5-2011

FACULTY PERCEPTIONS OF THE FACTORS ENABLING AND FACILITATING THEIR INTEGRATION OF INSTRUCTIONAL TECHNOLOGY IN TEACHING

Charles Michael Sturgeon
University of Tennessee - Knoxville, csturgeo@utk.edu

To the Graduate Council:

I am submitting herewith a dissertation written by Charles Michael Sturgeon entitled "FACULTY PERCEPTIONS OF THE FACTORS ENABLING AND FACILITATING THEIR INTEGRATION OF INSTRUCTIONAL TECHNOLOGY IN TEACHING." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Michael Waugh, Major Professor

We have read this dissertation and recommend its acceptance:

Trena Paulus, Barbara Thayer-Bacon, Jay Pfaffman

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a dissertation written by Charles Michael Sturgeon entitled "Faculty Perceptions of the Factors Enabling and Facilitating their Integration of Instructional Technology in Teaching." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Michael Waugh, Major Professor

We have read this dissertation
and recommend its acceptance:

Jay Pfaffman

Trena Paulus

Barbara Thayer-Bacon

Accepted for the Council:

Carolyn R. Hodges
Vice Provost and Dean of the Graduate School

FACULTY PERCEPTIONS OF THE FACTORS ENABLING AND FACILITATING THEIR INTEGRATION OF INSTRUCTIONAL TECHNOLOGY IN TEACHING

A Dissertation Presented for
the Doctor of Philosophy Degree
The University of Tennessee, Knoxville

Charles Michael Sturgeon
May 2011

DEDICATION

To my wife, Carla and my children Travis and Ashleigh. You stood by me through the whole process of the course work, through the dissertation writing, and to the point of completion. Thank you for the reassurance that you expressed so often. The completed work is ours, as it could not have been done without you and your support.

ACKNOWLEDGEMENTS

I will take the opportunity here to first thank my committee chair, Dr. Michael Waugh, and my committee members, Dr. Trena Paulus, Dr. Jay Pfaffman, and Dr. Barbara Thayer-Bacon for contributing valuable feedback and consistent support. Your time is valuable and I appreciate the time and effort you put into making my study successful. I also want to thank some colleagues at Lee University for assisting me along the way; Dr. Trevor Milliron, Dr. Gary Riggins, Dr. Charles Carrack, Dr. Jeff Sargent, Dr. Carolyn Dirksen, Dr. Mary Ruth Stone and Dr. Ashley Smith. Each of you has taken many hours to help me in the beginning, in the middle, and in the conclusion of this endeavor in many different ways. Thank you so much for standing by me. A big thank you goes to the Lee University family for believing in my abilities to accomplish this task, they have all supported me with words and actions alike.

I want to thank a few friends, Michael and Leslie Dehart for their great support, prayers, and constant words of encouragement. My long time Ukrainian friend Bogdan Prokopovych, I thank for his willingness to help with statistics over the web Skyping or emailing just to make SPSS procedures comprehensible. And lastly I thank Dr. Bob Hall and the Tennessee Baptist Collegiate Ministry for supplying me with a place to stay while taking summer courses. In doing so my academic success in those courses became a reality. Kind words, a place to stay, and many prayers have helped to make this dissertation writing process a believable accomplishment.

ABSTRACT

This study employed a survey research design to identify factors that facilitate university faculty to integrate computer-based technologies into their teaching practice. The purpose of the study was to measure the practices and perceptions of higher education faculty toward instructional technology. The designed survey instrument established a series of five personal profile categories. The five categories were used as variables manipulated to enable a series of statistical analyses to examine factors that enable faculty to use technology in their teaching. The survey was electronically administered to faculty in 36 universities in the Appalachian Region; a target population of approximately 4000 potential survey respondents. A total of 427 faculty from 22 of these institutions responded to the survey, which was approximately 10% of the total population.

The findings, showed statistically significant correlations between the teaching with technology subscale and personal technology use subscale. This may suggest that personal use and personal knowledge are indicators of whether or not university faculty will use technology in their teaching. Additionally, a statistically significant difference was found between the extent to which female faculty reported using technology compared to male faculty members. The generational factor (age), was not shown to have any significant relationship with the frequency of faculty members' use of technology, but results indicated generational differences on the personal requirements profile. Lastly, one finding related to the personal requirements profile indicated that the most common requirement for using technology reported by the faculty was the knowledge that doing so would enhance students' learning.

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: INTRODUCTION

Today's college students expect the presence and use of computer technology in their classes (Pajo & Wallace, 2001; Prensky, 2005; Roberts, 2008; Shapiro, Roskos, & Cartwright, 1995). According to researchers, as students' expectations increase, educators are encouraged by those expectations, and their administrations to incorporate instructional technology in their teaching practice (Ensminger & Surry, 2002; Maier & Warren, 2000; Roberts, 2008; Surry, Ensminger & Haab, 2005).

Higher education faculty continually seek ways to improve students' learning experiences and frequently *consider* implementing instructional technology, focusing on the potential benefits of those technologies in an academic setting (Andrade, 2001; Becker, 2000). Additionally, these same educators are likely to follow a rational process of considering the pros and cons for adopting technologies to support their pedagogy (Fishbein & Ajzen, 1980; Montalvo, 2006; Sahin & Thompson, 2007). According to Montalvo (2006) and Fishbein and Ajzen (1980), generally speaking, people are rational and make use of information when considering the adoption of new innovations and even more rational when the innovations are technical types of innovations. Though many higher education faculty have decided to integrate technology into their teaching, many others make the deliberate choice not to do so.

Higher education faculty members as well as K-12 teachers have voiced various reasons over the years for not integrating instructional technology into their teaching. Schools across the nation reported to not be using computer in the early 1990's which was reported to be at least partially due to lack of equipment (Appalachia Educational Lab and Tennessee Education Association, 1991). In recent years, faculty members have justified not integrating instructional technology because they lacked access to useful applications (Appalachia Educational Lab and

Tennessee Education Association, 1991; Becker, 2000; Ertmer, 1999). In the 1990's, K-12 teachers identified the principal barriers of using instructional technology to be inadequate access to hardware and software, lack of funding for training, lack of technical skills, and the lack of time (Akbaba-Altun, 2006; Ertmer, 1999, 2005; MacNeil & Delafield, 1998; Pelgrum, 2001). However, later, in the 1990's, as more and more education professionals began to assert the benefits of instructional technology, and more and more campuses acquired computer-based technologies and network connections, the push for both K-12 and higher education faculty to integrate instructional technology increased (Appalachia Educational Lab and Tennessee Education Association, 1991; Ertmer, 1999; Kozloski, 2006). Despite the mounting pressure from the culture at large and from schools' administrations, the integration of technology into higher education classrooms continues to be surprisingly low (Bai & Ertmer, 2008; Ertmer, 2005; Franklin, 2007; Hew & Brush, 2007; Wozney, Venkatesh, & Abrami, 2006).

Since computer-based technologies have become more accessible, many of the previously identified barriers have been eliminated (Becker, 2001). Ertmer (2005) has identified a more current list of barriers that prevent faculty from integrating instructional technology. She has categorized the barriers as either intrinsic or extrinsic. Extrinsic barriers are environmental obstacles outside of the control of individual teachers, such as lack of access, lack of training, and lack of support. Intrinsic barriers are items that are controllable by the individual such as interest, technical skills, and an attitude of doubt that instructional technologies can have a significant impact on students (Butler & Selbom, 2002; Chizmar & Williams, 2001; Ertmer, 2005; Lucas, 2005).

Ertmer (2005) has also linked the concepts of extrinsic and intrinsic to what she describes as levels of prioritization. She calls these *first-order* and *second-order* barriers, based on their degree of importance in affecting faculty members' ability to integrate and use instructional technology. By Ertmer's (2005) definition, first-order barriers are external or extrinsic barriers, and second-order barriers are internal or intrinsic barriers. In many situations, these identified barriers deter instructors from even considering the adoption of instructional technology (Ertmer, 2005; Morgan, 2003; Park, 2003; Park & Ertmer, 2008; Rogers, 2000; Surry, Ensminger & Haab, 2005).

In the past 15 years, Ertmer's is but one of numerous studies that have attempted to determine which factors deter faculty from integrating instructional technologies in their teaching. These studies point to a set of obstacles persisting across many settings, and over a long period of time: e.g., lack of time to learn new technologies, doubt about benefits for learners, and lack of funding for technologies. Researchers suggest that one of the most consistent factors that deter faculty from integrating instructional technology is a lack of research confirming that doing so will have a significant positive effect on student learning (Akbaba-Altun, 2006; Lucas, 2005; Spotts, 1999).

Spotts (1999) reported that some of the other aforementioned barriers, such as lack of access to computers, lack of well-developed applications for learning, and lack of technical support, were nearly eliminated by the end of the 20th century. Spotts (1999) also notes that instructional technology among teachers continues to be low and he poses a question that many researchers seek to answer, "Why do some faculty members use [instructional] technology while others do not?" (p. 92). Though Ertmer (1999, 2005) and others have identified factors that lead some teacher to decide against using technology in their instruction, very little research has been done to explore the factors that lead other faculty to favor using technology in their teaching (Butler & Sellbom, 2002; Ely, 1990; Reiser & Dempsey, 2005). What are the necessary facilitative conditions that can and do enable faculty to integrate instructional technology into their professional practices?

Very little investigation has been made into the facilitative conditions enabling faculty to integrate instructional technology. There is an abundance of research on the barriers that deter the integration of instructional technology and far less on enabling factors thereby indicating a need for research to identify what enables faculty to integrate technology (Butler & Sellbom, 2002; Ely, 1990; Reiser & Dempsey, 2005).

To better understand the issues that hinder the adoption and implementation of instructional technology, both the barriers and the enabling factors should be identified so as to provide perspectives for teachers seeking to integrate instructional technology (Butler & Sellbom, 2002; Weston, 2005). Butler and Sellbom stated, “Understanding the rate of adoption in any given situation requires analyzing factors that may facilitate the adoption and those that may operate as barriers to adoption” (p. 22). The barriers that help explain faculty members’ decisions not to integrate instructional technology are important factors and may help in determining the facilitative conditions compelling those who do integrate technology into their teaching.

Several studies have identified a number of common enabling factors that seem to influence K-12 faculty to use instructional technology (Ertmer, 1999, 2005; Weston, 2005). Since there appear to be more studies focused on K-12 settings, this study's review of the literature evaluated studies in K-12 settings and higher education in order to reveal potential enabling factors. Weston (2005) notes, “faculty at institutions of higher education encounter some of the same challenges for technology integration as K-12 teachers” (p. 101). Less research has been done on enabling factors in higher education than K-12.

This study addressed the following broad research question, "*What factors positively influence higher education faculty to adopt and implement computer technology in their instruction?*" The intent of this study was to determine whether or not there are common enabling factors that facilitate higher education faculty's use of instructional technology and to identify such factors. Many decision-makers, including administrators, policy makers, and instructional designers, seek ways to increase the use of technology in instruction (Surry, 2000). The data collected from faculty using technology in instruction were analyzed to identify factors that possibly influenced their integration of instructional technology. Findings from this study should provide a rationale and ideas for some decision-makers about steps they can take to encourage increased use of computer-based technology in teaching at their institutions.

Statement of the Problem

Previous studies have identified common principles, barriers, and some influences associated with the adoption and implementation of technology in instruction in K-12 and higher education (Ali, 2003; Ertmer, 1999, 2005; Pajo & Wallace, 2001; Rogers, 2000). While the numerous studies focusing on barriers have been and continue to be valuable sources of information for administrators, faculty, and instructional technologists, little research has focused on what specific facilitative conditions enable faculty members in higher education to integrate instructional technology.

According to Cuban (2000), Gura and Percy (2005), Hamza and Alhalabi (1999), Postman (1993) and others, even when most known barriers to the use of instructional technology are removed, many educators remain reluctant to use computer-based technology in the classroom. The lack of research that could potentially offer such educators reasons for using computer-based technologies in teaching practice signals a need for further investigation of the positive conditions that might encourage faculty to adopt and utilize technology in their instruction. This research study will hopefully contribute valuable insights in resolving questions for administrators, faculty, and instructional technologists.

Purpose of the Study

The purpose of the study was to examine higher education faculty regarding their practices and perceptions of the factors that enable them to integrate technology into their instruction. This study has proposed to identify some of the facilitative factors and conditions that are believed to enable faculty to use instructional technology in their teaching.

Importance of the Study

Some studies suggest that teachers who adopt computer-based technology and use it for teaching find that the computers help them improve their teaching (Dexter, Anderson, & Becker, 1999). The data collected in this study will help teachers, professors, administrators, and instructional technologists to be more informed on the matter of what influences instructors to use instructional technologies. With such findings, higher education leaders can possibly better plan faculty development and provide the appropriate conditions to enable their faculty members to integrate instructional technology by providing the needs faculty feel should be in place first.

Research Questions

This study addresses the following specific research questions:

1. Is there a relationship between faculty members' *Campus Technology Support Profile* and faculty members' *Teaching with Technology Profile*?
2. Is there a relationship between faculty members' *Personal Technology Use Profile* and their *Teaching with Technology Profile*?

3. Is there a relationship between faculty members' *Technology Knowledge Profile* and their *Teaching with Technology Profile*?
4. Do faculty members of different generations identify different enabling factors for integrating computer-based technology in their teaching?
5. Do faculty members of different academic disciplines identify different enabling factors for integrating computer-based technology in their teaching?
6. Do male and female faculty members identify different enabling factors for integrating computer-based technology in their teaching?
7. Do faculty members with different academic qualifications (BS, MS, PhD) identify different enabling factors for integrating computer-based technology in their teaching?
8. What factor(s) do individual faculty members identify and indicate as important personal requirements that enable them to use instructional technology in teaching?

CHAPTER II: REVIEW OF RELATED LITERATURE

Introduction

This literature review examines research related to faculty adopting innovations, specifically the innovation of integrating technology into their teaching. It surveys the current state of knowledge about the barriers that deter some faculty from integrating technology, the facilitative conditions that enable other faculty to surmount barriers and ultimately integrate technology, and the reasons why some faculty are more likely than others to adopt technology for teaching purposes.

The first section briefly reviews Rogers' (2003) Theory of Diffusion of Innovations which serves as a theoretical framework for this study. Additionally the theoretical section reviews the eight conditions that facilitate change, as prescribed by Ely (1976). Following the section on Rogers' (2003) Theory of Diffusion of Innovations is a section examining various studies on barriers that have been identified to deter teachers of K-12 and higher education from integrating technology in teaching. The final section examines research on conditions that facilitate faculty members' integration of technology in their teaching. The barriers section and the facilitative conditions section will both examine a number of factors that repeatedly appear in the literature as critical factors for integrating instructional technology.

Integrating Technology in Instruction

As mentioned in Chapter 1, there has been, and continues to be, an urgency among some faculty and higher education administrators to ensure that technology is being integrated into instruction (Ertmer, 2005; Maier & Warren, 2000; Pajo & Wallace, 2001; Prensky, 2005; Roberts, 2008; Surry, Ensminger & Haab, 2005; Unkefer, Shinde, & McMaster, 2009). Many research projects have focused on the the potential impact instructional technology may have on students' learning (Bauer & Kenton, 2005; Ertmer, 2005; Kopcha, 2008; Rogers, 2000). Becker (2000) stated that computers can be a "valuable and well-functioning instructional tool" (p. 29). In addition to these remarks, many research articles and books explain why teachers should be integrating technology in their instruction. Often the rationale is that the teachers' use of technology helps prepare the learner for a technology-rich society (Bauer & Kenton, 2005; Ertmer, 2005; Rogers, 2000; Unkefer, Shinde, & McMaster, 2009). However, these existing arguments for the use of technology in education do not appear to offer enough meaningful rationale to influence teachers.

According to Cuban, Kirkpatrick, and Peck (2001) many parents and school administrators assume that access to abundant software, hardware, and Internet connections will lead to extensive use of instructional technology by teachers and students. In numerous studies, many researchers concur that access is only one of many barriers that deter faculty from adopting and implementing technology (Butler & Sellbom, 2002; ChanLin, Hong, Horng, Chang, & Chu, 2006; Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 1999, 2005). Studies reveal that the facilitative conditions necessary for faculty to adopt and implement technology entail much more than making the technology available (Ely, 1990, 1999; Ertmer, 1999, 2005; Rogers, 2000; Rogers, 2003; West, Waddoups, & Graham, 2007; Sahin & Thompson, 2007). The adoption of instructional technology often requires a change of attitude and a change in the adopter's practice. The process of adopting and implementing an innovation, such as technology in the classroom, begins with the diffusion of the innovation (Ely, 1990; Rogers, 2003).

Theory of the Diffusion of Innovations

Even in the most ideal circumstances, change is still a difficult process. Surry, Porter, Jackson, and Hall (2004) asserted that it is out of the ordinary for any organization to find the procedures of adopting and implementing innovative technology easy or pleasant. Change is difficult not only for corporate personnel but also for educators as they find that even well-marketed technology innovations can create frustrations (Surry, et al., 2004). Rogers (2003) addressed the challenges of technology adoption and change in his theory known as *Diffusion of Innovations*. Rogers (2003) primarily focuses on the rate of adoption, analyzing the timeline of events leading up to the adoption of an innovation.

Rogers (2003) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). Additionally an innovation is a change that can potentially solve a problem or offer an alternative solution to a problem (Hoerup, 2001). Not all innovations are in fact new. To count as an innovation an idea of practice must be perceived as new. One's reaction to the innovation is indicative of its perceived newness (Rogers, 2003). Rogers (2003) explains that some technology innovations may not be appropriate for all people. As Rogers' (2003) example of an unsolicited innovation, he points to the mechanical tomato picker. This new piece of machinery seemed great for farmers, but in reality it ended up hurting the small farmers who could not afford to purchase it. These less fortunate farmers ultimately went out of business.

Understanding the events in Rogers' theory gives insight to instructional technologists and administrators as they plan for the integration of technology in faculty members' teaching. In Figure 1, there are four *prior conditions* Rogers referred to. This diagram, these conditions and the five events of the adoption process gave direction in developing the types of questions for the survey instruments used in this study. The five events/steps in Rogers' timeline for the diffusion of innovations are labeled; *knowledge, persuasion, decision, implementation,* and *confirmation* as presented in Figure 1 (Rogers, 2003).

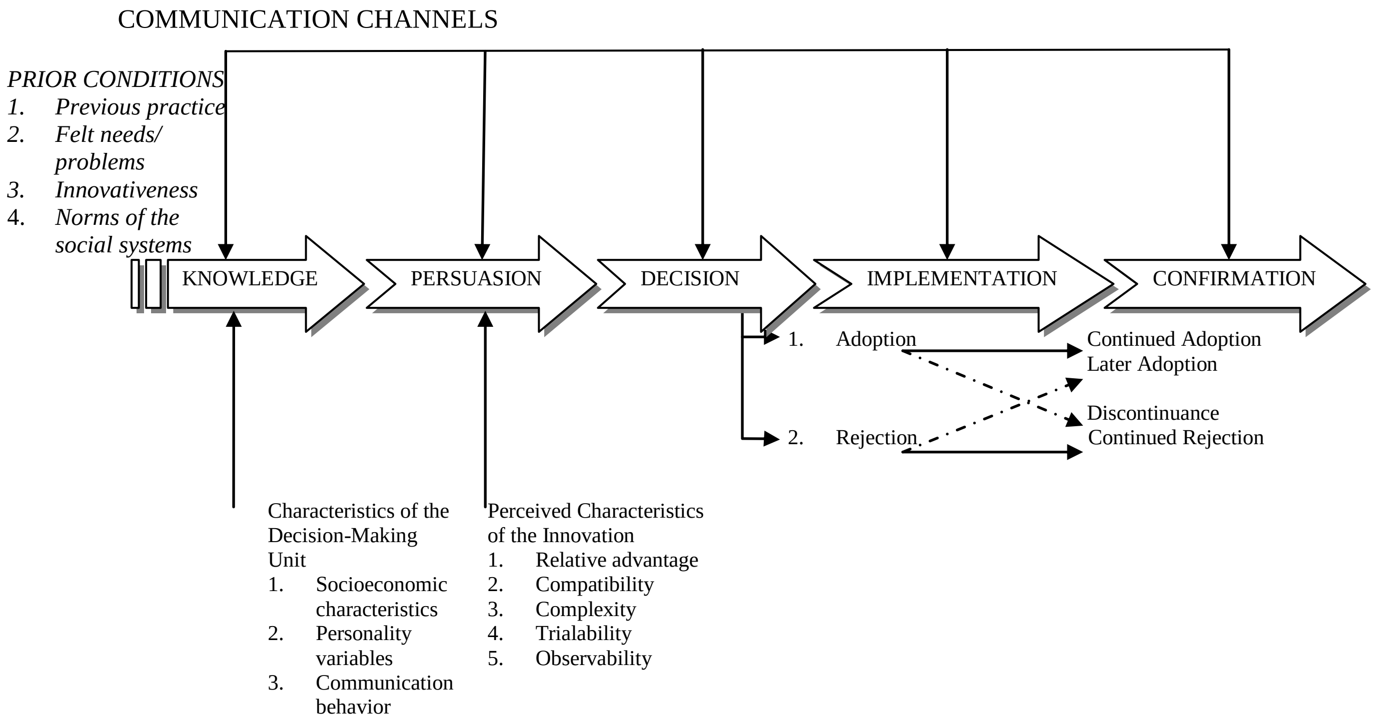

Figure 1 *The Innovation-Decision Process*

Rogers, Everett (2003), *Diffusion of innovations.*(p. 170, F. 5-1). New York: The Free Press, a Division of Simon & Schuster, Inc. Reprinted with permission of the publisher.

Categories of Adopters

Rogers (2003) identifies several different roles that people can take in the diffusion of innovations process. The role of interest for this particular study was that of the *adopter* (Rogers, 2003; Surry & Farquhar, 1997). Rogers' (2003) identifies various categories of *adopters*, defined by their levels of adoption. The categories are as follows:

Innovators: *Innovators* are defined as those to quickly adopt new ideas. In relation to educational technology, the innovators are often the instructional technologists or faculty members that have technological skills (Hall, Loucks, William & Beulah, 1996; Hoerup, 2001; Rogers, 2003).

Early Adopters: *Early adopters* often do not have the same resources as innovators, but nonetheless are quick to adopt. *Innovators* and *Early Adopters* are the first to use recent innovations or what is perceived as a new innovation. According to researchers, teachers that fit into one of the two categories are often younger faculty members and males (Braak, 2001; Rogers, 2003). This study takes both demographic variables into consideration.

Early Majority: *Early majority* adopters are those that "adopt new ideas just before the average member of a system" (Rogers, 2003, p. 283). According to Hoerup (2001), the *early majority adopters* are inclined "to observe the previous members' choices and decisions and form their own when the time is right" (p. 5).

Late Majority: *Late majority* adopters are those who adopt only due to increased pressure from within an organization or network and only after much persuasion. According to Beggs (2000) the *late majority* adopt instructional technology "as just part of their pedagogy" (p. 10).

Laggards: Rogers (2003) also refers to people in this category as *traditional* since they appear to want to keep doing what they do in a traditional manner. As the label suggests, the *laggards* are the last to make a decision to adopt an innovation. Similar to the *late majority*, *laggards* are also quite skeptical of innovations and primarily communicate with others that hold to the same traditional values as they do (Rogers, 2003). The *laggards* are usually "lagging far behind awareness-knowledge of a new idea" (Rogers, 2003, p. 284).

Numerous educational researchers (Butler & Sellbom, 2002; Rogers, 2000; Rogers, 2003; Surry, 2002; Surry, Porter, Jackson, & Hall, 2004; Wilson, Sherry, Dobrovolny, Batty, & Ryder,

2001) suggest that the various categories of adopters fall on a somewhat skewed bell-curve and the spread of each category is approximately as follows:

- Innovators: 2 – 3%
- Early Adopters: 13 – 14%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%

Wilson et al., (2001) assert, "The idea that people fall on a receptivity continuum seems to have some empirical support, and can help us think about adoption in terms of meeting individuals' needs" (p. 299).

Much research suggests that all faculty members face obstacles to some degree or another in adopting new technologies no matter what their grouping is within the types of adopters (Butler & Sellbom, 2002; Ertmer, 1999; Hew & Brush, 2007; Lucas, 2005). Rogers' (2003) theory of innovation diffusion strongly suggests that the end user of the innovation will ultimately implement the innovation in some setting that is practical, therefore becoming the force of change in the setting. Understanding the theory will help administrators relate the findings of this study to the process of implementing technologies on their campuses. The types of barriers many faculty face include reliability, lack of time, lack of technology support, and uncertainty (Butler & Sellbom, 2002; Ertmer, 1999; Hew & Brush, 2007). These barriers are a mix of intrinsic and extrinsic types that will be addressed throughout this chapter.

Adopting Innovations

Faculty members' rates of adopting innovations for instruction vary. According to Rogers' (2003) theory, Diffusion of Innovations, five factors determine the rate of adoption of an innovation. The subscales in the instrument used for this study were developed based on studies found in the literature and relate to most of the five factors in Rogers' (2003 theory. The five factors referred to are as follows:

- *Relative advantage*: the degree to which a new idea is perceived to be an improvement from the idea that it replaces. The *relative advantage* refers specifically to individual perceptions. Innovations are adopted more rapidly when they are perceived to be advantageous.
- *Compatibility*: the degree to which the innovation complies with the already existing standards and values. Rogers (2003) provides the example of the slow rate of adoption of contraceptives in communities with religious objection to family planning. Innovations that do not fit existing standards require the adoption of a new value system, which occurs at a slow rate.
- *Complexity*: the degree of difficulty the innovation entails. The more difficult or complex the new innovation, the slower the rate of adoption.
- *Trialability*: the degree to which an individual or group may have the opportunity to try the new idea in an experimental manner without making a commitment.
- *Observability*: the degree to which the positive results from the innovation can be viewed by others.

The continual emergence of computer technologies in education and the importance placed on them by parents, students, faculty, and society suggests that some users have already perceived some technologies to have a *relative advantage* in assisting students (Condie & Livingston, 2007; Yoon, 2003). The *Personal Requirements* item identified faculty members' perceptions of two factors; *relative advantage* and *compatibility* of using technology; questions within *Personal Use Profile* and the *Technology Knowledge Profile* address the factors of *complexity, previous practice,* and *trialability.* The survey developed for this study consisted of subscales that relate to these five aforementioned factors and other factors found to be of importance in the literature.

Facilitative Conditions for the Integration of Technology

Ely's Eight Facilitative Conditions

Ely (1990; 1999) suggested eight facilitative conditions that motivate and enable faculty to implement instructional technology innovations in their teaching. The suggested facilitative conditions are as follows: *dissatisfaction with the status quo* which motivates people to seek changes, *knowledge and skills exist, availability of resources, time* (often considered a resource), *rewards or incentives for participation* such as increased salaries, one-time incentives, and professional opportunities, *expectation and encouragement to participate in decisions* related to policies, practices, and possible innovations, *commitment by those involved,* and evident *leadership* (Ely, 1990; 1999; Surry, Ensminger, & Haab, 2005). The eight conditions identified by Ely (1990; 1999) are primarily extrinsic factors, i.e., factors that faculty members cannot control on their own. Ely's eight conditions and other factors that were identified to enable faculty to implement educational technology, are discussed in this chapter.

Administrative Support

This section of the review discusses some of the more common ways in which faculty perceive that they are or are not supported by their administration when it comes to change and/or implementing innovations. Many studies suggest that for teachers to integrate technology, administrative support is essential (Beggs, 2000; Brzycki & Dudt, 2005; Hoerup, 2001; Naimova, 2008). Additionally, to foster change and growth in teachers it is necessary for administrators to acknowledge the effort and time teachers put into professional development activities (Guilfoyle, 2006; Hoerup, 2001). In order for change of any type to be effective in an organization, the organizational leadership must support the change (Miller & Wolf, 1978). As this factor is out of the control of faculty, administrative support is categorized as an extrinsic factor. Through a broad spectrum of activities by administrators faculty may perceive an element of support for using technology. Some faculty may perceive support from administration whereas others may not. Sometimes support is demonstrated through monetary means, in other cases, support may take the simple form of recognition.

Kanaya, Light, and Culp (2005) emphasized the importance of acknowledgment, suggesting that teachers are "more likely to build on what they learn from professional development experiences when their existing knowledge and priorities are acknowledged" (p. 313). Through his own research, a review of previous studies conducted at small liberal arts colleges, Spodark (2003) identified perceived obstacles to integrating instructional technology. One of these was the lack of leadership encouraging faculty to integrate instructional technology. Given the many studies identifying administrative support as an essential factor, it is likely that the leadership factor will continue to be recognized as important. While recognition of one's efforts by administrators appears to be a common need shared by faculty, suggesting the need for administrative support, there are other ways that leaders can show support for faculty efforts, such as the offering of incentives for attending faculty development or instructional technology training (Ely, 1999; Surry, Ensminger & Haab, 2005). Moreover, administrative support is demonstrated through the availability of time provided, training opportunities, and availability of various types of technologies. Ely (1990; 1999) stressed that teachers often perceived administrators as being committed to innovation when they take a role in using the technologies themselves as well as making recommendations or strong suggestions. Ely (1990) also emphasized that faculty commitments occur especially when administrators include them in the decision-making processes pertaining to the adoption of new technologies, such as writing policies related to the uses of technologies or purchasing software.

Campus Technology Support

As more technologies emerge for education, and educators develop new ways to integrate the new technologies into teaching and learning, university campuses must be properly equipped, not only with adequate hardware but also with competent personnel to support the increasingly complex infrastructure. Researchers have argued that having access to reliable computer resources is a primary factor in faculty members' decisions to use instructional technology (Butler & Sellbom, 2002; Chizmar & Williams, 2001; Jaber & Moore, 1999). Butler and Sellboms (2002) found that lack of reliable technology was among the main reasons that faculty decided not to include technology in their teaching practices. Reliable technology and adequate support on a campus are often related but the perception among faculty members of inadequate technical support was a notable barrier. The frequent argument that adequate campus-technology support is an important factor for faculty members in using instructional technology is not a new one. Brown, Benson, and Uhde (2004) assert that, "One of the missing components is support for faculty" (p. 101). In their qualitative study, Brown et al., (2004) found that, "there is minimal support for faculty in the pursuit of technology infusion (p. 103). The aforementioned study was limited to the one campus where Brown et al., (2004) are professors. However, this study is included in this review of literature to demonstrate the faculty members' attitude toward the importance of campus technology support. Research studies illustrate the need for adequate and competent campus' technology infrastructure support (Bielema, Keel, & Musser, 2002; Butler & Sellbom, 2002; Chizmar & Williams, 2001; Jaber & Moore, 1999). As higher education faculty integrate technology into their teaching practices, the need for hardware and software support increases (Bielema et al., 2002). In their report of a successful implementation of instructional technology on a university campus, Bielema and colleagues

(2002) maintained that, “These innovators increasingly wanted to do more, and campus technology administrators were faced with providing more and more support to a myriad of hardware and software needs.” (p. 1).

Lucas (2005) stated that, “Among the issues preventing incorporation are barriers such as a lack of institutional and financial support … and the lack of technology support” (p. 3). A large number of publications that suggest campus technology support as a barrier were published in the 1990’s or early 2000’s, when campuses were first building technology into classrooms and making provisions for student use (Butler & Sellbom, 2002; Chizmar & Williams, 2001; Jaber & Moore, 1999). As times have changed and technologies have become more prominent on campuses, the possibilities for campuses to improve technology support increases. Thus, improved technology support may now no longer be a barrier to innovation, but instead, a positive factor facilitating change. As campus technology support improves, faculty members may also become more comfortable with instructional technology as a component of their teaching practices. Because campus technology support may now be a factor driven by the decision of faculty members to integrate instructional technology, it was included as a component of this study.

Personal Technology Use

Personal use of computer-based technology has been identified in numerous studies as a factor that increases faculty use of instructional technology (Ely, 1999; Jaber & Moore, 1999). Wozney, Venkatesh and Abrami (2006), found that personal use was, “the most significant predictor of teacher use of technology in the classroom” (p. 173). The aforementioned study took place in a K-12 setting. According to Dusick (1998) and Wozney et al., (2006), teachers’ attitudes toward technology and competency are factors related to personal use and classroom use as well. When teachers turn to technology for personal use, it is presumed that they will attain a certain level of competency over time. Additionally, teachers that use technology in their personal lives will likely perceive computer technologies as valuable tools. The study developed the Technology Implementation Questionnaire (TIQ) which was based on Expectancy-Value Theory (Wozney et al., 2006). Personal use of technology was included as a component in this study of higher education faculty members' use of technology because it has been identified as a predictor for teachers in K-12.

The need for teachers to feel confident using technology has been well-established in studies (Dusick, 1998; Ertmer et al., 2003; Wozney et al., 2006). However, confidence in one's abilities is not sufficient: Confidence in the pedagogical benefits of integrating technology is also necessary. Even computer-savvy teachers may choose to use technology, only for class management or not at all if they lack faith in the pedagogical value of instructional technology. Several studies have shown that teachers' pedagogical beliefs are impacted by their use of technology as a teaching tool (Albion & Ertmer, 2002; Ertmer et al., 2003; Jacobsen, 1998; Wozney et al., 2006). Pedagogical beliefs, self-confidence in using computer technology, and the frequency of technology use are often perceived to be related to age. The next section focuses specifically on generational differences.

Differing Generations

Some studies have focused primarily on age and age's possible relationship to technology adoption and integration and generally identified age-ranges by generation. Though there have been many studies, the question of age's influence on innovation adoption has been left as an unanswered question. This study applied a generation label that had been pre-defined to fit the respondents' corresponding age. Setting generational boundaries is controversial. Among the more prominent researchers of generational differences and technology are Oblinger and Oblinger (2005). Their timeline was adopted for this writing, primarily because they are the most prominent authors referenced throughout the literature who focus on higher education. Another distinguishing factor is that Oblinger and Oblinger (2005) are the only authors to include a post millennial period in their timeline. Other prominent authors have ended their timelines at the millennial period (Reeves & Oh, 2008). The timeline developed by Oblinger and Oblinger (2005) portrays the various generations as they are displayed in Table 1.

Table 1

Generational Labels and Dates

Matures	Baby Boomers	Gen-Xers	Millennials	Post-Millennials
(<1946)	(1947-1964)	(1965-1980)	(1981-1995)	(1995-present)

Source: *Generational Differences* by Thomas C. Reeves and Eunjung Oh (p. 296, Table 25.1). In J.M. Spector et al., (Eds.). Handbook of research for educational communications and technology. Copyright 2008 by Taylor & Francis Group, LLC.

In 2000, Morris and Venkatesh (2000) stated that, “There has been relatively little research on the influence of age on technology adoption decision in an organizational context” (p. 375). Since then, however, researchers have shown an increasing interest in the effects of demographic variables such as age and gender in the workplace. According to Morris, Venkatesh, and Ackerman (2005), both gender and age have a philosophical influence on individual perceptions and attitudes toward technology in the workplace. The United Nations, in fact, has recommended that research institutions encourage more research on the interrelationship between aging and gender in the workplace (Morris et al., 2005). The increased interest in the demographic variable of age in the workplace is derived from two trends in society: an aging workforce and the rapid increase of computer-based technologies in the workplace (Morris & Venkatesh; Morris et al., 2005).

Though there are still few studies pointing specifically at age as an influence on the adoption of new technologies, several studies have suggested that age might be a significant variable (Morris & Venkatesh, 2000; Morris et al., 2005; Venkatesh, Morris, & Ackerman, 2000; Wozney et al., 2006). Morris and Venkatesh (2000) conducted a study examining workers’ age as it related to technology adoption decisions. Through the process of investigating age differences and adoption of technology Morris and Venkatest (2000) grounded the study in

Ajzen's (1991) Theory of Planned Behavior (TPB). TPB identifies correlations between attitudes, norms, and control as predictors of intention and behavior and has been applied in various studies of the adoption of technologies (Morris & Venkatesh, 2000; Morris et al., 2005; Venkatesh, et al., 2000). The study included approximately 300 participants, personnel of a medium-size financial accounting firm, where a new data and information retrieval system had been installed. The participants had no prior knowledge to the software but were given two days of training on the new system. Though the participants were aware of the study, the trainers were not.

Morris and Venkatesh (2000) observed an overrepresentation of older individuals among the firm's personnel, specifically in the categories of higher income and higher educational qualifications, and reasoned that this imbalance in age of personnel might have significant effects on the success of the new innovation. The researchers observed users' reactions and usage behavior over a five-month period. Data were collected after two months and then at the conclusion of the study. Collecting data at two different times allowed the researchers to measure both short-term and long-term effects. They made two hypotheses related to age: "Age is negatively related to short-term usage." and, "Age is negatively related to long-term usage." (Morris & Venkatesh, 2000, p. 380-383). The researchers concluded that age does have an influence on technology usage. The findings were statistically significant at $p < 0.01$.

Little research has been conducted since the early 2000s on the influence of age on the use of technology. The research that exists has mostly been conducted in business settings. These two limiting factors suggest a need for new research on how age affects technology adoption.

Morris and Venkatesh (2000) found in two studies that there were additional variables that combined with age to influence the workers' behaviors and attitudes toward technology adoption. One variable combined with age was gender (Morris et al., 2005). The variable of gender is addressed further in this chapter.

Disciplinary Differences on Integration

Another factor that may influence faculty members' decisions about instructional technology is their discipline or subject area. A faculty members' field of study may influence their decision making behaviors as well as their practices in teaching (Becher, 1994; Nelson Laird, Shoup, Kuh, & Schwarz, 2008).

Stoecker (1993) suggests that while American higher education faculty are a homogeneous group in some respects, they are diverse in ways that often correlate with disciplinary differences. Many social scientists have noted the significance of disciplinary differences through studies of higher education faculty (Becher, 1994; Biglan, 1973a; Nelson Laird et al., 2008; Pearce, 2008; Smart & McLaughlin, 1978; Whitmire, 2002; Willis, 1992). In her revisit of Biglan's (1973) classifications of disciplines, Stoecker (1993) stated, "The influence of unique disciplinary attitudes, beliefs and behaviors is so obvious to some that they have characterized the faculty as academic tribes…" (p. 451). Though Biglan's (1973) classification of disciplines persists in many published articles (Becher, 1994; Nelson Laird et al., 2008; Smart & Elton, 1982; Smart & McLaughlin, 1978; Stoecker, 1993; Whitmire, 2002; Willis, 1992), many education faculty prefer to avoid the labeling of disciplines as "hard," "soft," "pure," or "applied" (Bates, 2010). Therefore, instead of using these labels, which some may regard as offensive, this study categorized disciplines under broader labels. The categories used in this study are (a) *Business & Computer Science*, (b) *Health Sciences,* (c) *Social Sciences,* (d)

Natural Sciences, (e) *Math & Statistics*, and (f) *Arts, Languages*, and *Music & Humanities* (Paulus, T.M., Phipps. G. & Harrison, J. [In progress]).

Disciplinary differences may influence a faculty member's decision to integrate technology in his or her teaching practice since these differences are often related to differences in values and beliefs (Becher, 1994; Hayden & Barton, 2007; Pearce, 2008; Waggoner, 1994). A faculty member's discipline of study often influences his or her philosophy of education, thereby having an impact on the integration of technology in the classroom practice (Hayden & Barton, 2007; Nelson Laird et al., 2008; Pearce, 2008; Waggoner, 1994). However, a review of the existing literature indicates that little has been published on how teachers' disciplines of study may or may not influence their use of instructional technology. Waggoner (1994) made an early contribution in the area of how disciplinary differences influence such matters as integration of instructional technology. Waggoner (1994) offered a model "for investigating disciplinary differences as they may relate to teaching with technology" (p. 176). His model was grounded in the claim that structure of a discipline by itself cannot predict how and whether faculty in that discipline will use instructional technology. It is also necessary to understand the assumptions that faculty in the discipline make about their students (Waggoner, 1994). In his work Waggoner (1994) provided a model that suggested direction of inquiry for this study about the influence of discipline on the integration of technology in teaching.

Recent research studies on disciplinary differences as they relate to the use of instructional technology are limited primarily to uses of *Information and Communication Technologies* (ICT) (Hammond & Bennett, 2002; Hayden & Barton, 2007; Pearce, 2008). One such study was conducted specifically to analyze the adoption of ICTs at a mid-sized university in Lancaster UK (Pearce, 2008). This study at Lancaster University involved the collection of

194 surveys from an academic staff of 861 members, including teachers and researchers, all faculty of the university. The survey entailed a series of questions pertaining to software types such as word processing and spreadsheet applications as well as more complex applications such as databases, bibliographic citation software, and video conferencing. Pearce (2008) found that there was a widespread use of these tools, some of which were used in only a few disciplines, and others that were used by almost all of those surveyed (e.g., web resources). The study's results suggested discipline-based patterns of usage as particular applications were used by particular clusters of disciplines (e.g., humanities, and physical sciences) (Pearce, 2008). However, Pearce's (2008) study did not reveal the disciplinary differences specific to which faculty integrated instructional technology into their practices.

In another study of disciplinary differences in the use of ICT, Hayden and Barton (2007) evaluated a teacher-training program implemented by the British Educational Communications and Technology agent (BECTa). In a series of articles, Hayden and Barton (2007) shared a history of the trainee teachers program which was funded by the British government to promote the goal of having all teachers use technology in their subject teaching. Hayden and Barton stated that, "In 1995 the Chief Education Advisor to British Telecom asserted that 'in [the] future, there will be two types of teacher—the IT literate and the retired'" (p. 1019). Disappointingly, even after the expenditure of over 1.6 billion pounds, approximately 60% of the teachers in the program were still making very little use of the provided technologies (Hayden & Barton, 2007). The objective of the study was to explore commonalities in the trainees' perceptions of what interventions had influenced their ability to integrate ICT in their teaching discipline. Hayden and Barton (2007) assert,

> There is some evidence to suggest that the ways in which new technology is used in schools in the United Kingdom varies significantly from one school subject to another, both in terms of the extent of its impact on classroom processes, and in terms of which particular ICT applications are of use or potential use in particular subjects (p. 1021).

Hayden and Barton (2007) also noted that the 84% of the Math faculty used computer-based technology for teaching, whereas less than 10% of those in History departments were integrating ICT in their teaching. The findings of the studies that explored disciplinary differences' influence on the integration of instructional technology suggest that there are yet more questions to be asked. More investigation is needed to learn whether different disciplines create different conditions for higher education faculty to integrate instructional technology. The lack of evidence identifying disciplinary differences was in itself rationale for including disciplinary differences as a variable in this study.

Gender Difference on Integration

Another variable that may influence whether faculty integrate instructional technology is gender. Some authors have taken into consideration that gender is not only physical but psychological (Venkatesh et al., 2000). With the idea of attitudes differing between genders, Venkatesh et al., (2000) suggests that studies focusing on gender should include at least the two concepts of gender that are prominent in research, the physical and psychological. Venkatesh et al., (2000) states that, "Much of the large body of research on gender differences has examined mean differences between women and men in terms of abilities, traits, and psychological constructs" (p. 34).

A body of research conducted over more than fifteen years suggests that gender was a strong predictor of the use of computer technologies. Wilder, Mackie, and Cooper (1985) prefaced their early study of this issue with the comment, "Anecdotal evidence abounds concerning the extent to which the world of technology is a male world" (p. 215). Their unexpected conclusion, however, was that females claimed technology as their world too. This study was limited to video gaming and school-aged subjects.

Venkatesh et al., (2000) have conducted a number of studies examining both age and gender as variables that may influence the adoption of technology. Though the studies examined workers in corporate business type environments, the findings are still of interest for this literature review. Venkatesh et al., (2000) assert that "little, if any, previous research has examined gender differences in the salience of different determinants of adoption and sustained usage of technology" (p. 34). They based their study on gender as a potential predictor of acceptance and adoption of technology on Ajzen's (1991) theory of planned behavior (TPB) (Morris et al., 2005; Venkatesh et al., 2000). The study was longitudinal, conducted over a five month period to investigate "gender differences in the relative influence of attitude toward using technology" (p. 35). The study also examined individual adoption and usage of new software in the workplace (Venkatesh et al., 2000). The participants comprised of 420 individuals from four different organizations, of which were introducing a new technology application to their employees. All participants had prior experience using computers but lacked experience with the new application. Of the surveys distributed, 45% of the responses came from women and the remaining 55% from men (Venkatesh et al., 2000). The researchers addressed potential factors that could complicate the results of their study. One of the factors that could have possibly confused the results was that of prior experience with computers and software in general (Venkatesh et al., 2000). There were three measurement points to examine the reliability and validity of the scales employed for this study. Venkatesh et al., (2000) affirmed that, based on the preliminary analysis of collected data from each of the four organizations, “At all three points of measurement, Cronbach alpha estimates for all scales were over .80, suggesting high reliability” (p. 45). Venkatesh et al., (2000) concluded their report stating, “there are clear gender differences in the salience of various factors determining an individual’s technology adoption decisions in the workplace” (p. 49). Additionally, compared to women, men placed a greater emphasis on perceived usefulness of the new technology (Venkatesh et al., 2000). The authors also suggested that though there were some non-significant effects, the function of gender in technology adoption was fundamental. Given these attitude findings, one could conclude that an individual’s attitude toward using a technology in the workplace is a key predictor of the individual’s ultimate use of technologies (Morris et al., 2005; Venkatesh et al., 2000).

Since the time of the aforementioned study by Venkatesh and his colleagues, additional studies of gender as an influence on technology adoption and integration have been conducted in K-12 settings. Yuen and Ma (2002) explored the gender differences in teachers’ computer acceptance. This study also applied the theoretical framework of Ajzen’s (1991) TPB combined with the Technology Acceptance Model (TAM). Yuen and Ma (2002) used the TAM as their primary framework to, “determine if such differences are present” [i.e., gender differences in the adoption and use of technology in teaching] (p. 365). Yuen and Ma (2002) began by reviewing research that has established the importance of teachers having a positive attitude toward computers and studies that have aimed to determine how such attitudes arise. They reported, “The perceived usefulness of computers can influence attitudes towards computers and the amount of confidence a teacher possesses in using computers” (p. 366).

The participants in Yuen and Ma’s (2002) study were primarily recent college graduates of a full-time teacher education program, 186 respondents of whom 24.9% were male and 75.1%

were female. “87.5% had no teaching experience. Nevertheless, a small number of respondents had some years of teaching” (p. 370). The survey instrument for this study included 12 items, five to measure perceived usefulness, five to measure perceived ease of use, and two to measure intention of use. All items were measured on a 7-point Likert scale. Yuen and Ma (2002) deemed this approach “to be appropriate because of considerable literature support for its use in intention-based studies and being the common method used in TAM research (p. 371).

According to Yuen and Ma (2002) the findings, “satisfied the criteria of reliability ($\alpha > 0.80$)” (p. 371). Two significant gender differences in computer acceptance were identified. First, perceptions of usefulness had more of an impact on females’ future use than on males. Second, Yuen and Ma (2002) found that the perceived ease of use was a significant factor. The ease of use factor showed to influence the intentions of use more for females that males in this particular study. The authors conclude by suggesting their findings were consistent with those of Venkatesh et al., (2000). The similarities in findings could suggest that people in a workplace outside of an educational setting may be similar when measuring attitudes and perceptions as a factor influencing the use of technology.

Spotts, Bowman, and Mertz (1997) conducted a survey of 760 full-time faculty members at Western Michigan University in Kalamazoo, a public Doctorate-Granting I institution with an enrollment of approximately 26,000 FTE. The survey consisted of 78 questions designed to attain information about the respondents’ knowledge and use of instructional technologies in their teaching, targeted to identify factors influencing their use of new technologies. According to Spotts et al. (1997) “The instrument was revised from an earlier instrument used by the researchers in a 1993 study” (p. 426). Basic demographic information about faculty (e.g. gender, and age) was also collected. Of the 760 surveys distributed, 48% were returned. Out of the total returned, 71% were male and 29% were female. Spotts et al. (1997) noted that, "In gender, discipline, and age, the sample was representative of the University population, with only minor variations between sample and population" (p. 426). Thirteen different technologies were investigated in the study, to examine respondents' level of knowledge and use. To examine the influence of gender on instructional technology use, the data were analyzed using t-tests. Though the results revealed few gender differences in perceived knowledge and experience of instructional technology, Spotts et al. (1997) asserted, "Males tended to rate their knowledge of multimedia, the Internet, and statistical computing as higher than their female colleagues. Females seemed to rate some factors and incentives as important or influencing their use, while men seemed to be little affected by this" (p. 427). Males also rated themselves significantly higher than females on the level of experience using technology to assist learning.

The three studies in this section on differences between genders and how one's gender may influence the adoption and use of instructional technology suggest in the findings that differences between male and female users of technology may exist. Though studies were conducted with participants of different types, and in different settings, they reach similar conclusions: a gender influence on the use of technology does exist. However, since all of the three studies in this section included other variables such as age, discipline, socioeconomic status, and other demographics, it is possible that gender does not function as an isolated variable. The current study investigated the classification of gender as a factor of adoption influence.

Differing Academic Qualifications

This review of literature has suggested that faculty of different ages, gender, and fields of study may be influenced by these demographic variables in their adoption of instructional technology. The existing literature does not address the influence on technology adoption decisions of differing academic qualifications, specifically varying degrees. Nelson Laird et al., (2008) examined different teaching styles in different disciplines and raised the possibility that differences in level of qualification might influence teacher preparation. Since teaching styles and class preparations are also related to the use of instructional technology, it is plausible that differences in academic qualifications might influence faculty members' willingness to integrate instructional technology in their teaching. Therefore, the current study examined the demographic variable of academic qualifications to see if there are existing differences in the adoption and use of instructional technology based on this variable.

Conclusion

The relevance of Rogers' (2003) Diffusion of Innovation theory to this study was discussed. Rogers' (2003) five factors for determining the rate of adoption of new innovations and Ely's (1990; 1995; 1999) eight facilitative conditions for the integrating of instructional technology were reviewed. Of Ely's (1990; 1995; 1999) eight facilitative conditions, three were emphasized and reviewed; (a) access to resources, (b) knowledge, and (c) skills.

A review of the existing research on the variable of administrative support indicated that leadership showing support is a core prerequisite to the success of faculty using instructional technology in their teaching practice. The literature on integration of instructional technology also indicates that campus technology support is a concern in the decision making of individual faculty members. This is consistent with Ely's (1990; 1999) claim that educators having the appropriate resources is of utmost importance for integrating technological innovations.

The review of literature also suggested that though support is important, without personal knowledge or interest, people are not likely to use technology. Research in educational settings confirms Ely's (1990; 1999) emphasis on the significance of skill as a variable in the adoption of instructional technology. The matter of how age and generational differences have been shown to influence the use of technology was discussed. The literature suggests that generational differences may be significant. The studies reviewed relating to age and how it may or may not influence the use of technology were limited to the corporate environments. Based on the content within the reviewed literature, there is a need to continue studying the age factor and its relationship to adoption and integration of instructional technology. Several studies of disciplinary differences related to technology adoption were also reviewed although these studies did not deal directly with the issue of higher education faculty adopting and using technology. However, the studies reviewed in this chapter did reveal disciplinary differences among faculty in their values and attitudes toward technology.

Additionally, this chapter reviewed research other demographic variables that may influence the adoption of instructional technology. The variables of gender and academic qualifications were discussed with mention of previous studies. Three studies of gender were reviewed, one that examined workers in the corporate world, one that examined newly graduated teachers in a K-12 setting, and the third study examined higher education faculty in 1997. All of these studies found some gender-based differences in the adoption and acceptance of computer technologies. This section suggests the value of conducting additional studies to possibly confirm the existence of gender differences in technology adoption in current higher educational settings or to suggest that times have changed.

Lastly, the demographic variable of academic qualification and the only study referenced on the matter of academic qualifications was a 2008 study. The results of the study suggested some differences across qualifications in the faculty members' approach to teaching and preparation. No other studies were available on the topic of academic qualifications as an influence of one’s use of technology in teaching, thereby suggesting a deficiency in current literature.

CHAPTER III: RESEARCH METHODOLOGY

Introduction

This chapter describes the methods used to collect data in order to answer the research questions stated in Chapter I and addresses these specific methodological elements of the study: the research questions and hypotheses, research participants, research design procedures, research timetable, and research instrumentation and materials.

Through a series of analyses, the study sought to determine whether or not differences in instructional technology integration might be related to gender, academic field, instructor degree level, personal requirements or preferences, technology knowledge, and personal use of computer-based technologies. A 58 item survey was used to attain responses from faculty participants on five individual subscales. The subscale items were then totaled thereby assigning a score per subscale, per individual participant. Each respondent's total profile score was used as a variable to answer one or more of the research questions in the study. The survey was composed of five subscales each of which examined respondents' perceptions of using technology. The five subscales were, (a) *Teaching with Technology Profile* (TTP) assessed the amount of technology use by individual respondents, (b) *Campus Technology Support Profile* (CTSP) assessed perception of campus technology support by individual respondents, (c) *Personal Technology Use Profile* (PTUP) assessed the amount of time spent using technology for personal reasons by individual respondents, (d) *Technology Knowledge Profile* (TKP), assessed perception of knowledge on a variety of technology types by the individual respondents, and *Personal Requirements Profile* (PRP) assessed the importance of specific needs respondents identified as requirements before integrating instructional technology. Each subscale was composed of multiple items and the score value for each scale was determined by summing the individual scores across the items. The PRP scale consisted of a single item stem (*Before I will implement a new technology into my classroom, I need:*) that was followed by 10 different completion items. Each respondent was asked to indicate his/her degree of agreement with each of the 10 statements. Respondents indicated his/her degree of value per items by selecting from a Likert scale between 1 and 7. Individual responses from the PRP were examined to determine which items respondents felt were essential requirements for them to integrate technology into their teaching. Each respondent was asked to identify the individual items presented in the PRP subscale as to the item's relevance or importance as a factor in enabling them to integrate instructional technology in their teaching.

Population Description

Faculty members from 36 of the institutions that comprise the Appalachian College Association (ACA) consortium were the intended study population. The ACA consists of approximately 4000 faculty members. All of the faculty from these schools were invited to participate in the study. However, the faculty who participated in the study represented only 22 of the 36 schools, which is approximately 61% of the institutions in the consortium. The total number of faculty employed by the 22 institutions is approximately 1,588. Therefore the sample of faculty who completed the survey (N=427) represented approximately 26.8% of the total number of faculty working at these 22 institutions. Overall, the self-selected sample who participated represent approximately 11% of the total number of faculty (427/4000) working in the 36 ACA institutions. Participants voluntarily completed the 58 item survey. ACA institutions were used as the experimental population for this study for two reasons: (a) ACA institutions are primarily private teaching institutions so most of their professional contributions and efforts are focused on student learning; (b) the ACA institutions are committed to increasing the use of instructional technology on their campuses, as stated in their missions and is part of the individual intuition's practice. ACA institutions have frequently requested training through the consortium on integration of technology in teaching. From 1998 to 2010, the ACA has attained over 20 million dollars in grant funding from the Mellon Foundation to make training of technology for teaching a priority.

The ACA institutions vary in student body size, from 300 Full-Time Enrollment (FTE) to approximately 4,200 FTE. They are located in five states: Tennessee, Kentucky, North Carolina, Virginia, and West Virginia. The approximate 4,000 faculty members come from a wide variety of academic backgrounds and experiences in education. Because of this, it is likely that the faculty members of the ACA represent diverse backgrounds and behaviors in instructional technology integration.

Instrument Development

The development of the survey was based on the process of compiling items identified through the review of the literature as potentially significant to the adoption and integration of instructional technology by faculty. Four sections of the survey are composed of Likert-type subscales. The subscale items are in a list for the respondents to answer. Above the list of items in each subscale is a prompting statement and the items are continuations of the statement. An example of this would be in the *Personal Requirements Profile* which starts with the statement, "Before I will implement a new technology into my classroom, I need:" which is followed by a list of items to be selected from 1 to 7; the "*least like me*" would be marked with the number 1 and the "*very much like me*" would be marked with the number 7.

The survey also contains eight items to collect demographic information. The less sensitive demographic questions were placed at the beginning of the survey, the more sensitive, such as age, were near the end. The complete 58 item survey used to collect the data analyzed in this study is included as Appendix A.

A panel of experts in research methods and statistics reviewed the survey for clarity and readability. Their suggestions for rewording questions, adding questions and eliminating questions were incorporated into the final survey. Nineteen faculty members of one of the ACA campuses conducted a usability review of the instrument. Based on feedback from these professional researchers and educators, the survey underwent additional minor revisions. Thanks to this extensive revision process, the final survey was a consensually valid instrument for gathering the data needed for the analyses proposed in this study.

Power Analysis and Sample Size

An appropriate number of subjects for a given study can be estimated through statistical power analysis. A power analysis prior to a study yields an estimated sample size required for detecting relationships among variables. The equation for power is 1- beta (β). Beta, commonly referred to as the Type II error (Cohen, 1988) is the probability of failing to detect significant differences that might in fact exist. Power is expressed from .01 to .99. As sample size increases, the strength to detect differences also increases. The Type II error refers to incorrectly accepting a false null hypothesis. Type I error, also referred to as α, represents the significance criterion determined by the researcher. The Type I error refers to incorrectly rejecting a true null hypothesis. In this study, the significance factor, or alpha level, was set to p=.05, as is commonly acceptable in the social sciences. Since an estimate of the minimal sample size had to be established, the two factors to be determined by the researcher were effect size and the alpha level. Cohen (1988) established r=.30 as a medium effect size. A power of .80 was confirmed to be appropriate for detecting relationships among variables.

According to Newton and Rudestam (1999), researchers will typically select a medium effect size in social science research studies. A medium effect size was thus determined to be appropriate for this study. Using tables provided by Cohen (1988, 101-103) it was determined, based on an alpha level of p = .05, which is considered a standard practice, a medium effect size of .30 and a desired power of .80 that at least 85 subjects were required for the statistical tests (mean comparisons and correlations).

Distribution of Survey

The President of the ACA wrote a letter explaining the purpose of the study and endorsing its distribution to the Provosts and Academic Vice Presidents on the ACA campuses using the ACA listserv which is provided for Chief Academic Officers. This letter was then delivered electronically to the ACA faculty from each campus Provost or Academic Chief Officer on each of the ACA campuses, informing the faculty (potential survey respondents) that they would be receiving a subsequent email with a URL link to the electronic survey. The ACA President's letter of permission to survey faculty within the ACA institutions can be found in Appendix B. After the Institutional Research Board (IRB) approval from University of Tennessee Knoxville (UTK) was received, the President of the ACA distributed the URL survey link to all of the ACA institutions through the listserv, and it was then distributed through the campuses from the Chief Academic Officers. The ACA campuses use listservs as a means in which they are able to reach faculty members. Thus, it was presumed that this method, a posting on the listserv soliciting participation, would be the best means of reaching a large sample of technology-using faculty across the ACA campuses.

The survey was electronically administered using Survey Monkey (SurveyMonkey, 1999). Survey Monkey (SurveyMonkey, 1999) was chosen as the online survey administration tool based on the researcher's previous uses and recognized stability from such experiences. However, the researcher acknowledges the lack of full control over the integrity of Survey Monkey's (SurveyMonkey, 1999) system, so the possibility exists that data might have been lost or corrupted. Based on prior experience with Survey Monkey, such an outcome was/is considered unlikely.

The survey respondents were a self-selected sample of those who received the email solicitation inviting faculty participation. As the survey was delivered in electronic form, it is likely that the respondents would be a group who were interested in instructional technology and willing to participate in completing an online survey instrument.

The survey was made accessible to all 36 institutions' Academic Vice Presidents or Provosts to distribute the URL to their faculty, though 22 actively participated in the study. According to the President of ACA, the Provosts and CAO (Chief Academic Officers) are usually eager to participate and share surveys with their faculty. The Provosts or Academic Vice Presidents received emails with the link to the survey through the ACA Listserv; a copy of the email is located in Appendix D. The survey link was sent a second time after the first two weeks giving additional faculty the opportunity to participate. A third, and final, reminder was sent out to the VPs two weeks after the second reminder. To maximize the number of participants, the survey was online for another four weeks, a total of 10 weeks in all.

Data were collected using Survey Monkey (SurveyMonkey, 1999) since an electronic survey appeared to be the simplest way to reach faculty across the ACA campuses. Web-based delivery of this survey was likely to have very little effect on the survey completion rate as the survey was intended for faculty users of technology. The administration of the survey (web-based) was likely to produce a small bias in the self-selected group of respondents. The respondents were likely to be users of technology, i.e. email, Internet, and other campus systems, that are fairly common in Higher Education.

Description of Survey Instrument

The survey instrument was composed of 58 items, broken down into five subscales. Each subscale is described in detail below. The first four individual Likert subscale scores were determined by summing the total responses based on their given values. The fifth subscale, the PRP, begins with an incomplete statement followed by 10 stemmed sentences which respondents ranked by degree of importance as factors in enabling them to integrate instructional technology. The scores of all five subscales were then used as variables in the statistical analyses. The ways in which the scales/profiles were used in the data analyses are described in the data analysis section.

1. *Teaching with technology profile (TTP)* – This subscale was composed of 13 items, identifying specific types of instructional technology. The respondents were asked to indicate the percentage of courses, over the past year, using each type of instructional technology by choosing 0%, 25%, 50%, 75%, or 100%. The percentages were given a value as follows: 0% = 1, 25% = 2, 50% = 3, 75% = 4 and 100% = 5. When summed, the respondent rankings on all thirteen items in the subscale would result in a score value between 13 and 65 with larger scores indicating a greater degree of self-reported instructional technology use. The total score or TTP was used in the data analysis, specifically in correlation with other profiles.
2. *Campus technology support profile (*CTSP*)* – This subscale was composed of eight items. The respondents were asked to mark each item on a four-point scale as poor (1), fair (2), good (3) or strong (4). The items were written in such a way that relative satisfaction

with the items would produce a positive score on the item. When summed, the respondent rankings on all eight items in the subscale would result in a score value between 8 and 32 with larger scores indicating a greater degree of satisfaction with campus technology support. The total score, or CTSP sum, was used in the data analysis to determine whether or not there are any strong associations among the CTSP and the TTP.

3. *Personal technology use profile (*PTUP*)* – This subscale was composed of nine items. The respondents were asked to indicate the amount of personal time spent per week on various Internet and/or computer-based activities by indicating (0) for zero hours, (1) for one hour, (2) for two hours, (3) for three hours, (4) for four hours, (5) for five hours, (6) for six hours or (7+) for seven or more hours. The results were quantified as: 0 hours = 1, 1 hour = 2, 2 hours = 3, 3 hours = 4, 4 hours = 5, 5 hours = 6, 6 hours = 7, and 7+ hours = 8. The items were written in such a way that relative use of technology as reported would produce a positive score on the item. When summed, the respondent rankings on all thirteen items in the subscale would result in a score value between 9 and 72 with larger scores indicating more hours of self-reported personal use of computer-based technology. The total score of the PTUP was used in analysis to determine whether or not there are any strong associations among the PTUP and the TTP.

4. *Technology knowledge profile (TKP)* - This subscale was composed of ten items. The respondents were asked to indicate their level of knowledge on each of the ten items as having No knowledge (1), Some knowledge (2), Functional knowledge (3) or Advanced knowledge (4). Relative knowledge on all ten items would result in a score between 10 and 40, with the larger scores indicating a greater degree of computer-based technology

knowledge. The total score, or TKP sum, was used in the data analysis to determine whether or not there are any strong associations among the TKP and the TTP.

5. *Personal requirements profile (*PRP*)* – This subscale was composed of ten statements representing factors the literature suggested to be perceived by respondents as necessary prerequisites/conditions for using instructional technology. The responses indicated how strongly the respondent felt about each specific item. The respondents were asked to rank each item on a seven-point scale from "not true for me" (1) to "very true for me" (7). Scale points 2 through 6 were not labeled but were points between the "not true" and "very true" marks. The subscale was written in such a way that relative importance of individual items produced a positive score per item, as each item identified a prerequisite that respondents would require before integrating technology. When summed, the respondent rankings on all ten items in the subscale would result in a score value between 10 and 70 with larger scores indicating a greater degree of importance on personal requirements before using instructional technology. The respondents were prompted to indicate how important each of the subscale items were to them personally by using a seven point Likert scale. The results were quantified, and the frequency distribution identified common enabling factors among faculty for integrating instructional technology.

Research Questions

The research questions that were the primary focus of this study are stated below.

Research question #1: Is there a relationship between an individual faculty member's *Campus Technology Support Profile* and faculty members' *Teaching with Technology Profile*?

Rationale: A review of the literature suggests that a key barrier to faculty using technology has been the lack of technology support. Results for research question #1 should provide insight into the relationship between how respondents viewed their campus technology support and their of use technology in their teaching.

Research question #2: Is there a relationship between faculty members' *Personal Technology Use Profile* and their *Teaching with Technology Profile*?

Rationale: The literature suggests that faculty members' discomfort with technology can deter them from using it, but the opposite may or may not be true. Even faculty members who are comfortable with technology for personal use may decide against using it in their teaching, for any number of reasons. This research question was to explore the respondents' level of comfort and how that related to their use of technology in their teaching.

Research question #3: Is there a relationship between faculty members' *Technology Knowledge Profile* and their *Teaching with Technology Profile*?

Rationale: Like research questions #1 and #2, this question helped to identify a specific factor that may or may not enable faculty to use technology in their teaching practice. This question probed faculty members' technology knowledge and skill as a possible factor enabling their integration of instructional technology.

Research question #4: Do faculty members of different generations identify different enabling factors for integrating computer-based technology in their teaching?

Rationale: It has been suggested by some authors that the age of the instructor is a factor that may correlate with the decision to integrate instructional technology. However, the relation of age to technology use is not yet fully understood. Since age may affect faculty members' decisions to integrate technology and might thus impact the positive effect of other enabling factors, this variable was explored as part of this research.

Research question #5: Do faculty members of different academic disciplines identify different enabling factors for integrating computer-based technology in their teaching?

Rationale: This particular factor was included in the study because Clark (1983) suggested that the content of some subjects may be more appropriate for using instructional technology than others. Since academic discipline may affect faculty members' decisions to integrate technology and might thus impact the positive effect of other enabling factors, this variable was explored in this research.

Research question #6: Do male and female faculty members identify different enabling factors for integrating computer-based technology in their teaching?

Rationale: The literature of past decades has suggested that men are more likely to use technologies than women. The research question (#6) was to determine whether or not any gender differences were evident among faculty use of technology in teaching. Since gender may affect faculty members' decisions to integrate technology and might thus impact the positive effect of other enabling factors, this variable was explored in this research.

Research question #7: Do faculty members with different academic qualifications (BS, MS, PhD) identify different enabling factors for integrating computer-based technology in their teaching?

Rationale: A higher level of academic qualifications implies that faculty have more experience as instructors. It has been suggested that teachers with more classroom experience are more likely to use technology. A study by Bauer and Kenton (2005) observed that teachers with advanced degrees tended to be skilled with technology, but did not use technologies consistently for teaching and learning. In this study, the objective is to identify factors that enable faculty to use technology.

Research question #8: What factor(s) do individual faculty members identify and indicate as important personal requirements that enable them to use instructional technology in teaching? Rationale: Just as there are many factors that deter faculty from using instructional technology, there are other factors that enable faculty to integrate technology into their teaching. The current literature does not clearly identify these factors. Therefore, research question #8 was examined as part of this research.

Research Design

In order to address the research questions posed in this study, a survey was administered to a population of faculty members from 36 different higher education institutions. The responses to the survey items were intended to provide information regarding the respondents' perceptions of the factors and circumstances pertaining to their use of instructional technologies in the classroom. Additionally, the results of the survey are intended to identify factors that facilitated faculty members' use of instructional technology in their teaching. The scores of each respondent-profile were correlated with the other respondent-profiles. Descriptions of specific correlation analyses are in the *Planned Data Analysis* section of this chapter. A one-way ANOVA was also performed to identify differences among or between sub-groups. The Tukey post hoc analysis was selected to further analyze any ANOVA results that required further investigation; i.e. when the ANOVA indicates that a significant difference among group means does exist and there is a need to identify precisely which pairs of means are significantly different from one another. Using the Tukey post hoc assumes equal variance across variable sub-groups (Field, 2005). With the alpha set at .05, the results were analyzed to discover whether statistically significant correlations existed between various profiles and the use of instructional technology. A one-way ANOVA was conducted to examine variations in demographic characteristics across two or more groups. A one-way ANOVA was conducted to reveal the relative effect of various demographics on respondents' *Personal Requirements Profile* score.

Using an online survey secured the anonymity of respondents, thereby relieving them of any motivation they might have had not to answer the survey honestly. The definitions of the subscales/profiles within the survey are located in an earlier section of this chapter.

Research Study Hypotheses

Hypothesis 1

There will be no correlation between respondents' *Teaching with Technology Profile* and their *Campus Technology Support Profile.*

Hypothesis 2

There will be no correlation between respondents' *Teaching with Technology Profile* and their *Personal Technology Use Profile*.

Hypothesis 3

There will be no correlation between respondents' *Teaching with Technology Profile* and their *Technology Knowledge Profile.*

Hypothesis 4

There will be no difference in identified enabling factors for integrating instructional technology among instructors of different generations (Mature, Baby Boomers, Gen-X, and Millennials).

Hypothesis 5

Instructors of different disciplines will not differ significantly in their identification of the enabling factors for integrating computer-based technology in their teaching.

Hypothesis 6

There will be no significant difference between male and female instructors in the types of enabling factors they identify for integrating instructional technology in their teaching.

Hypothesis 7

There will be no significant differences among instructors holding different academic degrees (BS, MS, EdS, PhD) in the types of enabling factors they identify for integrating instructional technology.

Hypothesis 8

Individual faculty members in higher education will report similar personal usage requirement patterns to those reported by K-12 faculty previously reported in the literature.

Statistical Hypotheses

The statistical hypotheses are written using acronyms representing each profile to be measured in this study. The acronym of the profiles and their meanings are as follows:

TTP – Teaching with Technology Profile

CTSP – Campus Technology Support Profile

PTUP – Personal Technology Use Profile

TKP – Technology Knowledge Profile

PRP – Personal Requirements Profile

Hypothesis 1

H_0: $r_{xy} = 0$ [x = TTP, y = CTSP]

H_1: $r_{xy} \neq 0$ [x = TTP, y = CTSP]

Hypothesis 2

H_0: $r_{xy} = 0$ [x = TTP, y = PTUP]

H_1: $r_{xy} \neq 0$ [x = TTP, y = PTUP]

Hypothesis 3

H_0: $r_{xy} = 0$ [x = TTP, y = TKP]

H_1: $r_{xy} \neq 0$ [x = TTP, y = TKP]

Hypothesis 4

H_0: $\mu_{\text{Matures}} - \mu_{\text{Baby Boomers}} - \mu_{\text{Gen-Xers}} - \mu_{\text{Millennials-Xers}} = 0$

H_1: $\mu_{\text{Matures}} - \mu_{\text{Baby Boomers}} - \mu_{\text{Gen-Xers}} - \mu_{\text{Millennials-Xers}} \neq 0$

Hypothesis 5

H_0: $\mu_{\text{Business \& Computer Science}} - \mu_{\text{Social Sciences}} - \mu_{\text{Arts, Languages, Music \& Humanities}} = 0$

H_1: $\mu_{\text{Business \& Computer Science}} - \mu_{\text{Social Sciences}} - \mu_{\text{Arts, Languages, Music \& Humanities}} \neq 0$

Hypothesis 6

H_0: $\mu_{\text{Male}} - \mu_{\text{Female}} = 0$

H_1: $\mu_{\text{Male}} - \mu_{\text{Female}} \neq 0$

Hypothesis 7

H_0: $\mu_{\text{Bachelors degree qualification}} - \mu_{\text{Masters degree qualification}} - \mu_{\text{EdS degree qualification}} - \mu_{\text{Doctoral degree qualification}} = 0$

H_1: $\mu_{\text{Bachelors degree qualification}} - \mu_{\text{Masters degree qualification}} - \mu_{\text{EdS degree qualification}} - \mu_{\text{Doctoral degree qualification}} \neq 0$

Hypothesis 8

There is not a statistical hypothesis for research question #8. A frequency distribution will be generated and these results will be compared against patterns reported in the literature.

Data Collection Process

The research methodology chosen for this research project was quantitative. To attain data, a survey was distributed to 36 university campuses through the ACA headquarters. Results were collected online, using Survey Monkey (SurveyMonkey.com, 1999), a web-based survey delivery system.

The purpose of the survey was to gather data from instructors who are presently using instructional technology in their teaching practice. In order to have a record of respondents' backgrounds, the first four survey questions assessed if the faculty members used technology in their teaching or not, then their particular discipline, years of teaching, and years at the current institution. For purposes of understanding which, and how many, institutions actually participated; participants were also asked where they were presently employed. The respondents were from 22 of the 36 ACA institutions, approximately 61% of the 36 ACA institutions solicited to participate in the study. The sample of faculty participating in this study (N-427) represent 26.8% of the total faculty employed by the 22 ACA participating institutions.

Data Analyses

The application, Predictive Analytic Software (PASW version 18.0.0), formerly Statistical Package for the Social Sciences (SPSS), renamed in 2009 by IBM (IBM, 2010), was used to conduct the specific analyses described in Chapter 3. Both descriptive and inferential statistical analyses were performed. Depending on the specific research question, correlations were calculated using the Pearson product-moment procedure (RQ#1, #2, and #3). ANOVAs were computed for RQs #4, #5, #6, and #7. Descriptive statistics were computed for Gender and the *Personal Requirements Profile.*

Hypothesis #1 Analysis: A Pearson product-moment correlation coefficient was calculated using the scores of the *Teaching with Technology Profile* scale and the *Campus Technology Support Profile* scale.

Hypothesis #2 Analysis: A Pearson product-moment correlation coefficient was calculated using the scores of the *Teaching with Technology Profile* scale and the *Personal Technology Use Profile* scale.

Hypothesis #3 Analysis: A Pearson product-moment correlation coefficient was calculated using the scores of the *Teaching with Technology Profile* scale and the *Technology Knowledge Profile* scale.

Hypothesis #4 Analysis: A one-way ANOVA with a Tukey post hoc analysis was calculated with the *Teaching with Technology Profile* scale as the dependent variable and *Generation* (Matures, Baby boomers, Gen-Xers, Millennials) as the independent variable. This first analysis with TTP is to indicate if there is a difference in the amount of technology used among groups. Additionally, a one-way ANOVA with a Tukey post hoc analysis was conducted with the *Personal Requirements Profile* (consisting of 10 items) as the dependent variable and *Generation* as the independent variable. The second analysis is to indicate if enabling factors differ among groups.

Hypothesis #5 Analysis: A one-way ANOVA with a Tukey post hoc analysis was conducted with the *Personal Requirements Profile* (consisting of 10 items) as the dependent variable and *Discipline* as the independent variable. The second analysis is to indicate if enabling factors differ among groups.

Hypothesis #6 Analysis: A one-way ANOVA was calculated with the *Teaching with Technology Profile* scale as the dependent variable and *Gender* as the independent variable. This first analysis with TTP is to indicate if there is a difference between male and female faculty in the amount of technology used. Additionally, a one-way ANOVA was conducted with the *Personal Requirements Profile* (consisting of 10 items) as the dependent variable and *Gender* as the independent variable. The second analysis is to indicate if enabling factors differ between male and female faculty.

Hypothesis #7 Analysis: A one-way ANOVA with a Tukey post hoc analysis was calculated with the *Personal Requirements Profile* (consisting of 10 items) as the dependent variable and *Academic Qualifications* as the independent variable. This analysis is to indicate if enabling factors differ between faculty of varying qualifications.

Hypothesis #8 Analysis: A descriptive analysis was performed to identify factors that were identified as enabling factors for faculty to integrate instructional technology. The results from the other aforementioned analyses also were observed in order to answer RQ#8.

CHAPTER IV: FINDINGS

This chapter reports the findings from the data analysis conducted to answer each research question. The findings are arranged under the following headings: (a) reliability of scales; (b) response rate; (c) demographics; (d) data analysis; and, (e) summary of the findings. Additionally, the data analysis section is divided into subheadings identifying the specific data analyses and results as they relate to the individual research questions of this study.

Reliability of Scales Analysis

The instrument for this study was developed by the researcher and had not been tested for reliability. After importing the collected data from survey responses, scales within the survey instrument were tested for reliability, using PASW 18. The results of the scale reliability analyses are in Table 2.

According to Nunnally (1978) "reliabilities of .7 or higher will suffice" (p. 245). Cortina (1993) agrees with this statement suggesting that reliability > .70 is adequate. Reliabilities in excess of .7 are considered sufficient (Cronbach, 1951; Nunnally, 1978) and adequate (Cortina, 1993). The first analyses conducted were to establish the reliability of the subscales from the survey. The results indicated that each subscale was reliable. All but one was > .80, PTUP was .69. The results of the reliability tests are shown in Table 2.

Table 2

Reliability Analyses of Survey Instrument Scales

Subscale/Profile	Cronbach's Alpha	*N* of items
Teaching with Technology Profile	.81	13
Campus Technology Support Profile	.83	8
Personal Technology Use Profile	.69	9
Technology Knowledge Profile	.82	10
Personal Requirement Profile	.81	10

Response Rate

The survey was distributed to 36 institutions in the Appalachian region consisting of approximately 4000 faculty. Institutions that received the survey are members of the Appalachian College Association described in Chapter 3. The self-selected sample was composed of 427 faculty members that represented 22 of the 36 ACA institutions. Therefore, 61% of the institutions were represented. In terms of participation, the 22 schools employ approximately 1588 faculty (http://www.stateuniversity.com). Thus, the proportion of faculty from the 22 schools represented in the sample was 26.8%, a moderate response rate. The 427 respondents were approximately 11% of the total faculty who might have participated.

Demographics

The demographic data were to specifically assess: years teaching in higher education, gender, age, and academic credentials. Though these variables were not the primary focus of the study, they proved to be quite informative when analyzed with variables of technology use and requirements faculty identified as important in order to integrate instructional technology. The demographic data are displayed as charts. The bar chart in Figure 2 displays the respondents' number of years in higher education.

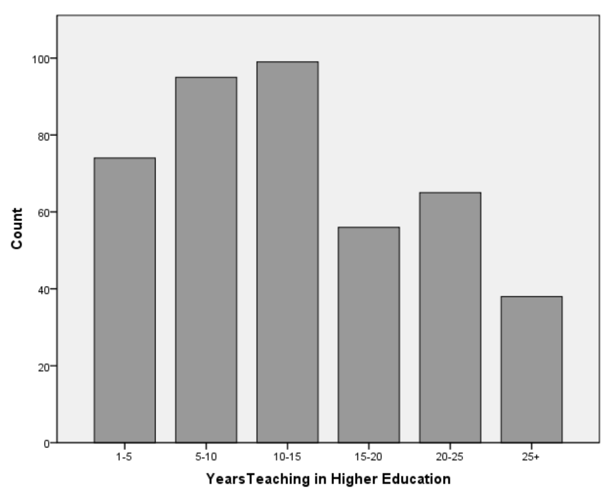

Figure 2 *Years Teaching in Higher Education*

Gender is a component of this study and an important variable to consider when answering the eight research questions. For the purpose of reporting demographics, a bar chart indicating the percentage and number of male and female respondents is provided below in Figure 3. Of the 427 respondents 54.8% were male and 45.2% were female.

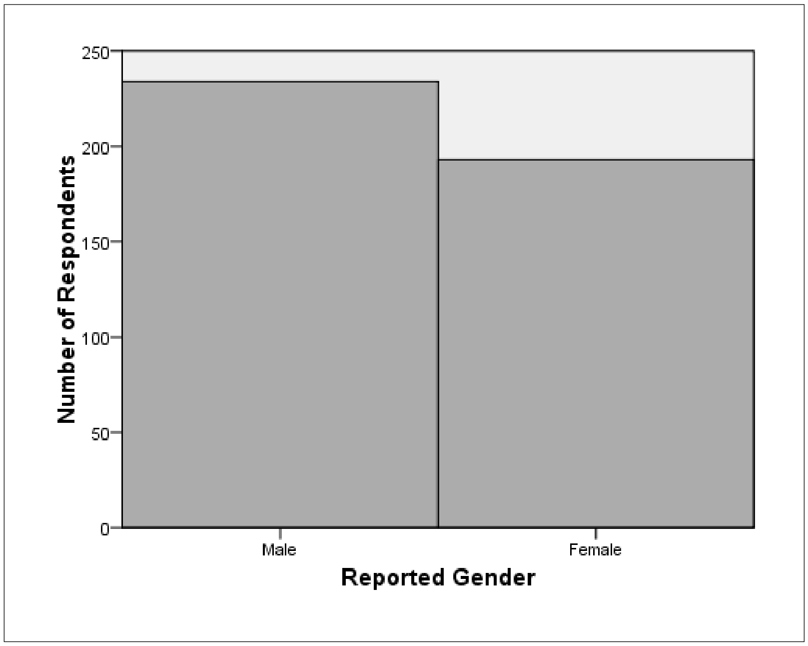

Figure 3 *Participants by Gender*

Other demographic data related to age. As referenced in Chapter II, the literature review, ages are organized for this study as generations. The generation chart proposed by Oblinger and Oblinger (2005) was adopted for this study. Therefore, the bar chart in Figure 4 indicates the number of participants in each of the generations based on Oblingers' (2005) well received timeline. There were 2.8% categorized as *Matures,* 42.2% categorized as *Baby Boomers*, 44% categorized as *Gen-Xers*, and 9.4% of the participants categorized as *Millennials.*

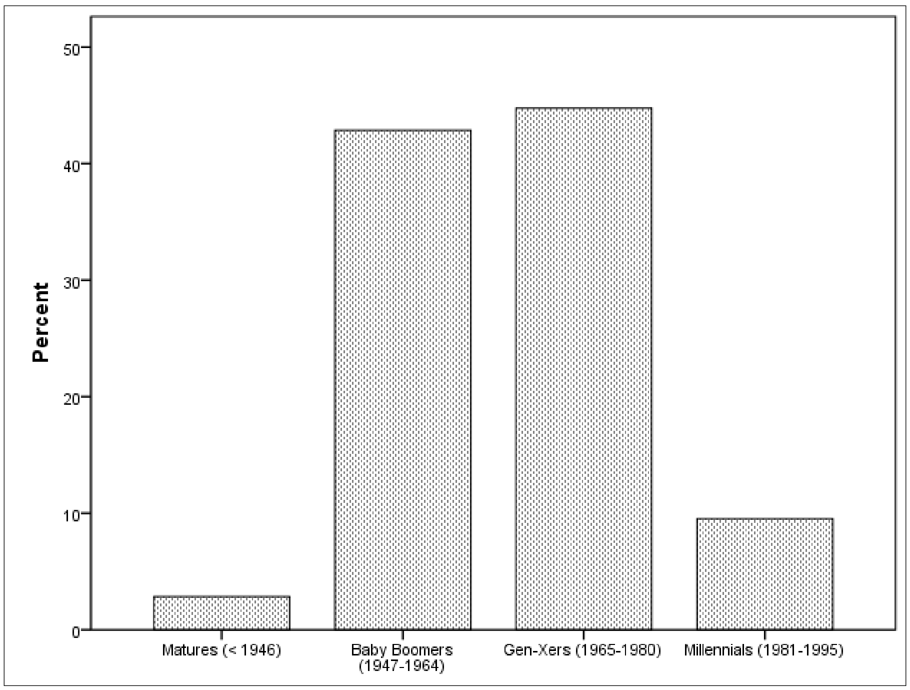

Figure 4 *Participants by Generation*

Additionally, *Academic Qualifications* is a demographic variable analyzed in this study. These data refer to the highest degree held and were intended to measure to what extent faculty integrate instructional technology according to their degree and thereby identifying possibly differences between faculty of different academic qualifications. As 1 of the 8 research questions, these data are of importance to the study. For the purpose of reporting highest degree held among participants, a bar chart indicating the percentage and academic degree of respondents as they are grouped by degree is provided below in Figure 5. Of the respondents, .7% held a bachelors degree, 29.5% held a masters, 1.4% held a specialists degree, and 67.4% held a doctoral degree. Additionally, .9% of the respondents reported "other" which were faculty with a Th.D. (doctorate in theology).

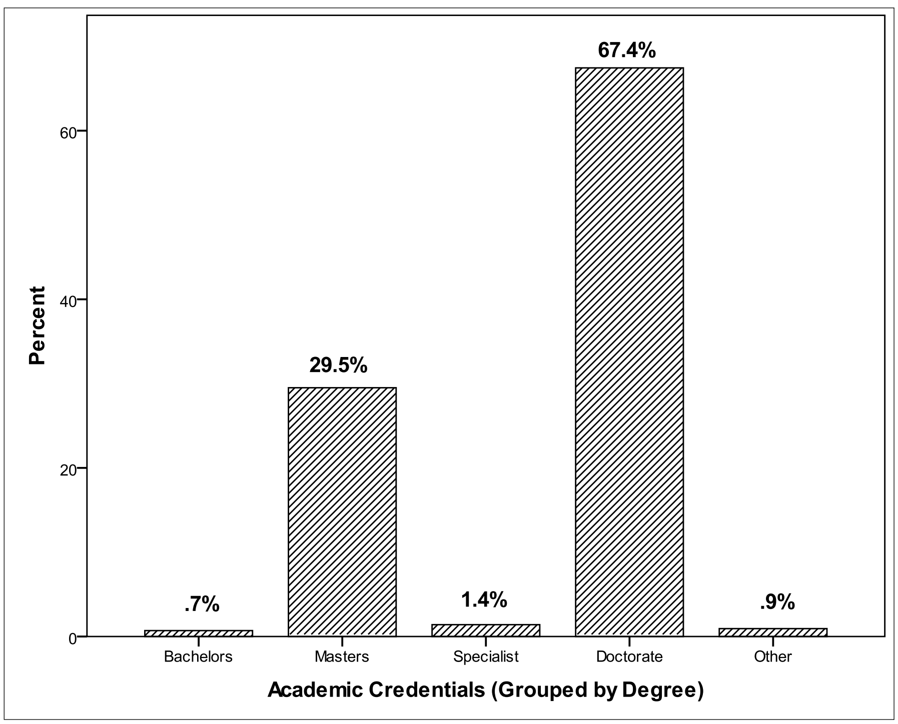

Figure 5 *Participants by Highest Degree Earned*

Data Analysis

The survey instrument consisted of a variety of questions with various response options per question. The first set of questions, in the subscale known as TTP, measured the percentage of classes in which the respondent used computer technologies. The specific subscale questions are listed on the survey instrument found in Appendix A. The *TTP*, which is used in the first three analyses to answer RQ#1, RQ#2, and RQ#3, is a subscale of 13 items. The questions within the *TTP* were scored and then compared to subscales CTSP, PTUP, and TKP. The subscale TTP was also used in conducting one-way ANOVAs with the following demographic data items: Generation, Gender, and Academic Qualification.

Subscales' Descriptive Statistics

In Table 3, the descriptive statistics are displayed referring to the five profiles/subscales; TTP (*Teaching with Technology Profile*), CTSP (*Campus Technology Support Profile*), PTUP (*Personal Technology Use Profile*), TKP (*Technology Knowledge Profile*) and, PRP (*Personal Requirements Profile*). Table 3 presents an overview of the descriptive statistics calculated from the responses to the subscales within the survey. The data in Table 3 show the overall respondents' minimum and maximum scores as well as the respondents' mean and standard deviation per subscale. The highest possible score for the *TTP* was 65, indicating the respondent used all 13 types of technology listed within the scale 100% of the time over the previous year. The lowest possible score for the *TTP* was 13, indicating the respondent used the items in the list 0% of the time over the previous year. The highest possible score for the CTSP was 32, indicating the respondent had a high perception of the campus support and the lowest score would be an eight indicating a negative perception of the campus technology support. The third scale measured the personal use of technology. The highest possible score for the PTUP was 72, indicating the respondent spends over seven hours a week on each type of technology listed in the scale, and the lowest possible score was a nine, indicating zero hours per week on all items in the scale. The subscale measuring technology knowledge, the *TKP* had the highest possible score of 40, indicating the respondent had substantial knowledge of all technologies listed within the TKP subscale. The lowest possible score for the *TKP* was 10, indicating the respondent had no knowledge of any of the technologies within the subscale. Lastly, the subscale measuring personal requirements necessary before integrating technology, the *PRP* had the highest possible score of 70, indicating the respondent identified all items as highly important before using technology in their teaching. The lowest possible score for the *PRP* was 10, indicating that none of the PRP items were necessary for them to integrate technology.

Table 3

Descriptive Statistics of Subscales / Profiles

Subscales	Minimum	Maximum	Mean	SD
TTP	13.00	58.00	31.47	9.47
CTSP	10.00	32.00	19.94	4.45
PTUP	11.00	64.00	25.09	8.54
TKP	10.00	40.00	18.88	5.23
PRP	17.00	70.00	51.14	9.44

N = 427

Research Question 1

CTSP and TTP

The correlation between the CTSP and TTP was $r = -.110$. The calculated probability associated with the correlation was $p = .023$, thus the two variables are highly correlated. This finding shows that there was statistical significance between scores on subscales TTP and CTSP. Therefore, there is a relationship linking how a faculty member perceives campus technology support and how much that individual faculty member uses technology. Strikingly, the correlation was a negative correlation. The more highly the faculty scored on the TTP, meaning the more they reported to use technology in teaching, the lower they tended to score on the CTSP, meaning their perception of the campus technology support was lower. The mean score for the TTP was 31.47, which equates to the usage of instructional technology approximately 40% of the time for courses taught. A score of 39 on the TTP would indicate technology usage 50% of the time.

The mean score on the CTSP was 19.94, which is also slightly below the midpoint. The midpoint of the CTSP is between "*fair*" and "*good*" which would be a score of 20. Potential explanations for this negative correlation are discussed in Chapter 5. The statistical results of the Pearson correlation analysis are shown in Table 4.

Table 4

CTSP and TTP Correlation

Subscales	TTP	CTSP	*M*	*SD*
TTP	1	-.110*	31.47	9.47
CTSP	-.110*	1	19.94	4.45

N = 427. $p = .023$.

Research Question 2

PTUP and TTP

The correlation between the PTUP and TTP was *r* = .234. The calculated probability associated with the correlation was *p* = .000, thus the two variables are highly correlated. Faculty members' personal use of technology scores correlated strongly with their use of technology in the classroom score. The findings in Table 5 show a positive correlation between the two aforementioned subscales. The higher the faculty reported their use of technology in teaching, the greater the individual faculty member's reported personal use of technology. The mean score for the TTP was 31.47, which equates to the usage of instructional technology approximately 40% of the time for courses taught. A score of 39 on the TTP would indicate technology usage 50% of the time.

The mean score on the PTUP was 25.09, which equates to approximately 3 hours of personal use per application, per day. The midpoint of the PTUP scale indicates approximately 3.5 hours used per application listed on the scale, per day for personal use. Potential explanations for this correlation are discussed in Chapter 5. The statistical results of the Person correlation analysis are presented in Table 5.

Table 5

PTUP and TTP Correlation

Subscales	TTP	PTUP	*M*	*SD*
TTP	1	$.234^{**}$	31.47	9.47
PTUP	$.234^{**}$	1	25.09	8.54

N = 427. *p* < .000.

Research Question 3

TKP and TTP

The correlation between the TKP and TTP was r = .305. The calculated probability associated with the correlation was p = .000, thus the two variables are highly correlated. A faculty member's technology knowledge score corresponds strongly with how much the individual faculty member's use of technology in teaching score. The findings in Table 6 show a positive correlation between the two subscales. The higher the faculty reported their use of technology in teaching, the greater the individual faculty member's reported their level of knowledge using technology. The mean score for the TTP was 31.47, which equates to the usage of instructional technology approximately 40% of the time for courses taught. A score of 39 on the TTP would indicate technology usage 50% of the time.

The mean score on the TKP was 18.88, which is between the point of "*some knowledge*" and "*functional knowledge*" on the types of technology selected for the survey. The midpoint of the TKP scale would be a score of 20. Potential explanations for this correlation are discussed in Chapter 5. The statistical results of the Person correlation analysis are presented in Table 6.

Table 6

Technology Knowledge and Teaching with Technology Correlation

Subscales	TTP	TKP	*M*	*SD*
TTP	1	.305**	31.47	9.47
TKP	.305**	1	18.88	5.23

N = 427. $p < .000$.

Research Question 4

Generational Differences and PRP

A one-way ANOVA was performed to answer RQ4. This question is to determine the extent of technology use in teaching and assess if there are differences between generations. An ANOVA was conducted to determine if differences between generations exist in their scores on the *Personal Requirements* subscale. RQ4 asks, "*Do faculty members of different generations identify different enabling factors for integrating computer-based technology in their teaching?"*

Prior to conducting the planned data analysis, Levene's test of homogeneity was conducted to ensure that the data met the assumptions required of an ANOVA analysis. The result of the Levene test showed that variance was not homogenous across the four groups. Therefore, the two smallest groups were eliminated, Matures and Millennials. The Levene test was then recalculated using only the two largest generational groups. The remaining dataset consisted of individuals representing the Baby Boomers and Gen-Xers, which passed the Levene's test for homogeneity and thus was appropriate for analysis using the ANOVA procedure. The following results were from conducted analyses using only two groups, Baby Boomers and Gen-Xers.

Respondents of the two different generation groups did not differ significantly in the amount of reported integration of technology into their teaching. ANOVA results were, $F(1, 366) = .107$, $\rho = .743$. However, an ANOVA using the dependent variable, *Personal Requirements Profile* (PRP), with the *Age Classification* (generation) as the independent variable, indicated a significant difference between age groups' requirements to be in place before using technology in their teaching. The results of the data analysis indicate that faculty members differ on their requirements before they will integrate instructional technology in their teaching.

There was a statistically significant difference between Baby Boomers and Gen-Xers and their scores on the *Personal Requirements* identified as enabling factors to integrating instructional technology. Gen-Xers indicated that the items from the PRP were significantly more important to be in place before they would integrate technology in their teaching. The significance was at alpha of < 0.01 ($p = .004$). The significant results are in Table 7.

Table 7

Generational Differences and PRP - ANOVA

	Sum of Squares	*df*	Mean Square	*F*	*ρ*
Between Groups	728.56	1	728.56	8.30	.004
Within Groups	32114.32	366	87.74		
Total	32842.88	367			

$p = .004$. $N = 368$

Research Question 5

Discipline Differences and PRP

A one-way ANOVA was performed in order to answer RQ5. This question is to identify if faculty members' *Personal Requirements* before integrating technology in their teaching differ based on their field of study or discipline. RQ5 asks, "*Do faculty members of different academic disciplines identify different enabling factors for integrating computer-based technology in their teaching?"* Prior to conducting the planned data analysis, Levene's test of homogeneity was conducted to ensure that the data met the assumptions required of an ANOVA analysis. The result of the Levene test showed that variance was not homogenous across the groups. Therefore, the smallest groups were eliminated. The Levene test was then recalculated using only the three largest discipline groups. The remaining dataset consisted of individuals representing the (a) Business & Computer Science, (b) Social Sciences, and (c) Arts, Languages, Music & Humanities, which passed the Levene's test for homogeneity and thus was appropriate for analysis using the ANOVA procedure.

The one-way ANOVA conducted with *Personal Requirements Profile* (PRP) as the dependent variable and *Discipline* as the independent variable indicated no significant differences between disciplines. The statistical results were, $F(2, 306) = .579$, $p = .561$. The groups' structure and organization are as follows: (a) *Business & Computer Science*, (b) *Health Sciences*, (c) *Social Sciences*, (d) *Natural Sciences*, (e) *Math & Statistics*, and (f) *Arts, Languages*, and *Music & Humanities* (Paulus, T.M., Phipps. G. & Harrison, J. [In progress]).

Research Question 6

Gender Differences and PRP

A one-way ANOVA was performed in order to answer RQ6. This question was to determine if male and female faculty were different in what they identified as enabling factors for integrating technology in their teaching. RQ6 asks, "*Do males and females identify different enabling factors for integrating computer-based technology in their teaching?"* The analysis applied was a one-way ANOVA, using the variables Gender and TTP. Table 8 shows the descriptive statistics displaying the means as they relate to the extent in which participants reported to teach with technology. In Table 9, the ANOVA results indicate a statistically significant difference between how male and female faculty identify factors as important to using technology in their teaching. The data analysis indicates female faculty members reported to use instructional technology more often than male faculty members; the significance was $p = .001$.

Table 8

Gender and Descriptive Statistics Using Technology

Gender	Minimum	Maximum	Mean	SD
Male	13.00	57.00	30.13	9.25
Female	13.00	58.00	33.09	9.50
Total	13.00	58.00	31.47	9.47

$N = 427$

Table 9

Gender Differences and TTP - ANOVA

	Sum of Squares	*df*	Mean Square	*F*	*ρ*
Between Groups	927.17	1	927.17	10.55^{**}	.001
Within Groups	37323.21	425	87.81		
Total		426			

$p = .001$, $N = 427$

In order to see if there were any reported differences between male and female faculty and their personal requirements for using technology, a second one-way ANOVA was conducted. The second one-way ANOVA was for the analysis of the *Personal Requirements Profile* (PRP) subscale as a dependent variable along with *Gender* as the independent variable. The analysis results indicated a significant difference between male and female faculty members' personal requirements before using instructional technology in their teaching. The female respondents indicated that the items from the PRP were significantly more important to be in place before they would integrate instructional technology in their teaching than did the male respondents. The statistically significant finding was at alpha < 0.01 (p = .006). The significant results are shown in Table 10.

Table 10

Gender Differences and PRP - ANOVA

	Sum of Squares	*df*	Mean Square	*F*	*ρ*
Between Groups	676.19	1	7.38	7.69	.006
Within Groups	37328.09	425	87.83		
Total	38004.28	426			

** p = .006. N = 427

Research Question 7

Academic Qualification Differences and PRP

Prior to conducting the planned data analysis, Levene's test of homogeneity was conducted to ensure that the data met the assumptions required of an ANOVA analysis. The result of the Levene test showed that variance was not homogenous across the four groups. Therefore, the two smallest groups were eliminated, Bachelors and EdS degree faculty. The Levene test was then recalculated using only the two largest groups (Masters and Doctoral). The test failed with the groups Masters and Doctoral thereby violating the assumed equal variance among groups. The planned analyses were therefore not possible.

RQ7 is stated as, "*Do instructors with different academic qualifications (AA, BS, MS, EdS, PhD), identify different enabling factors for integrating computer-based technology in their teaching?"* Due to the failure of meeting homogeneity of variance assumptions the *Academic Qualifications* data were not analyzed comparing with PRP as others were.

Research Question 8

Faculty Identified Enabling Factors for Using Technology

In addressing RQ #8, in regard to identifying enabling factors for integrating instructional technology, on a Likert-type scale, faculty indicated what their personal requirements would be by marking each item from a scale of 1 to 7. The low mark, 1 = "*not true of me*" to 7 = "*very true of me.*" Each item is categorized as a requirement they reported to have before they would implement a new technology in their teaching practices. The items of the PRP are in Table 12, showing the minimums, maximums, means, and standard deviations. The items are listed in descending order of respondents' answers; based on mean scores per item. As Table 12 indicates, the item with the highest mean score from respondents of this study was the need to *believe that the technology improves learning* with a mean score of 6.22.

Table 12

Requirements before implementing a new technology for instruction

Personal Requirement Profile Items	Min	Max	Mean	SD
to believe technology improves/enhances learning	1	7	6.22	1.09
to know the technology is reliable	2	7	6.19	1.14
clear knowledge of how to use the technology	2	7	5.88	1.14
to know it will not be difficult for my students to use	1	7	5.77	1.29
to know it will be easy to use	1	7	5.26	1.52
to know IT staff will be available if needed	1	7	5.26	1.74
to know it will not be difficult for me to use	1	7	5.24	1.48
to know I will receive institutional support for using technology	1	7	4.53	1.83
to know the setup of the technology is the same campus-wide	1	7	4.18	2.02
to know if others are using the technology	1	7	2.61	1.72

N = 427

CHAPTER V: CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this study was to examine a population of higher education faculty regarding their perceptions of factors enabling them to adopt and implement instructional technology. The approach identified some of the facilitative factors faculty reported to enable them in using technology for instruction and learning. The survey results as reported in Chapter 4 are further discussed in this chapter. The results of this study may be generalized to other similar higher education contexts, where faculty are focused primarily on teaching; however the extent of the generalizability is unknown. As 22 of the 36 ACA institutions participated in this study, the results can likely be generalized to the rest of the ACA institutions, but such a determination is beyond the scope of this study and would need to be determined on a case-by-case basis.

Conclusions

Factors Enabling Faculty to Integrate Instructional Technology

The literature is rich with research studies that provide thorough explanations as to why higher education faculty members determine that technology is difficult or troublesome to use in their teaching practices. Since it is notable that faculty members in various universities use technology as a tool in their teaching, the question as to what motivated or enabled them needed some answers. The general question regarding whether or not there are common enabling factors that facilitate faculty in the integration of instructional technology evolved into eight research questions. The literature helped to direct the development of the survey instrument based on previous studies that would potentially lead to some insight as to what enables faculty to use instructional technology.

Campus Technology Support - RQ #1

The first research question in this study asks if there is any association between faculty perceptions of the quality of their technology support and the extent to which they use technology in their teaching practice. The *Campus Technology Support Profile* results were analyzed for possible correlation with the *Teaching with Technology Profile.* Chapter 2, cited researchers' statements suggesting university campus' technology support as a predictor of faculty's use of instructional technology. However, the researcher understands that the cited articles were published nearly a decade previous to this study. Therefore, the understanding that earlier findings may or may not be confirmed identifying this as a factor of concern was taken into consideration when added to the survey. The results contained in Table 4 of Chapter 4 show a correlation of $r = -.110$, ($p < .05$) between the campus technology support and the extent of instructional technology used by individual faculty respondents. The relationship that was found in the data of this study did not confirm the findings of previous studies (Butler & Sellbom, 2002; Jaber & Moore, 1999). The results showed a negative correlation between the frequency in which a faculty member used technology and their perception of the campus' technology support.

The results indicate an association between the two variables, TTP and CTSP. Faculty who tend to report higher levels of usage also report weaker technology support on their campuses. This may be representative of the well known adage, "familiarity breeds contempt," suggesting that the fascination and awe are reduced through getting to know something or someone better (Aesop, 1869). It is quite possible that these data results are due to the confidence developed by the faculty that use technology in their teaching. Their familiarity with technology may be sufficient for them to have support needs that are beyond the usual requests of a campus' IT (information technology) department experiences and/or level or knowledge. If the analysis results mean that faculty members have difficulty receiving support for the technology they use in their teaching practices, then it would also imply that there is a need for campuses to provide instructional technology support. IT departments are not likely to invest time and effort into learning a number of diverse applications faculty may use for their teaching practices. Therefore, the IT personnel may be perceived as less than efficient in fulfilling instructor's support needs. If the researcher's interpretation of the results is true, it may indicate the need for campuses to have instructional technologists who are knowledgeable about technology sources that are outside of the realm of university IT departments' usual responsibilities. Faculty members who are concerned about teaching and learning are more likely to need help with applications and ideas that are academically oriented; therefore, they need an instructional technologist with a background in pedagogy and/or instructional design.

An additional interpretation of these results, which relates to Rogers' (2003) theory of Diffusion of Innovations, is that many respondents may possibly be categorized as one of the following types of adopters: (a)*Innovators,* (b)*Early Adopters* or (c)*Early Majority.* These three aforementioned adopter types are known for adopting innovations before the average mass of a given society or group. This would be fitting to the faculty who use technology extensively and perceive their campus technology support to be less than adequate. IT departments on given campuses seldom practice being the first to adopt new innovations, therefore IT department would more likely be categorized as the *Late Majority*. The *Late Majority* has also been referred to as the stage of investigation (Alemneh, 2009). The IT department on a university campus is responsible for the infrastructure and systems of the whole campus which is why they must take precautions when adopting new technologies. The *Late Majority* wait until the innovation in question is adopted and evaluated by others, then shown to be advantageous to adopt. This group is also often referred to as the skeptics (Rogers, 2003). The practice of the respondents reporting to use technology often is likely to try new applications when the opportunity emerges whereas this type of practice is likely to oppose that of the campus IT department. The perception that respondents' reported to have about their campus technology support could very likely be related to the contrast of adoption of innovation practices between faculty seeking technologies to use teaching and IT departments' cautions.

Personal Technology Use - RQ #2

Analyses were conducted examining possible relationships between the profiles *Teaching with Technology Profile (*TTP*)* and the *Personal Technology Use Profile*. The results shown in Table 5 of Chapter 4 indicated findings of positive correlations that are statistically significant between *Personal Technology Use Profiles* and *Teaching with Technology Profiles.* The correlation between *Teaching with Technology Profile* and *Personal Technology use Profile* was $r = .234$, ($p < .001$).

In the literature review, Chapter 2, findings in studies as recent as 2006 suggest that peoples' confidence is key to their use of technology in teaching, specifically in K-12 settings. Believing that higher education faculty are similar to K-12 faculty in this regard, the survey included items to assess the respondents' personal experiences with technology and confidence. Though the survey instrument did not include items directly assessing self-efficacy and confidence, it is the researcher's belief that personal use of technology would increase the development of self-efficacy in using technologies. Rogers (2003) frequently referred to the conditions that are needed in order for the adoption of new innovations in his theory, Diffusion of Innovations (DoI). One such condition relevant to the results of this finding is that of *previous* *practice.* The need for teachers to feel confident using technology appeared to be well-established in studies and to have a strong relationship to peoples' personal use of computer-based technology. (Dusick, 1998; Ertmer et al., 2003; Wozney et al., 2006).

The results from the correlation analysis of TTP and PTUP suggest that when faculty use technology for personal reasons, they are more likely to use it in the classroom environment. It could be inferred that the personal use of technology helps to develop confidence or suggests that the confidence in using technology already exists. If this is so, it would imply that the confidence is yet another factor that enables faculty to use technology in their teaching practice. An additional interpretation would be that the more common-place the technology is for individual instructors; the more likely they are to implement it for teaching purposes.

Technology Knowledge - RQ #3

Analyses were conducted examining possible relationships between the profiles *Teaching with Technology Profile (*TTP*)* and the *Technology Knowledge Profile* (TKP). The results shown in Table 6 of Chapter 4 indicated findings of positive correlations that are statistically significant between *Technology Knowledge Profiles* and *Teaching with Technology Profiles.* The correlation between TTP and TKP was $r = .305$, ($p < .000$).

With a strong positive correlation between *Personal Technology Use* and *Technology Knowledge* scores of the faculty members one may infer that their knowledge gives them confidence to use technologies in the classroom. This interpretation would also agree with findings of previous studies (Albion & Ertmer, 2002; Ertmer et al., 2003; Jacobsen, 1998; Wozney et al., 2006). Jacobsen (1998) investigated various factors that both deter and motivate faculty to adopt technology as a teaching tool. Of the numerous patterns Jacobsen (1998) studied were computer expertise and self-efficacy. Jacobsen (1998) used Rogers' (2003) DoI (Diffusion of Innovations) theory to investigate such patterns in faculty using instructional technology in the North Carolina system. If the need for faculty members to feel comfortable and/or confident with technology is truly a factor, then there is a need for faculty to have the training and opportunities to use technology in a safe environment in order to reach the level of confidence necessary.

To continue on the theme of individual *Technology Knowledge Profiles* and how they may relate to *Teaching with Technology Profiles,* an analysis was conducted using the knowledge of technology variable compared to the extent in which they use instructional technology. The statistical results, in Table 6 of Chapter 4, show positive correlations between *Technology Knowledge Profiles* and *Teaching with Technology Profiles.* The correlation between technology knowledge and teaching with technology was $r = .305$, $p < .000$. The relationship between technology knowledge scores and the teaching with technology scores indicate that faculty members' abilities with technology are strongly associated with their use of instructional technology. The matter of an instructor's confidence being a key issue is suggested by the researcher to be considered once again when viewing these statistics. This is not to propose that every instructor that has great skills in using technology or the confidence to do so will use technology as part of their teaching. The results could lead one to infer that higher education faculty members are more likely to use technology on a consistent and/or frequent basis if they already have the skills to do so.

When Rogers (2003) speaks of the process of adoption, he mentions *Persuasion* as one of the five steps. In the DoI theory the thought of previously gained knowledge is recognized as a motivating factor, or in Rogers' (2003) terms, a *Persuasion* which would lead to the use of a particular innovation. Persuading faculty members to use technology in their teaching is likely to be less difficult if they already have the confidence and knowledge of using computer-technologies. Faculty that are knowledgeable and confident with technology, indicate that they are willing to apply instructional technology in their teaching as they find it necessary and/or useful to do so.

The implications of these results vary. One matter is that of training faculty to the degree that they become confident enough to adopt and integrate technologies in their teaching. For the faculty members who do not yet have the skills, but voice their concerns of being less can comfortable with instructional technology, there is a need for training in a safe environment. The implications for a small private teaching university can be serious, as the decision to expend funds on a department that focuses on faculty development and specifically instructional technology training requires commitments. Based on Rogers' (2003) theory the commitments that a university campus would make to meet the needs of their faculty in the manner suggested would lead to individuals deciding to take part in the adoption. Rogers (2003) refers to *diffusion* as, "the process by which an innovation is communicated through channels over time among members of a social system" (p. 35). University administrators' undertaking of such a task would communicate to the faculty members how committed the university is as a whole. The opportunities for a university to develop faculty to become adopters of innovative ways of educating, particularly with technology are countless.

From the statistical results, a number of items can be identified as enabling factors. Those who reported more extensive personal use of technology and a higher degree of knowledge tended to also report more frequent use of technology in their teaching than other respondents. Faculty that reported to have technology skills and to use technology for personal purposes tended to be comfortable enough to use instructional technology. The need for one to be comfortable and confident with technology before using it in his or her teaching practice may be inferred from RQ #3 data analysis results. In RQ #8, the results indicate the factors of ease of use to be of concern for faculty members. The ease of use was a concern for faculty members themselves as they also were concerned about students' ease of use. Thus far, the ease of use factors are a few cited enabling factors and apparently common among higher education faculty members. There were commonalities found between this study and previous studies. The findings that ease of use is of importance to higher education faculty is not new information, however it does confirm that ease of use cannot be a factor ignored. Venkatesh and Morris (2000) stated that "user acceptance is determined by two key beliefs, namely perceived usefulness and perceived ease of use" (p. 116). Researchers, Moore and Benbasat (1991), developed an instrument measuring perceptions and adoption of innovations in which they identified ease of use as one of the constructs. Both of the aforementioned studies were based on Rogers' (2003) Diffusion of Innovations (Moore & Benbasat, 1991; Venkatesh & Morris, 2000).

Generational Differences - RQ #4

Results of RQ #4, "*Do faculty members of different generations identify different enabling factors for integrating computer-based technology in their teaching?*" identified significant differences between Gen-Xers and Baby Boomers and their responses to the *Personal Requirements Profile*. The *Personal Requirements Profile* indicates that Gen-Xers scored significantly higher than Baby Boomers, meaning they placed more emphasis on items that must be in place before they will integrate computer-based technology in their teaching. The amount of technology used in teaching practices did not differ between generations to a significant extent. A likely explanation of this phenomena is that instructors are a part of a common profession, that being higher education, and are similar in their practices. A second and possibly more probable reason for the lack of findings to suggest differences in generations when it comes to technology use is that out of 427 respondents more than 86% were of two generations that are side by side on a timeline and therefore could be similar in philosophies and behaviors in many respects. The two aforementioned generations are Baby-Boomers (42.2%) and Gen-Xers (44%). Since information was not gathered from the other generation groups, it is impossible to determine whether or not any differences might exist in terms of how their personal requirements for technology use compared with Baby Boomers or Gen-Xers. However, this was beyond the scope of the current study and will have to be examined by further studies.

Between the two generation groups, Gen-X generation group rated the value of having personal required item before integrating technology were shown to be statistically significant in the found difference.

Discipline Differences - RQ #5

Results of RQ5, "*Do faculty members of different academic disciplines identify different enabling factors for integrating computer-based technology in their teaching?"* did not identify any significant differences between discipline groups. Based upon the data gathered in this study, the extent to which various disciplines use technology in their teaching does not vary to a significant degree. Faculty members in particular academic discipline reported to use technology more or less the same as did faculty in other academic disciplines.

The *Personal Requirements Profile* scores, additionally, did not show any significant difference between groups. The results of this study conflict with the suggestion that faculty of varying disciplines use technology more or less than others (Becher, 1994; Nelson Laird, 2008; Stoecker, 1993; Waggoner, 1994). These data results, inconsistent with other study's results, may have occurred because of the times that studies took place investigating disciplinary differences and technology use in education. Nelson Laird and his colleagues (2008) took a general approach reviewing the adoption of effective educational practices in a more recent publication.

Hammond and Bennett (2002) demonstrated in their study that humanities and languages faculty used technology for small group discussions and collaboration; therefore their study suggested that faculty of varying disciplines do differ in their use of instructional technology. The faculty may use technology differently; however, their frequency of technology use did not differ significantly in this study's findings nor did the values they placed on personal requirements. There are a variety of reasons as to why this may have occurred. The instrument in this particular study may not have asked the most accurate questions for assessing such information. As groups were organized on a categorical system that has not yet been validated, there is the possibility that differences may have occurred if the discipline groups were categorized either differently or more explicitly. Since previous studies did find differences, though ten years and more before this study, it is still possible that differences do exist. Biglan's organizational structure of disciplines resulted in two and four groups, which makes discipline groups much larger than if they were more refined. If disciplines were less refined, the outcome of the study may have been different, however doing so it outside of the scope of this study and should be considered for later studies.

Studies referred to in Chapter 2 indicating findings showing differences between discipline groups often followed Biglan's organization of disciplines. It is possible that in the time since the earlier studies to the time of this study, practices and perceptions have changed such that disciplinary differences may no longer exist. Further research should be conducted to clarify the matter.

Gender Differences - RQ #6

Results of RQ6, "*Do males and females identify different enabling factors for integrating computer-based technology in their teaching?*" identified differences between genders and the extent to which they use instructional technology. The results of using the variables *Gender* and *Teaching with Technology Profile* show significant differences. The descriptive statistics in Chapter 4, Table 8, show that female faculty respondents reported to using instructional technology in their teaching significantly more often than male faculty members reported to use technology; the statistical significance was p = .001. Significant differences between male and female faculty and *Personal Requirements Profile* were also found when conducting the one-way ANOVA. The ANOVA results show that female faculty tended to assign higher score values (assign greater relative importance) to specific personal requirement items in the PRP subscale than did male faculty. The earlier literature suggested the use of technology was more common among those of the male gender. However, in the literature of the mid 80s to present times, the literature suggests that technology is so common that there are no gender differences in using it (Venkatesh et al., 2000; Wilder, Mackie, and Cooper, 1985). The studies found in the literature and reported in Chapter 2 focused predominantly on computer technology use in the corporate world. Possibly the reason this study's results conflict with what was found in Wilder and her colleagues' (1985) two surveys is because of the participants being from different environments. Venkatesh and Morris' (2000) studies were also conducted in business settings, which may again suggest differences in participants in such studies. The findings in this study do not support those reported by other in the literature. This may be due to environments in which the studies took place. The difference in results may be due to the matter of earlier studies assessing workers in the corporate world whereas this study assessed higher education faculty. Further research is needed to explore the matter of gender differences.

This study unexpectedly found female faculty to report using technology more frequently than male faculty members. The previous studies that examined gender differences in adopting technology suggested that, if there were to be a difference, men would be those to find technology more useful than women. As earlier studies were not of higher education faculty, the results of this study may be revealing of how potentially different educators are from people of other professions. One interpretation of this finding might be that female faculty in some parts of our society are still feeling the pressure to attain acceptance equal to that of men. If this is the case, it could be inferred that the female faculty members are involved in their work in ways that will help them gain their deserved recognition. Female faculty may see that one of many ways to reach such a level may be to adopt and implement instructional technology. According to Spotts and his colleagues' (1997) study, female faculty were the reported to use technology for instruction more than male faculty and a primary incentive they identified was tenure, merit pay, and the increase of student learning. An additional interpretation would be that female faculty are nurturing in their behavior toward their students and seek what is best for their students in a less authoritarian manner. As the respondents of this study were self-selected faculty and the data are self-reported, the results are not an objective assessment of females using technology more than males. Females may tend to over report and males may tend to under report. As technology may be more of a novelty for females than males, the male faculty members may be less enamored. There are a variety of interpretations possible for these findings of which have been shared in this Chapter. The useful information to take from the results is that university campuses should be intentional about including female faculty in the decision making process as they are likely to identify the applications and/or technologies that their colleagues would feel confident and comfortable using. The idea of intentionally assuring that female faculty members participate in decision making of this type would again be a way of communicating to the social system and further encouraging the adoption of technology (Rogers, 2003).

The findings were significant between male and female faculty and personal requirements however understanding what the specific differences are is outside of the scope of this study. Further studies are needed to clarify specific differences between male and female faculty if they do indeed exist. In this study, the significant differences found between genders and personal requirements confirm what studies in the corporate world already recognized. The results in this study also indicate, to some degree, that people are similar in behavior no matter what profession. In Chapter 2, Venkatesh and his colleague's (2000) study recognized that female workers were more hesitant to adopt new software and were resistant to the changes. The higher scoring of personal requirements before integrating instructional technology suggest that there are items from the PRP that need to be in place more for female faculty than male faculty. As the descriptive statistics show in Chapter 4 for research question eight, the items in the PRP with high scores are concerned with reliability, ease of use, and belief. These findings very closely coincide with previous findings (Moore & Benbasat, 1991; Morris, Venkatesh, & Ackerman, 2005; Venkatesh & Morris, 2000; Yuen, 2002). Instructional technologists may wish to consider improving training opportunities to make the technology appear to be less difficult. Again, the involvement of female faculty in the decision making process would likely be beneficial for all faculty on a given campus.

Academic Qualification Differences - RQ #7

It was not possible to conduct the analysis planned for the *Academic Qualifications* research question due to the subgroups not exhibiting similar within group variance. This was strongly influenced by the low number of respondents in the EdS and Masters groups. This decision was based upon the dataset failing Levene's test of homogeneity of variance among subgroups. Therefore, it was not possible to determine if the *Academic Qualifications* of faculty in any way affected their use of technology in instruction. If the survey sample were selected with the intention of balancing across the range of degree holding groups, then it might be possible to determine whether or not academic qualification (MS, EdS, PhD) is associated with or a predictor of technology use in teaching. However, due to the low numbers of participants in the BS and EdS groups and the resulting failure of the dataset to meet the homogeneity of variance assumptions, this analysis was not possible as part of this study.

Personal Requirements Profile - RQ #8

The PRP data were analyzed by conducting descriptive statistics. The descriptive results show that the respondent's primary requirement before integrating technology was to believe that the technology would enhance students' learning. The other items that were identified by respondents as necessary items related to ease of use and knowing that the technology is reliable. Of the constructs in Rogers' (2003) DoI theory, the *relative advantage,* and *observability* are reflected in the respondents' higher scoring of PRP items. Faculty members observing improved learning through the use of technology would be the most increase the likelihood of them believing it is possible. One practice of *observability* would be for a faculty member to review research results or a colleague's practices showing students' learning improved through the use of technology in the classroom.

Results and Rogers' Theory

Some results of this study are closely related to Rogers' (2003) five factors for determining the rate of adoption of an innovation are applicable. The highest ranked personal requirement among the 427 respondents was the need to know that the technology would enhance or improve students' learning. This is directly related to Rogers' (2003) first of the five factors; that being *relative advantage*, which was more thoroughly reviewed in Chapter 2. The idea that technology may enhance student learning would certainly be considered having *relative advantage* especially for educators. Another factor that emerged from this study's results was the ease of use. Rogers' (2003) third of the five factors is *complexity*; which is referring to the suggestion that the more complex an innovation is, or difficult, the less likely it is going to be adopted. *Observability* refers to the degree to which positive results can be observed from the use of the innovation. This is again related to seeing that students' learning can be enhanced. These three are the most applicable of the five factors Rogers (2003) refers to in his writing.

Implications of Findings

With the information gained through these findings, instructional technologists, higher education administrators, and faculty members can better assess their campuses' practices. It is important to recognize that the respondents that use technology for personal purposes and respondents reporting to have knowledge of various technology types are comfortable enough to use the technology in the classroom. The value of being comfortable with technology is a factor that this study has derived from the correlation analyses. The implications of the correlation findings alone can be of use to those planning faculty development and seeking to find what faculty need in order to integrate technology. In the personal requirements component it was observed that faculty want to know or believe that the use of technology in teaching will impact students and enhance their learning experience. If such experiences can be observed through faculty development sessions where colleagues share their experiences, it can be suggested that Rogers' (2003) *observability* construct applied. The activity of faculty sharing with their peers would also be directly related to Rogers' (2003) component of communicating to the social system in order to increase adoption of innovations. The other factors that were identified as important to respondents were matters related to how difficult or easy the technologies would be. Knowing that these are concerns of faculty in the year 2010 gives much insight to what can or cannot be done to enable faculty to use instructional technology. As the study revealed, male and female faculty do report different levels of technology use in their teaching. It is possible that female faculty members have found ways in which technology fits into their teaching practices without too much difficulty, which would then allow them to use it more extensively in the classroom. It would probably be helpful in planning campus technology developments to keep opportunities open involving faculty representing both genders. The plans would be more apt to meet the needs of a greater mass. Administrators often seek to implement the latest technologies for their campuses without the involvement of faculty members. This study reveals that higher education faculty of various disciplines and generations, and a fair representation of both genders should be participants in some of the campus technology decision making. As Rogers (2003) suggested, there will often be a spread of the types of adopters. Some will be quick to adopt the more recent innovations and others, those he identified as laggards, are either the last to adopt an innovation or those never to adopt. From the spread of results in the frequency of use, the thought that there will be a variety of users is confirmed. Some will be the first to try a new technology, some will be the last or not use technology at all, and many will fall somewhere in between the two ends of the spectrum.

Recommendations for Future Studies

Based upon the findings reported in this study, it is clear that more data are needed to further clarify the enabling factors that will help faculty adopt and use technology more extensively in their teaching. A future study would be to conduct research evaluating higher education campuses' instructional technology faculty support compared to the type of faculty support provided by the department responsible for supporting the campus technology infrastructure. Faculty need to know that their needs are understood and supported for using technology in their teaching. Support from both departments of a campus may influence an individual instructors behavior toward the use of technology in teaching. Additionally, conducting an intentionally-focused study on computer/technology self-efficacy of faculty and their use of technology would be valuable for those working with faculty that show to have low computer technology self-efficacy. A pre and post study that would include training toward enhancing the computer self-efficacy would not reveal if the training designed in the study was effective, but would also inform if this is an area that needs more attention or not.

Though this study did look at the frequency of computer-based technology use by faculty members, it did not survey faculty that are infrequent users specifically. A future study conducting a survey and/or interviews to identify factors that inhibit faculty from using technologies more frequently than they do would reveal useful information. Lastly, it is suggested by this researcher to conduct a study that would only survey high-end users of instructional technologies to assess their intentions of using these and other technologies in their teaching. High-end users are often faculty members that work independently of others; yet they have aspirations that are possibly ignored or silent. With knowing what some faculty would do with technologies, were they available, administrators and instructional technologist can possibly get an understanding of what the future may hold in the field.

Summary

Based on the findings of this study, there are higher education faculty members that are frequent users as well as many that are less frequent users of computer-based technology for instruction. The more familiar faculty members are with technologies and/or use them for personal purposes, the more often they use it in their teaching practices. The users that have report to have an advanced level of knowledge in technologies are also more likely to use the technology in their teaching practice. The comfort and self confidence that comes with the knowledge and common everyday use of technology for some is yet another factor suggested to promote the use of technology in the classroom.

Along with the knowledge and confidence in using technology, it appears that the matter of support on a given campus and concerns about ease of use are common enabling factors. Though other factors were found to show differences in faculty members' use of technology, some factors were not controllable (i.e. generation, gender). Though females reported to use technology more than males, it is not known if the self-reporting was accurate. This information merely informs readers that the sample surveyed in this study revealed a self-reported gender difference and this factor should probably be considered when forming committees that will participate in decision making for a university's future technology needs. This can also be said for other intrinsic factors that emerged as differentiating factors among faculty members. As small private teaching institutions consider offering degree programs online, the findings of this study are of value in concluding that faculty members should be consulted when such decisions are made. Correlations in this study showed associations between technology use in teaching and the level of technology knowledge and personal technology use, which would be useful to know when consulting faculty on their personal level of comfort with technology. Distance education is only one of many instructional approaches that the future may hold for small teaching institutions, so the findings of study are potentially beneficial for institutions that do intend on approaching new ways in involving faculty program planning and developing.

REFERENCES

References

Aesop, Croxall, S., & Townsend, G. (1869). The Fables of Æsop. London, F. Warne and Co.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50**,** 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Albion, P.R. & Ertmer, P.A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends, 46*(5), 34-38.

Ali, A. (2003). Faculty adoption of technology: Training comes first. *Educational Technology, 43*(2), 51-53.

Appalachia Educational Lab and Tennessee Education Association (1991). Bits, bytes, and barriers: Tennessee teachers' use of technology. Charleston, WV: Appalachia Education Lab. (ERIC Document Reproduction Service No. ED 343 580)

Bai, H., & Ertmer, P. A. (2008). Teachers educators' beliefs and technology uses as predictors of preservice teachers' beliefs and technology attitudes. *Journal of Technology and Teacher Education, 16*(1), 93-112.

Bates, M. J. (2010). *An operational definition of the information disciplines.* Paper presented at the iConference 2010, February 03, 2010, Champaign, Ill. Retrieved July 07, 2010 from http://www.ideals.illinois.edu/handle/2142/14922

Bauer, J., & Kenton, J. (2005) Toward technology integration in the schools: Why it isn't' happening. *Journal of Technology and Teacher Education, 13*(4), 519-546.

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher Education, 19*(2), 151-162.

Becker, H. J. (2001). *How are teachers using computers in instruction.* Paper presented at the Meetings of the American Educational Research Association, Seattle, WA.

Becker, H. J. (2000). Findings from the teaching, learning, and computing survey: Is Larry Cuban right? *Educational Policy Analysis Archives, 8*(51), 1-35.

Becker, H. J. (2000a). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computer in schools. *Journal of Research and Computing in Education, 26*(3), 291-321.

Becker, H. J., & Ravitz, J. (1999). The influence of computer and internet use on teachers' pedagogical practices and perceptions. *Journal of Research on Computing in Education, 31*, 356-384.

Beggs, T. A. (2000). *Influences and barriers to the adoptions of instructional technology.* Paper presented at the Mid-South Instructional Technology Conference, Murfreesboro, TN.

Bielema, C., Keel, R. & Musser, D. (2002). How to Successfully Implement Change --- Build It and They Will Come. In C. Crawford et al., (Eds.), Proceedings of Society for Information Technology and Teacher Education International Conference 2002 (pp. 2324-2325). Chesapeake, VA: AACE.

Biglan, A. (1973). The characteristics of subject matter in different academic areas. *Journal of Applied Psychology, 57*(3), 195-203.

Biglan, A. (1973a). Relationships between subject matter characteristics and the structure and output of university departments. *Journal of Applied Psychology, 57*(3), 204-213.

Braak, J. (2001). Factors influencing the use of computer mediated communication by teachers in secondary schools. *Comptuer & Education, 36*(1), 41-57.

Brown, A. H., Benson, B., & Uhde, A. P. (2004). You're doing what with technology? An expose on" Jane Doe" college professor. *College Teaching, 52*(3), 100-105.

Butler, D. L., & Sellbom, M. (2002). Barriers to adopting technology for teaching and learning. *Educause Quarterly, 25*(2), 22-28.

ChanLin, L., Hong, J., Horng, J., Chang, S., & Chu, H. (2006). Factors influencing technology integration in teaching: A Taiwanese perspective. *Innovations in Education and Teaching International*, *43*(1), 57-68.

Chizmar, J. F., & Williams, D. B. (2001). What do faculty want? *Educause Quarterly, 24*(1), 18-24.

Cohen, J. (1988). *Statistical power analysis for behavioral sciences* (2nd ed). New York: Academic Press.

Condie, R. & Livingston, K. (2007). Blending online learning with traditional approaches: changing practices. *British Journal of Educational Technology, 38*(2), 337-348.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*(1), 98-104.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *53*(1), 297-334.

Cuban, L. (2000). *Taking stock: what does the research say about technology's impact on education?* Retrieved June 23, 2007, from http://www.techlearning.com/db_area/archives/cuban.php

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

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*(4), 813-834.

Dexter, R. (2005). Instructional leadership for systemic change: The story of San Diego's reform. *School Administrator, 62*(9), 57-57.

Dusick, D. (1998). What social cognitive factors influence faculty member's choice to use computers for teaching. *Journal of Research on Computing in Education, 31*(2), 123-137.

Ely, D. P. (1976). Creating the conditions for change. In S. Faibisoff & G. Bonn (Eds.), Changing Times: Changing Libraries (pp. 150-162). Champaign, IL: University of Illinois Graduate School of Library Science.

Ely, D. P. (1990). Conditions that facilitate the implementation of educational technology innovations. *Journal of Rsearch on Computing in Education, 23*(2), 298-306.

Ely, D. P. (1995). Technology is the Answer! But What was the Question?, *US Department of Education.*: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. 381152 at http://eric.ed.gov/ERICWebPortal/).

Ely, D. P. (1999). Conditions that facilitate the implementation of educational technology innovations. *Educational Technology, 39*(6), 23-27.

Ensminger, D. C., & Surry, D. W. (2002). *Faculty perceptions of factors that facilitate the implementation of online programs*. Paper presented at the Mid-South Instructional Technology Conference.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *ETR&D, 47*(4), 47-61.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *ETR&D*, *53*(4), 25-39.

Ertmer, P. A., Addison, P., Lane, M., Ross, E., & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education, 32*(1), 54-72.

Ertmer, P., Conklin, D., Lewandowski, J., Osika, E., Selo, M., & Wignall, E. (2003). Increasing preservice teachers' capacity for technology integration through the use of electronic models. *Teacher Education Quarterly*, *30*(1), 95-112.

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: Sage Publications.

Fishbein, M., & Ajzen, I. (1980). *Understanding Attitudes and Predicting Social Behavior*: Englewood Cliffs, NJ: Prentice-Hall.

Franklin, C. (2007). Factors that influence elementary teachers use of computers. *Journal of Technology and Teacher Education*, *15*(2), 267-293.

Guilfoyle, C. 2006). NCLB: Is there life beyond testing? *Educational Leadership, 64*(3), 8-13.

Gura, M., & Percy, B. (2005). *Recapturing technology for education: Keeping tomorrow in today's classrooms*. Lanham, MD: Rowman & Littlefield.

Hall, G. E., Loucks, S. F., William, L., & Beulah, W. (1996). Levels of use of the innovation: A framework for analyzing innovation adoption. In D. P. Ely & T. Plomp (Eds.), *Classic writings on instructional technology*. Westport: Libraries Unlimited.

Hammond, N., & Bennett, C. (2002). Discipline differences in role and use of ICT to support group-based learning. *Journal of Computer Assisted Learning*, *18*(1), 55-63.

Hamza, M.K., & Alhalabi, B. (1999). *Technology and education: Between chaos and order.* Retrieved June 22, 2007, from http://www.firstmonday.dk/issues/issue4_3/hamza/

Hayden, T.A. & Barton, R. (2007). Common needs and different agendas: How trainee teachers make progress in their ability to use ICT in subject teaching. Some lessons from the UK.

Computers & Education, 49(4), 1018-1036.

Hew, K., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252.

Hoerup, S. L. (2001). *Diffusion of innovation: Computer technology integration and the role of collaboration.* Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Jaber, W. E., & Moore, D. M. (1999). A survey of factors which influence teachers' use of computer-based technology. *International Journal of Instructional Media, 26*(3), 253-266.

Jacobsen, D.M. (1998). *Adoption patterns and characteristics of faculty who integrate computer technology fro teaching and learning in higher education.* Unpublished doctoral dissertation. University of Calgary, Department of Educational Psychology, Calgary, Canada.

Kanaya, T., Light, D., & Culp, K. M. (2005). Factors influencing outcomes from a technology-focused professional development program. *Journal of Research on Technology in Education 37*(3), 313-329.

Kozloski, K. C. (2006). *Principle leadership for technology integration: A study of principal technology leadership.* Unpublished doctoral dissertation, Drexel University, Philadelphia, PA.

Lucas, S. B. (2005). *Who am I? The influence of teacher beliefs on the incorporation of instructional technology by higher education faculty.* Unpublished doctoral dissertation, The University of Alabama, Tuscaloosa, AL.

MacNeil, A. J., & Delafield, D. P. (1998). *Principal leadership for successful school technology implementations.* Paper presented at the 9th International Conference of Society for Information Technology and Teacher Education, March 10-14, 1998, Washington, DC.

Maier, P., & Warren, A. (2000). *Integrating technology in learning & teaching: A practical guide for educators*. London: Kogan Page.

Montalvo, C., (2006). What triggers change and innovation? *Technovation 26*, 312-323.

Morgan, G. (2003). *Faculty use of course management system*. Paper published by the Educause Center for Applied Research (ECAR). Washington, DC & Boulder, CO.

Morris, M., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology, 53*(2), 375-403.

Morris, M., Venkatesh, V., & Ackerman, P. (2005). Gender and age differences in employee decisions about new technology: An extension to the Theory of Planned Behavior. *IEEE Transactions on Engineering Management, 52*(1), 69-84.

Naimova, V. (2008). *Factors affecting the implementation of instructional technolog in the second language classroom.* Unpublished doctoral dissertation, Brigham Young University, Provo, UT

Nelson Laird, T. F., Shoup, R., Kuh, G. D., & Schwarz, M. J. (2008). The effects of discipline on deep approaches to student learning and college outcomes. *Research in Higher Education*, *49*(6), 469-494.

Newton, R. R., & Rudestam, K. **E.** (1999). *Your statistical consultant: Answers to your data analysis questions.* Thousand Oaks, CA: Sage.

Nunnally, J. C. (1978). *Psychometric theory* (2^{nd} Edition). New York: McGraw-Hill.

Oblinger, D. G., & Oblinger, J. L. (2005). *Educating the net generation*. In Oblinger, D. G. & Oblinger, J. L. (Eds.): North Carolina: EDUCAUSE.

Pajo, K. & Wallace, C. (2001). Barriers to the uptake of web-based technology by university teachers. *The Journal of Distance Education, 16*(1), 70-84.

Park, B. (2003). *Faculty adoption and utilization of web-assisted instruction (WAI) in higher education*. Unpublished doctoral dissertation. Florida State University.

Park, S., & Ertmer, P. (2008). Examining barriers in technology-enhanced problem-based learning: Using a performance support systems approach. *British Journal of Educational Technology, 39*(4), 631-643.

PASW (2010). PASW for Windows (Version 18) [computer software]. Chicago, IL: Available from http://www.ibm.com/

Paulus, T. M., Phipps, G. & Harrison, J. (in progress). *Faculty research on technology integration in their teaching at a research-intensive university*, Unpublished manuscript, University of Tennessee Knoxville, Knoxville, TN.

Pearce, N. (2008). *Technology use across a campus: An analysis of the uptake of ICT across faculties within a single university*. Paper presented at the 4th International Conference of e-Social Science, June 19, 2008, Manchester, England. Retrieved January 11, 2010 from http://www.ncess.net/events/conference/programme/thurs/1bPearce.pdf

Pelgrum, W. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education, 37*(2), 163-178.

Prensky, M. (2005). Engage me or enrage me: What today's learners demand. *Educause Review, 40*(5), 60-64.

Reeves, T. C., & Oh, E. (2008). Generational differences. In J. M. Spector, M. D. Merill, J. V. Merrienboer, & M. P. Driscoll (Eds.), *Handbook of research for educational communications and technology* (pp. 295-303). New York: Taylor & Francis Group, LLC.

Reiser, R. A., & Dempsey, J. V. (Eds.). (2007). *Trends and issues in instructional design and technology* (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc.

Roberts, C. (2008). Implementing educational technology in higher education: A strategic approach. *The Journal of Educators Online, 5*(1), 1-16.

Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New York: The Free Press.

Rogers, P. (2000). Barriers to adopting emerging technologies in education. *Journal of Educational Computing Research, 22*(4), 455-472.

Sahin, I. & Thompson, A. (2007). Analysis of predictive factors that influence faculty members' technology adoption level. *Journal of Technology and Teacher Education, 15*(2), 167-190.

Shapiro, W. L., Roskos, K., & Cartwright, G. P., (1995). Technology-enhanced learning environments. *Change, 27*(6), 67-69.

Smart, J. C., & Elton, C. (1982). Validation of the Biglan model. *Research in Higher Education, 17*(3), 213-229.

Smart, J. C., & McLaughlin, G. W. (1978). Reward structures of academic disciplines. *Research in Higher Education, 8*(1), 39-55.

Spector, J. M. (2008). Cognition and learning in the digital age: Promising research and practice. *Computer in Human Behavior, 24*(2), 249-262.

Spodark, E. (2003). Five obstacles to technology integration at a small liberal arts university. *THE Journal (Technological Horizons In Education), 30*(8), 14-19.

Spotts, T. H. (1999). Discriminating factors in faculty use of instructional technology in higher education. *Educational Technology & Society, 2*(4), 92-99.

Spotts, T. H., Bowman, M. A., & Mertz, C. (1997). Gender and use of instructional technologies: A study of university faculty. *Higher Education,34*(4), 421-436.

Stoecker, J. L. (1993). The Biglan classification revisited. *Research in Higher Education, 34*(4), 451-463.

Surry, D. W. (2000). Strategies for motivating higher education faculty to use technology. *Innovations in Education and Training International, 37*(2), 145-153.

Surry, D. W., Ensminger, D. C., & Haab, M. (2005). A model for integrating instructional technology into higher education. *British Journal of Educational Technology, 36*, 327-329.

Surry, D.W., & Farquhar, J.D. (1997) Diffusion theory and instructional technology. *Journal of Instructional Science and Technology (2)*1. Retrieved May 2009 http://www.doaj.org/doaj?func=abstract&id=93977

Surry, D. W., Porter, B., Jackson, K., & Hall, D. (2004). *Conditions for Creating an Innovation Friendly Environment in K-12 Schools.* Paper presented at the Society for Information Technology and Teacher Education International Conference 2004, Atlanta, GA, USA.

SurveyMonkey Corporation (1999-2010). *SurveyMonkey* [Computer Software]. Palo Alto, CA, USA. http://www.surveymonkey.com/

Unkefer, L. C., Shinde, S., & McMaster, K. (2009). Integrating advanced technology in teacher education courses. *TechTrends, 53*(3), 80-85.

Venkatesh, V., & Morris, M. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115-139.

Venkatesh, V., Morris, M. & Ackerman, P. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes, 83*(1), 33-60.

Waggoner, M. D. (1994). Disciplinary differences and the integration of technology into teaching. *Journal of Information Technology for Teacher Education, 3*(2), 175-186.

West, R. E., Waddoups, G., & Graham, C. R. (2007). Understanding the experiences of instructors as they adopt a course management system. *Education Technology Research & Development*, *55*(1), 1-26.

Weston, J. W. (2005). Why faculty did - and did not - integrate instructional software in their undergraduate classrooms. *Innovative Higher Education, 30*(2), 99-115.

Whitmire, E. (2002). Disciplinary differences and undergraduates' information-seeking behavior. *Journal of the American Society for Information Science and Technology, 53*(8), 631-638.

Wilder, G., Mackie, D., & Cooper, J. (1985). Gender and computers: Two surveys of computer-related attitudes. *Sex Roles, 13*(3/4), 215-228.

Willis, J. (1993). Technology diffusion in the "Soft Disciplines". *Computers in the Schools, 9*(1), 81-106.

Wilson, B., Sherry, L., Dobrovolny, J., Batty, M., & Ryder, M. (2001). Adoption factors and processes. In H. H. Adelsberger, B. Collis, & J. M. Pawlowski (Eds.), *Handbook on* *information technologies for education & training* (pp. 293-307). New York: Springer-Verlag.

Wozney, L., Venkatesh, V. & Abrami, P. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education, 14*(1), 173-207.

Wunsch, M. (1992). Killing the old myths: Positioning an instructional technology center for a new era in higher education. *TechTrends*, *37*(6), 17-21.

Yoon, S. (2003). In search of meaningful online learning experiences. In S. R. Aragon (ed.). *New Directions for Adult and Continuing Education,* 19-30.

Yuen, H. K., & Ma, W. K., (2002). Gender differences in teacher computer acceptance. *Journal of Technology and Teacher Education, 10*(3), 365-382.

APPENDICES

Appendix A – Faculty Technology Inventory

Thank you for participating in this study. This questionnaire is designed to assess your present state as an instructor and the state of your institution in reference to integrating computer-based technology into the teaching practice. Please answer all questions.

Do you use technology in your teaching practice? Yes ☐ Now ☐

I. Faculty Demographics

Q: Discipline/ Field Category

- Business & computer science
- Health sciences
- Social sciences
- Natural sciences
- Math & statistics
- Agricultural sciences
- Arts, languages, music & humanities
- Other: ________________

Q: Years teaching in higher education: ______________ (ranges of five years)

Q: Years teaching at current institution: _____________ (ranges of five years)

Q: Institution name: ____________________________________ (menu of institution names)

Section A: Teaching with Technology Profile (TTP)

Please indicate in the following list, in what percentage of your classes over the last year do you use these types of computer technologies in your teaching.

PowerPoint	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Course Management System	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Audience Response System	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Online Discussions	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Post Grades Online	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Post Materials Online	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Online Project Collaboration	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Podcasting	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Show Video / Clips	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Online Exercises	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Online Assignments	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
Online Assessments	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%
eBooks	☐ 0%	☐ 25%	☐ 50%	☐ 75%	☐ 100%

Section B: Current Campus Technology Support Profile (CTSP)

Please indicate your institution's current support for faculty integrating computer technology in teaching.

Stipend for technology integration	☐ Poor	☐ Fair	☐ Good	☐ Strong
Most classrooms have adequate technology	☐ Poor	☐ Fair	☐ Good	☐ Strong
Encouragement from administration	☐ Poor	☐ Fair	☐ Good	☐ Strong
Monetary support for training	☐ Poor	☐ Fair	☐ Good	☐ Strong
Training on campus	☐ Poor	☐ Fair	☐ Good	☐ Strong
Competent technical support	☐ Poor	☐ Fair	☐ Good	☐ Strong
Recognition of efforts	☐ Poor	☐ Fair	☐ Good	☐ Strong
Decisions are based on faculty input	☐ Poor	☐ Fair	☐ Good	☐ Strong

Section C: Personal Technology Use Profile (PTUP)

Indicate the number of hours per week you spend on the following technologies or technological activities.

Email	0	1	2	3	4	5	6	7+
Facebook / Social Networks	0	1	2	3	4	5	6	7+
Texting/Chatting	0	1	2	3	4	5	6	7+
Surfing Internet	0	1	2	3	4	5	6	7+
Blogging or Twittering	0	1	2	3	4	5	6	7+
Video / Audio technology	0	1	2	3	4	5	6	7+
Web Design	0	1	2	3	4	5	6	7+
Desktop Publishing	0	1	2	3	4	5	6	7+
Graphic Work (Photoshop etc)	0	1	2	3	4	5	6	7+

Section D: Technology Knowledge Profile (TKP)

Please indicate your knowledge level of the following computer-based technologies.

Desktop publishing (e.g., InDesign, MS Publisher)	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Audio editing	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Database design	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Spreadsheets	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Video editing	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Flash / animation	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
HTML (coding)	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Graphics (e.g., Photoshop, illustrator etc)	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
PowerPoint	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge
Statistical / Math programs (e.g., SPSS, SAS)	☐ No knowledge	☐ Some knowledge	☐ Functional knowledge	☐ Advanced knowledge

Section E: Personal Requirements Profile (PRP)

Ask yourself the following question and answer each of the sentence completions on a scale from 1 to 7, where 1 is not true at all for you and 7 is very true for you.

Before I will implement a new technology into my classroom, I need:

to know the technology is reliable	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
clear knowledge of how to use the technology	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to believe the technology improves/enhances learning	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know it will not be difficult for me to use	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know I will receive institutional support for using technology	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know if others in my department are using it	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know it will not be difficult for my students to use	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know it will be easy to use	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know the setup of the technology is the same campus-wide	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
to know IT staff will be available if needed	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7

Q: Highest degree held:

a. High School
b. Associates
c. Bachelors
d. Masters
e. Educational Specialist (EdS)
f. Doctorate
g. Other __________________

Q: Gender:

a. Male
b. Female

Q: Age: __________

Your participation in this study is greatly appreciated.

Appendix B – Simon & Schuster Letter of Permission

S I M O N & S C H U S T E R

1230 Avenue of the Americas
10th Floor
New York, NY 10020
(212) 698-7260
(212) 698-7283 (fax)
agnes.fisher@simonandschuster.com

Agnes Fisher
Director
Permissions Department

July 29, 2009

C. Michael Sturgeon
2135 Greendale Drive, NE
Cleveland, TN 37323

Dear Mr. Sturgeon:

In reply to your letter of July 22nd, you have our permission to use Figure 5-1 (A Model of Five Stages in the Innovation-Decision Process), p 170 *Diffusion of Innovations, 5th Edition* by Everett M. Rogers, in your doctoral dissertation and in all copies to meet degree requirements at the University of Tennessee-Knoxville. Reapply for permission for all subsequent uses.

The following acknowledgement is to be reprinted in the caption for the figure:

Source: *Diffusion of Innovations, 5th Edition* by Everett M. Rogers (p 170, F. 5-1). Copyright © 1995, 2003 by Everett M. Rogers. Copyright © 1962, 1971, 1983 by The Free Press, a Division of Simon & Schuster, Inc. Reprinted with permission of the publisher. All rights reserved.

Sincerely,

Appendix C – ACA Letter of Survey Permission

ACA Appalachian College Association

210 Center St. - Berea, KY 40403
Phone: (859) 986-4584
FAX: (859) 986-9549
http://www.acaweb.org

February 23, 2010

Mr. Michael Sturgeon
Faculty Coordinator of Instructional Technology
Mayfield Annex—Suite 101
Lee University
Cleveland, TN 37320

Dear Michael:

Dr. Carolyn Dirksen recently requested that I write a letter to your dissertation committee at the University of Tennessee Knoxville. This letter gives you permission to survey ACA member institutions as part of your dissertation research.

Please let me know if I may of further assistance.

Sincerely,

Paul B. Chewning
President

cc: Dr. Carolyn Dirksen

Appendix D -- Distributed Survey Email

! Dissertation

To: faculty list;

Actions

Friday, April 16, 2010 9:52 AM

Dear Faculty,

Michael Sturgeon is completing his doctoral research, and he needs our help. He has a survey about faculty use of technology at the link below. It takes about 5-10 minutes. You have all been in Michael's position, so please take a few minutes to help our colleague get this wrapped up. Thanks so much.

Carolyn

http://www.surveymonkey.com/s/W7QLS39

No virus found in this incoming message.
Checked by AVG - www.avg.com
Version: 9.0.801 / Virus Database: 271.1.1/2812 - Release Date: 04/16/10 02:31:00

Appendix E – Timeline

April 2010	Received IRB Approval to execute study.
April 2010	April 16 – Distributed link to survey instrument.
	April 26 – Send reminder of survey instrument, with link.
	May 5 – Send final follow-up to attain additional respondents.
June 2010	Download all data from survey respondents and import received data, format for PASW, begin analyses of data collected.
July 2010	Meet with statistician for clarification on processing complex analyses.
August 2010	Write out Chapter 4 and 5
September 2010	Meet with dissertation/committee chair for input
	Continue revisions on Chapters 4 and 5 (some Chapter 3 changes)
	Meet with dissertation chair again for clarification on recent revision requirements.
November 2010	Check on paperwork processed in graduate office: Room 209 SSB.
	Meet with Thesis/Dissertation Consultant for preliminary review.
November 9, 2010	Submit Scheduling of Defense of Dissertation form
	Appointments: Distribute copy of dissertation to committee members.
November 19, 2010	Defend dissertation
December 8, 2010	Submit revisions
January 6, 2011	Submit completed dissertation with committee signatures.

VITA

Michael was one of five children, born in Michigan, yet grew up in the Florida Keys. He earned his undergraduate degree from Palm Beach Atlantic University with a major in Psychology and a minor in Religion. After discovering his desire to learn, he earned a Master's in Information Science from Florida State University. The work as a systems librarian for 15 years, in higher education, evolved to more involvement in education. Subsequently, Michael went on to earn his Doctor of Philosophy degree in Education from the University of Tennessee.

He enjoys his work as an instructional technologist at Lee University in the Center for Teaching Excellence. Michael's academic interests are in self-efficacy, motivation, cognitive learning, language learning, and neuroscience research related to learning. Following the experience of his dissertation study, research has become a new passion to add to the list.

Michael has been married to his wife, Carla, for over thirty years. They have two children, one in college and the other still at home.