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Online Professional Development: Implications on Self-Efficacy Levels and Classroom Instruction for Teachers in a Catholic High School

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LOYOLA MARYMOUNT UNIVERSITY

Online Professional Development: Implications on Self-Efficacy Levels and Classroom Instruction for Teachers in a Catholic High School.

by

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Online Professional Development: Implications on Self-Efficacy Levels and Classroom Instruction for Teachers in a Catholic High School

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DEDICATION

To my wife, Richelle De Vera

And our children,

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ABSTRACT

Online Professional Development: Implications on Self-Efficacy Levels and Classroom Instruction for Teachers in a Catholic High School

by

Jose Carlo De Vera

Online professional development (online PD), the acquisition of new skills and knowledge related to the teaching profession via the Internet, is an emerging field for teachers. This mixed-methods research explored the impact of an online PD program on high school teachers' self-efficacy levels, classroom instruction, and the role that school culture played on teachers accepting or rejecting the online PD. Within a social cognitive theory lens, this study helped frame teacher attitudes and adult learning in the context of school culture.

Phase 1 of this study used quantitative data from two surveys called PRE and POST, which were taken before and after the online PD program, respectively. Qualitative data were collected in Phase 2, using the International Society for Technology in Education Classroom Observation Tool (ICOT), participants' journal reflections, and interviews. Findings indicated statistically significant changes in self-efficacy levels for eight of the 21 survey items and minimal changes in technology use during instruction. Furthermore, various aspects of school culture independently affected teachers' inclination to accept or reject the online PD. Findings

supported the concept of designing personalized professional development programs tailored to the individual's specific learning styles, attitudes, and experiences of school culture.

CHAPTER 1

BACKGROUND

An important issue in the field of teacher professional development concerns the rapid increase in the availability of technologies and their relevancy in education, thus creating a need for effective programs focused on the applicability of these technologies with regard to instruction and learning. Effective professional development is anything that engages teachers in learning activities that are supportive, job-embedded, instructionally focused, collaborative, and ongoing (Guskey, 1994; Hunzicker, 2011). Therefore, programs that are intentionally designed to educate teachers on classroom-applicable technologies must be structured to meet these criteria.

Online methods of professional development have emerged with the use of various web-based programs such as videos, webinars, online courses, or a combination thereof. Known as online teacher professional development, these programs began in the late 1990s (Harlen & Doubler, 2007). Online professional development (online PD) originated from the need for professional development programs that accommodate teachers' busy schedules while providing real-time, ongoing support (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009). The need for supportive, reflective learning communities is crucial for teachers in their attempts to implement new techniques (Darling-Hammond, 1997). Furthermore, schools and districts facing budget cuts and a higher demand for professional development have found that online PD lowers their bottom lines and increases access to opportunities for teacher improvement even when faced with an expensive, initial payment (Davis, 2009).

Problem

As is the case with today's students, teachers differ in their learning styles. Even though they are regarded masters of their own craft and are called upon to deliver engaging and scaffolded lesson plans that accommodate various learning modalities, teachers will always carry with them learning preferences that are most effective for the way they think. Therefore, teacher education programs, professional development service providers, and their presenters should deliver products that are appropriate to the teachers' needs. However, presently available research and published literature that allows for a better design and delivery of online PD programs is limited (Dede et al., 2009).

Professional development can also be structured in a way that is inconvenient and untimely. With regard to workshops, a majority of them range in length from one hour per day to as many as 40 hours, spanning the course of a year. The effectiveness of single versus multiple sessions has been argued. One-day workshops are the norm as they provide an allotted amount of time to deliver the content. In this context, research was conducted on attendees who were given a "drive-by" exposure to the material and asked to make connections to their pedagogy. This was a superficial transformation in pedagogy, however, in the sense that there was not enough time to allow for meaningful, long-lasting impressions (Barnet, 2002; Borko, 2004). The other option was a series of workshops that covered an entire week or an extended period of time throughout the year. The additional time did not necessarily translate into a more effective design, however. The length of time between workshops might have been too far apart and the attendees may have forgotten the material. It is not surprising that these time restraints did not provide adult learners the setting for optimal learning, follow-up, checks for understanding, and meaningful

connections indicative of efficacious professional development. After all, changing a teacher's pedagogy takes a considerable amount of time, even when attempted in a structure that is temporally conducive to the individual's learning preferences (Lock, 2006).

Another pressing issue regarding online PD is cost. Many schools and districts across the country are facing a time of economic hardship coupled with budget cuts. Administrators are forced to restructure and reallocate school monies toward other areas of the school in order to remain open. Some schools and districts are hard pressed to maintain the budget set aside for professional development (Davis, 2009). Therefore, administrators responsible for managing professional development must identify online PD programs that are cost-efficient, meaningful, and effective.

Additionally, matters become more complex when professional development that centers on integrating educational technology into school curriculum is met with resistance. Such was the case at the site for this dissertation research, referred to by the pseudonym Southern California Catholic High School (SCCHS). The majority of teachers who criticized educational technology did so not because of the actual technology itself. Instead, their criticisms stemmed from the lack of knowledge and experience with educational technologies mixed with negative attitudes and low levels of self-efficacy associated with the applicability of technology in the classroom.

One emerging solution to the aforementioned problems is online PD programs. Organizations such as the Association for Supervision and Curriculum Development (ASCD), EdTech Leaders Online, International Society for Technology in Education (ISTE), and PBS TeacherLine provide online professional development in the form of courses, webinars, and/or

hybrid options. One criticism of online PD, however, concerns how to ensure the program's effectiveness in transforming the teacher's pedagogy coupled with limited research on the benefits of online and hybrid professional development in comparison to the traditional, face-to-face methods that predominate (Dede et al., 2009).

Research Questions

The following research questions were formed considering the problems mentioned above:

1. How does an online professional development course affect self-efficacy levels concerning educational technologies for teachers in secondary schools?
2. What impact does an online professional development course have on secondary school teachers' integration of technology during classroom instruction?
3. What aspects of school culture condition teachers to accept or reject online professional development?

Purpose

One aim of this research was to measure teachers' levels of self-efficacy regarding the applicability of educational technology before and after participation in the ASCD online program used in this research. This was accomplished through a repeated measures method that used a pre- and post-survey instrument. This allowed the researcher to establish initial and subsequent data sets, which were then used to calculate changes. The calculations were used to identify teachers who had experienced the least and most amount of change in self-efficacy, which then allowed the researcher to narrow the list of prospective interview participants to gain a deeper, qualitative understanding of the online PD's effect on self-efficacy.

Another aim of this research was to explore the long-term impact of ASCD's program on teachers' classroom practices. This exploration involved the researcher acting as an observer in selected teachers' classrooms over the course of three to four months following the online PD. The researcher used a checklist that measured the teacher's usage levels of educational technology for instructional purposes. The checklist was based on Talbot Bielefeldt's (2012b) observational instrument. The checklist was then analyzed for changes across six months of observations. Additional teachers were selected for interviews based on a combination of their survey and observational results.

Another goal of this research was to implement an effective online PD program that was timely and accommodating to teachers in secondary schools. The knowledge gained allowed the participants to better inform the personnel responsible for managing and implementing the school's professional development plan about general perceptions of the faculty and their use of educational technology in the classroom. These options accounted for the effectiveness in optimizing teacher pedagogical transformation, as well as facilitating a restructuring of professional development programs, and providing an optimal reallocation of professional development expenditures.

A final aim of this study was to explore the different aspects of school culture that influenced teachers to accept or dismiss online professional development. The combination of a school's culture on professional learning, faculty policies, and expectations revolving around the teaching profession can have an impact on a teacher's mindset toward professional development. Coupled with specific learning preferences and lived experiences, teachers possess different attitudes toward the necessity or purpose of engaging in professional development. By

investigating the interconnectedness of these relationships, schools can improve the design and delivery of their professional development programs.

Significance

This research contributes to scholarly literature on different topics. This study showed the value of online PD and its ability to alter teachers' levels of self-efficacy concerning educational technology and its effect on classroom instruction. This is particularly important for schools with faculty members that are identified as luddites; it provides a resource in which school leaders can help change and transform the school culture into one that is more informed, knowledgeable, and accepting of technological innovation and its potential to positively affect teaching and learning. Accordingly, this research established a list of parameters that are conducive to online PD programs with the intention of raising low levels of self-efficacy in teachers. In turn, this research gives school administrators guidelines by which they can model and structure their school site's professional development plan. Furthermore, this research contributes to literature on the long-term effects of online PD on teachers' instructional methods. Lastly, this research continues the discussion of the impact that school culture has on teacher attitudes toward professional development.

Link to Leadership for Social Justice

At the heart of this research was the need to create a competent community of teachers committed to their profession and lifelong learning. The training and development of the teacher workforce are critical to reaching this goal considering that they are at the frontlines of teaching and learning. For example, the National Commission on Teaching and America's Future (2003) noted that a lack of day-to-day professional support and mentoring for entry-level teachers—

assistance that current approaches to professional development generally failed to provide—was a major factor underlying the nearly 50% attrition rate among new teachers within their first five years in the classroom. Online PD is a platform by which day-to-day support is facilitated along with exploring the applicability of educational technologies in the classroom. Therefore, it is pertinent that administrators and leaders remain up-to-date with the rapidly changing technologies that are increasingly finding their way inside the classroom, and it is incumbent on them to provide opportunities for the faculty to develop and hone their skills with those technologies.

The most pervasive argument for the implementation of online PD is that of finances and accessibility (Davis, 2009). The Internet offers an option for schools and districts to remain within their budgets by reducing travel expenses for both presenters and teachers. Furthermore, because many of these programs are available online, teachers can access the content virtually from anywhere in the world. They can also access online PD that is done in other countries.

For Southern California Catholic High School (SCCHS), it was important for the administration and other school leaders to embrace the impact that technology could have on teaching and learning. It was difficult, however, to create a culture of willingness and acceptance of educational technologies because teachers were hesitant to change their instructional methods. The issue then became one of tending to the teachers' cognitive impediments. SCCHS's administrators and leaders could assure the faculty of their vested interest and commitment to ongoing professional development by providing an online PD that was tailored to meet each individual's needs.

Theoretical Framework

Andragogy

The emergence of adult learning theory as a separate entity began with the work of early theorists in the 1920s and 1930s such as Edward Thorndike and his 1928 book *Adult Learning* and, in 1935, *Adult Interests*; Eduard Lindeman's *The Meaning of Adult Education* in 1926; and, Herbert Sorenson's *Adult Abilities* in 1938 (Knowles, 1977). Up until that point, the literature and understanding of adult learning was limited and compared to the way children learned (Knowles, 1970, 1973). It would be the work set forth by Lindeman that Malcolm Knowles, the modern-day pioneer for adult learning, based his seminal book *The Modern Practice of Adult Education* (1970) that substantiated andragogy as a separate discipline from pedagogy.

Based on Knowles (1970), andragogy is characterized under the following assumptions:

1. Adults are motivated to learn as they experience needs and interests that learning will satisfy; these are, therefore, the appropriate starting points for organizing adult learning activities.
2. Adults' orientation to learning is life centered; therefore, the appropriate units for organizing adult learning are life situations, not subjects.
3. Experience is the richest resource for adults' learning; therefore, the core methodology of adult education is the analysis of experience.
4. Adults have a deep need to be self-directing; therefore, the role of the teacher is to engage in a process of mutual inquiry with them rather than to transmit his/her knowledge to them and then evaluate their conformity to it.

5. Individual differences among people increase with age; therefore, adult education must make optimal provision for differences in style, time, place, and pace of learning.

These assumptions served as the lens by which the participants evaluated the effectiveness of ASCD's online program as an instrument to change teachers' instructional methodology. More specifically, Knowles' model of andragogy informed the researcher to frame the program's efficacy of accommodating adult learning preferences and motivations, thus creating an optimal learning environment suited for long-term retention and content applicability; in this case, the use of educational technologies for instructional purposes.

Social Cognitive Theory

Another key theoretical framework that informed this study came from Albert Bandura's early work on modeling and observational learning. Known as social cognitive theory, this idea proposed that human behaviors such as self-development, adaptation, and change, are possible by the interplay of personal, behavioral, and environmental influences (Bandura, 1986). This interplay, called "triadic reciprocal causation" holds that one of the three sources of influence can affect the other two but can be inversely affected by the other sources as well (see Figure B in Chapter 2*)*.

Conceptual Frameworks

Effective Online Learning Model

The Effective Online Learning Model (EOLM) connects learning components that make for an effective online learning design (Ally, 2004). The first component is Learner Preparation (LP) and it involves activities that motivate the user and connects him/her to the lesson content. The next component consists of multiple learning activities (LA) that help the user achieve the

learning outcomes while accommodating his/her individual learning needs. Learner interaction (LI) surrounds the user with a variety of interactions that include the interface, content, support, and context. Because these interactions are present throughout the learning activities, LI can also provide feedback to LA. Learner transfer (LT) is the final component. Under LT, users must have opportunities to transfer what they learn to real-life applications.

Similar to andragogy, EOLM was used to inform the researcher about the effectiveness of the online PD as a tool for learning. In addition to andragogy's basic assumptions, EOLM focuses on the use of activities and experiences as the most important factor in learning. It accounts for establishing the proper types of motivation in LP and the necessity of accommodating learner preferences through LA, LI, and LT.

Concerns-Based Adoption Model

To better understand the impact of online PD on classroom instruction, the Concerns-Based Adoption Model (CBAM) served as a lens through which the researcher observed educational technology use by each participating teacher. Hall Loucks, Rutherford, and Newlove (1975) posited that eight different levels of use (LoU) exist when using an innovation (e.g., educational technology); they are nonuse, orientation, preparation, mechanical use, routine, refinement, integration, and renewal. Furthermore, these levels varied across different categories: knowledge, acquiring information, sharing, assessing, planning, status reporting, and performing. They also argued that the individual's effectiveness of the innovation increased over time with more use and that this growth was unique to that user. CBAM served as the structural framework by which the teacher observations were conducted. The framework has been included in Chapter 2, Figure C.

The CBAM also supplements Talbot Bielefeldt's (2012b) ICOT in the sense that the tool measures the performance and frequency of using technology. In relation to CBAM, the ICOT's analysis of observational data can help quantify and interpret qualitative values that correspond to the different levels of technology use. Although it is possible to measure the appropriateness, degree, and fluency within each level, this research and the ICOT instrument looked specifically for performance indicators and the frequency therein. For this research, a successful change in classroom instruction influenced by the online PD was indicated by an increased amount of use as shown by integration.

Technology Acceptance Model

Research has shown that technology users' psychological variables (e.g., self-efficacy, confidence, and attitudes) can have different levels of influence on user technology acceptance. The Technology Acceptance Model (TAM) is a theoretical model that predicts how a user processes acceptance and use of information on a technology (Alavi & Joachimsthaler, 1992). As stated by Holden (2011), the perceived usefulness (PU) and perceived ease of use (PEU) elements represent each participant's cognitive responses in using the technology. These cognitive responses then influence the participant's attitude (AT) toward using the technology. The participant's affective response ultimately drives their behavioral response (BI) toward technology. The model is depicted in Figure 1.

TAM serves the purpose of tracking the participants' behavioral and thought processes, starting from the first point of introduction to the technology and all the steps through the actual use of the technology. Like EOLM and CBAM, this model helped the researcher understand

teacher perceptions and how those perceptions applied to transforming the participant teachers' instructional methodology.

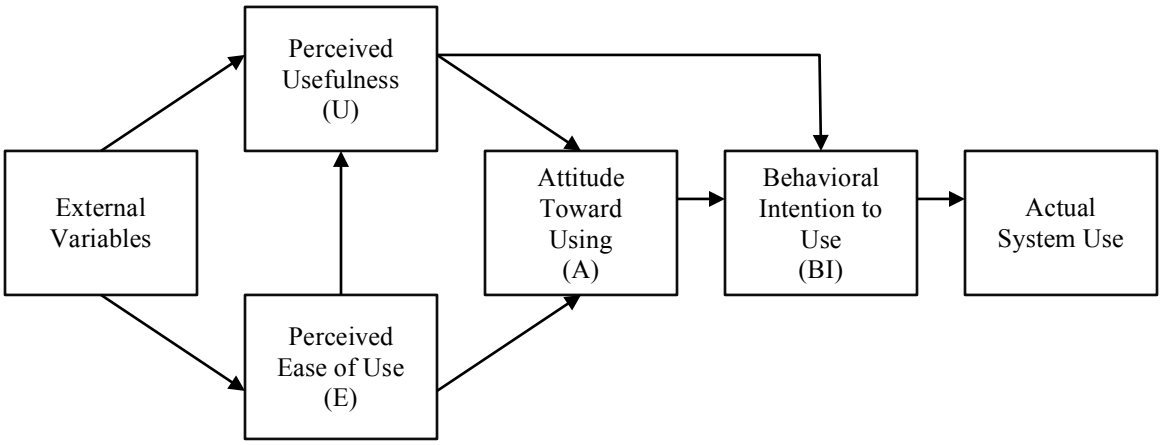

Figure 1. The Original Technology Acceptance Model (Holden, 2011).

Methodology

The goals of this research were to implement an online PD program that educated secondary school teachers on the applicability of educational technologies; measure for changes in teachers' levels of self-efficacy related to educational technologies; monitor for educational technology integration; and better understand the effect of school culture on teachers' acceptance or rejection of an online professional development program.

These goals were addressed in this mixed-methods study across two phases. The first phase was quantitative in nature and measured for changes in self-efficacy levels. Phase two was qualitative in nature and documented the integration of educational technology as part of classroom instruction and also investigated the different aspects of school culture through observation.

Setting

SCCHS, the pseudonym for the school site, is a private, Catholic, and single-sex (all boys) secondary school owned and operated by a religious order. This school was selected for reasons of accessibility and commitment to teacher professional development, which are explained in greater detail in Chapter 3.

Participants

Participants were adult learners working as full-time teachers at SCCHS. This sample of 47 teachers included 27 males and 20 females with ages between 28 and 65 years. The least-experienced teacher had taught for five years while the most experienced faculty member had taught for more than 30 years. Each participant was responsible for teaching a total of five classes and did so according to their college degree, certification, and/or background experience. Each participant had varying levels of self-efficacy prior to the online PD.

Data Collection

This research followed a mixed-methods approach. Pre- and post- surveys were administered before and after the online PD program, respectively. These paper-based surveys were distributed onsite by the researcher. A final survey was distributed and collected within two weeks after each participant had completed the online PD to measure for differences in self-efficacy.

Following the completion of the online PD, participants were selected for classroom observations over the course of the study's timeframe. The classroom visits consisted of classroom observations and interviews with purposefully selected individuals. Evaluation of

school culture occurred simultaneously with and throughout the data collection process regardless of phase of the study.

Data Analysis

Surveys were analyzed using SPSS, which allowed for descriptive and inferential Statistics. Inferential statistics allowed for generalizations about the sample population by using factor analysis and *t*-tests. Observations were analyzed and coded for themes using qualitative methodologies for research on teaching presented by Frederick Erickson (1985).

Limitations and Delimitations

Limitations

The school site was a limiting factor to the findings because of its unique characteristics: small number of faculty, Catholic composition, and single-gender student population. This sample was not representative of general secondary school populations. Furthermore, SCCHS's previous technology plans included professional development on educational technologies, and the classrooms included recent advances in technologies. Therefore, the participants were not a valid representation of the population of secondary school teachers and the varying levels of self-efficacy concerning educational technologies.

The researcher had no control over the teachers' decisions about actions that could impact his/her levels of self-efficacy and/or usage of the technology over the course of the study timeframe. Teachers that attended professional development workshops on educational technologies during the study were more likely to alter their levels of self-efficacy as a result of the online PD.

Researcher positionality was also a limiting factor in this study. As a member of the SCCHS faculty, the researcher may have been viewed by the participants as an evaluator of their professionalism and job performances, thus affecting the data. The researcher also carried a positive bias in the efficacy of online PD as a means of prompting a positive change in teacher attitudes. Furthermore, the researcher served the school in an administrative capacity, and this may have affected teachers' perceptiveness to the study and the online PD, specifically.

Delimitations

A delimitation of this study was the researcher's decision to implement the online professional development program to one school site instead of a representative sampling of secondary schools within the district. By not including other secondary schools, the data set was subject to issues of reliability and validity.

Another delimitation of this study was the researcher's choice to implement the ASCD online PD instead of other available options. Although comparable programs are available, the online PD offered by ASCD provided courses more applicable to the use of educational technology within the classroom. The ability to schedule these courses in a timeframe chosen by each participant was also a preferred option.

Selecting ASCD's online course provided a limited scope of the different types and uses of current educational technologies. This particular course was selected by the researcher in order to measure teachers' integration of technology using the International Society for Technology in Education's Classroom Observation Tool, also known as ICOT (Bielefeldt, 2012b). Other course options were available through ETLO, but they did not allow for this type of measurement within the study's proposed time frame.

This research also did not study the efficacy of the participants' online PD knowledge and the correlation thereof to produce desired student outcomes. Because this study focused on teacher attitudes and professional development, the connection between teacher and student outcomes was omitted.

Definition of Terms

Definitions of terms used in this study follow:

Educational technology: the ideas, theories, processes, and technologies of teacher instruction and student learning.

Online teacher professional development (online PD): the acquisition of new knowledge and skills relating to the teaching profession. This is accomplished using the Internet as the vehicle by which a program delivers the information to the learner.

Self-efficacy: a person's belief in his/her ability to accomplish a certain task or goal.

Organization of the Dissertation

This dissertation was organized as a traditional, five-chapter dissertation as described in the *Dissertation Guide* (Loyola Marymount University, Los Angeles, 2015). Chapter 1 of this dissertation includes a background of the study, followed by the purpose, significance, and the research questions that guided the study. Chapter 2 presents pertinent literature on the theories, various concepts, and models with which the researcher viewed the study. The research methods are included in Chapter 3, while the findings and results are discussed in Chapter 4. Finally, the conclusions, implications, and recommendations are stated in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

The purposes of this study were threefold. First, the effectiveness of an online professional development program was measured in pre- and post-tests by calculating the differences in levels of perceived self-efficacy amongst secondary school teachers. Second, in order to better understand the impact of an online professional development program on pedagogy, the study investigated the instructional practices of selected teachers throughout the course of an entire academic semester. Last, the impact of school culture on the inclination of teachers to either accept or reject online professional development was explored through observations.

Theoretical Framework

Andragogy

Classification of adult learning as a separate entity from the traditional understandings of learning began with the work of Edward Thorndike and Eduard Lindeman. Each pioneered a separate understanding of adult learning theories. In 1926, Lindeman wrote *The Meaning of Adult of Education* that spoke about the process of adult learning. In his book, Lindeman (1926) argued that adult education is characterized by five assumptions:

1. Adults are motivated to learn as they experience needs and interests that learning will satisfy.
2. Adults' orientation to learning is life-centered.
3. Experience is the richest source for adult learning.
4. Adults have a deep need to be self-directing.

5. Individual differences among people increase with age. (Eduard C. Lindeman (n.d., para 1)

Eduard Lindeman and other like-minded supporters viewed adult education as a process wherein individuals sought to discover new knowledge through intuition and the analysis of experience. This type of thinking came to be known as the artistic or intuitive/reflective stream of adult education and became the basis for many adult learning theories.

Edward Thorndike led the other widely accepted school of thought, which was known as the scientific stream. In contrast to the artistic stream, Thorndike and other supporters of the scientific approach perceived adult education as acquiring knowledge through investigations and experiments. In his seminal book *Adult Learning*, Thorndike (1928) researched the learning ability of adults as it related to discovering new knowledge. His studies set the foundation for the field of adult learning by demonstrating that adults can learn. Both of these individuals and their contributions influenced Malcolm Knowles (1970) and laid the groundwork to his theory on adult learning, also known as *andragogy*.

The etymology of andragogy can be traced back to Alexander Kapp in 1833 (Gessner, 1956). As a German schoolteacher, Kapp used the word to describe the educational philosophies of Plato that would later be referenced by Lindeman in *The Meaning of Adult Education* and his other works (Gessner, 1956). The term eventually fell out of use for nearly a century, until 1921 when German scientist Eugen Rosenstock reported to the Academy of Labor in Frankfort that adult education was circumstantially applicable to education theory due to teachers, methods, and philosophical requirements (van Enckevort, 1971). From 1950 to the present, the term has

been applied to numerous uses and concepts, with Malcolm Knowles arguably the most notable andragogical theorist (Holton, Knowles, & Swanson, 2005).

Adult learners under the andragogical theory are defined from a psychological perspective as persons whose self-concept includes personal responsibility toward their own life and self-direction. Based on this definition, the andragogical model, as implied by Holton et al. (2005), suggested that:

1. Adults need to know why they need to learn something before they begin the process of learning.
2. Adults have a self-concept of being responsible for their own decisions; they develop a deep psychological need to be seen by others and treated by others as being capable of self-direction.
3. Adults possess a greater amount and variety of experiences compared to that of the youth.
4. Adults develop a readiness to learn whatever must be learned in order to effectively manage real-life situations.
5. Adults prefer learning that is life-centered; they learn most effectively when things are presented in the context of real-life situations.
6. Adults respond better to intrinsic motivating factors as opposed to extrinsic.

The andragogical model presented criteria and conditions for adult learning, although it did not convey a set of requirements that equated to the effective teaching of adults. However, this model did give rise to theories of teaching adult learners. Carl Rogers (1969), for example, characterized teachers as facilitators of learning rather than imparters of knowledge. As

facilitators, teachers must be genuine, caring, and empathic. Furthermore, Rogers suggested that facilitators were responsible for certain guidelines applied to learning:

1. Establish a positive group climate or class experience.
2. Clearly articulate individual and general purposes of the class.
3. Rely on an individual's motivational factors to drive significant learning.
4. Manage the widest possible range of learning resources.
5. View teachers as a flexible resource.
6. Accept rational, intellectual, and emotionalized content from individuals.
7. Become a participant learner.
8. Take the initiative to share personal attitudes as a form of feedback.
9. Understand and communicate empathy towards individuals.
10. Accept personal limitations. (pp. 164–166)

Social Cognitive Theory

The theory I used to frame my researcher's lens came from the field of behavioral psychology and the work of Albert Bandura; specifically, social cognitive theory (SCT). This idea differs from traditional behavioral theories that propose a linear model of human behavior wherein personal characteristics and the environment affect behavior; there is no reciprocality in effect. On the other hand, social cognitive theory implies that self-development, adaptation, and change occur through interplay of personal, behavioral, and environmental influences (Bandura, 1986). Known as triadic reciprocal causation (see Figure 2), an interaction exists between the three sources of change. In other words, personal characteristics such as knowledge, beliefs, and traits can influence changes in behavior. Conversely, behavior in the form of performance

feedback can impose a reciprocal effect on individuals. Environmental influences such as persuasion or social interaction can affect personal characteristics that, in turn, can affect the environment. Finally, environmental factors influence behaviors and vice versa.

Social cognitive theory stems from Bandura's early work on modeling and observational learning. According to Bandura (1986), observational learning is characterized by four processes: attention, symbolic representation, transformation to action, and motivational incentive. The first process requires people to pay attention to the behavioral event and cognitively acquire the most significant aspects. Then, observers conceptually translate the behavior so as to remember it; essentially, store it into memory. Next, the conception is converted into action. Lastly, behaviors are only sustainable if the proper incentive is provided.

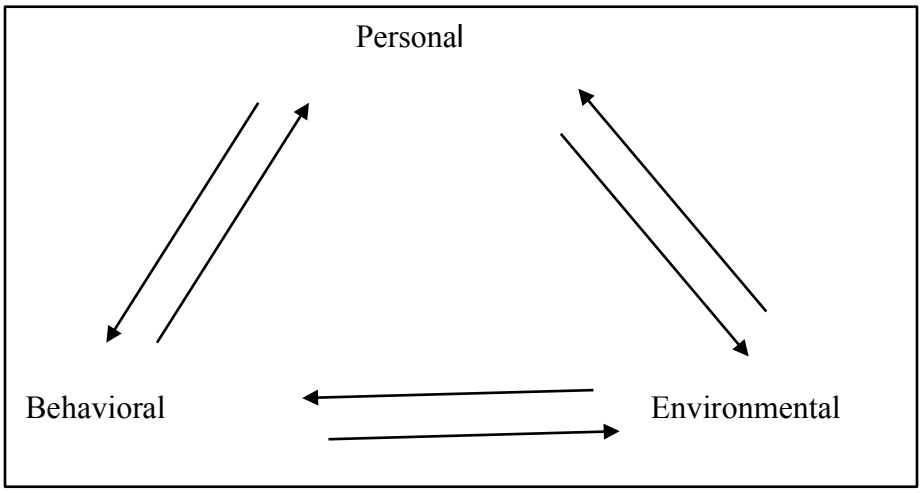

Figure 2: Triadic reciprocality.

Self-Efficacy

Self-efficacy is defined as a person's beliefs in his or her ability to produce desired results by his or her own actions and is foundational to human motivation. If people do not believe they could produce desired outcomes based on their own actions, there would be little

motivation to act or persevere through difficult moments (Bandura, 1986). People use four main sources of information to construct, develop, and influence their personal sense of self-efficacy: enactive mastery experience, vicarious experiences, verbal persuasion, and physiological and affective states. Each source independently influences self-efficacy but not always exclusively.

Enactive mastery experiences are performance-based situations that rely on authentic evidence of a person's ability to accomplish a goal, complete a task, or be successful in challenging situations. Each enactive experience has different effects, consequences, and outcomes that influence self-efficacy in a positive or negative manner. For example, success helps to develop a strong belief in one's abilities, whereas failure weakens personal self-efficacy. However, if people experience only easy successes, they are more prone to become discouraged by failures. Mitigating successes and failures so as to create a resilient sense of self-efficacy requires individuals to overcome obstacles through perseverance. Challenging situations inculcate the idea that success necessitates authentic effort. Through multiple successes and failures, then, a person learns and better understands his/her abilities so as to better refine them.

Self-efficacy is also influenced by a secondary source of information: vicarious experiences. The difficult nature of personal, performance evaluation, or the inaccuracy of measuring one's abilities to successfully complete a task requires people to self-estimate their skills in comparison to other people's attainments. Social comparative influence, for example, as a tenet of vicarious experiences, shows that self-efficacy levels can be raised after seeing people similar to oneself successfully perform certain activities. The more similarly related the observed person's capabilities are to the observer, the greater the effect on the observer's perception to accomplish or fail at an equal or similar task (Bandura, 1986). Brown and Inouye (1978) showed

that observing others who are seen to be similarly competent fail despite high effort can lower the observer's judgments about their own capabilities.

Verbal persuasion is the third source of self-efficacy, and it can have a significant impact on individuals. If a person is struggling with difficulties or possesses self-doubt in trying to accomplish a given task or reach certain goals, the use of verbal persuasion can strengthen and sustain personal efficacy and encourage self-change (Bandura, 1997). Furthermore, research supports the idea that self-affirming beliefs promote the development of skills and a sense of personal efficacy. Thus, verbal persuasion has the greatest impact on people who have reason to believe they can produce desired effects through personal actions (Chambliss & Murray, 1979a, 1979b).

The fourth source of self-efficacy involves an individual's physiological and affective states. This domain of self-efficacy is characterized by somatic indicators related to physical accomplishments, health functioning, and stressors. During stressful times, for example, people interpret their physiological activation state as a predictive sign or precursor to vulnerability or dysfunction. This, in turn, can lead to aversive thoughts that negatively affect the individual's present self-efficacy levels. Conversely, people that respond to stressful, taxing situations with an unthreatened attitude are less prone to waiver in their self-efficacy and are more inclined to expect success (Bandura, 1997).

An individual's perception of self-efficacy is not solely dependent upon nor exists independently from one of the four aforementioned sources. Rather, self-efficacy can be developed from a combination of each source with each one varying in different levels. Furthermore, applying various weights or degrees that are specific to each source complicates the

gauging of total self-efficacy. To complicate matters even more, the integration rules that people use in forming their efficacy judgments are varied. People can assess their self-efficacy levels additively, relatively, multiplicatively, or configurally. In other words, more indicators represent stronger beliefs in capability; some indicators are weighted more or less heavily than others; the factorial of indicators is greater than their additive effects; and, indicators are weighted differently depending on other available sources of self-efficacy information (Bandura, 1997). Therefore, establishing a thorough, reliable, and valid construct that measures self-efficacy becomes an imperative for comparative and research purposes.

Measuring Self-Efficacy

The standard methodology for measuring self-efficacy involves scales. The structure of these scales is complex because self-efficacy beliefs and their measurement must account for different task levels, generality, and strength (Bandura, 1997). In terms of level, individuals can perceive the difficulty of a task within a range from simple to moderately difficult to extremely difficult demands. The generality of self-efficacy scales accounts for how individuals measure themselves across a wide range of activities, which can differ in the degree, modality, quality, and other characteristics of the situation or capability. Additionally, the strength of efficacy beliefs range from weak to strong wherein weak beliefs are easily compromised by negative experiences and strong beliefs are not as easily overtaken by adversity.

Researchers design self-efficacy scales that are grounded in conceptual analysis and expert knowledge of what it takes to succeed in a specific task or goal (Bandura, 2006). This information is supplemented with interviews, open-ended surveys, and structured questionnaires to identify the levels of challenge and impediment to successful performance of the required

activities (Bandura, 1997). Self-efficacy scales are phrased in terms of "can do" rather than "will do" because the word "can" is a measurement of capability whereas "will" is an indicator of intent. Furthermore, the strength in perceived self-efficacy is measured using a 100-point scale that ranges from 0–100 with intervals that allow for different degrees of assurance (e.g., cannot do, moderately certain can do, certainly can do). The quantitative phase of this research used an adaptation of Wang, Ertmer, and Newby's (2004) instrument, which is a survey of teacher self-efficacy related to instructional technology while the supplementary qualitative portion followed Talbot Bielefeldt's (2012a) methodology and Erickson's (1985) analytic induction.

Teachers' Perceived Efficacy

The principles behind Albert Bandura's 1986) Social Cognitive Theory and self-efficacy can be applied to many disciplines like education. Known as teacher perceived efficacy when referring to educators, the concepts can be applied to each teacher's perceived capabilities. The earliest studies of teacher perceived efficacy started with the RAND Corporation in the 1970s using research that correlated efficacy to student performance, percentage of achieving project goals, the amount of teacher change, and the continued use of methods and materials after a project ended (Berman & McLaughlin, 1978). The Berman study concluded that the consequences of teaching were internally controlled (i.e., in the hands of the teacher). Additionally, teachers' beliefs in their instructional efficacy influenced pedagogy and, in turn, affected students' self-evaluation of intellectual ability (Bandura, 1997). And, in 1984, Gibson and Dembo showed that teachers with a strong belief in instructional efficacy were more likely to create mastery experiences for their students, whereas teachers with a low perception of

instructional efficacy were more likely to challenge students' judgment of their abilities and cognitive development.

Concerns-Based Adoption Model

The theoretical model, which was used to frame this research, is called the Concerns-Based Adoption Model (CBAM), presented in Gene Hall and Shirley Hord's (1987) *Change in Schools: Facilitating the Process*, which outlined the fundamental assumptions that guide the CBAM approach. A graphical representation of their model is seen in Figure 3.

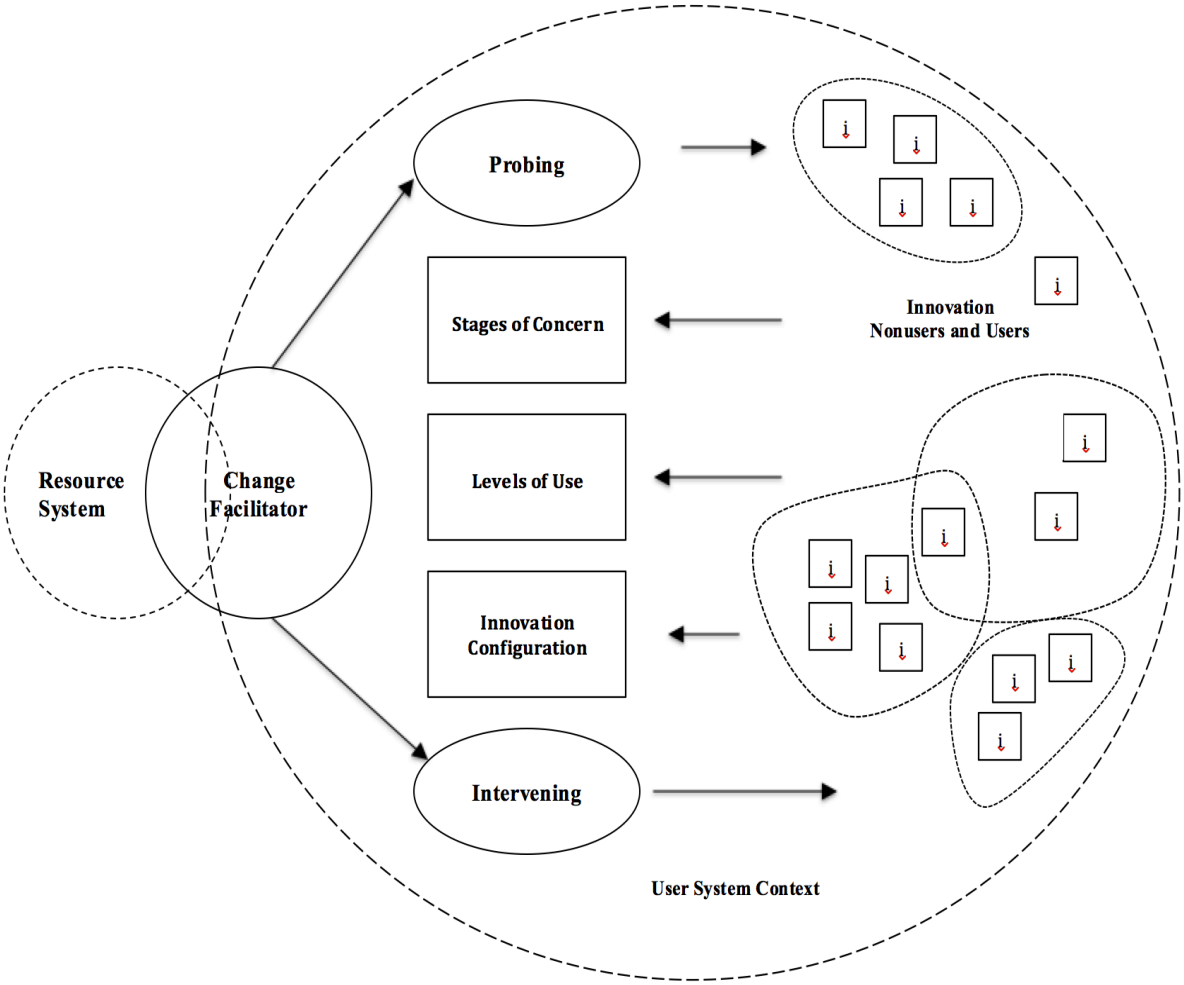

Figure 3. CBAM model.

The CBAM posits seven key assertions that serve as framing guidelines for approaching this dissertation research. The first assumption emphasizes the participant's point of view throughout the entire change process. Without understanding of where the participants *are*, the interventions made by change facilitators will address the needs of innovation users and non-users only through chance (Hall & Hord, 1987). The second assumption articulates change as a process as opposed to an event. Through their research, Hall and Hord (1987) affirmed that implementing educational innovations is a process that is accomplished over time in a series of phases and steps. Third, a majority of the changes, reactions, and consequences of the process can be anticipated. Thus, many aspects of the implementation and change processes can be planned so as to manage the unexpected events or consequences which, in turn, allows the change facilitator to better utilize his or her time and resources. The fourth assertion states that innovations come in all sizes and shapes. It's important to note that innovations are defined as products or processes that are being implemented. For example, an innovation as a product can be a textbook, instructional material, or curriculum-related resources such as a speaker. As a process, an innovation can take the form of disciplinary procedures, student counseling, or teacher professional development. This concept further implies that an innovation is bound by neither timeframes nor a particular delivery method. The fifth assertion clarifies that innovation and implementation are two parallel sides to the change-process coin. According to Hall and Hord (1987), more literature exists about procedures and development of innovations versus those that address planning that tracks the necessary steps to ensure the innovation has been used. The sixth assertion states that an individual must first change in order for a change to be made. In other words, data and assessments concerning each individual must first be gathered and analyzed so

as to create a better understanding of how the school, district, or system will be affected on a macro-level. This coincides with the idea that the effectiveness of an innovation depends on the individual's incorporation of the new practice. Lastly, the seventh assertion of the CBAM approach claims that everyone can be a change facilitator. This idea reemphasizes the fact that an entire school is responsible and can be credited for a desired change; the job should not be assigned to one person, such as the school principal.

Teacher Learning

Educating, training, and the development of teachers and their instructional practices have been important research topics for many years. The dynamic nature of teachers' acquiring new skills and information coupled with an understanding that it will affect student outcomes poses problems to the learning process. Teachers face issues such as: the *apprenticeship of observation,* wherein prior experiences as a student create improper or false preconceptions of how to teach and the ways students learn; or the *problem of enactment,* wherein persons are required to teach while performing multiple tasks; and the *problem of complexity,* wherein teachers work with many students at once while juggling various academic and social goals that require moment-to-moment trade-offs (Jackson, 1974; Kennedy, 1999; Lortie, 1975). The goal of teacher education must be to help teachers become professionals who continuously learn and strive to be adaptive experts. This requires teacher educators, services, and professional development programs to view teachers as individuals with needs that are specific to adults and the ways most adults prefer to learn.

Adaptive experts are those who are prepared for effective lifelong learning that allows them to continuously add to their knowledge and skills. Individuals identified as adaptive experts

are more apt to change core competencies and continually expand the breadth and depth of their expertise as opposed to routine experts who develop a core set of competences that are applied throughout their lives with greater and greater efficiency (Hatano & Inagaki, 1986; Hatano & Oura, 2003). Schwartz, Bransford, and Sears (2005) indicated that adaptive expertise is applicable to issues of learning and teaching. They suggested that people who possess high levels of task efficiency can quickly and accurately apply knowledge and skills to solve problems. Teachers who have seen many cases of students struggling with problems on a test can solve this issue by exposing the students to similar questions and problems over the course of time. The problem with routine expertise, however, is that it requires a stable and unchanging learning environment. The dynamic nature of student learning makes routine expertise an unfavorable outcome. Innovative expertise, on the other hand, requires an "unlearning" of previous routines and a "letting go" of preconceptions and beliefs. The downside, however, is that adaptive expertise creates flexible instructional methods and strategies that are too inefficient for problem-solving.

Schwartz et al. (2005) suggested that people benefit most from learning opportunities that balance the two dimensions of expertise by remaining within the "optimal adaptability corridor" or OAC. This means that learning opportunities involve understanding and developing personal solutions as well as becoming efficient in coming up with those solutions when posed with similar problems. Instruction that balances efficiency and innovation must also include ways to experiment with ideas. Furthermore, these experiences must be coupled with chances to interact with artifacts and other people so as to find inconsistencies and preconceptions that need refinement.

As adaptive experts, these teachers balance the two dimensions of efficiency and innovation during instruction to remain within the OAC mode. Then teachers are able to multitask various activities without having to be overly attentive to each task. Also, teachers who are adaptive experts frequently rethink key ideas, methodologies, and even personal values, which can be emotionally challenging, but these teachers do so without feeling threatened. For those who are not adaptive experts, the developmental process to become one is not something done overnight. Rather, engaging teachers in professional development brings about this change.

Professional Development

As part of the learning process, teachers are called to continually develop their personal pedagogies. To that end, many consider teacher development and teacher education to be a necessary aspect of educational improvement during a time of school reform (Hawley & Valli, 1999). An increasing number of professional development programs have emerged to address this growing need thanks to the reauthorization of the Elementary and Secondary Education Act under the provisions and legislation of No Child Left Behind (NCLB) (2002). Professional development is commonly associated with teachers receiving some form of training related to instructional programs, teaching strategies, learning new information, and improving pre-existing skills or creating new ones. Professional development is not exclusive to the educational profession, as it has similar meanings and objectives in other industries such as medicine, law, and engineering. In these sectors, professional development is referred to as staff development. For this study's purposes, professional development is defined as processes and activities designed to enhance professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students by improving their own practice.

The increasing need for professional development imposes a cost to schools and districts wishing to implement any particular program. Research on five urban school districts by Karen Miles et al. (2004) showed that districts invested significant amounts of resources into various professional development opportunities and that the spending to provide teacher time was significant but highly variable. The study also concluded that districts tended to rely on external funding for almost one-half the provided professional development. To further complicate matters, a gap is apparent in professional learning between what teachers expect from a program versus what they actually receive (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009).

Professional development happens in ways that are different and specific to the learning needs of the individual. Research shows that teachers can progress through phases of the teaching and learning process during which the focus moves from a self-centered outlook to a perspective related to student learning (Fuller, 1969). Evidence has also shown that beginning teachers have a tendency to respond to classroom demands with superficial, general observations that overlook the intellectual aspect of the classroom. Experienced, expert teachers, in contrast, view similar scenarios with more detailed observations while taking into account the effect of intellectual work (Berliner, 1994, 2001). Furthermore, Berliner (1994) suggested that teacher expertise is developed through stages: novice, advanced beginner, competent, proficient, and expert. Moreover, Joyce and Showers (2002) pointed out that teachers undergo a repetitive process of learning, experimentation, and reflection as they develop new skills, and that the enactment of these new skills can be supported by skilled coaching.

Theories that frame teacher development within the context of stages can clarify, guide, and predict the process by which educators develop; they do not, however, tell us much about the learning experiences that can also have an impact on their development.

Teacher Professional Development

Some programs are designed to help teachers become adaptive experts and follow a core set of principles that coincides with the issues proposed by Jackson (1974), Kennedy (1999), and Lortie (1975). According to the National Academy of Sciences (National Research Council, 2005), three principles apply:

1. Prospective teachers' understanding and preconceptions of how teaching and learning dynamics work in the classroom must be engaged during professional development for fear of failing to grasp new concepts and information or regression.
2. Teachers must have a deep foundation of factual and theoretical knowledge, understand facts and ideas in the context of a conceptual framework, and organize knowledge in ways that facilitate retrieval and action.
3. A "metacognitive" approach to instruction can help teachers learn to take control of their own learning by providing tools for analysis of events and situations that enable them to understand and handle the complexities of life. (para. 1)

In addition to meeting the aforementioned principles, the value behind any teacher professional development is based on its effectiveness in creating a desired change within people or institutions.

This study frames the structure of effective professional development programs to bring about a desired change based on certain criteria. First, empirical evidence suggests that programs

with coherent visions of teaching and learning, which also integrate related instructional strategies across courses and field placements, have greater impact on concepts and practices. In other words, the learning content integrated with real-world applications reinforces and reflects key ideas, while also building a deeper understanding of teaching and learning dynamics (Darling-Hammond, 1999, 2000; Darling-Hammond & MacDonald, 2000).

According to the work of Darling-Hammond, Grossman, Rust, and Shulman (2005), the scope and sequence of teacher education programs must take into consideration three elements:

1. The content of teacher education—what is taught and how it is connected, including the extent to which candidates are helped to acquire a cognitive map of teaching that allows them to see relationships among the domains of teaching knowledge and connect useful theory to practices that support student learning.
2. The learning process—the extent to which the curriculum builds on and enables candidates' readiness and is grounded in the materials and tools of practice in ways that allow teachers' understandings to be enacted in the classrooms.
3. The learning context—the extent to which teacher learning is situated in contexts that allow the development of expert practice including subject matter domains and a community of practitioners who share practices, dispositions, and a growing base of knowledge. (pp. 394–395)

Online Professional Development

The need for professional development that is tailored to teachers' busy schedules, that draws on valuable resources not available locally, and that provides work-embedded support prompted the creation of online teacher professional development (online PD) programs.

However, there is little known about the best practices for designing and implementing these online programs (Dede, 2006). Coupled with this uncertainty, little evidence is available to support the long-range impact and sustainability of online PD as it pertains to teacher instruction and student outcomes. Ultimately, the validation of online PD comes from empirical research that studies the effectiveness of the program and its design to deliver desired outcomes.

Presently, the focus of existing research for online PD can be narrowed to five key areas of concern:

1. Design of professional development: Empirical data is used to inform and improve the content, instruction, delivery, or administration of online PD with a focus on the program model, policy, context, and/or best practices.
2. Effectiveness of professional development: Outcomes of online PD such as participation, satisfaction, quality in relation to a standard, and other intended effects or outcomes are measured for effectiveness.
3. Technology to support professional development: Research is conducted to test or improve the design of a technology learning environment, tool, online delivery system, or to gauge the effect of using a particular technology to support aspects of teachers' learning.
4. Online communication and professional development: Research provides understanding and identification of support structures for teacher learning through effective discourse in an online environment or to describe the characteristics of teachers' online discourse. The study is focused on the practices of instructors, moderators, and/or facilitators.

5. Research methods: Research is carried out on important issues and methods for studying teacher professional development including programs that accommodate teachers' busy schedules while providing real-time, ongoing support (Dede et al., 2009).

Based on these five areas of research, the intention of this study coincided with points 2 and 3: measuring the effectiveness of an online PD program as it relates to outcomes based on self-efficacy and improving the technology learning environment as it is framed within classroom instruction.

Educational Technology

The frequent, rapid, and dynamic pace of development of technologies requires teachers to pursue their own professional development in the context of continuous change. This calls for special types of teacher efficacy, given that beliefs affect their receptivity, adoption, and integration of various technologies. The technology then shifts the emphasis in 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. Therefore, a special type of teacher efficacy must account for teachers' beliefs in their abilities to "integrate different pedagogical practices successfully with a broad perspective of education" (Bandura, 1997, p. 241).

CHAPTER 3

RESEARCH METHODS

The following research questions guided this mixed-methods research design:

1. How does an online professional development course affect self-efficacy levels concerning educational technologies for teachers in secondary schools?
2. What impact does an online professional development course have on secondary school teachers' integration of technology during classroom instruction?
3. What aspects of school culture condition teachers to actively engage or reject online professional development?

Research Design

This research followed a mixed-methods design that was sequential and explanatory (Creswell, 2009). This research strategy was applied to explain and interpret quantitative results by collecting and analyzing follow-up qualitative data. Sequential explanatory strategy weighs heavily upon quantitative data, which explains why researchers who use it have a stronger preference for quantitative measurements. This is not to say that the two types of data are separate; rather, they are connected when the initial quantitative data informs the secondary qualitative data. As stated by Axinn and Pearce (2006), this form of research methodology combines the strengths of multiple methods while providing a counterbalance for weaknesses. Furthermore, it allows for more complete and in-depth descriptions of the behavior and experiences of the participants using a variety of instruments (Tashakkori & Teddlie, 2002). This research used both quantitative and qualitative approaches so that the overall strength of the study was greater than either approach used independently (Creswell & Plano Clark, 2007).

This mixed-methods study was conducted in two phases. The first phase was quantitative in methodology and derived its data from two self-efficacy surveys: pre-online PD (PRE) and post-online PD (POST). The gathered data from these surveys provided a basic understanding of each participant's self-efficacy levels. The second phase was qualitative in methodology, which consisted of classroom observations and teacher interviews. This phase was guided by the information gathered from the quantitative data.

Phase One

This quantitative phase derived data from two paper-based surveys, PRE and POST. These surveys were similar to the Computer Technology Integration Survey taken from Wang et al.'s (2004) study with a slight modification. In this dissertation study, the researcher explored how vicarious learning experiences and goal setting influenced preservice teachers' self-efficacy for integrating technology into the classroom. The Wang et al. (2004) survey spoke specifically to levels of self-efficacy toward computer use. For this study, vicarious learning experiences were taken into account and not goal setting. Furthermore, the two surveys used in this study replaced the word "computer" with the term "technology." By doing so, the study reframed the context of the original survey to include other educational technologies.

This study's version of the Wang et al. (2004) instrument was called the *Technology Integration Survey (TIS)* and served as the template for constructing the PRE and POST surveys. It used a Likert-type survey scale that measured for self-efficacy. This instrument included a section for instructions on how to complete the survey, a definition of educational technology integration, and examples of different situations in which educational technologies were being used for teaching and/or learning. The TIS consisted of 21 items with a range of responses that

included: *Strongly Disagree* (SD), *Disagree* (D), *Neither Agree Nor Disagree* (NA/ND), *Agree* (A), and *Strongly Agree* (SA). The TIS instrument can be found in Appendix A.

The PRE survey was taken prior to start of the online professional development course. Teachers that volunteered to participate received this paper-based survey inside an unmarked envelope, which was placed into their work mailboxes. Participants were assured that their responses would not affect their employment and that the data would be kept confidential.

The 21 questions were answered by marking Likert-type scale choices in pen or pencil, with a one-week time limit to complete the survey. Participants were given the option to completely stop and/or abandon the survey at any time. Once this survey was completed, participants were instructed to insert it into the original unmarked envelope and return it to the researcher by hand or mailbox. Participants in the qualitative portion of the research were selected and notified in the weeks following the date of last person to submit the paper-based survey.

Teachers received login information for the online PD from the researcher within 24 hours of submitting the PRE survey. The information included a set of log-on instructions; protocol for completing the online PD; and procedures once the online PD had been completed.

Participants then began an online professional development course through the Association for Supervision and Curriculum Development (ASCD, 2015) website. ASCD is a nonprofit organization that provides programs, resources, various products, and services to teachers, administrators, professors, and educational advocates. Furthermore, it offers advice and innovative solutions in the areas of professional development, capacity building, and educational leadership essential to the way educators learn, teach, and lead. Professional development is one

of ASCD's main services, and it was under this department that the online PD for this study was found.

Titled *Technology in Schools: A Balanced Perspective: An ASCD Online PD Course* ® (ACSD, 2015), this online course educated participants about (a) the challenges and benefits of incorporating technology into instruction, (b) engaging and meaningful ways to encourage proper technology integration in schools and working toward increasing access for all students, and (c) the importance of helping students and their families think critically about the role technology plays in their daily lives. This course was chosen for this study because the course objectives related specifically to developing enactive and vicarious learning experiences (Bandura, 1997), included characteristics of effective online learning (Dede, 2006), and viewed technology from a critical, social-justice perspective. The ACSD (2005) course objectives were as follows:

- Examine the pros and cons of integrating technology in education.
- Evaluate the positives and negatives of using technology in specific classroom settings.
- Develop strategies for bridging the digital divide in specific teaching situations.
- Identify ways to overcome technological inequalities between students and teachers, among students, and between students and parents.
- Develop strategies for incorporating technology in the classroom for collaboration and relationship building.
- Identify the ways technology can be used to promote collaboration among students and between students and teachers.

- Establish strategies to incorporate technology in classroom and homework activities to differentiate instruction.
- Identify how technology how can be effectively used to differentiate instruction and to provide students with authentic, meaningful, and engaging learning activities.
- Develop effective strategies for teaching students balanced, responsible use of technology, as well as the critical thinking skills necessary to use technology effectively.
- Realize that although many students may be proficient technology users, they may lack the critical thinking skills necessary to use it efficiently and appropriately.
- Develop strategies for helping students use multitasking skills appropriately to enhance learning—as well as help them develop the ability to focus in depth on complex tasks.
- Understand the effects that overexposure to technology can have on the psychological and physical health of students. (para. 1)

The online PD's affordability, accessibility, and open enrollment were also factors in its selection for this study. The $99 per-person fee to take the course was absorbed by the hosting school and did not financially affect the participants. The online PD course was accessed via the Internet on the participant's work-issued laptop or personal laptop. The participants had the option to work on the course during nonwork-related hours and on any day of the week. This study's methodology required the online PD to be completed within the program's timeframe. Furthermore, the online PD had a completion timeframe that ranged from four hours to course expiration in one year. Participants were strongly encouraged to complete the online PD within a four-week period to maximize retention and minimize external influences on factors that affect self-efficacy.

Participants were enrolled into the online PD once they were selected, notified of selection, and accepted the offer to participate in this study. The researcher enrolled each participant individually using that participant's name and personal information for registration purposes. The course provided a syllabus with a general overview, a list of objectives, and the sequence of materials with precourse and postcourse assessments that aligned to the course objectives.

Upon completing the online PD, participants received certificates of completion, which they presented to the researcher who then gave them the POST survey that was completed within the hour and returned to the researcher or his mailbox.

The POST survey was identical to the PRE survey in terms of the questions and answer choices with the exception that it was taken and completed after the online course instead of before it.

After both surveys were completed, the answer choices were manually entered into the SPSS statistics software program. Using SPSS allowed the researcher to calculate both descriptive and inferential statistics.

Phase Two

The second phase was qualitative; it involved classroom observations and interviews with purposefully selected participants based on data from Phase One. The selected participants were observed for the use of technologies during classroom instruction and learning. The first set of data was gathered by using ISTE Classroom Observation Tool, referred to as ICOT (Bielefeldt, 2012b), because it accounted for the frequency and duration of technology implementation and

also measured the task-appropriateness of the technology. Additional qualitative data were gathered through interviews.

The researcher acted as an observer-participant with his role known to both the teacher and students. According to Creswell (2009), observations provide the researcher with first-hand experience and allow for the immediate recording of information as it occurs, which is helpful especially in any unusual instances. Some limitations of this method, however, include the researcher being seen as intrusive, the inability to report private information, or behaviors deemed inadmissible by the participant, and/or the researcher having limited observational skills. Observations were recorded with the ICOT (Bielefeldt, 2012b) instrument and lasted approximately 25 to 30 minutes, during which the researcher noted the nature and extent to which technology was integrated throughout classroom instruction. This observation tool was originally developed for use in program evaluations by the International Society for Technology in Education, but was also applicable for assessing classroom needs, effects of professional development, and to help gauge changes in pedagogy (Bielefeldt, 2012b). The ICOT was used because it accounts for seven attributes of the learning environment as they relate by theory or experience to technology integration. These are:

- Student groupings
- Teacher roles
- Learning activities
- Technologies used by teachers
- Technologies used by students
- Technology use time

- Percent of students engaged

Talbot Bielefeldt (2012b) conducted a study using these seven attributes as variables to analyze patterns of technology need; technology use; student engagement related to technology use; and NETS teacher standards as performance indicators. This study replicated his analysis method.

Selected participants were observed using the ICOT tool prior to taking the online PD and afterward in order to detect any differences between the levels of technology integration before or after the online professional development course. Then, comparisons were made between the two ICOT data sets using SPSS.

Setting

This study was conducted at Southern California Catholic High School (SCCHS), a pseudonym. SCCHS was an all-male high school with a student population of approximately 820 boys. There were six administrators, 48 teachers across eight different departments, and 40 staff members.

SCCHS had an existing history of professional development with a focus on instructional technology, which was managed by the assistant principal in collaboration with the principal. Since 2007, teachers had attended various in-services and workshops that covered topics such as the use of Webquests, Google Documents, the functionality and use of Interactive Whiteboards (IWBs), Blackbaud (online grade book), managing teacher websites using Edlio, and managing course pages through a virtual learning management system called Moodle. The assistant principal, principal, and selected faculty members served as presenters, discussion leaders, or speakers for each of the in-services and workshops. In 2010, the school converted office space into a dedicated Instructional Technology Training Center wherein teachers attended the

aforementioned workshops thereby reinforcing the importance the school and administrators assigned to teacher professional development and instructional technology.

Technology was also prevalent in classrooms, where it was an important teaching and learning resource for both teachers and students. The earliest devices available to teachers included calculators, overhead projectors, televisions, VHS, and cassette and CD players. Desktop computers, personal laptops, tablets, and smartphones were available from the early 1990s and continue to the present day. Students, on the other hand, used scientific and graphing calculators, desktop computers, personal laptops, tablets, and smartphones. The students' desktop computers were stationary and located in various buildings throughout campus including dedicated rooms for computer science classes, yearbook and newspaper publishing, language learning labs, and the Library Resource Center (LRC). The LRC is the campus library, which contains 32 computer terminals that are available for use before, during, and after school hours.

The prevalence of technology in the hands of students increased at SCCHS over the 2000s. In 2001, a select group of 32 students was invited to participate in the school's first laptop program. The cohort of students, called "eMates" for the Apple laptop model they carried, were the only students at the time that were allowed to use a laptop for learning and completing assignments. The eMate program was discontinued after that year. From 2002 to 2010, the school allowed students to bring laptops if they preferred to do so but required a formal approval process that was managed by the assistant principal. Then, in 2010, the school inducted another cohort of 32 students into a new academic program that required them to have a laptop available for use during classroom instruction. During that year, the school's technology infrastructure was upgraded to include high-speed Internet via Ethernet, campus-wide WiFi, updated teacher

laptops and desktops, and overhead projectors with IWB functionality in four classrooms. In 2011, the school launched a 1:1 program initiative by requiring all incoming freshmen to purchase a school-approved laptop. By the beginning of Fall 2012, each classroom had an IWB with approximately half of the student population (sophomores and freshmen) required to participate in the 1:1 program and the junior and senior students being given the option to bring a laptop if they chose to do so. Then, in 2013, the school implemented a Bring Your Own Device (BYOD) policy, whereby any student had the option of using a laptop, tablet, smartphone, or other mobile device during classroom instruction and learning. This policy continued throughout this study's timeframe.

Participants

All faculty members at SCCHS participated in Phase One of the study with selected participants continuing onto Phase Two. The faculty demographics included: an age range between 22 to 55+ years; years of teaching experience ranged from first-year to 30 years or more; and the composition was 34 males versus 14 females.

Data Collection

This mixed-method study was sequential-explanatory in methodology and followed data collection methods similar to previous research, but with slight modifications. In other words, gathering data for the quantitative phase was similar to that of Wang et al.'s (2004) study, and the qualitative phase was based on adaptation of Talbot Bielefeldt's (2012b) instrument.

The first phase of this study began once the PRE survey was distributed to the faculty of SCCHS. Teachers had seven days to complete the survey and return it to the researcher personally or to his mailbox. The researcher collected the TIS responses and manually

transferred them into a Microsoft Excel spreadsheet titled "PRE Online PD," then calculated for self-efficacy levels (See Appendix B). Participants received login credentials along with protocol and instructions on how to complete the online PD.

Teachers were requested to complete the POST survey after successfully completing the online PD, which was given after they provided the researcher with the online PD's certificate of completion. This survey was completed and resubmitted to the researcher within an hour of having received it. The results of the POST surveys were manually entered into another Microsoft Excel spreadsheet titled "POST Online PD" for self-efficacy calculations (See Appendix C). During Phase Two of the study, the researcher collected qualitative data in the form of classroom observations and teacher interviews.

Classroom observations were gathered only for the selected participants and employed the ICOT tool. Teachers and students were recorded for technology use during each observation, which typically lasted 25–30 minutes. Each observation started at or near the beginning of the class period. According to the ICOT User's Manual (Bielefeldt, 2012b), the observer recorded initial observations about the classroom setting (number of students, presence of technology, room arrangement, special characteristics of the environment) and a start time. Then, the observer checked boxes that indicated technology use during sequential three-minute intervals and whether or not the technology was being used for learning. The ICOT tool stored data on the total minutes of observation, proportions of technology use (student and teacher), and the proportions of that technology-use time devoted to learning.

After observations, the researcher interviewed each selected participant. The interview protocol was semistructured based on the data generated by the pre- and postsurveys as well as

questions that pertained to extraordinary or irregular data. Frederick Erickson's (1985) qualitative analysis methodology was used.

Data Analysis

In Phase One, data from the two surveys were analyzed for descriptive and inferential statistics. Ranges, frequencies, means, and standard deviations were calculated as descriptive data. Means and standard deviations were calculated for each participant on the pre- and post-surveys. An independent samples *t*-test measured for significant or insignificant differences between the sample's pre- and post-scores, which were related to self-efficacy levels before the program and immediately after the program.

During Phase Two qualitative data analysis was carried out by examining the stored data of the ICOT as well as coding the transcribed interviews. ICOT analysis accounted for changes in teachers' instructional practices while interviews provided an expanded analysis of self-efficacy levels in comparison and contrast to those indicated by the pre- and post-surveys.

Analysis of the ICOT data was similar to that of Talbot Bielefeldt's study (2012a) wherein seven variables accounted for: (a) teacher roles, (b) student groupings, (c) student learning activities, (d) the amount of time technology was used, (e) types of technology used, (f) student engagement, and (g) the need for technology use. Categories were collapsed in the ICOT's data storage in order to find meaningful patterns across individual observations and in comparison to other teacher's observations.

The data were coded for themes based on responses and based on Frederick Erickson's (1985) method of analytic induction.

Limitations and Delimitations

Wang et al.'s (2004) Computer Technology Integration Survey was used throughout the quantitative phase with the exception of replacing the word "computer" with the generalized term "educational technology." The content, structure, and meaning behind the survey questions did not change, but this modification is noted.

During classroom observations, teachers were not confined to using lesson plans that involved projects specifically designed to influence the ICOT's seven measureable variables, unlike Talbot Bielefeldt's (2012a) study. Teachers were given the autonomy to conduct classroom instruction and management as normal. This was done to obtain more authentic data in terms of measuring how much the teacher's instructional practices were affected by the online PD.

The researcher's part as an observer-participant and former-faculty-member-turned-administrator played an indirect role in the study. Many of the previous professional development workshops were conducted by the researcher, and thus teachers had a preconditioned mentality and understanding about the importance of the online PD. This issue was mitigated, however, by the researcher's professional obligations and principles of maintaining a professional, unbiased, and completely objective perspective.

CHAPTER 4

RESEARCH FINDINGS

One purpose of this research was to quantitatively identify any changes in teachers' self-efficacy levels both before and after participation in an online professional development program. Self-efficacy levels were measured using the Technology Integration Survey (TIS) that was completed by each participant before the online PD and after; surveys are titled PRE and POST, respectively. A paired sample *t*-test measured for a significant difference between the means of the same measuring unit, which was one of the 21 questions on the survey. The null hypothesis (H_0) for this part of the study stated:

$$H_0: \mu 1 - \mu 2 = 0$$

In other words, there was no difference between the sample 1 mean ($\mu 1$) and sample 2 mean ($\mu 2$). The null hypothesis was tested against the alternative hypothesis:

$$H_1: d_1 > 0$$

Another purpose of this research was to qualitatively explore the long-term impact of the online PD on teachers' instructional practices. This was done through classroom observations over a span of six months, an analysis of participant journals that were integrated into the online PD, and an interview protocol for purposefully selected teachers.

The third goal of this research was to implement an effective online PD program with the intention of creating a foundational set of baseline data that accounts for perceptions, attitudes, and best practices in the use of educational technology. In turn, this data could then be used to inform and design a professional development program that addresses multiple adult learning styles and varying levels of self-efficacy centered on developing best practices with educational

technology that helps drive student learning outcomes. This discussion is introduced toward the end of this chapter and examined in greater detail in Chapter 5.

The final aim of this study was to discern aspects of school culture that influenced teachers to engage in or dismiss online professional development. Data were compiled and evaluated from observations, interviews, and school documents, which allowed the researcher to derive conclusions.

Quantitative Results

The first part of this mixed-methods research was quantitative in nature, wherein the data were derived from two identical paper-based surveys, PRE and POST. Both PRE and POST consisted of responses to 21 questions using Likert-style ratings, which served as a range of indicators of self-efficacy. The responses for each question were ordinal and scaled in the order of *Strongly Disagree* (SD), *Disagree* (D), *Neither Disagree/Agree* (ND/NA), *Agree* (A), and *Strongly Agree* (SA). Participants' responses were manually transferred to a Microsoft Excel file by the researcher and saved for calculations by the IBM SPSS program.

Initially, this study began with 42 teachers who became committed research participants by completing the PRE online PD survey. Their pre- and post-responses were taken from the Excel file and entered into the IBM SPSS program, which the researcher used to perform independent sample *t*-tests for each item of the survey. The following tables were generated by the SPSS software and are arranged according to significance levels, starting with the most significant items and the least significant items presented later.

Findings of Significance

The first table, Table 1, summarizes the eight significant findings from the pre- and post-surveys with data organized according to significance values (*p*), difference in means (*M*), the *t*-test value (*t*), and the corresponding survey question.

Table 1

Significant Findings

Item	*p*	*M*	*t*	Survey question
11	0.007	0.47059	3.108	I feel confident I can provide initial feedback to students during technology use.
21	0.014	0.41176	2.746	I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.
5	0.029	0.35294	2.400	I feel confident that I can use correct technology terminology when directing students' technology use.
19	0.029	0.35294	2.400	I feel confident that as time goes by, my ability to address my students' technology needs will continue to improve.
9	0.056	0.29412	2.063	I feel confident I can mentor students in appropriate uses of technology.
15	0.056	0.29412	2.063	I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.
10	0.083	0.17647	1.852	I feel confident I can consistently use technology in effective ways.
12	0.096	0.29412	1.768	I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.

The data from Table 1 suggest that the online PD program had a significant effect on teachers' self-efficacy levels as they related to eight different practices of technology integration in the classroom. Items 11, 21, 5, and 19 calculated as highly significant data points, with each one well within the 95% confidence interval ($p < .05$), whereas items 9, 15, 10, and 12 were deemed significant with 90% confidence ($p < .10$). A total of eight out of 21 items showed significant changes, which accounted for approximately 40% of the entire survey.

Furthermore, each paired sample test was individually analyzed as a prompt for discussion of the statistics identified with that pair. Each table was accompanied by an extrapolation of data in reference to the significance level, difference in means, or *t*-value wherein an assertion or conclusion was inferred by the researcher.

Table 2 shows a significant difference in the means between *Post11* and *Pre11* with a *t*-value of t(16) = 3.108 and a *p*-value of .007 at a 95% confidence level. An *M*-value of .47059 (*SD* = .62426) rejected the null hypothesis and inferred that teachers' experienced a significant effect on their self-efficacy levels after participating in the online PD. This *t*-test was the most significant calculation of the 21 paired sample *t*-tests.

The *post11* and *pre11* variables represented the TIS question, "I feel confident I can provide initial feedback to students during technology use." This variable affirmed the online PD's course objectives by addressing instructional strategies as students use technology. Specifically, the content from Module 3 through Module 6 covered concepts related to instructional strategies such as: collaboration through technology (Module 3); differentiating instruction with technology (Module 4); teaching technological literacy (Module 5); and, teaching a balanced use of technology (Module 5).

Table 2

Paired Samples Test Pair 11

		Paired differences							
				Std. error	95% confidence interval of the difference				Sig. (2-
		Mean	Std. deviation	mean	Lower	Upper	t	df	tailed)
Pair 11	post11 - pre11	.47059	.62426	.15141	.14962	.79156	3.108	16	.007

Table 3 indicates a significant difference in the means (M = .41176, SD = .61835) between variables *post21* and *pre21*, which was confirmed by a t value of t(16) = 2.746, $p < .05$. Therefore, the null hypothesis was rejected. This *t*-test calculated the second most significant value in comparison to the other 20 paired samples.

In relation to the TIS, this variable represented the question, "I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues." Although there was no module objective or activity that specifically addressed lesson planning for technology-based projects coupled with confidence building in response to skepticism and opposition, the totality of the online PD helped contribute to the development and increase in self-efficacy levels as they related to technology use during instruction.

Table 3

Paired Samples Test Pair 21

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 21	post21 - pre21	.41176	.61835	.14997	.09384	.72969	2.746	16	.014

Table 4 shows a significant difference in Pair 5, which analyzed *post5* to *pre5* results. The difference in means (M = .35294, SD = .60634) inferred a meaningful and positive change in teacher self-efficacy levels. The null hypothesis was rejected with t(16) = 2.400, $p < .05$. This *t*-test calculated in a tie with Pair 19 as the third most significant value amongst the 21 paired samples.

The question for this variable reads, #5, stated: "I feel confident I can use correct technology terminology when directing students' technology use." This finding suggested a

strong factor affecting the teachers' self-efficacy levels in a way that improved their facility in using appropriate technical terminology while delivering instruction. Although there were no course objectives in the online PD that specifically addressed learning proper technology terms during instruction, the fact that teachers' were exposed to the terminology throughout the entire course may have been significant enough to drive a positive change in self-efficacy levels.

Table 4

Paired Samples Test Pair 5

		Paired differences							
					95% confidence interval of the Difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 5	post5 - pre5	.35294	.60634	.14706	.04119	.66469	2.400	16	.029

Table 5 shows a significant difference between the means of variables *post19* and *pre19* (M = .35294, SD = .60634), wherein t(16) = 2.400, $p < .05$. The M-value showed a slight increase in self-efficacy levels for the participants and, therefore, this t-test rejected the null hypothesis. This t-test was tied with Pair 5 as the third most significant calculation in comparison to the other 20 paired samples. It was also identical to Pair 5.

In connection to the TIS, this variable represented TIS question #19, which stated: "I feel confident that as time goes by, my ability to address my students' technology needs will continue to improve." This finding can be attributed to the online PD's objectives, which aimed to improve teacher knowledge and instructional practice with technology use.

Table 5

Paired Samples Test Pair 19

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 19	post19 - pre19	.35294	.60634	.14706	.04119	.66469	2.400	16	.029

Table 6 shows a slight difference between the means of Pair 9. Although the *p* value in this pair was above the 95% threshold at $p = .056$, the variables in this *t*-test were considered significant with a $t(16) = 2.063$, $p < .10$. The null hypothesis was rejected. The difference between means of *post9* and *pre9* ($M = .29412$, $SD = .58787$) indicated a significant increase in self-efficacy levels after participating in the online PD.

The TIS question #9 represented by *post9* and *pre9* stated: "I feel confident I can mentor students in appropriate uses of technology." This spoke to the idea that teachers felt comfortable enough to help students choose the proper device and applications during instruction, which was a learning outcome that the online PD addressed in Modules 4 and 5.

Table 6

Paired Samples Test Pair 9

		Paired differences					T	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 9	post9 - pre9	.29412	.58787	.14258	-.00814	.59637	2.063	16	.056

As shown in Table 7, the difference in means for Pair 15 ($M = .29412$, $SD = .58787$) was considered significant within a 90% confidence interval and a *t*-value of $t(16) = 2.063$, $p < .10$.

The *M* value for this test showed a slight increase in self-efficacy levels for the variables *post15* and *pre15*.

Post15 and *pre15* represented TIS question #15, which stated: "I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning." There were no specific activities or content within the online PD that deliberately connected curricular goals and technology to assessing for student learning. However, there were application activities within Module 4: Option 1 that asked participants to "write a lesson plan that includes a technology-based tool that assesses students' knowledge of going green, as well as renewable and nonrenewable energy."

Table 7

Paired Samples Test Pair 15

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 15	post15 - pre15	.29412	.58787	.14258	-.00814	.59637	2.063	16	.056

Table 8 shows that the variables *post10* and *pre10* in this *t*-test were considered significant within a 90% confidence interval with a $t(16) = 1.852$, $p < .10$. The null hypothesis was rejected. The difference between means of *post10* and *pre10* (*M* = *.17647*, *SD* = .39295) indicated a minimal increase in self-efficacy levels after participating in the online PD.

Post10 and *pre10* represented TIS question #10, which stated: "I feel confident I can consistently use technology in effective ways." The results of this *t*-test support the online PD's course objectives across all modules.

Table 8

Paired Samples Test Pair 10

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 10	post10 - pre10	.17647	.39295	.09531	-.02557	.37851	1.852	16	.083

Table 9 shows the variables *post12* and *pre12* in this *t*-test were considered significant within a 90% confidence interval and a t(16) = 1.768, $p < .10$. The null hypothesis was rejected. The difference between means of *post12* and *pre12* ($M = .29412$, $SD = .68599$) indicated a minimal increase in self-efficacy levels after participating in the online PD.

The *post12* and *pre12* variables represented TIS question #12, which stated: "I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning." The results of this *t*-test supported the online PD's course objectives and outcomes found in Modules 4 and 5.

Table 9

Paired Samples Test Pair 12

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 12	post12 - pre12	.29412	.68599	.16638	-.05859	.64682	1.768	16	.096

Findings of Nonsignificance

Table 10 shows results parallel to Table 1 in that it summarizes the data from paired samples tests, which calculated as nonsignificant within a 90% confidence interval ($p > .10$). It

includes information from the remaining 13 questions from the PRE and POST surveys, which were arranged according to *p*-values, difference in means (*M*), and *t*-values.

Table 10

Nonsignificant Findings

Item	*p*	*M*	*t*	Survey question
4	.188	.17647	1.376	I feel confident in my ability to evaluate software for teaching and learning.
17	.188	.17647	1.376	I feel confident that I will be comfortable using technology in my teaching.
8	.216	.23529	1.289	I feel confident that I can motivate my students to participate in technology-based projects.
16	.264	.29412	1.159	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.
1	.332	.11765	1.000	I feel confident that I understand technology capabilities well enough to maximize them in my classroom.
6	.332	.11765	1.000	I feel confident I can help students when they have difficulty with technology.
20	.332	.17647	1.000	I feel confident that I can develop creative ways to cope with constraints (such as budget cuts on technology facilities) and continue to teach effectively with technology.
13	.422	.17647	.8240	I feel confident about selecting appropriate technology for instruction according to curriculum standards.
2	.431	.11765	.8080	I feel confident that I have the skills necessary to use technology for instruction.
14	.431	.11765	.8080	I feel confident about assigning and grading technology-based projects.
18	.608	.11765	.5230	I feel confident I can be responsive to students' needs during technology use.
3	1.00	.00000	.0000	I feel confident that I can successfully teach relevant subject content with the appropriate use of technology.
7	1.00	.00000	.0000	I feel confident I can effectively monitor students' technology use for project development in my classroom.

Table 11 shows no significant difference between the means of Pair 4. The results for the variables *post4* and *pre4* were nonsignificant with a t(16) = 1.376, $p > .05$. Therefore, the null hypothesis was accepted. The minor difference of means between *post4* and *pre4* (M =.17647, SD = .52859) indicated a minimal change in self-efficacy levels after participating in the online PD.

These variables represented question #4 on the TIS, which stated: "I feel confident in my ability to evaluate software for teaching and learning." Similar to the first three paired *t*-tests, this result inferred minimal effects of the online PD to change teachers' self-efficacy levels. Unlike the previous three tests, however, this item was unrelated to skills that directly affected student learning and instead indicated more about an individual skill related to assessing instructional resources.

Table 11

Paired Samples Test Pair 4

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 4	post4 - pre4	.17647	.52859	.12820	-.09531	.44825	1.376	16	.188

Table 12 shows a minimal difference of means for Pair 17 (M = .17647, SD = .52859) was calculated and was nonsignificant based on a *t*-test value of t(16) = 1.376, $p > .05$. The null hypothesis was accepted.

The variables *post17* and *pre17* represented TIS question #17, which stated: "I feel confident that I will be comfortable using technology in my teaching." This finding was contrary

to the objectives in Modules 3 through Module 6, which were intentionally designed to incorporate technology use into instructional practice.

Table 12

Paired Samples Test 17

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 17	post17 - pre17	.17647	.52859	.12820	-.09531	.44825	1.376	16	.188

Table 13 shows no significant difference between the means of Pair 8. The results for the variables in this test, *post8* and *pre8,* were nonsignificant, with a $t(16) = 1.289$, $p > .05$. Thus, the null hypothesis was accepted. The difference between means of Pair 8 ($M = .23529$, $SD = .75245$) indicated a minimal increase in self-efficacy levels after participating in the online PD, but not one of significance.

The variables for this pair represented item #8 on the TIS, which stated: "I feel confident that I can motivate my students to participate in technology-based projects." Although no module activities were included within the online PD that purposely addressed developing motivational skills, the Module 4 objectives implied that participants would be able to "identify how technology can be used to differentiate instruction and to provide students with authentic, meaningful, and engaging learning activities." This *t*-test, however, disproved that assumption.

Table 13

Paired Samples Test Pair 8

		Paired Differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	T	df	Sig. (2-tailed)
Pair 8	post8 - pre8	.23529	.75245	.18250	-.15158	.62217	1.289	16	.216

Table 14 shows a slight difference in means for variables *post16* and *pre16* (*M* = *.29412*, *SD* = 1.04670). This difference was nonsignificant with a *t*-value of t(16) = 1.159 and a $p > .05$. The null hypothesis, therefore, was accepted.

The variables in Pair 16 represented TIS question #16, which asked: "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." Although no course objectives or activities were included that specifically addressed data collection and analysis as part of improving instructional practices, content within Module 3 and Module 4 introduced technology resources as a means of using technology for collaboration and differentiation.

Table 14

Paired Samples Test Pair 16

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 16	post16 – pre16	.29412	1.04670	.25386	-.24405	.83228	1.159	16	.264

Table 15 shows no significant difference between the means of Pair 1. The results for the variables *post1* and *pre1* were nonsignificant, with a $t(16) = 1.000$, $p > .05$. Therefore, the null hypothesis was accepted. The negative value in the difference of means between *post1* and *pre1* ($M = -.11765$, $SD = .48507$) indicated an average decrease in self-efficacy levels after participating in the online PD. However, the difference was not large enough to be significant. The question from the Technology Integration Survey (TIS) associated with this variable read, "I feel confident that I understand technology capabilities well enough to maximize them in my classroom." Therefore, this *t*-test inferred that the online PD had no profound effect on participants' self-efficacy levels as they related to an understanding of their technology skills and how they could be best maximized in the classroom. This result was contrary to the objectives of the online PD; specifically, "Develop strategies for bridging the digital divide in specific teaching situations" (Module 2), "Develop strategies for incorporating technology into the classroom for collaboration and relationship building" (Module 3), "Establish strategies to incorporate technology in classroom and homework activities to differentiate instruction" (Module 4), "Develop effective strategies for teaching students balanced, responsible use of technology, as well as critical thinking skills necessary to use technology effectively (Module 5), "Develop strategies for helping students use multitasking skills appropriately to enhance learning —as well as help them develop the ability to focus in depth on complex tasks" (ACSD, 2015, para. 1).

Table 15

Paired Samples Test Pair 1

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 1	post1 - pre1	-.11765	.48507	.11765	-.36705	.13175	-1.000	16	.332

Table 16 shows no significant difference between the means of Pair 6. The results for the variables *post6* and *pre6* were nonsignificant, with a t(16) = -1.000, $p > .05$. Therefore, the null hypothesis was accepted. The small difference of means between *post6* and *pre6* (M = -.11765, SD = .48507) indicated a minimal decrease in self-efficacy levels after participating in the online PD.

The *post6* and *pre6* variables represented item #6 on the TIS, which stated "I feel confident I can help students when they have difficulty with technology." This *t*-test inferred that minimal to no changes occurred in teachers' self-efficacy levels after the online PD contrary to what the course objectives imply.

Table 16

Paired Samples Test Pair 6

		Paired differences					T	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 6	post6 - pre6	-.11765	.48507	.11765	-.36705	.13175	-1.000	16	.332

Table 17 shows that the difference in means between variables *post20* and *pre20* (M = .17647, SD = .72761) was considered nonsignificant according to the paired samples *t*-test, which calculated a value of t(16) = 1.000, $p > .05$. Therefore, the null hypothesis was accepted.

Variables *post20* and *pre20* represented TIS question #20, which read: "I feel confident I can develop creative ways to cope with constraints (such as budget cuts on technology facilities) and continue to teach effectively with technology." No objectives or activities within the online PD specifically focused on coping strategies and teaching effectively with technology. However, Modules 3 through Module 6 were designed to develop instructional practice.

Table 17

Paired Samples Test Pair 20

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 20	post20 - pre20	.17647	.72761	.17647	-.19763	.55057	1.000	16	.332

Table 18 shows that the variables in the Pair 13 *T*-test were considered nonsignificant, with a *t*-value of t(16) = .824 and $p > .05$. The calculated difference in means between *post13* and *pre13* showed a minimal increase, with an *M*-value of .17647 and *SD* = .88284. Therefore, the null hypothesis was accepted.

Post13 and *pre13* represented the TIS question #13, which stated: "I feel confident about selecting appropriate technology for instruction according to curriculum standards." This finding was most confounding to Module 4 objectives, which were focused on differentiating instruction with technology. However, the TIS item narrowed the instructional strategy to comply with curriculum standards. None of the modules specifically addressed using technology in connection to standards for any curriculum.

Table 18

Paired Samples Test Pair 13

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 13	post13 - pre13	.17647	.88284	.21412	-.27745	.63039	.824	16	.422

Table 19 shows no significant difference between the means of Pair 2. The results for the variables *post2* and *pre2* were nonsignificant, with a $t(16) = .808$, $p > .05$. Therefore, the null hypothesis was accepted. The low value in the difference of means between *post2* and *pre2* (M =.11765, SD = .60025) indicated a minimal increase in self-efficacy levels after participating in the online PD. This difference, however, was not large enough to be considered significant.

Both the *post2* and *pre2* variables represented the TIS question #2, which stated: "I feel confident that I have the skills necessary to use technology for instruction." This *t*-test inferred that the online PD had no profound impact on teachers' self-efficacy levels pertaining to their skills and abilities to use technology for instructional purposes—a finding similar to the *t*-test for Pair 1.

Table 19

Paired Samples Test Pair 2

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 2	post2 - pre2	.11765	.60025	.14558	-.19097	.42626	.808	16	.431

Table 20 shows the result of the *t*-test for variables *post14* and *pre14*, which produced a nonsignificant result of t(16) = .808, $p > .05$. The difference in means between the pair of variables showed a minimal increase ($M = .11765$, $SD = .60025$) in participants' self-efficacy levels. Therefore, the null hypothesis was accepted.

The variables within Pair 14 represented the TIS question #14, which stated: "I feel confident about assigning and grading technology-based projects." In relation to the online PD, there were no objectives or content that specifically focused on developing the skills necessary to assign and grade technology-based projects. However, application activities were included within Module 3 through Module 6 that addressed lesson planning and teaching with technology.

Table 20

Paired Samples Test Pair 14

		Paired differences							
					95% confidence interval of the difference				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 14	post14 - pre14	.11765	.60025	.14558	-.19097	.42626	.808	16	.431

Table 21 shows minimal change in the difference of means for Pair 18 ($M = .11765$, $SD = .92752$). This difference was considered a nonsignificant value according to the *t*-test, which calculated a value of t(16) = .523, $p > .05$. Thus, the null hypothesis was accepted.

The variables *post18* and *pre18* represented TIS question #18, which stated: "I feel I can be responsive to students' needs during technology use." This was contrary to the objectives and activities within Module 2 and Module 6, which addressed "bridging the digital divide" and "teaching a balanced use of technology." The question might have been misinterpreted by the teacher based on the definition and understanding of the word "needs" in the question.

Table 21

Paired Samples Test Pair 18

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 18	post18 - pre18	.11765	.92752	.22496	-.35924	.59453	.523	16	.608

For Table 22, no significant difference was found between the means of Pair 3. The results for the variables *post3* and *pre3* were nonsignificant with a t(16) = .000, $p > .05$. Therefore, the null hypothesis was accepted. The zero value in the difference of means between *post3* and *pre3* (M =.00000, SD = .61237) indicated no change in self-efficacy levels after participating in the online PD.

The *Post3* and *pre3* variables represented question #3 in the TIS, which stated, "I feel confident that I can successfully teach relevant subject content with the appropriate use of technology." Similarly to the *t*-test for Pair 1 and Pair 2, this test inferred no meaningful effects of the online PD on teachers' self-efficacy levels concerning successful teaching with use of technology.

Table 22

Paired Samples Test Pair 3

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 3	post3 - pre3	.00000	.61237	.14852	-.31485	.31485	.000	16	1.000

Table 23 shows no significant difference between the means of Pair 7. The results for the variables *post7* and *pre7* were nonsignificant, with a t(16) = .000, $p > .05$. Therefore, the null hypothesis was accepted. The difference between means ($M = .0000$, $SD = 1.27475$) indicated a minimal change in self-efficacy levels after participating in the online PD.

The *post7* and *pre7* variables represented item #7 on the TIS, which stated: "I feel confident I can effectively monitor students' technology use for project development in my classroom." The results of this *t*-test were similar to Pairs 1-4 and 6-7, all of which are also implied contrary outcomes according to the online PD's objectives.

Table 23

Paired Samples Test Pair 7

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference Lower	Upper			
Pair 7	post7 - pre7	.00000	1.27475	.30917	-.65542	.65542	.000	16	1.000

A Connecting Assertion

One assertion from all of the paired samples tests connected Hall and Hord's (1987) Concerns Based Adoption Model to the sample of findings. Specifically, the innovation nonusers and users (i.e., teachers) all have unique user system contexts, which are implicated by the individual's placement in levels of use, stages of concern, and innovation configuration. For example, items in the pre- and postsurveys that calculated as significant can be classified under the levels of use factor as mechanical or refinement. However, the teacher's approach to using the technology was influenced by learning preferences and varying stages of concern. Therefore, each individual possessed a different set of requirements and characteristics that were indicative

of his or her learning style profile. Furthermore, this concept added to the importance of designing and implementing an individualized professional development program as the most adjustable and accommodating option for teacher growth.

Qualitative Results

The second part of this mixed-methods study was qualitative in nature and included observations, interviews, and journal analysis. The ISTE Classroom Observational Tool (ICOT) developed by Bielefeldt (2012b) was used as the primary observational instrument while note-taking and audio recordings were used during the interviews. Only 17 of the initial 42 participants successfully completed the research requirements. Therefore, only these 17 individuals were observed and had their online PD journal entries analyzed using Frederick Erickson's (1985) analytic induction methods. The other 25 participants who did not successfully complete the research requirements were still interviewed in order to obtain information as to why they did not complete the program and collect any feedback of the online PD itself. A total of eight assertions arose from the data analysis.

The first assertions were from the ICOT analysis, which compared the pre- and postobservation data. These assertions were guided by Talbot Bielefeldt's (2012b) study, wherein the ICOT allowed for seven different observable variables that were accounted for during this study.

Assertion 1

Technology density improved after the online PD.

More students were using their personal devices per classroom observation and for a longer period of instructional time as evidenced by an observed pre-online PD Density value of

6.36 to a postonline PD Density value of 2.88 and a pre-online PD sPct of 0.40 and postonline PD sPct to 0.58. One possible explanation of this can be attributed to the fact that the online PD made participants more aware of the need for technology. This was evidenced by an improvement in the ICOT variable Need (pre-online PD = 2.35; postonline PD = 2.71), which rated the necessity of using technology as opposed to alternative methods. Furthermore, some participants stated that they learned different instructional tools from the second module of the online PD that they could implement in their classrooms. For example, Mr. Moore used the blogging idea to have students post pictures of their artwork onto the class Moodle page and comment on others' posts. When speaking of the online PD, Mr. Taylor said, "It gave me ideas of other tech to use on a day-to-day basis. I've turned into a more online way of turning things in. I'm saving paper, saving time, and accommodating to more students." Similar to Mr. Taylor, Ms. Hall's instruction for the semester changed to include "more surveys and submitting work online and providing more avenues for research."

Assertion 2

Following the online PD, participants' roles remained teacher-centered.

It was an implicit/explicit goal of the online PD to promote student-centered teaching. However, a marked improvement was seen in the amount and time of technology was used during classroom instruction. This finding was supported by an observation of higher percentages of Lectures (0.31, 0.22), Interactive Direction (0.56, 0.55), and Facilitator (0.17, 0.11) in combination with teacher-centered learning activities by the students: Receive Presentation (0.32, 0.37), Writing (0.42, 0.16), Student Discussion (0.15, 0.08), and Other Activities (0.00, 0.17). The learning activities were dominated by note-taking and receiving

presentations with students being arranged in a noncollaborative grouping (Individually, Whole Class, Pairs/Small Groups).

Assertion 3

The online PD did not have a considerable effect on the preferred type of technologies for either teacher or students.

Teachers preferred to use their computers or laptops (0.37, 0.45) in combination with an interactive whiteboard (0.15, 0.47), a presentation system (0.12, 0.41), and a web browser (0.05, 0.19). On the other hand, students preferred to use handheld devices such as tablets and smartphones (0.32, 0.40) over laptops (0.28, 0.20) in combination with a text editor (0.21, 0.15) and web browser (0.29, 0.28). This finding supports the previous assertion of teacher-centered instruction as the preferred teaching and learning modality wherein teachers present material and students take notes.

Assertion 4

The online PD did not affect student engagement.

The average score of student engagement before the online PD was 0.99; it increased to 1.00 after the online PD. These values indicated that student engagement was not linked to the amount or various types of technology being used in the lesson. Almost all of the students were engaged regardless of the learning activity.

The last variable that was be measured by the ICOT involved “Addressing” or “Meeting” the ISTE (2008b) Standards for Students, formerly called National Education Technology Standards for Students (NETS). These standards are specific to learning technology skills and

knowledge that students must have to be effective and productive in a digital world. They included six main concepts:

1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem Solving, and Decision Making
5. Digital Citizenship
6. Technology Operations and Concepts. (ISTE, 2008b, para. 4)

Assertion 5

Teachers used lesson plans that consistently addressed ISTE Standards 1 and 6, but needed to be more intentional about addressing Standards 2 through 5 while paying particular attention to Standards 3 and 4, according to the ICOT.

The caveat here was that teachers were not specifically trained or expected to instruct with the ISTE Standards in mind. That said, the online PD's modules did address some of the ISTE Standards; most notably, digital citizenship and collaboration. Furthermore, some teachers affirmed the necessity for students to meet some of these standards. Mr. Moore, for example, mentioned that even though technology can be a headache at times and difficult to incorporate, "It is a skill that needs to be taught." Mrs. Clark, who had a wealth of teaching experience and therefore had seen the evolution of the teaching and learning with technology, stated, "Digital citizenship is on the student."

Assertion 6

Teachers' attitudes toward technology use in the classroom are affected by similar concerns.

One of these concerns was an unreliable and inconsistent wireless network that prevented teachers from successfully implementing web-based resources in their lesson plans. Eight teachers out of the 17 explicitly stated their frustrations—Mr. Moore, Mr. Miller, Mr. Anderson, Mr. Davis, Mrs. Jones, Ms. Allen, Mr. Adams, and Ms. Hall. Of the eight, Ms. Allen best capitulated their concerns when she said, "We take more time trying to connect than doing the activity." Another concern many teachers expressed was that students lacked digital literacy skills such as proper Internet research, easily getting distracted, and the issues revolving around plagiarism. These concerns should have been quelled by the online PD's modules, which specifically covered the "Digital Divide" and "Technological Literacy." Mr. Moore's response to Module 3 gave insight as to how daunting and confusing it is to be unable to control what students do with technology:

> I am all for incorporating technology into the classroom. If used correctly, such as how the articles and videos described the use of interactive whiteboards, it can be a great tool. However, if students are left to their own devices (figuratively and literally) most students are easily distracted by the barrage of distractions the Internet has to offer. Some of these distractions include text messages, ghat, emails, facebook, and millions of other so-called time-wasters that we all look at and get sucked into. For this reason, it is important that the use of technology is purposeful and that students have limitations of when and how they can use their

> technology. Their technology can help, but they must understand when it is OK to use their technology, and when it is not. This can be very difficult to enforce.

The fact that teachers were unable to overcome their concerns about digitally illiterate students showed the difficulty in changing attitudes using a single source of self-efficacy as the means by which to do so. In this instance, the online PD relied on a simple layer of vicarious experiences as shown through readings and videos, which were not enough to alter Mr. Moore's attitudes and self-efficacy levels. But there was a sense of hope as noted by Mrs. Clark:

> The typical concerns of educators regarding technology in the classroom consists of wasting time, no accountability, plagiarism, and general rules of digital citizenship. After allowing them more leeway during this last semester and seeing how far the school has come in general regarding digital learning communities, *I am less concerned*. The ultimate check is balance for this entire concern in digital literacy, and then engaging the student. If he knows the rules and becomes truly interested in "the project" or producing intellectual property, there will be (or should be) some pride and pay-off in what he does.

Within her journal response, Mrs. Clark showed the benefits of accepting the digital world in which her students live and loosened her grip on instructional management pieces over which she had no control—what students actually do on their devices. As a result, she became less concerned with the technology usage and was able to approach instruction from a more positive perspective. The final concern that arose out of the interviews and conversations with the participants was that of students' equitable access to the technology. As a preface, SCCHS practiced a Bring Your Own Device policy as part of its 1:1 initiative. That said, it was

surprising and enlightening to know that although teachers could be skeptical of how technology can enhance the teaching and the learning dynamic, they kept the best interests of all students at heart. The most telling story came from Mrs. Clark's interview, in which she provided a narrative of a recent classroom experience:

> The online PD was encouraging. I was encouraged by the fact that those students who do not have equitable access, that phones are becoming a better tool. With the PD, I am much more aware when a student tells me, 'I don't have this at home' or in one case 'I don't have access to a phone.' Before the PD I was not as aware of the inequities amongst the students and I might've not believed it as readily.

Module 2's learning objectives were to help teachers "Develop strategies for bridging the digital divide in specific teaching situations" and "Identify ways to overcome technological inequalities between students and teachers, among students, and between students and parents." It was in this module that teachers began to think of the implications that technology had on the lives of their students both in the classroom and at home.

Assertion 7

Teachers prefer in-person and subject-specific forms of professional development that are personalized and collaborative.

The data for this assertion provided a little insight regarding the participants' learning preference or requirement for learning: With regard to the first preference, this study's main form of delivering content was online and therefore could not directly accommodate the personal, collaborative need. Furthermore, this learning preference was connected to the underlying concept of building professional learning communities through dialogue. Prior to the study and

in years past, the faculty of SCCHS attended professional development workshops conducted by the assistant principal, in-person, and usually in large groups. The biggest proponent of community dialogue amongst the teachers was Mrs. Jones, who said that the structure of the online PD and the timeframe within which teachers were expected to finish it made her "feel rushed." She went on to say that she "likes other peoples' perspectives" and that "a dialogue is important amongst professionals and while it is important to reflect individually, it can be argued that it is equally if not more important to do so as an institution as well." Another supporter of this train of thought was Mr. Miller, who said, "I think a group discussion would help everyone and I like to learn in dialogue." Ms. Johnson also endorsed this thought by saying, "If we were to do it in a workshop, in-person, it would be more kinesthetic for me." Without generalizing to the other teachers, their statements spoke to adult learning preferences as they are connected to vicarious learning experiences. Some teachers, like Mrs. Lewis, were, as she put it, "at a level [in my professional career] where I can learn independently," but the majority of the teachers wanted to learn, communicate, and collaborate as a group of professionals. The second part of this assertion dealt with the preference of subject-specific professional development. Mr. Adams, for example, described the online PD as "one-sided and outdated; most of it was applied to English and Social Studies and not so much math." One intention of the online PD was to introduce teachers to resources and strategies that could potentially be applied to any subject matter. However, some of the teachers viewed the online PD as too broad or general.

Assertion 8

Teachers lacked the time to collaborate throughout the online PD and, therefore, were unable to build upon their levels of self-efficacy. Perhaps the most prevailing theme across all of

the journal reflections and interviews was that of time—or the lack thereof. A majority of the participants expressed their frustration with the timing and noncollaborative nature of the online PD as they expressed their likes and dislikes of the entire program. For example, Mr. Davis described the online PD as:

> It was taking way too long to finish and we are all busy people. If there is something that extensive added to our workload it should be added to our contract. It was good stuff, but it took very, very long.

This was a surprise, considering teachers were given multiple extensions to complete the online PD and enter the journal reflections over a span of three months. Furthermore, one of the benefits of the online PD was the flexibility it allowed participants in terms of being able to work on it anytime and anywhere. One consideration, however, is that teachers may have been overwhelmed with all the different changes occurring with them and to the school all at one time. For example, the school welcomed a new vice principal of academic affairs, applied a new rotating daily schedule, implemented new grading policies, and required attendance of in-person technology workshops. As Mr. Brown put it, "The teachers were being bombarded left and right with PD and change."

In conclusion, the first aim of this research was to quantitatively identify changes in self-efficacy levels after completion of an online PD focused on educational technologies. It was my hope that the online PD would have a positive impact on teacher beliefs and attitudes with regard to integrating educational technologies into their classroom instruction. This was true for only certain aspects of their self-efficacy. If the online PD were to include other avenues of learning experiences, and modalities of learning, and if it were structured in a way that best fit each

participant's busy work schedule, then perhaps a more significant positive change would have occurred.

The next goal of this study was to qualitatively record the long-term impact of the online PD on teachers' classroom instructional practices. Based on results of using the ICOT tool, an improvement was evident in the amount of technology being used as well as an increase in usage time. The online PD, however, did not change the most commonly used types of technology being used by both the teachers and students. Furthermore, the classroom setting was not all that different after the online PD in terms of the various teacher roles and student learning activities, both of which remained focused on teacher-centered instruction. The final goal of this research was to implement an effective online professional development program in which a baseline set of data was compiled to include teacher perceptions, attitudes, and best practices in the use of educational technology. This data set was created and will be used to inform future research.

CHAPTER 5

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This study was founded on the premise of improving teachers' self-efficacy levels and affecting instructional outcomes as they relate to educational technology. The medium of doing so was through participation in an online PD program that focused on integrating educational technology. The research questions that guided this study were:

1. How does an online professional development course affect self-efficacy levels concerning educational technologies for teachers in secondary schools?
2. What impact does an online professional development course have on secondary school teachers' integration of technology during classroom instruction?
3. What aspects of school culture condition teachers to actively engage or reject online professional development?

In order to address these questions, this research followed a mixed-methods design. The quantitative portion involved pre- and postsurveys while the qualitative part was based on classroom observations and interviews; respectively, each piece was labeled as Phase One and Phase Two. The previous chapter discussed this study's findings and brief analyses. This chapter continues those discussions as well as provides further insight into related topics, points of significance, and implications for future research.

Implications of Self-Efficacy Levels

One of the primary goals of this research was to measure changes in teachers' levels of self-efficacy associated with the application of educational technologies during classroom instruction, where an online PD served as a facilitator to initiate the change. The premise behind

employing the online PD was that it would have a significant effect on the participants' attitudes and perceived self-efficacy levels. However, the data from both the pre- and postsurveys showed that only eight items of the 21-item questionnaire tested as statistically significant changes. In addition to what was discussed in the previous chapter, other contributing factors led to this study's findings on self-efficacy.

First, the scope and sequence of this study was not conducive to the professional learning needs of the initial 43 participants. From the outset, many of the faculty were hesitant to participate because of the amount of time they would have to commit outside of their regular work hours. This was a surprising finding considering the flexibility in time management that online professional development programs offer. Furthermore, some apprehensive faculty members negatively criticized the process and the online course's value in a way that influenced the views and attitudes of the 17 faculty members that eventually completed the study's requirements. These critiques may have jeopardized the value of the online PD since they were coming from veteran teachers who had a strong voice among the faculty. Thus, they may have influenced many of the teachers to not finish the course or may have impacted the attitudes and self-efficacy levels of those teachers that did. It was interesting to note from this study that a comparison of individual participants pre- and post–self-efficacy levels showed an average of .190 points across the sample. And, 13 of the finishing 17 participants showed an increase in self-efficacy levels that ranged from .095 points to 1.095 points as the highest. Of the 17 participants, Mrs. Jones and Mrs. Lewis showed a difference in scores of .048 and .000, respectively. Meanwhile, Ms. Allen and Mr. Miller were the only individuals whose self-efficacy levels decreased. Therefore, the entirety of this study—including but not limited to the online PD

program—did have an effect on changing participants' self-efficacy levels. The difficult task is correlating any change, positive or negative, directly to the online PD.

On a similar note, the allotted amount of time to complete the online PD created a space for teachers to interact with other colleagues, programs, and pertinent resources of information that focused on educational technology. This opportunity allowed for a change in self-efficacy levels and attitudes that were either positive or negative depending on the type of interaction. For example, part of the school's professional expectations required teachers to attend a seminar or workshop once a quarter. The makeup of these workshops allowed for continued learning dedicated to technology use as well as provided a forum for dialogue, which was a common learning preference that emerged from the qualitative phase of this study. Furthermore, these workshops offered the flexibility of attending and learning in-person or via pre-recorded online videos with accompanying handouts. Two workshops took place during the timeframe of this study. As noted by Mr. Baker and Mr. Taylor, these in-house workshops also helped contribute to their views and attitudes toward using technology in the classroom. Thus, narrowing the sources of change in self-efficacy strictly to the online PD proved to be difficult. In response to future research, using multiple measures throughout the course of the online PD program would allow for a more descriptive dataset of minor changes in self-efficacy as well as account for any possible external sources.

Another matter of contention when it comes to teacher self-efficacy is the difficult task of changing teacher attitudes. A fundamental premise of this study was similar to what Joyce and Showers (2002) and Jones and Hayes (1980) have described as a common misconception of institutions that treat professional development programs as change agents for teacher attitudes

and beliefs. According to their studies, professional development programs rest on the assumption that change in attitudes and beliefs occurs first, and programs are designed to gain acceptance, commitment, and enthusiasm from teachers and school administrators before new practices or strategies begin implementation. These programs involve teachers in planning sessions and include needs surveys to ensure alignment of the new practices or strategies with the wants and needs of teachers. As important and meaningful as these intentions are, this approach seldom changes attitudes significantly or elicits strong commitment from teachers (Jones & Hayes, 1980; Joyce & Showers, 2002).

The intention of the online PD was exactly that—a means to change attitudes and beliefs of educational technology before implementing new practices or strategies. Herein lies the problem: some of the teachers had been previously exposed to the ideas and practices found within the online PD and, therefore, had a preconceived notion of how well they worked in the classroom. Thomas Guskey (2002) has offered an alternative linear model implying that changes in classroom practices and student learning outcomes will lead to a change in teachers' beliefs and attitudes (see Figure 4). This model of teacher change challenges conventional understandings of the purposes behind professional development programs. It implies there is no set sequence of events in terms of changing and/or developing beliefs and attitudes. Furthermore, it also lends itself to the principles behind andragogy and self-efficacy. In terms of adult learning theories, the most preferred and powerful way of learning for adults relies heavily upon experiences in life and in work. In Guskey's (2002) model, teachers would experience a change in their classroom practices as well as see the benefits that the changes would have in their students' learning outcomes. In terms of a self-efficacy, the model places adults in scenarios of

enactive mastery and vicarious learning experiences, both with the students and colleagues, while also creating a forum for dialogue and therefore, verbal persuasion. The flaw in this model, however, is that it asks teachers to take a leap of faith in implementing the pedagogical changes. In a professional learning culture like SCCHS, using new strategies, especially those that involve technology, are often viewed as a fad or trend that will eventually phase out over time. This mentality prohibits Guskey's (2002) model at SCCHS.

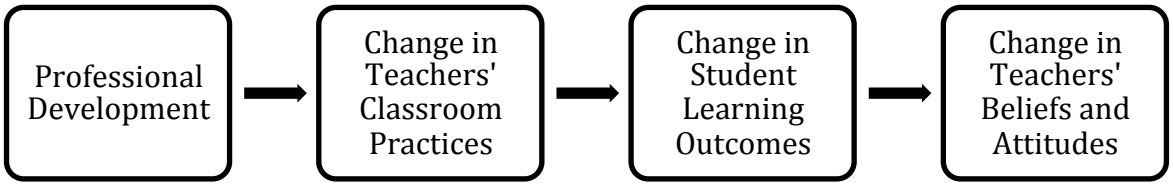

Figure 4. A model of teacher change.

In addition to the challenge of changing teacher attitudes, there is the contention of dealing with a school's culture of professional learning. This study began at a critical period in the school's history, which included a change in administration and an efflux of faculty and staff. With new administration came new initiatives, outcomes, and expectations. For the faculty and staff at SCCHS, this would prove to have a significant impact on school culture and the professional learning community especially since the principal and vice principal of academics came from outside the school. The new administration brought new ideas and challenged the status quo. This disruption left a significant impact on teachers' attitudes, especially those who had been with the school for more than a decade. Furthermore, the Common Core initiative and California's choice to adopt them by 2014 imposed a new set of student learning outcomes and curricular standards that required institutions and schools to restructure and reframe their curricula to meet the Common Core requirements. For the faculty at SCCHS, all these events

meant more to learn and work on the front end on top of their regular day-to-day professional responsibilities. In addition, many of the teachers at SCCHS were involved in extracurricular activities and obligations that required more time of them. What's more is that the school was in the last year of its current accreditation cycle, which put the school underneath a microscope both internally and externally. All of these events happened within a three-year timespan for SCCHS and led into this study's online PD. This wave of change, coupled with teachers' apprehension toward change, generated a sense of resistance and reluctance toward the proposed online professional development program, thus influencing attitudes, self-efficacy levels, and ultimately full participation by the faculty.

Implications to Classroom Instruction

Another goal of this research was to explore the long-term impact of the online PD on classroom instruction. Following analysis of the ISTE Classroom Observational Tool (Bielefeldt, 2012b), referred to as ICOT, the most prevailing assertions were: (a) an increase in the amount of technology present per classroom, (b) no marked difference in participants' roles of teacher-centered instruction, (c) no change in preference of the type of technology used by either teacher or student, (d) no change in student engagement, (e) lesson plans failed to meet a majority of the ISTE Standards for Students, (f) teachers' attitudes towards technology were affected by similar concerns, (g) teachers preferred in-person and subject-specific professional development, and (h) teachers' preferred vicarious learning experiences but lacked the time to collaborate. These eight assertions were further grouped into two themes.

The first theme was that it is a necessity to develop a higher quality of teaching that uses best practices in integrating educational technology. Furthermore, in connection with this theme

and the principles behind andragogy, self-efficacy, and a growth mindset, the second theme was that implementing a personalized professional development plan tailored to pedagogical growth would have a more profound and meaningful impact on the teaching-learning dynamic and, thus, would have a positive impact on student outcomes. These themes are articulated in detail in the following discussions.

In this study, although the quantity of technology increased, there was no significant change in the teaching-learning dynamic. Both teachers and students stayed with their preferred type of technology and kept to their pre-online PD roles of information-deliverer and knowledge-taker, respectively. This pedagogical model follows what Paolo Freire's defined as a "banking concept of education" (Freire, 2000). This is further supported by the ICOT's observable variable of ISTE (2008b) Standards for Students, which concluded that although the six main standards were "addressed," the teachers as a whole were not conducting learning activities that consistently "met" each standard and especially needed help with Standard 3 and Standard 4: researching and information fluency, and critical thinking, problem solving, and decision-making. Granted, teachers were never explicitly instructed per school policy or professional expectations to teach with these standards in mind, and for many of them, this study was the first time they may have been exposed to the ISTE Standards at all.

The teachers and the online PD were not entirely to blame. Bringing about any change in schools is a complicated process that involves the entire community of students, parents, teachers, and administrators. Furthermore, change is a process and not an event; in other words, it does not happen overnight (Hall, Wallace, & Dossett, 1973). Keeping this principle in mind, to cause a shift in attitudes and best practices in teacher pedagogies runs parallel to the change process

timeline. In the context of this study, therefore, it was somewhat unreasonable to expect teachers to quickly implement or adjust their pedagogy after a three-month long online professional development program wherein they had the flexibility to control what they learned and when they learned it. One of the strengths of using online PD is the user's freedom and autonomy to learn at his or her own pace. In relation to change theory, however, this characteristic produces an undesired effect of slowing the change and implementation process. To that end, Guskey's (2002) proposed model of teacher change is appealing because it allows for a reordering of events along the change continuum wherein pedagogical change occurs first, followed by positive student outcomes, and then a change in teacher attitudes. Again, adult educators and administrators should be cautious and aware that this model applies to the adult learner who is not adverse to new strategies and is willing to adapt his or her instruction accordingly.

To that end, one possible strategy to help guide teachers and administrators toward successful integration of educational technologies during instruction is to include common standards and expectations of best practices with these technologies. The combination of ISTE (2008a, 2008b) Standards for Students, Teachers, and Administrators provides a cohesive suite of interrelated outcomes, which can serve as the foundation for basic principles of implementing a school-wide initiative. This approach offers a three-tier system of standardization and accountability, which is already being used in schools nationwide. These standards are just a suggestion, however, and are not the only option for any school. One advantage they have over other alternatives is the fact that the ISTE Standards are supported with relevant research, literature, and input from numerous educators and field experts that contributed to their development.

The qualitative phase of this study also found that each teacher had a set of unique learning preferences. Taking Malcom Knowles's (1970) theory of andragogy into consideration, it is possible that adults have particular learning styles specific and unique to their situations. This is aligned with andragogy's five underlying assumptions, which posit life experiences and changing social roles as enriching facets of learning. Furthermore, any combination of the five assumptions and various life experiences could lead to a more distinct and specific style of learning. Albert Bandura's (1986) principles of social cognitive theory are also applicable in determining learning preferences. According to Bandura, human behavior, learning in this case, occurs through an interplay of personal, behavioral, and environmental influences. This "triadic reciprocality" influences the personal experiences of each individual and, thus, will affect each person's learning preferences. The life experiences of the teacher participants at SCCHS varied depending on their age, teaching experience, and level of education; each of which represented a wide range of values. These presumptions, then, implicitly necessitate individualized professional development programs: not generalized, but subject-specific and tailored in a way that promotes and tracks pedagogical growth.

Implications of School Culture

This study began during a time of transition in leadership. The first sets of pre-online PD classroom observations were completed at the end of the new principal's second year and the remaining items of survey data and postonline PD observations were completed at the beginning of his third year. Additionally, a new vice principal of academics was added to the school administration. With new leadership came new initiatives and professional expectations. For example, teachers within the math and science department were expected to attend professional

development workshops focused on implementing best practices of the recently adopted Common Core State Standards and Next Generation Science Standards, respectively. These workshops took place at least once a month, requiring an average of 90 minutes, and were led by local university professors. This program's intentions were to align the math and science curriculum to the new incoming standards while strengthening teacher pedagogies and best practices. However, not all members were completely supportive of the new initiative and some opted not to participate in the program. Furthermore, those in opposition to change relied on each other for support, thus creating an oppositional collective. This mentality toward opposing new initiatives and new professional commitments had negative effects on these teachers' attitudes and approaches toward completing the online PD. Only three out of the six math teachers finished the online PD in addition to the two out of seven science teachers. Furthermore, as veteran teachers whose opinions, concerns, and decisions were valued and respected by many, these teachers influenced other faculty members.

In addition to the change in leadership, teachers at SCCHS were contracted to accompany their students in extracurricular activities either through their presence or as moderators. For example, many of the faculty served as chaperones at multiple school events throughout the year, which lasted an average of two to three hours. Teachers also moderated student-led organizations and clubs, which met on their own time during the regular school week and throughout the year. Teachers also coached sports in every season. In short, being a teacher at SCCHS meant more than classroom activity; it required individuals to wear multiple hats. This concept was nothing new to the faculty; however, it affected their attitudes toward accepting and implementing new tasks, initiatives, or policies. Furthermore, the idea of wearing multiple hats supported the

necessity of teachers' requiring more time to meet their professional expectations and classroom responsibilities, which was one of the assertions addressed in Chapter 4. Ms. Johnson, for example, was willing to try new technologies, but felt she did not have enough time in her workdays to successfully use them in her classroom. She said in one of her journal responses, "As far as challenges, it comes down to time—how much time do I have to play around with the application."

Part of the academic program at SCCHS included a robust technology program highlighted by a Bring Your Own Device (BYOD) policy for students. This policy required students to have a smartphone, tablet, or laptop for academic purposes, whether it was in the classroom or elsewhere on campus. This proved a challenge for many of the faculty members in terms of successful instructional implementation because of the various skillsets, attitudes, and learning curves. Furthermore, the online network infrastructure was not configured and maintained to accommodate a substantial rise in data bandwidth. School administrators, therefore, designed in-house professional development opportunities, which focused on best practices of teaching with technology and did so throughout the entire year. They also created a new administrative position to deliver these professional development workshops, which the teachers appreciated. However, these workshops required more time away from their already busy schedules; and thus, teachers were reluctant to complete the online PD program. Already inundated and overwhelmed with technology workshops, faculty treated the voluntary online PD as an expendable task on their growing list of responsibilities.

Another factor in teachers' decisions to engage or dismiss the online PD was the added burden of SCCHS preparations for an accreditation visit. This required teachers to participate in

after-school meetings wherein they gathered in groups according to areas of Catholic identity, teaching and learning, support, school organization, and material stewardship. Each member was assigned a list of tasks to complete in order to populate a data library for the school's self-study report. Although a majority of the teachers had previously experienced an accreditation cycle, there was a sense of disdain toward the process because of the amount of time it required from each person. Coupled with the professional development workshops, extracurricular commitments, and teaching responsibilities, all of this study's participants were engulfed in what seemed to be an insurmountable challenge of tasks and, therefore, were not inclined to participate or complete the online PD.

Needless to say, this study was conducted during a critical time period in SCCHS's history. It was a time of change across many levels of school organization, management, and classroom dynamics. These factors negatively impacted teachers' attitudes and approaches toward new expectations and, ultimately, the online PD program.

Evaluation of the Study

Another aim of this study was to implement an effective online PD program in order to better inform the school's administrative personnel about faculty perceptions and uses of educational technology. In turn, this study would have implications on future planning for teacher professional development on an individual, case-by-case basis. The following items present some generalizations about the faculty at SCCHS that arose from further analysis of this study's findings presented in Chapter 4 in order to provide some context towards an evaluation of this study's research methodology and effectiveness in informing the administration about the next steps moving forward:

1. A majority of the faculty had average self-efficacy levels about integrating educational technologies during instruction. On a scale of 1 (lowest) to 5 (highest), the average score across all teachers—participants or not—before the online PD was 3.755.
2. Teachers remained confident about their ability to teach relevant subject content amidst skepticism from colleagues, but required work-embedded support structures like a forum for dialogue and allocated time to do so.
3. Multiple preferred learning modalities were represented across the faculty, which were best served by different forms of professional development; the single delivery method of traditional in-person workshops or strictly online PD did not meet everyone's learning needs.

In regard to assessing teacher self-efficacy levels, this study's design presumed that all teachers would be open to being participants. Many of the teachers' initial concerns involved the estimated 20-hour time commitment that the online course proposed for successful completion. Part of their worry came from experiences in recent years wherein they had little to no additional time in their professional workdays to perform other work-related duties and responsibilities. As was often anecdotally mentioned about teachers and those that work in Catholic schools in particular, *teachers wear multiple hats*. This was not the case for every teacher, but the voices of the few who held credibility and weight amongst the rest of the faculty were able to sway and influence other teachers who were apprehensive and skeptical of the study's objectives. Subsequently, their attitude and negative outlook on the online professional development and this study's program design as a whole would spread to a majority of the teachers and, therefore, not everyone chose to participate in the study. This led to a decreased sample size from 43 to 17,

thus driving the quantitative measurements to multiple paired-samples testing instead of the proposed analyses of variances or multiple analyses of variances.

Another characteristic of this research design involved the implementation of the online course as a means to improve teachers' outlook and practice for using educational technology during instruction. There was a marked increase in the quantity of technology being used in the classrooms, but there was also a lack of change in the teaching and learning roles by both teachers and students. According to literature and research, technology is ineffectively used to support instructional methods such as student-centered approaches that are believed to be the most powerful for facilitating student learning (Cuban, Kirkpatrick, & Peck, 2001; International Society for Technology in Education, 2008; Partnership for 21st Century Learning, 2007). The online PD's objectives included ways to develop strategies and examples of best practices that used technology throughout instruction. This study concluded that some of the participants were reluctant to change their lesson plans even after being presented with supportive research and examples of successful implementation. Much of this speaks to the difficult process of changing teacher behaviors (Guskey, 2002).

In response to these findings, future research can include modifications to this study's design and methodology. Timing is one example. Generally speaking, online PD offers access to the course content from anywhere in the world as long as the user has a suitable digital device and Internet connection. This means future use of online professional development need not be restricted to the walls of a school, office, library, or home—it can be done anywhere, essentially. Keeping this in mind, administrators can accommodate teachers' limited amount of space and work time by framing an online PD as part of continuing education over the summer. Or, schools

can dedicate a block of days before or after the academic calendar year for teachers to work on the program. Another alternative would be to commit to multiple faculty meetings that would normally be transactional in nature but instead serve as an opportunity for teachers to work on the program in community. Furthermore, administrators can use multiple checkpoints throughout the program in order to intermittently measure for changes in self-efficacy levels. This would allow for a detailed and precise dataset to be collected and analyzed on a frequent basis. Lastly, the study's timeframe can also be designed to last for more than three to four months. By combining a multiple measurements approach with a longer timeframe for implementation, administrators can track and account for any changes in teacher attitudes and self-efficacy levels at specific points in the program's timeframe.

Another suggestion is to include the online PD program as part of each teacher's professional expectations. This requires the program to be included as part of their employee contract to ensure full participation and uphold teacher accountability. However, in order to have a meaningful impact on pedagogy, this study's findings and supporting literature concluded that the program must be subject-specific and applicable to the workplace (Bandura, 1997; Guskey 1994). This gives rise to the possibility of different online PD programs that are geared toward teaching best practices within each academic department. For example, the English Department would benefit more from a program that trains teachers and students on developing literary critique than would the science teachers. Conversely, science teachers would benefit more from a program that trains teachers and students about inquiry-based lab experiments than would the English teachers. This notion does not rule out the chance of implementing a common, school-wide program. If professional development were to focus on teaching and developing skills such

as critical thinking, problem solving, and communication, then the program would apply to all teachers. Furthermore, a connection of the program's objectives to that of school and state policies is needed. Specifically, if the content spoke to the proper implementation of Common Core State Standards or Next Generation Science Standards, for example, then it would become more meaningful for the teachers.

Next, offering different methods of PD that adapt to each teacher's needs is preferable and can potentially lead to future research topics. Using online PD as the primary source of content and information delivery did not accommodate teachers' various learning styles. That said, administrators must offer teachers a choice in deciding on the professional development program's method of delivery—in-person, a hybrid of in-person and online, or purely online. The task of finding subject-specific programs that are work-related resides in the hands of the administrator who must also have an accurate understanding of each teacher's needs for professional growth.

To that end, effective professional development geared to improving student learning outcomes must focus on developing teacher pedagogies, rather than just showing instructional tools and resources. Perhaps the most important modification to this study's methodology involved creating a personalized, professional growth plan that served as a guide and accountability structure. The genesis of this idea came from this study's prevalent finding that each teacher had a unique learning style and that professional development cannot be approached as a "one size fits all" treatment. Therefore, for professional development to be truly impactful, meaningful, and purposeful in changing both teacher pedagogy and student outcomes, an effective way to monitor this process and make adjustments when necessary is to develop

personalized, professional growth plans. Each plan necessitates that the administrator and teacher work collaboratively to identify pedagogical strengths and weaknesses both in a quantitative and qualitative way. Furthermore, they must share a reasonable expectation as to which learning and performance outcomes are measureable and realistic. A proposed implementation plan that includes all of these factors can be the focus of future research.

Emerging Ideas

As the researcher, I constantly found myself questioning the literature, previous research, findings, analyses, and conclusions. In the following sections, I have expanded on two questions that struck me in particular and the possible explanations and connections to this study and future research.

One idea behind teacher change that was constantly in the back of my mind asked the question: What was the common factor that initiates an authentic response to change teacher behavior? My answer three years ago—at the onset of this study—would have been from a social cognitive theory point of view. Albert Bandura's theory of triadic reciprocality (1986) made the most sense in explaining human behavior because it takes into account the different sources of information that influence cognitive development. One end of the triangle groups personal attributes like knowledge, beliefs, ethics, and morals. Another includes behavioral factors such as performance feedback, which is connected to Bandura's theory of enactive mastery as a source of self-efficacy. And the last idea in triadic reciprocality accounts for the effect of environmental influences on behavior—social interactions. But, this concept provides a framework for understanding who an individual is and how his or her present state of behaviors came to fruition. It is not an explanation of the instantaneous causation of behavioral change that

occurs after learning takes place. Throughout the process of this study and in dialogue with other experts and professionals in the field of educational psychology, I came across the work of Jack Mezirow (1991; Mezirow & Associates, 2000; Mezzirow & Taylor, 2009) and his theory of transformational learning. According to this theory, the core elements that foster transformational learning involve: (a) individual experiences, (b) critical reflection, (c) dialogue, (d) holistic orientation, and (e) awareness of context The idea of critical reflection resonated with me as the most plausible explanation to my previous question because it refers to a process or event that can initiate the behavioral change. In this study, for example, Mrs. Clark referred to an experience in her classroom wherein a student failed to bring in his homework because he did not have a printer at home. Up until this moment, and before the online PD, Mrs. Clark believed that the ever-decreasing cost of technology meant that more and more households had access to these technologies, especially those that SCCHS serves. After the online PD and at the moment of her conversation, Mrs. Clark was able to critically reflect on her own beliefs and understandings of what was actually taking place in her students' lives. Therefore, she was not quick to conclude that the young man might be lying, but rather relied on her newfound understanding and approached the young man's situation as an authentic one; she was more aware of the student's cultural life and circumstances.

The other question with which I continued to struggle addressed the differences in school culture on teachers. Specifically: In what ways does a Catholic school's identity and culture affect teacher learning, attitudes, and self-efficacy levels, and do they differ from those of the public school sector? Unfortunately, this is an emerging field of research for me and thus I have no credible sources of literature to help form a coherent, critical lens. However, what I lack in

depth of literature I can make up for in breadth of experience. The histories and foundations of Catholic schools are deeply rooted in the principle of serving others and many schools' missions and educational philosophies speak to this idea. To that end, Catholic schools thrived in the early 1900s while showing a peak in national enrollment in 1964 (DeFiore, Convey, & Schuttloffel, 2009). Shortly after, however, came a steady decline in enrollment, and schools began to close. This decline, coupled with the diminishing number priests and clergymen taking on the roles of classroom teachers, placed Catholic schools in dire need of a new direction. Herein lay the challenge: Catholic schools found it difficult to remain open and relevant because, as organizational institutions of learning, their success was predicated on servicing the needs of others. Many Catholic school communities and people changed and so did their needs, but institutional advancement and organizational development did not. Religious orders and the rising class of laypersons experienced an increased amount of pressure to keep schools open and the faith alive. They, as the priests and clergymen before them, dedicated their time and energy in long workdays to serve the school in different capacities. This workman's attitude and ethic disseminated into the entire being and culture of the schools to this day. The implication of this environment on teachers was an increased sense of pride in providing sustainable services and education for the community. But, the underlying story here is the effect of this engrained, hard-head mentality and its causation of a reluctance to change or adopt innovations.

One can say that Catholic schools are behind the times when it comes to innovation and progress. At SCCHS, a mentality existed wherein teaching methods and organizational operations that have proved successful in the past were still relevant and applicable to present and future students. This adverse thinking added another layer of difficulty in implementing

change and educational transformation, particularly when it came to the teaching and learning dynamics of the classroom. Change was further complicated in the event of a turnover in leadership and new initiatives, which was the case at SCCHS. This current situation circled back to my question of Catholic school culture and its effect on teachers, which led me to an alternative theory of learning and change: growth or fixed mindsets by Carol Dweck (2006).

Dweck's work on mindsets began in 1986 with Elaine Elliott in empirical study of children's approach to motivation and achievement (Dweck & Elliott, 1983; Elliott & Dweck 1988). They concluded that learning and performance goals amongst children operate under different factors and therefore produce different cognitive, affective, and behavioral responses, which is similar to Albert Bandura's model of triadic reciprocal causation (Bandura, 1986). This early work led to Carol Dweck's seminal book, *Mindset: the New Psychology of Success* (2006). One of the main takeaways from this book, which is applicable to individuals framing a new lens of self-efficacy, is that "great teachers believe in the growth of the intellect and talent, and they are fascinated with the process of learning" (p. 194). Furthermore, Dweck (2006) briefly discussed psychologist Aaron Beck's (1963) work on an individual's set of beliefs and its impact on personal feelings and emotions. Although not explicitly stated in her book, Carol Dweck (2006) constantly referred to narratives that described components of Jack Mezirow's model of transformational learning for adult learners (Mezirow, 1991; Mezirow & Associates, 2000; Mezzirow & Taylor, 2009).

Certain faculty members at SCCHS developed a culture of fixed-mindsets and mediocre standards, which minimized growth and hindered progress for both the school and, ultimately, its students. Although a change in leadership over the past years has created a sense of uneasiness

amongst the faculty, it has also stimulated a change in conventional thought and ushered in a new era of expectations. This, in turn, created an opportunity for the faculty to critically reflect on pedagogies and narratives so as to begin the process of institutional and personal growth. Throughout the course of this study, there was a recognizable change in SCCHS's faculty that was indicative of an organization going through transformational change from average to continuous and sustainable growth.

Implications for Future Research

This study continued the discussion of adult learning theory, teacher self-efficacy, and effective professional development. The goals and purposes of this research were to improve teachers' perceptions, attitudes, and best practices in integrating educational technology. This study's research design and methodology produced data that indirectly addressed each outcome. Furthermore, this study gave rise to new approaches and concepts that branch into relevant and related literature as well as implications for future research pertaining to professional development. One point of consideration is that of hybrid models of professional development. This study concluded that online PD is not the best-fit model for addressing the different learning needs of multiple types of learners. Some warranted in-person workshops while others were content with the online method. The findings within this study indirectly imply a need for more research on teacher preferences for multiple methods of delivering professional development. Another point for future research can be framed from the connectedness of the different theories presented in this study. There are similarities within Bandura's (1986) principles of self-efficacy and social cognitive theory, Malcolm Knowles's (1970) theory of andragogy, Thomas Guskey's

(2002) proposed model of teacher change, and Carol Dweck's (2006) concept of mindsets. With all these in mind, it is understood that more work remains to be done.

References

Alavi, M., & Joachimsthaler, E. A. (1992). Revisiting DSS implementation research: A meta-analysis of the literature and suggestions for researchers. *MIS Quarterly, 16*(1), 95–116.

Ally, M. (2004). Foundations of educational theory for online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 3–32). Alberta, Canada: Athabasca University.

ASCD. (2015). *Technology in schools: A balanced perspective*. *An ASCD Online PD Course ®*. Retrieved from http://shop.ascd.org/Default.aspx?TabID=55&ProductId=123582953

Axinn, W. G., & Pearce, L. D. (2006). *Mixed method data collection strategies.* New York, NY: Cambridge University Press.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents*, *5,* 307–337.

Barnet, M. (2002). *Issues and trends concerning electronic networking technologies for teacher professional development: A critical review of the literature.* Paper presented at the American Educational Research Association, New Orleans, LA.

Beck, A. (1963). Thinking and depression: Idiosyncratic content and cognitive distortions. *Archives of General Psychology, 9,* 325–333.

Berliner, D. C. (1994). Expertise: The wonder of exemplary performances. In J. Mangieri & C. C. Block (Eds.), *Creating powerful thinking in teachers and students: Diverse perspectives* (pp. 161–186). Fort Worth, TX: Harcourt Brace College Publishers

Berliner, D. C. (2001). Learning about and learning from expert teachers. *International Journal of Educational Research, 35*(5), 463–483.

Berman, P., & McLaughlin, M. W. (1978). *Federal programs supporting educational change: Vol. 3: Implementing and sustaining innovations.* Santa Monica, CA: Rand.

Bielefeldt, T. (2012a). Guidance for technology decisions from classroom observation. *Journal of Research on Technology in Education, 44*(3), 205–223.

Bielefeldt, T. (2012b). *ISTE classroom observation tool: ICOT v3.1 user manual.* Eugene, OR: International Society for Technology in Education.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3–15.

Brown, I., & Inouye, D. K. (1978). Learned helplessness through modeling: The role of perceived similarity in competence. *Journal of Personality and Social Psychology, 36*, 900–908.

Chambliss, C. A., & Murray, E. J. (1979a). Efficacy attribution, locus of control, and weight loss. *Cognitive Therapy and Research*, *3*(4), 349–353.

Chambliss, C. A., & Murray, E. J. (1979b). Cognitive procedures for smoking reduction: Symptom attribution versus efficacy attribution. *Cognitive Therapy and Research*, *3*(1), 91–95.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal, 38*, 813–834.

Darling-Hammond, L. (1997). *Doing what matters most: Investing in quality teaching.* Kutztown, PA: National Commission on Teaching and America's Future.

Darling-Hammond, L. (1999). Educating teachers for the next century: Rethinking practice and policy. In G. A. Griffin (Ed.), *The education of teachers* (pp. 221–256). Chicago, IL: University of Chicago Press.

Darling-Hammond, L. (Ed.). (2000). *Studies of excellence in teacher education* (Vols. 1–3). Washington, DC: American Association of Colleges for Teacher Education.

Darling-Hammond, L., Hammerness, K., Grossman, P., Rust, F., & Shulman, L. (2005). The design of teacher education programs. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 390–441). San Francisco, CA: Jossey-Bass.

Darling-Hammond, L., & MacDonald, M. (2000). Where there is learning there is hope: The preparation of teachers at the Bank Street College of Education. In L. Darling-Hammond (Ed.), *Studies of excellence in teacher education: Preparation at the graduate level* (pp. 1-95). Washington, DC: American Association of Colleges for Teacher Education.

Davis, M. R. (2009, March 13). Online professional development weighed as cost-saving tactic. *Education Week: Digital Directions*. Retrieved from http://www.edweek.org/dd/articles /2009/03/13/04ddprofdev.h02.html

Dede, C. (2006). *Online professional development for teachers: Emerging models*. Cambridge, MA: Harvard Education Press.

Dede, C., Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. (2009). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(11), 8–19.

DeFiore, L., Convey, J. J., & Schuttloffel, M. J. (2009). *Weathering the storm: Moving Catholic schools forward.* Washington, DC: National Catholic Educational Association.

Dweck, C. (2006). *Mindset: The new psychology of success.* New York, NY: Random House.

Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. *Handbook of child psychology*, *4*, 643-691.

Elliott, E. S., & Dweck, C. S. (1988). An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54*(1), 5–12.

Erickson, F. (1985). *Qualitative methods in research on teaching* (Occasional Paper No. 81). East Lansing, MI: The Institute for Research on Teaching, Michigan State University.

Fuller, F. F. (1969). Concerns of teachers: A developmental conceptualization. *American Educational Research Journal, 6*(2), 207–226.

Freire, P. (2000). *Pedagogy of the oppressed*. New York, NY: Bloomsbury Publishing.

Gessner, R. (Ed.). (1956). *The democratic man: Selected writings of Eduard C. Lindeman.* Boston, MA: Beacon.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology*, *76*(4), 569.

Guskey, T. R. (1994). *Professional development in education: In search of the optimal mix.* Paper presented at the annual meeting of American Educational Research Association, New Orleans, LA.

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice, 8*(3/4), 381–391.

Hall, G. E., & Hord S. M. (1987). *Change in schools: Facilitating the process*. Albany, NY: State University of New York.

Hall, G. E., & Hord, S. M. (2011). *Implementing change: Patterns, principles, and potholes* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Hall, G. E., Loucks, S. F., Rutherford, W. L., & Newlove, B. W. (1975). Levels of use of the innovation: A framework for analyzing innovation adoption. *Journal of Teacher Education, 26*(52), 52–56.

Hall, G. E., Wallace, R. C., & Dossett, W. A. (1973). *A developmental conceptualization of the adoption process within educational institutions*. Austin, TX: Research and Development Center for Teacher Education, The University of Texas.

Harlen, W., & Doubler, S. (2007). Researching the impact of online professional development for teachers. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage handbook of e-learning research* (pp. 466–487). London, UK: Sage Publications. doi:10.4135/9781848607859

Hatano, G., & Inagaki, K. (1986). Two courses of expertise. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.). *Child development and education in Japan* (pp. 262–272). New York, NY: Freeman.

Hatano, G., & Oura, Y. (2003). Commentary: Reconceptualizing school learning using insight from expertise research. *Educational Researcher, 32*(8), 26–29.

Hawley, W., & Valli, L. (1999). The essentials of effective professional development: A new consensus. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 127–150). San Francisco, CA: Jossey-Bass.

Holden, H., & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on Technology in Education, 43*(4), 343–367.

Holton, E. III, Knowles, M., & Swanson, R. (2005). *The adult learner: The definitive classic in adult education and human resource development*. Burlington, MA: Elsevier.

Hunzicker, J. (2011). Effective professional development for teachers: A checklist. *Professional Development in Education, 37*(2), 177–179.

International Society for Technology in Education (ISTE). (2008a). *National educational technology standards for teachers* (2nd ed.). Eugene, OR: Author.

International Society for Technology in Education (ISTE). (2008b). *National educational technology standards for students.* Retrieved from http://www.iste.org/standards/iste-standards/standards-for-students

Jackson, P. W. (1974). *Life in classrooms.* New York, NY: Holt, Rinehart & Winston.

Jones, L. L., & Hayes, A. E. (1980). How valid are surveys of teacher needs? *Educational Leadership, 37*, 390–392.

Joyce, B., & Showers, B. (2002). *Designing training and peer coaching: Our needs for learning*. Alexandria, VA: ASCD.

Kennedy, M. (1999). The role of preservice teacher education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 54–85) San Francisco, CA: Jossey Bass.

Knowles, M. (1970). *The modern practice of adult education: Andragogy versus pedagogy*. New York, NY: Association Press.

Knowles, M. (1973). *The adult learner: A neglected species*. Houston, TX: Gulf Publishing.

Knowles, M. (1977). *A history of the adult education movement in the United States: Includes adult education institution*. Huntington, NY: R. E. Krieger Publishing.

Lindeman, E. C. (n.d.). In *Wikipedia.* Retrieved from https://en.wikipedia.org/widi /Eduard_C._Lindeman

Lindeman, E. C. (1926). *The meaning of adult education*. New York, NY: New Republic.

Lock, J. (2006). A new image: Online communities to facilitate teacher professional development. *Journal of Technology and Teacher Education, 14*(4), 663–678.

Lortie, D. C. (1975). *Schoolteacher; A sociological study.* Chicago, IL: University of Chicago Press.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco, CA: Jossey-Bass.

Mezirow, J., & Associates. (2000). *Learning as transformation*. San Francisco, CA: Jossey-Bass.

Mezirow, J., & Taylor, E. W. (2009). *Transformative learning in practice: Insights from community, workplace, and higher education*. San Francisco, CA: Jossey-Bass.

Miles, K. H., Odden, A., Fermanich, M., & Archibald, S. (2004). Inside the black box of school district spending on professional development: Lessons from five urban districts. *Journal of Education Finance*, 1-26.

National Commission on Teaching and America's Future. (2003). *No dream denied: A pledge to America's children*. Washington, DC: Author.

National Research Council. (2005). *How students learn: History, mathematics, and science in the classroom*. Washington, DC: The National Academies Press.

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107–110, § 115, Stat. 1425 (2002).

Partnership for 21st Century Learning. (2007). *Framework for 21*st-*century learning*. Retrieved from http://www.p21.org

Rogers, C. (1969). *Freedom to learn: A view of what education might become*. Columbus, OH: Merrill Publishing.

Schwartz, D. L., Bransford, J. D., & Sears, D. (2005). Efficiency and innovation in transfer. *Transfer of learning from a modern multidisciplinary perspective*, 1–51. Retrieved from http://aaalab.stanford.edu/papers/innovation_in_transfer.pdf

Tashakkori, A., & Teddlie, C. (2002). *Handbook of mixed methods in social & behavioral research.* Thousand Oaks, CA: Sage Publishing.

Thorndike, E. (1928). *Adult learning*. New York, NY: MacMillan.

Thorndike, E. (1935). *Adult interests*. New York, NY: Macmillan.

van Enckevort, G. (1971). *Andragology: A new science*. Amersfoort, Netherlands: Nederlands Centrum Voor Volksontwikkeling.

Wang, L., Ertmer, P., & Newby, T. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal for Research on Technology in Education, 35*(3), 231–250.

Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the US and abroad: Technical report*. Dallas: National Staff Development Council.

APPENDIX A

TECHNOLOGY INTEGRATION SURVEY (TIS)

Participant's Name:_____

Disclaimer:

Thank you for choosing to participate in this research. This survey is intended for research purposes only and your name and responses will be kept confidential. Your employment will not be affected by your participation or responses, in any way.

Please insert the completed survey into the unmarked envelope, sealed, and returned to Jose Carlo De Vera either by hand or via mailbox.

Thank you.

Technology Integration Survey

Directions: The purpose of this survey is to determine how you feel about integrating technology into classroom teaching. For each statement below, indicate the strength of your agreement or disagreement by circling one of the five scales.

Below is a definition of terms with examples:

Technology: an electronic device that is used to aid teachers during instruction or student learning.

Examples: computer, laptop, Interactive Whiteboard, tablet, wireless mouse, Internet, projectors, smartphone, cell phone, response clickers, etc.

Technology integration: teachers using an educational technology to support students as they construct their own knowledge through the completion of authentic, meaningful tasks assigned and facilitated by the teacher.

Examples:
Teachers using laptops to project content information onto a screen.
Teachers using webcams and/or phone cameras to display student work.
Teachers using software to supplement student learning.

Using the above as a baseline, please circle one response for each of the 21 statements in the table:

SD = Strongly Disagree, D = Disagree, NA/ND = Neither Agree nor Disagree,
A = Agree, SA = Strongly Agree

1.	I feel confident that I understand technology capabilities well enough to maximize them in my classroom.	SD	D	NA/ND	A	SA
2.	I feel confident that I have the skills necessary to use technology for instruction.	SD	D	NA/ND	A	SA
3.	I feel confident that I can successfully teach relevant subject content with the appropriate use of technology.	SD	D	NA/ND	A	SA
4.	I feel confident in my ability to evaluate software for teaching and learning.	SD	D	NA/ND	A	SA
5.	I feel confident that I can use correct technology terminology when directing students' technology use.	SD	D	NA/ND	A	SA
6.	I feel confident I can help students when they have difficulty with technology.	SD	D	NA/ND	A	SA
7.	I feel confident I can effectively monitor students' technology use for project development in my classroom.	SD	D	NA/ND	A	SA
8.	I feel confident that I can motivate my students to participate in technology-based projects.	SD	D	NA/ND	A	SA
9.	I feel confident I can mentor students in appropriate uses of technology.	SD	D	NA/ND	A	SA
10.	I feel confident I can consistently use technology in effective ways.	SD	D	NA/ND	A	SA
11.	I feel confident I can provide initial feedback to students during technology use.	SD	D	NA/ND	A	SA
12.	I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.	SD	D	NA/ND	A	SA
13.	I feel confident about selecting appropriate technology for instruction according to curriculum standards.	SD	D	NA/ND	A	SA
14.	I feel confident about assigning and grading technology-based projects.	SD	D	NA/ND	A	SA
15.	I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.	SD	D	NA/ND	A	SA

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.	SD	D	NA/ND	A	SA
17. I feel confident that I will be comfortable using technology in my teaching.	SD	D	NA/ND	A	SA
18. I feel confident I can be responsive to students' needs during technology use.	SD	D	NA/ND	A	SA
19. I feel confident that as time goes by, my ability to address my students' technology needs will continue to improve.	SD	D	NA/ND	A	SA
20. I feel confident that I can develop creative ways to cope with constraints (such as budget cuts on technology facilities) and continue to teach effectively with technology.	SD	D	NA/ND	A	SA
21. I feel confident that I can carry out technology-based projects even when I am opposed by skeptical colleagues.	SD	D	NA/ND	A	SA

APPENDIX B

PRE ONLINE PD DATA

Participants	PRE Survey Item																					Mean
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Adams	4	4	4	3	4	4	2	4	3	3	4	4	4	4	3	2	4	4	4	4	4	3.619
Brown	4	4	4	4	4	3	3	5	4	4	3	4	4	3	4	3	4	3	4	4	4	3.762
Taylor	5	5	5	4	4	4	4	4	4	4	3	4	4	3	4	3	4	4	4	5	4	4.048
Anderson	5	5	4	4	4	5	3	4	3	4	5	5	4	5	5	5	4	3	4	3	5	4.238
Hall	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	3.952
Davis	3	4	4	2	4	3	2	4	3	4	3	4	3	3	4	2	4	3	4	4	3	3.333
Thomas	4	4	4	4	4	4	3	3	4	4	4	4	4	4	4	3	4	4	4	4	4	3.857
Clark	1	2	4	2	2	2	3	4	3	2	2	2	4	4	2	2	3	3	4	3	3	2.714
Smith	4	3	4	4	3	3	3	3	2	4	3	4	4	3	3	4	4	3	3	4	3	3.381
Moore	5	4	5	4	3	4	3	4	4	4	4	5	5	4	4	4	5	4	4	4	4	4.143
Johnson	4	3	4	4	3	2	4	3	4	4	4	4	4	3	4	2	4	3	3	4	4	3.524
Martin	3	3	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	3	4	3	4	3.762
Baker	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	3	4	4	4	4	4	3.905
Jones	3	4	3	3	3	2	1	3	3	3	3	4	3	3	3	2	3	3	3	1	3	2.810
Lewis	4	4	4	4	4	3	4	4	4	3	4	3	4	4	4	3	4	4	4	4	5	3.857
Allen	4	4	3	3	4	2	3	4	3	4	4	4	4	4	3	2	4	4	4	4	3	3.524
Miller	5	5	5	4	5	5	5	4	4	4	2	5	4	2	4	4	5	5	5	5	5	4.381

APPENDIX C

POST ONLINE PD DATA

Participants	POST Survey Item																					Mean
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Adams	4	5	5	4	5	4	5	5	5	4	5	5	5	4	5	4	5	5	5	5	5	4.714
Brown	4	4	4	3	4	3	5	5	4	4	4	4	3	4	4	5	4	4	5	5	5	4.143
Taylor	4	5	4	4	5	5	4	5	4	5	4	5	5	4	4	4	4	4	4	4	5	4.381
Anderson	5	5	5	4	5	4	2	3	4	5	5	5	4	5	5	5	5	5	5	4	5	4.524
Hall	4	4	4	4	4	4	4	5	4	4	5	5	5	4	4	2	5	5	4	3	5	4.190
Davis	3	4	4	3	4	2	2	4	3	4	4	4	4	3	4	3	4	4	4	4	4	3.571
Thomas	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4.000
Clark	1	2	3	3	3	2	2	4	3	2	3	4	4	3	3	1	4	2	4	4	3	2.857
Smith	3	3	4	4	3	3	3	4	3	4	3	4	3	4	4	4	4	3	4	4	3	3.524
Moore	4	5	5	4	4	4	2	5	4	4	4	5	4	4	4	4	5	5	5	4	5	4.286
Johnson	4	4	4	4	4	2	4	4	4	4	4	4	4	3	4	2	4	2	3	4	4	3.619
Martin	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	3	4	4	4	3.857
Baker	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4.000
Jones	3	3	2	3	2	2	2	2	4	3	3	3	4	3	4	2	3	2	4	2	4	2.857
Lewis	4	4	4	4	4	3	4	4	4	3	4	4	4	4	4	4	4	3	4	4	4	3.857
Allen	4	3	4	4	4	2	3	3	3	4	4	4	3	3	3	2	4	4	4	4	4	3.476
Miller	5	5	5	4	5	5	2	4	4	4	4	5	5	2	4	4	4	4	4	4	5	4.190