink)

9. Screencasting Tools (PowerPoint Mix, Educreations, Screencast-o-matic)
10. Mobile Technologies (cell phones, tablets, convertible laptops)

Technology Comfort Level

The purpose of this portion of the survey is to determine how you feel about integrating technology into classroom teaching. For each statement below, indicate the strength of your agreement on the scale. (Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree). Used with permission of Dr. Ling Wang, Nova Southeastern University.

1. I feel confident that I understand computer capabilities well enough to maximize them in my classroom.
2. I feel confident that I have the skills necessary to use the computer for instruction.
3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.
4. I feel confident in my ability to evaluate software for teaching and learning.
5. I feel confident that I can use correct computer terminology when directing students' computer use.
6. I feel confident I can help students when they have difficulty with the computer.
7. I feel confident I can effectively monitor students' computer use for project development in my classroom.
8. I feel confident I can motivate my students to participate in technology-based projects.
9. I feel confident I can mentor students in appropriate uses of technology.
10. I feel confident I can consistently use educational technology in effective ways.

11. I feel confident I can provide individual feedback to students during technology use.
12. I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.
13. I feel confident about selecting appropriate technology for instruction based on curriculum standards.
14. I feel confident about assigning and grading technology-based projects.
15. I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.
16. I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.
17. I feel confident that I will be comfortable using technology in my teaching.
18. I feel confident I can be responsive to students' needs during computer use.
19. I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.
20. I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.
21. I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.

APPENDIX C

Individual Survey Question Results

Mean Differences for all Items Measuring Technology Skills

Technology Skills	Mean Differences
Learning Management System	-.730
Word Processing	-.133
Spreadsheets	-.202
Presentation Tools	-.238
Assessment Tools	-.798
Digital Portfolios	-.597
Digital Note Taking Tools	-.656
Study Aids	-.715
Screencasting Tools	-.688
Mobile Technologies	-.302

Mean Differences for all Items Measuring Self-Efficacy

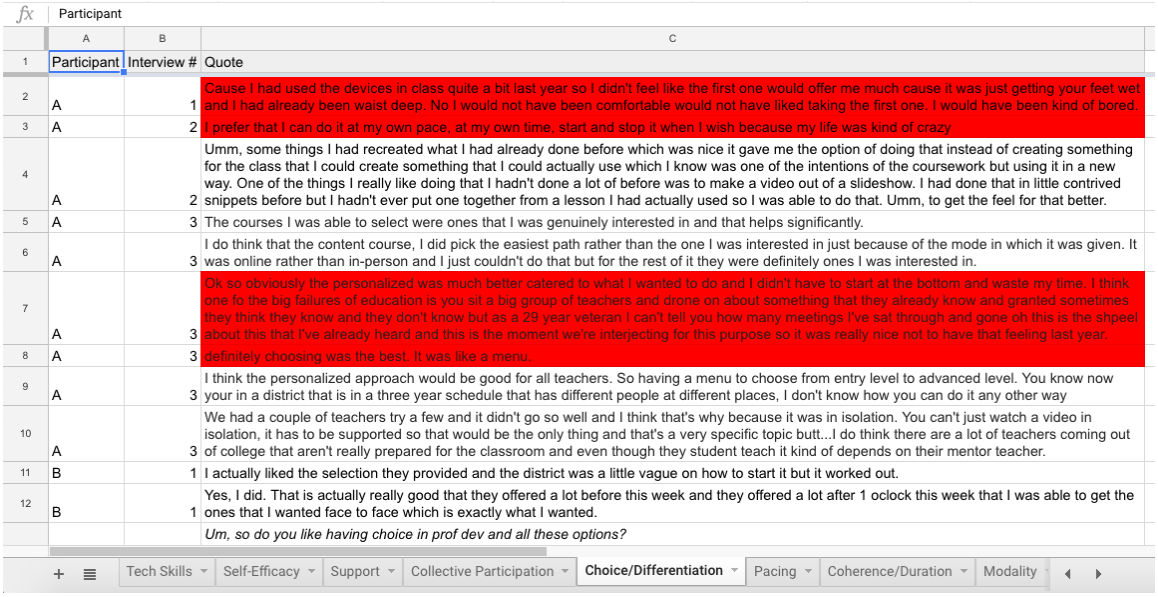
Comfort Level	Mean Differences
1. I feel confident that I understand computer capabilities well enough to maximize them in my classroom.	-.319
2. I feel confident that I have the skills necessary to use the computer for instruction.	-.198

3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.	-.177
4. I feel confident in my ability to evaluate software for teaching and learning.	-.335
5. I feel confident that I can use correct computer terminology when directing students' computer use.	-.246
6. I feel confident I can help students when they have difficulty with the computer.	-.238
7. I feel confident I can effectively monitor students' computer use for project development in my classroom.	-.387
8. I feel confident I can motivate my students to participate in technology-based projects.	-.238
9. I feel confident I can mentor students in appropriate uses of technology.	-.294
10. I feel confident I can consistently use educational technology in effective ways.	-.335
11. I feel confident I can provide individual feedback to students during technology use.	-.355
12. I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.	-.331
13. I feel confident about selecting appropriate technology for instruction based on curriculum standards.	-.419
14. I feel confident about assigning and grading technology-based projects.	-.468
15. I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.	-.391
16. I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.	-.403
17. I feel confident that I will be comfortable using technology in my teaching.	-.234

18. I feel confident I can be responsive to students' needs during computer use.	-.270
19. I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.	-.133
20. I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.	-.234
21. I feel confident letting students explain how to use or troubleshoot technology, even if I don't understand it.	-.137

APPENDIX D

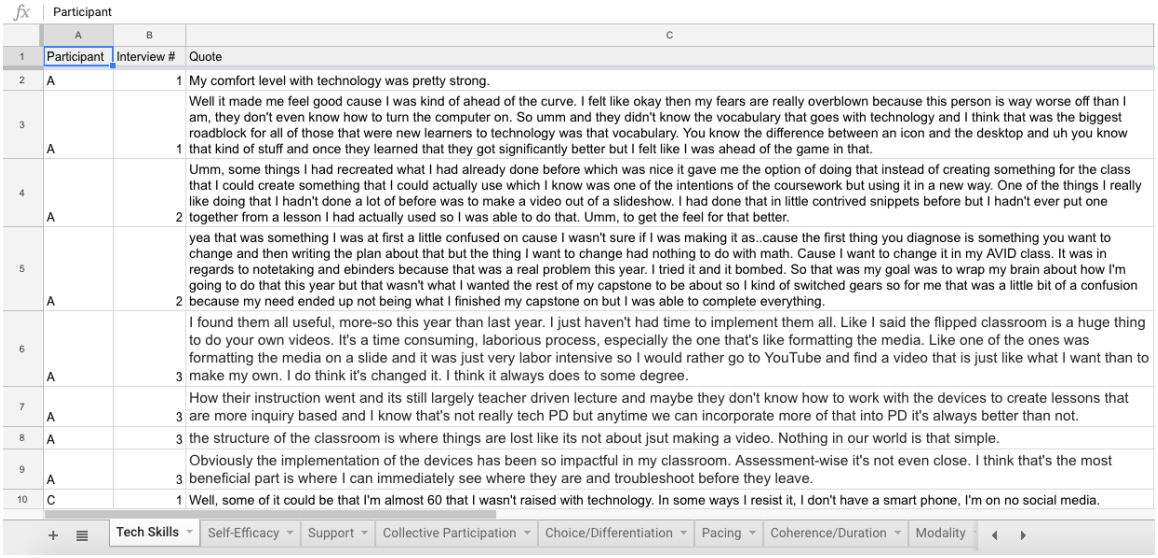
Sample of Interview Theme Analysis



Participant

	A	B	C
1	Participant	Interview #	Quote
2	A	1	Cause I had used the devices in class quite a bit last year so I didn't feel like the first one would offer me much cause it was just getting your feet wet and I had already been waist deep. No I would not have been comfortable would not have liked taking the first one. I would have been kind of bored.
3	A	2	I prefer that I can do it at my own pace, at my own time, start and stop it when I wish because my life was kind of crazy
4	A	2	Umm, some things I had recreated what I had already done before which was nice it gave me the option of doing that instead of creating something for the class that I could create something that I could actually use which I know was one of the intentions of the coursework but using it in a new way. One of the things I really like doing that I hadn't done a lot of before was to make a video out of a slideshow. I had done that in little contrived snippets before but I hadn't ever put one together from a lesson I had actually used so I was able to do that. Umm, to get the feel for that better.
5	A	3	The courses I was able to select were ones that I was genuinely interested in and that helps significantly.
6	A	3	I do think that the content course, I did pick the easiest path rather than the one I was interested in just because of the mode in which it was given. It was online rather than in-person and I just couldn't do that but for the rest of it they were definitely ones I was interested in.
7	A	3	Ok so obviously the personalized was much better catered to what I wanted to do and I didn't have to start at the bottom and waste my time. I think one fo the big failures of education is you sit a big group of teachers and drone on about something that they already know and granted sometimes they think they know and they don't know but as a 29 year veteran I can't tell you how many meetings I've sat through and gone oh this is the shpeel about this that I've already heard and this is the moment we're interjecting for this purpose so it was really nice not to have that feeling last year.
8	A	3	definitely choosing was the best. It was like a menu.
9	A	3	I think the personalized approach would be good for all teachers. So having a menu to choose from entry level to advanced level. You know now your in a district that is in a three year schedule that has different people at different places, I don't know how you can do it any other way
10	A	3	We had a couple of teachers try a few and it didn't go so well and I think that's why because it was in isolation. You can't just watch a video in isolation, it has to be supported so that would be the only thing and that's a very specific topic butt...I do think there are a lot of teachers coming out of college that aren't really prepared for the classroom and even though they student teach it kind of depends on their mentor teacher.
11	B	1	I actually liked the selection they provided and the district was a little vague on how to start it but it worked out.
12	B	1	Yes, I did. That is actually really good that they offered a lot before this week and they offered a lot after 1 oclock this week that I was able to get the ones that I wanted face to face which is exactly what I wanted.
			Um, so do you like having choice in prof dev and all these options?

Tech Skills | Self-Efficacy | Support | Collective Participation | **Choice/Differentiation** | Pacing | Coherence/Duration | Modality



Participant

	A	B	C
1	Participant	Interview #	Quote
2	A	1	My comfort level with technology was pretty strong.
3	A	1	Well it made me feel good cause I was kind of ahead of the curve. I felt like okay then my fears are really overblown because this person is way worse off than I am, they don't even know how to turn the computer on. So umm and they didn't know the vocabulary that goes with technology and I think that was the biggest roadblock for all of those that were new learners to technology was that vocabulary. You know the difference between an icon and the desktop and uh you know that kind of stuff and once they learned that they got significantly better but I felt like I was ahead of the game in that.
4	A	2	Umm, some things I had recreated what I had already done before which was nice it gave me the option of doing that instead of creating something for the class that I could create something that I could actually use which I know was one of the intentions of the coursework but using it in a new way. One of the things I really like doing that I hadn't done a lot of before was to make a video out of a slideshow. I had done that in little contrived snippets before but I hadn't ever put one together from a lesson I had actually used so I was able to do that. Umm, to get the feel for that better.
5	A	2	yea that was something I was at first a little confused on cause I wasn't sure if I was making it as..cause the first thing you diagnose is something you want to change and then writing the plan about that but the thing I want to change had nothing to do with math. Cause I want to change it in my AVID class. It was in regards to notetaking and ebinders because that was a real problem this year. I tried it and it bombed. So that was my goal was to wrap my brain about how I'm going to do that this year but that wasn't what I wanted the rest of my capstone to be about so I kind of switched gears so for me that was a little bit of a confusion because my need ended up not being what I finished my capstone on but I was able to complete everything.
6	A	3	I found them all useful, more-so this year than last year. I just haven't had time to implement them all. Like I said the flipped classroom is a huge thing to do your own videos. It's a time consuming, laborious process, especially the one that's like formatting the media. Like one of the ones was formatting the media on a slide and it was just very labor intensive so I would rather go to YouTube and find a video that is just like what I want than to make my own. I do think it's changed it. I think it always does to some degree.
7	A	3	How their instruction went and its still largely teacher driven lecture and maybe they don't know how to work with the devices to create lessons that are more inquiry based and I know that's not really tech PD but anytime we can incorporate more of that into PD it's always better than not.
8	A	3	the structure of the classroom is where things are lost like its not about jsut making a video. Nothing in our world is that simple.
9	A	3	Obviously the implementation of the devices has been so impactful in my classroom. Assessment-wise it's not even close. I think that's the most beneficial part is where I can immediately see where they are and troubleshoot before they leave.
10	C	1	Well, some of it could be that I'm almost 60 that I wasn't raised with technology. In some ways I resist it, I don't have a smart phone, I'm on no social media.

Tech Skills | Self-Efficacy | Support | Collective Participation | Choice/Differentiation | Pacing | Coherence/Duration | Modality

CHAPTER FIVE: REFLECTION AND CONCLUSIONS

Introduction

Chapter Five contains a summary of the research and findings surrounding Personalized, Professional Learning (PPL) and its impact on teacher technology skills and self-efficacy towards using technology that have been explored in this dissertation process. The relationship between studies one and two including implications for practice and recommendations for future research are summarized in this chapter. Also included is a summary of lessons learned from the paper-based dissertation process and a conclusion of findings.

Relationship of Study 1 & Study 2

Program Design

2016 Program of Study

The first Program of Study took place in 2016 and enrollment was open to teachers from four high schools, the English and mathematics departments of nine junior high schools, as well as district leadership and professional development specialists. During this program 418 teachers, 83% of enrollees, completed the program and 96.5% of them reported that the program helped prepare them for integrating or personalizing learning that school year. A quantitative study was conducted during that summer to determine growth in teacher comfort levels with technology skills and self-efficacy towards using technology in the classroom. Survey results showed that there was a

statistically significant increase in the technology skills and self-efficacy scores between the pre- and post-test.

While the responses from this program of study were positive there were suggested improvements. Teachers expressed a desire for increased choice in course selections. The 2016 program contained 11 primary permutations of learning pathways which can be viewed in Table 5.1.

Table 5.1 PPL Program Structures 2016

IBL Program	PLT Program
Required Anchor Course (ex. classroom management, TPACK, digital citizenship)	Required Anchor Course (ex. personalized learning, mastery learning, digital citizenship)
3 - Learning Management System courses	3 - Learning Management System Courses
4 - Electives (ex. Kahoot, Google Docs, LanSchool)	3 - Focus Area courses (station rotation, PBL, gamification, flipped classroom)
Capstone	Capstone

Once teachers began their coursework, they gained greater insight into the possibilities of enhancing teaching with technology, as well as improved understanding of their own capabilities for working with technology. This created a desire for increased flexibility in regard to course selection. For example, a teacher who selected Project Based Learning as a focus area found that the station rotation model was a better fit for her students once they learned more about what the models were. Another teacher found that for her honors classes she wanted to plan for a flipped classroom but wanted to leverage gamification with her non-honors classes. As they began to consider how to

incorporate what they had learned to benefit their students, they found a need for greater personalization of their coursework. Another main request from teachers were more courses that represented specific content areas such as, mathematics, art, or biology. They were having trouble translating potential ideas into their practice. The third most requested improvement was the reorganization of the capstone. Teachers found it to be quite long and did not find that they followed or referred to their plan during the school year. While 95% of teachers reported that the capstone project helped to determine their course of action for the school year, only 47.55% continued to refer to their capstone once the school year began. These suggestions were incorporated into the improvements for the 2017 Program of Study.

2017 Program of Study

The 2017 Program of Study incorporated the suggestions provided by a study of the 2016 PPL participants (Hall & Trespalacios, 2019). The three main areas of suggested feedback were to increase choice, improve content focus, and focus the design of the capstone project. These three adjustments serve to extend the highly adaptive, learner-centered experience of the 2016 program into a PPL framework to support ICT integration that demonstrates the traits of the core conceptual framework (Desimone, 2009).

To improve choice, teachers were still given two learning pathways to choose from with required focus areas and a capstone project, but the requirements were opened to allow for a greater choice in course selection. While the 2016 program had 11 primary iterations, the 2017 program contained over 75 million possible combinations ($_{60}C_{10}$) due to the number of course options and flexibility of choice. Teachers could select any of the

courses as long as the required number of primary anchor courses, LMS courses, and focus area courses were met that can be seen in Table 5.2.

Table 5.2 PPL Program Structures 2017

IBL Program	DFI Program
Required Anchor Course (ex. classroom management, TPACK, digital citizenship)	Required Anchor Course (ex. personalized learning, mastery learning, digital citizenship)
3 - Learning Management System courses	3 - Learning Management System Courses
4 - Electives (ex. Kahoot, Google Docs, LanSchool)	4 - Focus Area courses (any combination of electives that support the design plan including station rotation, PBL, gamification, flipped classroom)
1 - Content Area Course	1 - Content Area Course
Capstone	Capstone

This allowed teachers to adapt their course selections as they learned and chose the courses that best met their needs, thus improving coherence. However, this volume of choice and flexibility can be overwhelming. To assist teachers in the selection of their coursework, two learning pathways were provided geared towards teachers new or uncomfortable with ICT integration and another pathway for those who were ready to attempt more blended and personalized forms of learning. The Introduction to Blended Learning (IBL) pathway for teachers new to ICT integration included required courses that covered topics such as classroom management of devices, the TPACK framework, growth mindset, and learning management system courses, as well as over 60 elective

choices. The electives for both pathways included courses in how to leverage ICT tools for pedagogical purposes such as presentation, assessment, collaboration, and active learning through Web 2.0, Google, and Microsoft educational tools. All products produced in these courses were intended to be used in the classroom, which, in turn, promoted active and meaningful learning for the teachers since they were engaged in creating artifacts to immediately use in their classrooms.

The pathway for more advanced teachers was called Designing for Innovation (DFI). The focus of the DFI anchor courses was to identify a problem of practice within their classroom or curriculum, develop a plan to integrate an innovative instruction practice to address the problem of practice, and then determine how they would assess that plan to identify next steps for improvement. By mirroring the concept of design-based research in the classroom, teachers were prepared to apply the skills from these anchor courses, not just in the area of education technology, but indefinitely as they improved their practice over time. All of the same elective courses were available to these teachers as well, but they were encouraged to select one learning innovation to focus their plan around. Support for this included courses in gamification, flipped classroom, station rotation, project-based learning, and the SAMR model. The goal of this was to integrate design-based models of PD into classroom practice and attempt to bridge the gap between research and practice (Lawless & Pellegrino, 2007). Helping teachers to design their own learning plan within their classroom supports coherence, duration, content focus, and active learning (Desimone, 2009).

The redesign of the capstone projects also promoted the elements of the core conceptual framework as they focused on the development of plans to be completed

during the first nine weeks of the school year. As teachers progressed through their coursework, they completed components of their capstone projects to help bridge the gap between summer learning and their classroom practice. These plans were developed in partnership with educational technology trainers supporting teachers during the school year and shared with school administrators to provide additional coaching. The goal was for all stakeholders to enter the school year with an actionable technology integration plan. Many teachers elected to create their capstone projects with their Professional Learning Communities (PLCs) so that they could support each other throughout the planning and implementation process thus increasing the collective participation.

The final change to the 2017 program was the inclusion of content focused courses in the programs. A new required component was added to the program in the form of a course on the teachers' subject matter. This required working with district content specialists to assure that not only would they be offering courses during the summer institute timeframe but also that these training sessions would include and support learner-centered ICT integration. Since the majority of district professional development and content specialists had not experienced learner-centered ICT integration themselves when they were in the classroom, they were partnered with an educational technology trainer to help them adapt their PD offerings accordingly. Even with this effort, not *all* subjects could be represented. In order to ensure all teachers had a content specific course for their subject matter, the educational technology department created a series of courses titled, *Integrating Technology in the [ELA, math, PE, music, driver's ed, etc.] Classroom*. Throughout the 2016-2017 school year, educational technology trainers collected examples from teachers demonstrating how they were integrating ICT in

meaningful, pedagogically appropriate ways and that resulted in improved student achievement and overall learning experience. These real-life examples from teachers within the district served as the basis for the content of these courses and were collected into a repository. The repository is an open resource where teachers can contribute accounts of their own successful practices and connect with other subject matter experts. This has been shown to be particularly valuable to increase collective practice among teachers who are the only teacher in their content area on their campus.

Rationale and Results from the Studies

The two studies in this dissertation present the impact and experiences of participants in a fledgling PPL program. The first study measured the impact of the PPL program on teachers' technology skills and self-efficacy towards using technology in the classroom established the groundwork for developing a more in-depth understanding of teachers' experiences in the second study. The second study built on the existing framework of the 2016 study and expanded the quantitative survey methodology into a mixed methods framework inclusive of semi-structured interviews. Interviews were included in the design of the second study to develop a more comprehensive understanding of how PPL program impacted teacher learning and to better understand and share the experiences directly from the voice of the participants.

Both studies measured the progression of teachers' perceptions of their technology skills and self-efficacy towards using technology in the classroom through the use of a Likert scale survey developed by Wang, Ertmer, and Newby (2004). The results of both studies revealed significant growth in technology skills and self-efficacy as is shown in Tables 5.3 and 5.4. It is important to note that these results are independent of

each other and thus cannot be compared directly. The participants from the 2017 study were not a continued observation of the participants in the 2016 study.

Table 5.3 Overall Paired Samples T-Test

		Mean	Std. Deviation	t	df	Sig. (2-tailed)
2016	Pre-test Tech Skill- Post-test Tech Skill	-.508	.496	-16.106	246	.000
2016	Pre-test Self-efficacy - Post-test Self-efficacy	-.293	.437	-10.539	246	.000
2017	Pre-test Tech Skill- Post-test Tech Skill	-.615	.565	-20.207	343	.000
2017	Pre-test Self-efficacy - Post-test Self-efficacy	-.362	.474	-14.164	343	.000

Table 5.4 Overall Paired Samples Statistics

		Mean	N	Std. Deviation
2016	Pre-test Tech Skill	3.3926	247	.80079
	Post-test Tech Skill	3.8997	247	.66397
2016	Pre-test Self-efficacy	3.9535	247	.63686
	Post-test Self-efficacy	4.2460	247	.53439
2017	Pre-test Tech Skill	3.1939	344	.76230
	Post-test Tech Skill	3.8090	344	.69794
2017	Pre-test Self-efficacy	3.7829	344	.68878
	Post-test Self-efficacy	4.1451	344	.59037

Implications and Recommendations

Study 1

- Survey results showed that there was a significant difference in the pre- and post-survey in the technology skills scores $t(247)=-16.106$, $p < 0.05$; and in the self-efficacy technology integration scores $t(247)=-10.539$, $p < 0.05$
- The technology skills categories that exhibited most growth were the LMS, assessment tools, and study aids
- The self-efficacy categories that exhibited the most growth were assigning and grading technology-based projects, selecting appropriate technology for

instruction based on curriculum standards, and keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning

Study 2

- Survey results demonstrated a significant difference in the pre- and post-surveys for both technology skills $t(344)=-20.207$, $p<0.05$; and self-efficacy towards technology integration $t(344)=-14.164$, $p<0.05$
- Interview results demonstrated positive experiences in the program were attributed to:
    - Support from both trainers and other teachers in the form of collective participation
    - Choice in regard to pacing, modality, and courses
    - Enhanced coherence, duration, and content focus compared to traditional PD
- The challenges that emerged from the interviews focused on:
    - The overarching struggles of teaching with and without technology
    - The minimal offering and inconsistent format of content specific courses
    - A desire for increased community among the teachers participating in the program

Future Research

Future studies that could emerge from these current studies include the continuation of studies into PPL or expansion into classroom practice and student achievement. The current studies in the current ecosystem could be extended as the school district has continued the program and the collection of the survey data to continue

tracking and improving the program of study. While the focus of the studies in this dissertation was to track teachers' experiences in the PPL program and its impact on their technology skills and self-efficacy towards the use of technology in the classroom, future focus could further explore the impact of PPL on teacher practice in the classroom and student achievement. The impact on teacher practice could be further studied through tracking of capstone project process and continued interview series. This could be combined with studying students' experiences in technology-enhanced classrooms quantitatively through academic achievement or surveys and qualitatively through interviews or focus groups.

In addition to continuing the study of PPL in the current design and setting, the methods used in this dissertation could be used to study other PPL programs in different settings. These studies occurred in a large, suburban school district of diverse socioeconomic settings but it would be interesting to study the experiences of teachers in other environments such as small, rural, or urban school districts. Another area of continued study would be to explore PPL outside of K-12 education. How does personalization impact professional learning in other professions such as design or healthcare and other learning environments such as higher or continuing education?

Reflections

The process of conducting the studies and combining them into a cohesive dissertation taught me valuable lessons that will prepare me to continue my growth as a researcher. The following section includes a timeline of the dissertation process, shown in Table 5.5, as well as three stories describing my experiences. I hope that these provide insights into the decisions that have been made during these dissertation studies.

Table 5.5 Dissertation Study Timeline

Time	Action
Summer 2016	1st PPL program is conducted and initial survey data collection
Fall 2016	Data analysis conducted for the 1st study
Spring 2017	Adaptations made to program design for 2nd PPL program including new course construction
Summer 2017	2nd PPL program run. Pre- and post-program surveys and interviews are conducted
Fall 2017	2nd program survey analysis is conducted. The 3rd interview is conducted after October.
Spring 2018	Initial interview analysis conducted and preliminary results shared with the program director to guide adaptations for 3rd PPL program to run in Summer 2018
Summer 2018	Dissertation Chapters 1-3 completed and the dissertation proposal is defended. Continued interview transcription and analysis for study 2.
Fall 2018	Study 2 data analysis and composition concluded
Spring 2019	Dissertation Defense

Selecting an Area of Study

I entered the doctoral program because I wanted to learn how to conduct studies. As an educational technology trainer, I often worked with teachers that wanted to know the research behind why they should take the time to learn to integrate technology into

their teaching and how it would benefit their students. Sometimes when I showed them the great blog post I had found in my Google search, they would say, “That’s not legitimate. I want to see some peer-reviewed evidence.” Not only did I not know where to find that information, but I did not even know what they meant. As I began to develop training for teachers whose schools were receiving 1:1 devices, I knew that I needed to know how to find and assess studies for validity and that I wanted to track and evaluate the training sessions that were being developed.

Within the *Program of Study*, there were multiple topics that could have been the focus of study. The efficacy of technology integration models such as TPACK and SAMR, development of online training, and digital badging were among the possible study topics. PPL was selected as the area of study due to the lack of existing literature and the potential impact of sharing the program design and results with others embarking on 1:1 initiatives. The needs of teachers as their students receive devices are highly individualized. Sharing and analyzing methods of how to best support each teacher through PPL seemed the be the most impactful contribution that could be shared.

Focusing on the Research Questions

When writing the first study, the most common feedback that I received was that it included too much extraneous information that was not pertinent to the research questions. I struggled with this concept a great deal because I felt like there was so much important information to include. How will readers understand the complexities of this project if I don’t tell them *everything*? My moment of clarity came one day at work while speaking with a faculty member about their online course. We were talking about learning objectives and how they help to keep the course focus on what is important for

the students to know. If the materials aren't relevant to the learning objectives, it does not matter how interesting they are, they might not belong in this course. At that moment, I understood the importance of research questions. While it still remains an area that I have to focus on, it gives me a mental anchor to refer back to as I continue to engage in the research and writing process. Research questions keep the writing on topic and help both the reader and writer focus on the important learning points.

Building on Past Research

One aspect that drew me to selecting PPL as a focus was the ability to draw together multiple areas of past research. I was advised at the beginning of the research process, to focus on one small area in order to investigate more deeply. PPL seemed like a path to extensively mine the history of professional learning while also exploring its future. Since the construction of the program of study drew on multiple educational and professional learning philosophies, PPL was a way to continue the work of seemingly dissimilar studies and map their connections. For example, the connections between continuous professional learning (Webster-Wright, 2009), communities of practice (Farnsworth, Kleanthous, & Wenger-Trayner, 2016; Wenger, 2011), learner-centered professional development (Polly & Hannafin, 2010), and online professional development (Dede et al, 2009) might not be overt but they all contain elements of personalization that each contributes to the overall mission of PPL. I shared concerns of others that certain studies into PL are funded by or closely connected to technology vendors.

Conclusions

Supporting teachers as they shift their pedagogical practices to leverage technology tools to enhance student learning and achievement is not a one-size-fits-all endeavor (DeMonte, 2013; Gynther, 2016). Teachers need support not only developing their technology skills but building self-efficacy to feel that they are capable of integrating technology in meaningful ways that will benefit their students (Bandura, 1997; Mishra & Koehler, 2006; Sadaf, Newby, & Ertmer, 2016). The findings of the studies in this dissertation show that PPL can support the development of both technology skills and self-efficacy toward using technology for teachers preparing to work in technology rich personalized learning environments.

Personalized learning in its current form is a highly scrutinized area of practice and study (Bartolomé, Castañeda, & Adell, 2018; Pane et al., 2015). Personalization in professional learning environments is applied and studied less but carries the potential for similar successes and pitfalls. My study of PPL has given me a deep understanding of the pedagogical and ethical considerations of how to both design and study the application of personalized learning in professional learning environments. I look forward to continuing to explore and expand my studies in the field.

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