A Mixed Methods Study: Assessing and Understanding Technology Pedagogy and Content Knowledge Among College Level Teaching Faculty

A Dissertation
Submitted to the Faculty of Drexel University
By Heather A. Blackburn
In partial fulfillment of the Requirements for the degree of Doctor of Education
May 2014
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A MIXED METHODS STUDY: ASSESSING AND UNDERSTANDING TECHNOLOGY, PEDAGOGY, AND CONTENT KNOWLEDGE AMONG COLLEGE LEVEL TEACHING FACULTY

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6/26/2017

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Dedication

I dedicate my dissertation work to my husband, David Seifert. You have provided me tremendous emotional support, patience, and prodding throughout this long endeavor. I could not have accomplished this without your help, love, and encouragement. I also dedicate the completion of this work to my late boss and mentor, Dave O’Brien. It was at Dave’s prompting that I entered the doctoral program and through all of the challenges and frustrations encountered I knew that I would always complete this because of my desire to live up to the ideal he set out for me. I was fortunate to share my profound appreciation to Dave prior to his passing. When relaying my thoughts to Dave I shared this Abraham Lincoln quote that captures his impact on my life: I'm a success today because I had a friend who believed in me and I didn't have the heart to let him down.”
Acknowledgements

There are many people to acknowledge and thank for their help and guidance throughout my educational pursuits culminating with my doctoral work. First, I have to thank my parents, Jim and Bev Blackburn for sacrificing so much to provide me with the best education anyone could ever ask for and for always encouraging me along the way.

I would also like to thank my Drexel University Sport Management colleagues, particularly my friend, Amy Giddings for her tolerance of all of my crazy questions and emotions. Amy provided immense guidance to me throughout this process and celebrated all of my small milestones along the way to get me to the finish line. My other colleague and doctoral cohort member, Brett Burchette was there experiencing every moment right along with me and that made all of this that much easier. I also have to thank Mary Waechter, Jen Valore, Ellen Staurowsky, Jim Reese, and Karen Weaver for all of their support and encouragement, particularly on those days away from the office when I was working on dissertation work.

I also owe much thanks to my Ed.D. cohort members who were in the trenches with me each weekend for three years and provided additional motivation to get this done as well as to Dean William Lynch for extending me the opportunity to enter into the doctoral program.

Lastly, and certainly not least, I want to thank my committee members, Dr. Aroutis Foster, Dr. Allen Grant, and Dr. Ronald Hill for all of your time and attention on my dissertation work from idea to proposal to completion. You are all exceptional at what you do and I was so fortunate to have benefitted from your time and expertise.
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Abstract

A Mixed Methods Study: Assessing and Understanding Technology Pedagogy and Content Knowledge Among College Level Teaching Faculty
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Online higher education has grown rapidly over the last decade. While online higher education has improved access for many students, it suffers from the problem of higher learner attrition. Student persistence engagement in online learning may be enhanced through improvements in instructor technology and pedagogy knowledge. This mixed-methods study on online learning is an exploration into the online instructional faculty’s knowledge of integrated Technological, Pedagogical, and Content Knowledge (TPACK). TPACK has been used to assess teaching in the K-12 classroom setting and is currently being utilized as an assessment in the U.S. Department of Education’s Race to the Top grant selection process. This study applied the TPACK framework to college level teaching faculty to assess their technology and pedagogy knowledge, their TPK, and TPACK. The primary research questions of this study were, “What is the level of TPACK among college level teaching faculty within a diverse college at a large, private four year university?”, “What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?” and “What techniques do instructors with high TPACK utilize to engage online students?”

The study began as a quantitative study and measured the level of TPACK among college level teaching faculty. A qualitative method followed with one-on-one interviews of nine selected instructors demonstrating high TPACK components.

Quantitative findings of the study indicate that there is high technology, content, pedagogy, and technological pedagogical knowledge amongst the college level teaching faculty within the
college studied. The level of full, integrated TPACK amongst the faculty has not fully been explored due to limited data on content knowledge. Qualitative findings of the study indicate that the college level teaching faculty instructors are engaged in high impact practices with their online students that demonstrate their TPACK skills and that the college level teaching faculty use their TPK to assess inclusion of new technologies tools in the online classroom.

Keywords: TPACK, Technology, Pedagogy, Online Learning, Student Persistence, Learner Engagement
Chapter 1: Introduction

Online higher education has grown rapidly over the last decade. Approximately 30 percent of students took an online course in 2008 compared to fewer than 10 percent of students in 2002 (Allen & Seaman, 2011). While online learning is most often associated with for-profit institutions, 74 percent of public institutions view online learning as critical to their long-term strategy (Allen & Seaman, 2010). Specifically, many types of institutions view online learning as a way to grow their enrollments, extend their presence beyond the traditional boundaries of campus, and provide flexible scheduling to meet the changing student needs (Allen & Seaman, 2010).

Statement of Problem

As more institutions expand online course offerings and as more students enter into online programs, faculty and instructional design professionals need to better understand how instructor pedagogy contributes to online student success, engagement, and learning satisfaction. If instructors and instructional designers fail to recognize the factors that lead to student success, engagement, and satisfaction in online programs then student learning outcomes and student attrition will negatively impact online degree programs. Online learning programs with weak learning outcomes and high student attrition may subject institutions to increased public and legislative scrutiny, potential loss of public funding, loss of employer tuition reimbursement plans for online programs, and diminished overall brand of the institution. Therefore, the problem this study sought to address is how to advance online instruction among higher education faculty that can lead to gains in student engagement and degree completion.

Purpose Statement

The purpose of this action research study was to understand how improvements in instructional faculty knowledge can contribute to online student engagement and course
satisfaction of students enrolled in online programs within a diverse college at a large, private four year university.

The college that is being studied offers online degree programs in 22 distinct academic areas including such fields as education, sport management, construction management, engineering technology, and computing security and technology. Online learning at the college is managed by a collaborative group of people that include the faculty, program managers and directors from the various academic units, and a learning technologies group that includes instructional design experts and learning technologists. The instructional design experts work with the program managers and teaching faculty to develop online course modules that meet program level and course level learning objectives for curricula. The instructional design experts assist faculty by converting course content into online modules and suggesting learning technologies to enhance course experience. The college’s instructional design team also conducts training workshops on technology tools for faculty as well as provides an online instructional training for faculty who are new to online learning. The online instructional training is a mandate by the college dean for new online faculty to complete.

The culture of online learning within college was well established among academic program staff, the learning technologies group, and many faculty. Many full-time faculty within the college develop and teach online courses. Faculty are incented to develop online courses through a stipend commission that is in addition to regular salary and benefits. The developed courses can then be taught by a variety of course instructors for many terms thereafter, with additional stipends provided to refresh content.

The structure of online learning within the college contains strengths in several areas. Online courses within the college are well organized. The courses utilize a common look and feel
with a consistent layout and structure that benefits both faculty and students. The college is also
strong in providing faculty with access to additional technology tools that may enhance the
student course experience while also providing training on such tools upon request. Despite these
strengths the college could improve and further develop online learning in specific areas. First, it
is clear through some course evaluations that not all faculty are adept at teaching online. The
faculty within the college have varying levels of abilities to teach online including how they use
and apply technology tools, how frequently or infrequently they make contact with students, and
how they engage online students. The college could advance online learning through a thorough
assessment of faculty online teaching levels and identification of techniques on how faculty learn
and apply technology tools to teaching. This study therefore sought to strengthen online learning
at the college by assessing the online faculty’s teaching skills with technology. This study
utilized the technological, pedagogical, and content knowledge (TPACK) framework developed
for teacher education by Michigan State researchers, Mishra and Koehler (2006) and applied it to
online higher education to determine if the presence of TPACK among online higher educational
instructional faculty can lead to more engaging virtual learning models.

The importance of studying online learning models is attributable to the view that it can
be used to change the culture of education by increasing an educated citizenry and expanding
education to non-traditional learners. Online and technology based learning is viewed as a
vehicle to achieve the U.S. Department of Education’s goal of increasing the percentage of
Americans with two and four year degrees from 39 percent to 60 percent by 2025, an increase of
23 million graduates from current rates (U.S. Dept of Education, 2010). The ability to achieve
such a goal will require improvements in online learning instruction and a faculty capable of
delivering and engaging in high quality instruction.
Increasingly higher education faculty are being measured and assessed by their ability to teach and their students’ achievement of learning outcomes. This is particularly expected in undergraduate education. If faculty are to reach today’s “digital natives” and demonstrate achievement of course learning outcomes they will need methods and tools to assess and develop their technological instructional skills. The TPACK framework has been successfully utilized in teacher education programs and is currently being utilized to assess grant funding for the U.S. Department of Education’s Race to the Top program (Mishra, 2011). It may similarly demonstrate applicability and usefulness in higher education online instruction.

The research findings from this study that capture the instructional faculty perspectives will illuminate the factors that contribute to, and impede, online learning engagement and satisfaction in higher education. The research findings will be utilized to create tools and programs that better equip faculty to engage students in an online environment. In addition, the results of this research will allow advisors at the college to better support the needs of their online students and faculty as web-based and technological learning environments grow and expand.

**Research Questions**

This explanatory mixed-methods research study focused on understanding instructional faculty teaching techniques in online courses by applying the technological, pedagogical, and content knowledge (TPACK) framework to online higher education courses (Mishra & Koehler, 2006). The primary research questions that guided this study were:

1. What is the level of TPACK among college level teaching faculty within a diverse college at a large, private four year university?
2. What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?

3. What techniques do instructors with high TPACK utilize to engage online students?

The secondary research questions in this study were:

4. Is there any statistical significance between the faculty instructor’s TPACK score and their full-time or adjunct status within the college?

5. Is there any statistical significance between the faculty instructor’s TPACK score and number of years teaching in higher education?

**Conceptual Framework**

This study pulled from two distinct theoretical perspectives. The first theoretical perspective utilized concerns an assessment of the instructional faculty’s knowledge and skills. The theory that was applied to assess the online instructional faculty is the technological, pedagogical, and content knowledge (TPACK) theory developed by Mishra and Koehler (2006) from Michigan State. Mishra and Koehler (2006) founded their TPACK theory on an earlier teacher instructional concept known as pedagogical content knowledge (PCK) developed by Lee Shulman in 1986. Both Shulman’s PCK and Mishra and Koehler’s TPACK concern how teachers integrate diverse knowledge areas that lead to effective teaching practices.

The second theoretical perspective utilized in the study comes from student retention and persistence theory of distance learners developed by Garland in 1993. Garland’s framework organizes student attrition into four categories, including: 1) situational, 2) dispositional, 3) institutional, and 4) epistemological barriers to student persistence. This study will focus on institutional categories of student attrition.
Definition of Terms

Attrition – The loss of a matriculated student in an academic program.

Content Knowledge (CK) – “Content knowledge is knowledge about the actual subject matter that is to be learned or taught” and includes “knowledge of concepts, theories, ideas, organizational framework, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge” (Shulman, 1986, p. 9-13).

Online education – Based on the definition provided by The Sloan Consortium, online education is defined as “a course where 80 percent or more of the content is delivered online [and where there are] typically no face-to-face meetings” (Allen & Seaman, 2010).

Pedagogical Knowledge (PK) – “Pedagogical knowledge is deep knowledge about the processes and practices or methods of teaching and learning encompasses overall educational purposes, values, and aims” (Shulman, 1986, p. 14).

Pedagogical Content Knowledge (PCK) – “The most regularly taught topics in one’s teaching area, the most useful representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations – in a word, the ways of representing and formulating the subject matter that make it comprehensible to others” (Shulman, 1986, p. 9).

Retention – This term is identified as the act of keeping a college student continually enrolled until such time that the student completes his or her intended degree program.

Student Success - Success in online education is defined as course completion with a grade of C or higher, certificate achievement and/or degree attainment.

Technology Knowledge (TK) – “FITness [of technology] goes beyond traditional notions of computer literacy to require that persons understand information technology broadly enough to apply it productively at work and in their everyday lives, to recognize when information
technology can assist or impede the achievement of a goal, and to continually adapt to changes in information technology” (Koehler and Mishra, 2009).

Technological Content Knowledge (TCK) – “TCK, then, is an understanding of the manner in which technology and content influence and constrain one another. Teachers need to master more than the subject matter they teach; they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of particular technologies…[and how] specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology” (Koehler and Mishra, 2009).

Technological Pedagogical Knowledge (TPK) – “TPK is an understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies” (Koehler and Mishra, 2009).

Technological Pedagogical and Content Knowledge (TPACK) – “TPACK is an emergent form of knowledge that goes beyond all three “core” components…[and] is an understanding that emerges from interactions among content, pedagogy, and technology knowledge” (Koehler and Mishra, 2009).

Assumptions, Limitations and Delimitations

As stated this research focused on the instructional knowledge of college level teaching faculty within a diverse college at a large, private four year university. The college has a tradition of online education dating back to 1996 thus imbuing the college with a culture of the importance and need for online learning. This culture and value of online learning may not be as
extensive at other colleges or other institutions. In addition to the college culture is the composition of the teaching faculty. Very few teaching faculty at the college are tenured compared to other private, four year institutions and many faculty are adjunct teaching faculty not physically connected to campus. The lack of tenured faculty may or may not factor into the results of this study. Given these unique conditions the results of this study may not be similar or applicable to online teaching faculty at other private, four year, non-profit institutions.

The sample size being utilized in this study may ultimately make the research findings not generally applicable to other online programs or institutions. Sixty-seven faculty instructors participated in the quantitative phase of the study and nine instructors progressed through the qualitative phase of the study. These sample sizes may not ultimately represent the full range of experience and teaching capabilities of the college’s online teaching faculty.

Summary

Research on online student engagement and satisfaction is growing and contributing to the knowledge of what works in meeting the unique needs of online students. However, research that probes college level teaching faculty is needed to understand what knowledge and skills the online faculty instructors’ possess and how they are putting this to use in engaging ways in online learning environments. The results of this research will allow the university studied to better prepare faculty instructors for online teaching and improve the experience of its students enrolled in online programs. Ultimately this research should lead to a better understanding of effective teaching practices, effective ways to engage and satisfy online learners, and stronger quality of online degree programs at the university and serve as a template for similar institutions to assess their online learning faculty.
Chapter 2 Literature Review

Introduction to the Problem

Online higher education has grown rapidly over the last decade. Approximately 30 percent of students took an online course in 2008 compared to fewer than 10 percent of students in 2002 (Allen & Seaman, 2011). While online learning is most often associated with for-profit institutions, 74 percent of public institutions view online learning as critical to their long-term strategy (Allen & Seaman, 2010). Specifically, many types of institutions view online learning as a way to grow their enrollments, extend their presence beyond the traditional boundaries of campus, and provide flexible scheduling to meet the changing student needs (Allen & Seaman, 2010).

As more institutions expand online course offerings and as more students enter into online programs, faculty and instructional design experts need to better understand how instructor pedagogy contributes to online student success, engagement, and learning satisfaction. If instructors and instructional designers fail to recognize the factors that lead to student success, engagement, and satisfaction in online programs then student learning outcomes and student attrition will negatively impact online degree programs. Online learning programs with weak learning outcomes and high student attrition may subject institutions to increased public and legislative scrutiny, potential loss of public funding, loss of employer tuition reimbursement plans for online programs, and diminished overall brand of the institution. Therefore, the problem this study sought to address was how to advance online instruction among college level teaching faculty that can lead to gains in student engagement and degree completion.

The purpose of this mixed methods research study was to understand how improvements in instructional faculty knowledge can contribute to online student engagement and course
satisfaction of students enrolled in online programs within a diverse college at a large, private, four year university. This study utilized the technological pedagogical and content knowledge (TPACK) framework developed for teacher education by Michigan State researchers, Mishra and Koehler (2006) and applied it to online higher education to determine if the presence of TPACK among college level teaching faculty can lead to more engaging virtual learning models.

The importance of studying online learning models is attributable to the view that it can be used to change the culture of education by increasing an educated citizenry and expanding education to non-traditional learners. Online and technology based learning is viewed as a vehicle to achieve the U.S. Department of Education’s goal of increasing the percentage of Americans with two and four year degrees from 39 percent to 60 percent by 2025, an increase of 23 million graduates from current rates (U.S. Dept of Education, 2010). The ability to achieve such a goal will require improvements in online learning instruction and a faculty capable of delivering and engaging in high quality instruction.

Increasingly higher education faculty are being measured and assessed by their ability to teach and their students’ achievement of learning outcomes. This is particularly expected in undergraduate education. If faculty are to reach today’s “digital natives” and demonstrate achievement of course learning outcomes they will need methods and tools to assess and develop their technological instructional skills. The TPACK framework has been successfully utilized in teacher education programs and is currently being utilized to assess grant funding for the U.S. Department of Education’s Race to the Top program (Mishra, 2011). It may similarly demonstrate applicability and usefulness in higher education online instruction.

The research findings from this study that capture the instructional faculty perspectives will illuminate the factors that contribute to, and impede, online learning engagement and
satisfaction in higher education. The research findings will be utilized to create tools and programs that better equip faculty to engage students in an online environment. In addition, the results of this research will allow advisors at the college to better support the needs of their online students and faculty as web-based and technological learning environments grow and expand.

**Conceptual Framework**

Instructional technology development over the last decade has led to new models of learning. Blended, or hybrid learning, and fully online, asynchronous courses represent two models of education that have developed in higher education. These models rely on high-speed Internet access and web-based learning platforms to reach and engage learners in non-traditional ways. While blended and online learning models have expanded access to higher education, concerns about student retention, engagement, and learning outcomes abound. These challenges combined with the planned use of instructional technologies and online learning models to increase the number of American citizens with college education from 39 percent to 60 percent over the next 25 years compels a deep understanding of online teaching, learning, and course design (U.S Dept of Education, 2010). In an effort to understand what leads to online student engagement and satisfaction research from myriad fields must be considered. This literature review will, therefore, present two areas of research that overviews how improvements in online teaching may lead to gains in online student engagement and satisfaction.

First, research on student retention in online learning environments is presented to outline what is currently known about student persistence in technology based learning environments. Retention research that considers the role of the instructors, the course design, and the learners themselves will be presented to better understand the complex interplay among these elements.
Second, research on understanding online course design and instructor pedagogy will be presented to highlight the heightened role these constructs play in the online learning process.

**Student Success & Retention in Web-Based Environments**

Retention of online learners has been reported to be lower than that of traditional, on campus students (Tyler-Smith, 2006). Nationally, traditional on campus student retention is reported to be approximately 50 percent of all entering learners (Tinto, 1993). With more than $20 billion spent by the federal government on higher education it is important to make all learning delivery modes efficient and effective so that increases in student graduation rates and learning outcomes can be recognized (Budget of the U.S. Government quoted in Public Agenda, 2011). Much like traditional student attrition, attrition among non-traditional learners enrolled in distance and online education is also complex and varied. To make sense of the multi-faceted and complex reasons students depart from online education, a framework is needed. Garland’s (1993) framework that considers attrition among distance education students will be utilized to organize and analyze student departures. Garland’s (1993) framework organizes student attrition into four categories, including the following: 1) situational, 2) dispositional, 3) institutional, and 4) epistemological barriers to student persistence.

Garland’s (1993) situational barriers of attrition focus on the external factors that lead a student to leave his/her institution or program of study such as work and family commitments. It is believed that situational barriers are often the most cited reasons for student attrition in online programs (Schaffhauser, 2009). Dispositional barriers of student attrition include a student’s learning style, motivation and attitudes to learning. Institutional barriers of attrition include difficult experiences that may occur between the student and the institution such as poor instructional quality, little academic guidance and poor technical support. Finally,
epistemological barriers of attrition focus on the difficulty and challenge of the course content itself.

This study will focus on the institutional category of student attrition. It is here where the instructional faculty’s teaching expertise and knowledge can impact the student learning experience and potentially the level of engagement and satisfaction in online courses. While this category may not be the barrier responsible for the majority of student attrition, it is the category that can be impacted by changes in institutional practice and policy. Moreover, while students often cite situational or external reasons for their lack of success in online courses, McGivney reminds us “it is possible that students cite only those [reasons] that do not threaten their self-esteem or that they perceive as ‘acceptable’” (as cited in Nichols, 2010, p. 95). Consequently, understanding institutional barriers may be of more importance to helping students succeed in online environments. The remainder of the literature stream is therefore, primarily organized within this category. Studies that represent institutional efforts in the areas of good course design, instructor engagement, and support services will be presented.

Institutional Factors

Colleges and universities can affect student persistence in a variety of ways. With respect to online students, institutions can create structures and services that promote student success and persistence. For instance, online courses and programs that focus on quality course design and coherence have demonstrated positive impact on student success and persistence (Rovai & Downey, 2010; Morris & Finnegan, 2009; Reisetter & Boris, 2004; Dietz-Uhler, Fisher & Han 2007).

Morris and Finnegan’s (2009) research analyzing four studies of over 500 undergraduate students enrolled in online classes supports the importance of good course design on student
persistence. One study, which was conducted via a mailed survey and follow-up telephone interviews of students, found that the unsuccessful students needed more course management assistance to learn the course layout, understand expectations and assignments, and locate content and resources. Moreover, the authors’ telephone interviews with the students found that the students who withdrew from their courses did so early in the course or term, which the students attributed to feeling lost or overwhelmed by the course. This study may similarly explain early student attrition in online programs as well at the institution studied. Early student dropouts would encompass students who dropout within the first two weeks from their online degree program and cease to return. There are a small, but consistent number of students who enter online programs at the college that fit this description.

Dietz-Uhler, Fisher and Han (2007) also studied the importance of good course design on student retention. The authors report a 95 percent retention rate across 11 offerings of an online introduction psychology and statistics courses. The authors attribute the high retention and completion rate of these two courses due to implementation of a program called Quality Matters, which is a research-based initiative that relies on review standards to assess online courses. Quality Matters is a faculty-driven/ peer review process that assesses online courses using the following standards: course overview and introduction, learning objectives, assessment and measurement, resources and materials, learner interaction, course technology, learner support, and accessibility. Within these eight general standards are 40 specific review standards that are based on research that has shown to positively affect student learning.

The Quality Matters program appears to serve an important function for assessing online courses. Utilizing such a tool in the college’s online programs could prove valuable in better understanding good course design and deficiencies. However, the Quality Matters rubric focuses
only on online course design and content and does not consider any impact online instructors or instructional pedagogy plays in the online learning process. Simply studying content and course layout ignores a substantial element of the online learning process. So while the retention success that the authors report from Quality Matters is impressive, it only considers one element of the online learning process. Other limitations of the Dietz-Uhler, Fisher and Han (2007) study may also have influenced the reported retention results. Most notably, the authors did not report what type of student population was enrolled in these online courses. The authors do not provide a description as to whether these students were traditional students who resided on campus and happened to be taking an online course or if the students were adult learners enrolled exclusively in online courses. Such a distinction as residency can be particularly important when reporting student persistence in an online course. For instance, if the students were on campus students who had face-to-face access to support services and instructors then the high student retention rate could be partially attributed to these factors. For this reason the reported retention rate can limit the understanding and impact Quality Matters has on affecting student retention.

Despite the limitation of the Dietz-Uhler, Fisher and Han (2007) study above, good course design emerges elsewhere as an important factor in student success. In revisiting the Reisetter & Boris (2004) study, the authors provide validation on the importance of good course design for online students through their survey of online graduate students enrolled in education courses at the University of South Dakota. Here the authors report that 95 percent of the student respondents believed that the structure and coherence of the course was very or somewhat important to learning in an online environment.

In addition to good course design, institutions can affect student success and persistence through strong instructor engagement. In his correlation study that examined the relationship
between instructional interaction and student persistence, Tello (2007) found that instructor interaction via asynchronous discussions accounted for 26 percent of variance in course persistence. His survey instrument included one survey for students who maintained enrollment throughout the course and a separate survey instrument for non-persisters. The study included survey responses from 714 undergraduate and graduate students enrolled in online courses through a continuing education division at a public university. While situational barriers such as work and family accounted for the largest reason students’ reported for withdrawing from a course, 11 percent of non-persisters reported instructor interaction as the reason for dropping out or not continuing in a future online course. The potential to reclaim 11 percent of lost students through improvements in instructor engagement is an appealing and relatively achievable goal. It also provides strong evidence that studying online instructor pedagogy, interaction, and engagement in online learning is an important construct to be considered when understanding online student engagement and satisfaction.

Similarly to Tello’s findings, Bocchi, Eastman & Swift (2004) found that consistent faculty contact is a vital element for successful online course retention. The authors’ research focuses on use of a cohort model that provides extensive faculty feedback to students enrolled in a part-time online MBA program offered through the University of Georgia. The authors’ report an 89 percent retention rate through three cohorts that began before 2003. The students portrayed in this study are all employed full-time, which matches the profile of many online students at the institution studied.

The students in the study were all surveyed at the beginning of their MBA program when they attended an on campus two-day orientation session. The survey questions were constructed using a range of responses from strongly agrees to strongly disagree. Initially this survey
appeared to have great applicability to online students at the study site given the use of the cohort based model, which is often utilized in the institution’s online programs, and the demographic profile of the students. However, the fact that the students in this survey attended a two day face-to-face campus orientation program makes interpreting the results particular to this institution and less valid to the online student populations at the college study site. Because the college study site utilizes only an online orientation tutorial to the Blackboard Learn system and does not include any on campus component, this survey instrument and persistence rate may not be similarly achievable within the college’s online programs.

Despite the limitations of the Bocchi, Eastman & Swift (2004), faculty feedback once again emerges as an important factor in the Reisetter & Boris (2004) study. Here the authors find that teacher voice and extensive teacher feedback were important elements for online learner success in their study of online graduate students enrolled in a master’s courses at the University of South Dakota. Ninety-eight percent of the 59 study participants rated the instructor’s level of knowledge and helpfulness as the most important factor in their online course.

In addition to strong course design and instructor engagement, institutions can affect online student success through other support services. Services such as online orientations, mentoring, skills assessments, technology support and personal contact can improve online student success (Moore & Fetzner, 2009; Truluck, 2007; Nichols, 2010). In a case study review of several institutions reporting high online retention rates in both undergraduate and graduate courses, Moore and Fetzner (2009) identify that the institutions successfully retain students by preparing them to succeed in an online environment. The six institutions that Moore and Fetzner (2009) study prepared students for the online environment by orienting them to the online environment, conducting a skills assessment before taking an online class, providing 24/7
technical support and then offering additional support services online such as tutoring, library, and financial aid. These important actions, along with other institutional practices, the authors report, results in an 85 percent course completion rate among the six institutions studied.

The presence of support personnel for online students is an important institutional construct that can promote online student success. Personnel, who may be labeled as instructors, advisors, mentors or coordinators, can maintain regular student contact that lessens the isolation online students often experience and provide an identifiable relationship for points of questions and concerns. These support personnel may function to provide academic plans of study, hold virtual office hours for students, assist with registration and generally orient the students to the online experience. Truluck (2007) reported on the impact of establishing a mentoring plan for online students enrolled in graduate education at the University of Georgia. Services that begin with a personal telephone call between the coordinator and student to discuss an academic plan for the duration of the program, time management techniques and the benefits of receiving a master’s degree commence the student and mentor/ coordinator relationship. The mentor/ coordinator also teaches one of the first courses in the program to learn more about each student’s academic ability and intervene if any academic difficulties arise. Students are also invited to “virtual office hours” with the mentor/ coordinator and telephoned again during mid-semester. All of these support services and interventions have led to an attrition rate of approximately 18 percent. The author points out that the students who did leave predominantly do so during the first semester and none of them cited dissatisfaction with the program as a reason for leaving. The reasons for leaving were based on change in responsibilities such as a new job, family and/ or personal illnesses.
Similar to Truluck (2007) Nichols (2010) also studied the impact of an academic support coordinator on online student success. Nichols conducted a comparative study of retention rates before and after the hiring of an academic support coordinator for two cohorts. The academic support coordinator focused on four specific interventions with online students that included a student support readiness survey, an online orientation program, personal contact and general messages of support regarding advice on exam techniques and essay writing. Nichols attributes a 20 percentage point gain in retention from first semester 2008 to first semester 2009 based on the four interventions conducted by the academic support coordinator.

Truluck’s and Nichols study are of interest into understanding online student success, engagement, and satisfaction within the college study site’s programs because many online teaching faculty at the college take on such roles and/ or provide students the points of contacts necessary to succeed in online learning environments.

However, Nichols study may prove to be quite limiting for a number of reasons. First, his study took place amongst online undergraduate students enrolled at Laidlaw College, which had changed its name from the Bible College of New Zealand during the first study group. Second, the institution also made changes to the number of teaching weeks from 15 to 12 and standardized curricula to a 15 credit course load from the previous 2-, 3-, 5-, and 10-credit courses. Finally, the study took place in New Zealand. All of these distinctions make application of the findings to the college’s online programs difficult to ascertain.

Building on all of these studies is the concept of Online Human Touch (OHT) developed by Betts (2009) that uses a framework of instructional social presence to impact learning engagement and student retention rates in an online master’s degree program. OHT includes the concepts of faculty engagement, community development, personalized communication, faculty
development, and data driven decision making to create robust engaging online learning environments. Through the results of faculty and student surveys and comments shared by students over a three year period Betts (2009) reports an 83 percent master’s program retention rate, program growth, and high level of faculty teaching satisfaction. The use of Betts’ OHT (2009) framework for online instruction may be similarly applicable to the college site being studied because of its large online graduate student population that is similarly cohorted.

**Teaching and Instruction in Web-Based Environments**

Research presented in the retention stream above demonstrates how the elements of course design, location of content, and instructor engagement can positively impact student retention in online learning. Course design and instructor engagement are particularly important elements of the online learning experience because these are the two primary mechanisms by which online learning is facilitated, through course material interaction and course instructor interaction. The elevated importance these elements play in the online learning process compels a review about evidence based approaches regarding online course design and instruction. Therefore, this next section will review several theories related to teaching and instruction utilizing technology and web-based learning environments. Several frameworks exist to evaluate technology education and choosing the proper framework will further our understanding of how online student engagement and satisfaction can be positively impacted in online learning environments.

The ACTIONS framework by Bates (2005) is a framework that seeks to provide an objective way of applying technology in education. The ACTIONS framework, which stands for Access, Cost, Teaching and learning, Interactivity and user-friendliness, Organizational issues, Novelty, and Speed, provides a structure to move technology integration from a haphazard method to a more purposeful and systematic one (Bates, 2005). Without such a framework of
evaluation, Bates (2005) cautions that technology tools are purchased or applied in education based on political, commercial, or administrative motivations rather than being strategic and purposeful decisions. The ACTIONS framework is useful on several levels, including understanding the distinction between media and technology structures. Bates (2005) defines media as the generic forms of communication that are used to convey knowledge, such as text, audio, face-to-face communication and video while technologies are considered the vehicles that deliver the media. Examples of technologies include satellite, cable, and video-cassette delivery. Bates (2005) further separates out technologies by distinguishing between one-way and two-way style communication technologies and synchronous and asynchronous technologies. For instructors considering technology tools, understanding these distinctions and structures represents the most rudimentary level of evaluating technology usefulness and fit into learning.

A critical component of the ACTIONS framework (Bates, 2005) is the consideration it makes regarding the elements of teaching and learning when selecting technologies. Bates (2005) offers the user three criteria to consider when evaluating technology tools. Criteria one concerns itself with considering learning theories such as behaviorism and constructivism to make a conscious decision about the type of learning to be developed. Criteria two considers what instructional strategies will be adopted to enable the learning needs, and criteria three compels an understanding of each technologies’ educational characteristics that would make it a match for the needed learning and teaching requirements (Bates, 2005). In addition to these criteria, Bates (2005) illustrates the various technology tool match ups with educational applications to aid the user/evaluator’s understanding.

Despite the inclusion of teaching and learning as a component of the ACTIONS framework, Bates (2005) limits the importance of these components in his framework by stating
that teaching and learning are a weak criterion for selecting media and technology. The author contends that learning and instruction are less important considerations because good instructors can overcome limitations of technology (Bates, 2005). He further states that the complexities of teaching and learning make it too difficult to understand how specific technologies impact learner performance. However, his framework does not provide for an understanding or consideration of how good instructors are to be considered or measured as a component of technology integration. Without consideration on how to measure, assess, or guide instructor teaching activities the framework is limited in its usefulness of teaching and learning. Ultimately, the ACTIONS framework concerns itself more with how learning organizations select technology tools rather than how individual instructors might select and use such tools to teach. With the ACTIONS framework stated emphasis on access and cost as the most important criterion for selecting and applying technology, the framework does not advance instructional teaching and learning and thus limits its applicability to improving or understanding online student engagement and satisfaction in online learning environments. While the framework may help organizations make efficient strategic based decisions, it does not address the criticism that online learning is a less engaging learning medium or advance individual instructors’ learning knowledge and capabilities in teaching in technology based environments.

The Technology Selection Method (TSM) presents another theoretical framework for evaluating technology based learning activities (Caladine, 2008). The Technology Selection Method is comprised of two sub-frameworks, the Learning Activities Model (LAM) and the Learning Technologies Model (LTM). The LAM framework provides a structure by which all learning events can be described and analyzed (Caladine, 2008). The LAM consists of several categories that help designers of learning events assess their value and fit with potential learning
outcomes. The categories consist of 1) provision of materials, 2) interaction with materials, 3) interaction between learners, 4) interaction with facilitator, and 5) intra-action (Caladine, 2008). According to Caladine (2008) every learning event, course, or program can be assessed using these five categories. Four categories of the LAM represent what Caladine (2008) considers as intentionally designed activities to facilitate learning while the fifth category, what he calls, intra-action, is a description of the learning event as it occurs to the student. Caladine (2008) contends that intra-action cannot be prescribed or guaranteed in learning events because this is completely dependent on the learner and not the instructional designer or facilitator. By separating out the intentional instructor/facilitator designed learned activities from the student recipient learner’s outcome, Caladine’s LAM framework accounts for what other authors would categorize as self-directed learning, self-regulated learning, learning style, and/or motivation.

The second component of the TSM framework is the Learning Technologies Model (LTM). Much like the LAM, the LTM provides for a structure of categories to assess various types of learning technologies. The LTM assesses both the nature and capabilities of technologies to determine their value and fit in the learning process. The LTM framework utilizes media richness theories as its basis. The LTM framework first breaks down learning technologies into either one-way representation of materials, called representational, or two-way interactions between humans or dialogues, called collaborative, by Caladine (2008). The LTM framework next assesses technologies based on one of three levels of communication: text, voice and other audio, and voice and moving pictures and then concludes with the final assessment category of synchronous versus asynchronous communication types.

Taken together the LAM and LTM form the Technology Selection Method (TSM). The TSM functions as a step-by-step process for matching learning activities from the LAM to the
appropriate technology in the LTM. Criteria used in the TSM include considerations of 1) the mechanics of the subject, 2) learner and facilitator implications, and 3) costs. Caladine (2008) also recommends an additional step in the TSM, which is a comparison of learning events between the new and old versions. According to Caladine (2008) the TSM is designed to be utilized for designers of learning events who may or may not have training in pedagogical theory or knowledge. Caladine (2008) identifies the human resource development area and higher education faculty particularly fitting audiences of the TSM.

In comparison to the ACTIONS framework by Bates (2005) the TSM (Caladine, 2008) focuses largely on the teaching and design needs of technology based education. The TSM functions more at the individual instructor and course designer level and not the organizational level that the ACTIONS framework considers. The TSM even accounts for theoretical learning approaches in the framework. Caladine (2008) contends that both constructivism and “direct instruction” approaches could be enhanced under the TSM framework because the TSM does not proscribe any particular approach, but rather provides the freedom of approach to the learner designer (2008). Conversely, the ACTIONS framework diminishes the importance of the teacher and learning design in the process by focusing more on access and cost. The TSM with its focus on the teacher, the learner and the learning activities, therefore, is a stronger framework for evaluating and considering student learning engagement and satisfaction than the ACTIONS framework. Other frameworks, however, may also add value and understanding.

Another approach to understanding technology integration into schools is the ecosystem metaphor (Zhao and Frank, 2003). According to Zhao and Frank (2003), the promise of a technology learning revolution never arrived and most schools have failed to recognize a return on investment in the computers they purchased. In their ecosystem metaphor, Zhao and Frank
(2003) equate technology integration as an invading species that threatens the equilibrium of the learning environment. The authors state that schools naturally resist change that challenge existing practices particularly in the area of teaching. While viewing teaching as a transmission of knowledge from teacher to student, Zhao and Frank (2003) highlight that teachers are not equipped to meaningfully adopt technology tools to learning. Teacher attitudes toward and expertise with technology are other factors slowing technology based learning inclusion (Zhao and Frank, 2003). According to the authors, all of these factors that have previously been studied in isolation can be analyzed under the ecosystem metaphor.

Using their ecosystem framework that is based on the analogy of an invading zebra mussel to the Great Lakes, Zhao and Frank (2003) reviewed 19 schools in four districts to evaluate and analyze technology adoption. According to the authors, the framework, much like the zebra mussel invasion of the Great Lakes, is attributable to a variety of systemic and individual factors. In reviewing technology adoption in schools, these factors include cognitive, social, organizational, technological, and psychological reasons. Following on the ecosystem metaphor, the authors undertook a mixed-method study of the schools using their framework. The authors utilized a quantitative Likert scale instrument to survey teachers from the 19 schools and received a 92 percent response rate. Zhao and Frank (2003) then utilized interviews and observation for their qualitative data collection. The interviews were conducted with principals, technology directors, and teachers while the observation component focused on each school’s technology infrastructure. The authors found that technology based education functions much like an invading species into a new ecological system. This system must account for multiple forces and interactions between existing (teachers) and invading species (technology) to drive co-evolution. In quantifying the influences that impact technology usage, the authors found that
school districts can influence 10-15% of computer usage in schools through decisions made on hiring technology directors, providing resources, and providing a general vision for technology use, but that the majority of the influence on computer usage comes down to individual teachers (Zhao and Frank, 2003).

Zhao and Frank’s (2003) study provides two important connections in understanding technology based education. First, the authors’ approach on studying the complexity of technology based learning in a mixed-methods approach provides a more meaningful understanding of the overall research problem. The mix of Likert scale quantitative data combined with interview and observation provides for a richer understanding of the complex interplay among systemic and individual variables. Such an approach could be adopted to study online student engagement and learning satisfaction in online higher education environments where the complexity of teaching and learning with technology are similarly confounded. Second, with its focus and findings that highlight the importance of individual teachers’ capabilities, attitudes, and pedagogical techniques a vision starts to emerge about how student engagement and learning satisfaction can be influenced in online higher education. By focusing on individual teachers’ willingness and readiness to embrace technology based education, we are able to decipher some of the challenges that confront instructors in online learning environments. The next theoretical framework will therefore, consider situated knowledge integration as a pivotal link in moving individual teachers toward a more focused technology based learning approach.

Technological, pedagogical, and content knowledge (TPACK) is a conceptual framework for understanding and advancing teacher instruction in education technology environments based on three overlapping areas of knowledge: technology, pedagogy, and content. The framework
developed by Michigan State researchers, Mishra and Koehler (2006) and built on Shulman’s “pedagogical content knowledge” was designed to situate learning activities into all three learning domains. According to the framework, the design of learning activities should be based on contextually situated content, or subject matter knowledge, pedagogical expertise, and an understanding of technology tools that achieve learning objectives. The authors’ point out that many uses of technology in education are add-ons and are often not matched to achieving learning objectives, or as Zhao and Frank (2003) point out, are simply underutilized. Moreover, the rapid increase of available technologies makes it difficult for instructors to keep up with technological developments let alone a way to evaluate how such technologies can be used in learning environments and add learning value.
Figure 1: This figure illustrates the integrated knowledge domains of technology, pedagogy, and content. (Koehler, 2011).

The TPACK framework thus concerns itself with teachers becoming well versed in integrated technology education that facilitates learning. The authors recognize that many teachers are knowledge experts in their content areas and pedagogical theory, but often lack conceptual knowledge in technology education. The authors, therefore, provide their framework as a way to reconceptualize teaching and to provide a way to evaluate how and when to use technology tools in education settings.
Using a learning-technology-by-design approach Mishra and Koehler (2006) demonstrate how TPACK can be developed in teacher education courses. Through a qualitative study that required graduate students to become practitioners in technology education, the students, who were predominantly teachers, were tasked to create solutions to learning problems through the use of technology. The students were tasked to create one of three technology based learning activities: an online course, an educational website, and educational movies. Through an end of course assessment that measured each individual learning concept as either, a technology construct, a content construct, or pedagogy construct, the authors’ demonstrated that the student participants acquired TPACK through their course deliverables.

The authors provide a deeper evaluation of TPACK through further course based study. Functioning again as part of a graduate education curriculum, a trained researcher evaluated seminar course participants to determine their acquisition of TPACK. The researcher recorded field observation notes during three points of the course and categorized the learning into three categories of content, pedagogy, and technology. Through quantitative and qualitative analysis, the researcher found that the course participants moved from having content, pedagogy, and technology knowledge function as independent learning constructs to an integrated model where the constructs were codependent on one another, thus demonstrating their TPACK acquisition.

Integrated TPACK has also been demonstrated by other researchers (Archambault & Crippen, 2009). For instance, Archambault and Crippen (2009) found in their review of 596 K-12 teachers that there was strong teacher confidence in the knowledge areas of content and pedagogy, but less knowledge confidence in technology. Because many of these K-12 teachers are increasingly expected to utilize web-based learning environments in education their perceived knowledge confidence in technology may result in poorly designed learning
environments. However, Achambault and Crippen (2006) also find a weakness with the TPACK framework itself. Through their study the authors found that there was significant lack of distinction between what teachers considered content knowledge and pedagogy knowledge. According to the authors this “fuzziness” in categories, or inability to separate out domains calls into question the precision of the TPACK framework (Arcambault & Crippen, 2006).

Nonetheless, the authors do believe in the organizational and practical applications of the TPACK framework even though they were not able to specifically validate it themselves. According to Mishra and Koehler (2006) integrated TPACK is a higher form of knowledge that is necessary to create the robust learning environments needed for today’s learner needs. The fact that TPACK can be difficult to acquire and put to use is recognized by the authors. However, through their learning-by-design approach (Mishra and Koehler, 2006) and through their TPACK assessment survey (Mishra, Koehler, Schmidt, Baran, & Thompson, 2009) the authors have illustrated how TPACK can be acquired and assessed. Nonetheless, simply acquiring or possessing TPACK usefulness is limited if not actionable. To truly understand TPACK one must apply it to actual teaching situations and realities. Therefore, providing evidence that TPACK can be applied to actual teaching and learning environments is essential to validating the framework and advancing its practicality. One illustration of TPACK application was provided through the review of teacher lesson plans (Harris & Hofer, 2011). Seven teachers who were exposed to TPACK through a project based professional development course demonstrated that they advanced their capabilities of designing learning activities for their students (Harris & Hofer, 2011). By reviewing teacher lesson plans before and after the professional development training as well as reviewing teacher journals differences in how teachers select technology tools was evidenced (Harris & Hofer, 2011). Moreover, the teachers
demonstrated an expanded toolkit of available learning activities and integrated technology at a higher and more engaging level for their students (Harris & Hofer, 2011).

In instances where technology is present in structured learning settings there is still the problem that the technology was added without thought to the needs of the content discipline and pedagogical strategies. Therefore, teachers are in need of a method to integrate the three domains into learning settings. Using the TPACK framework as the theoretical foundation Harris, Mishra and Koehler (2009) designed a learning activities chart that allows teachers to thoughtfully consider the needs of the content discipline when selecting the appropriate learning activity types. The learning activities chart considers both digital and non-digital learning activities. The activity structures that Harris, Mishra, and Koehler (2009) created were based on prior research from ecological psychology, which focuses on the distinct learning segments such as the focus, format, setting, participants, materials, duration, pacing, cognitive level, goals, and level of student involvement. Much like the Technology Selection Method (Caladine, 2008) the learning activities chart by Harris, Mishra and Koehler (2009) allows a matching of activity types, content, and technology in an integrated way and provides teachers an easier and more accessible way of applying TPACK outside of the project based learning approaches that have been heretofore the dominant method of acquiring TPACK. This approach of putting TPACK into action helps the framework overcome the limitations of its practicality for teachers while also making it more useful for instructors who are less educated in pedagogical strategies. Professors in higher education fields who are deemed content experts, but often have no formal education in pedagogy, let alone instructional technologies, could utilize the learning activities chart to construct rich and robust web-based learning environments.
The challenge and complexity of selecting the proper technology tool to achieve a desired learning objective can be illustrated through an example of course writing blogs and discussion boards, both popular tools for use in online and blended learning environments. With a reflective writing learning objective in mind, blogs and discussion boards can demonstrate a constructivist learning approach by getting writers to demonstrate and reflect on their learning activity and observations (Jonassen, 2008). However, blogs and discussion boards have advantages and disadvantages when it comes to achieving the learning objective such as the exclusion of outside class participant perspectives in discussion boards, access to the discussion tool after the class has concluded, and topic continuity (Friedhoff, 2008). A three step process approach that identifies pertinent technology principles, evaluates potential technologies, and assesses the technology implementation is advocated by Friedhoff (2008) as a way in which instructors can thoughtfully integrate technologies into teaching. Friedhoff’s (2008) action oriented approach to studying technology utilization relies on the interdependency of TPACK (Mishra and Koehler, 2006). Moreover, Friedhoff (2008) identifies how course management systems present their own learning constraints that need to be considered by instructors and designers of learning activities.

How Technology Based Learning Frameworks Can Inform Online Learning Engagement

The research presented here makes it increasingly clear that instructors need a methodology of thinking about and selecting technology tools to achieve learning objectives. Without such a structure technology goes unutilized or haphazardly applied to learning. The frameworks presented here all provide value in understanding the challenges in technology based education. The ACTIONS framework (Bates, 2005) focuses on the challenges of technology at the organizational level. The TSM framework (Caladine, 2008) provides instructors and learning designers a precise tool in assessing every learning event and technology type. The ecology
framework considers how the system and individual components interact to predict successful adoption. And the TPACK framework (Mishra and Koehler, 2006) provides a mechanism by which to assess individual teachers’ knowledge of technology based education. The strengths of these individual frameworks can form the basis of a more engaging and stimulating online learning environment in higher education. TPACK specifically, can provide a level of assessment at both the instructor and institutional level that will provide for an understanding of an institution’s and an instructor’s strengths and identify areas for improvements.

Synthesis

The literature presented points to the interplay among retention strategies and technological instructional techniques that impacts online student engagement and learning satisfaction. To advance our understanding of student engagement in online higher education I propose to study how the presence of instructor TPACK applies to online higher education. Ultimately, it is my hypothesis that college instructors and online instructional course designers with TPACK can create more purposeful online learning environments that promote student success, engagement, and course learning satisfaction.
Chapter 3: Research Methodology

Introduction

The problem of online higher education teaching faculty knowledge and student engagement in online learning was studied from a mixed-methods approach. This mixed-methods research study focused on understanding instructional faculty teaching techniques in online courses by applying the technological, pedagogical, and content knowledge (TPACK) framework to online higher education courses (Mishra & Koehler, 2006). The research addressed the following questions:

1. What is the level of TPACK among college level teaching faculty within a diverse college at a large, private four year university?
2. What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?
3. What techniques do instructors with high TPACK utilize to engage online students?

The secondary research questions in this study were:

4. Is there any statistical significance between the faculty instructor’s TPACK score and their full-time or adjunct status within the college?
5. Is there any statistical significance between the faculty instructor’s TPACK score and number of years teaching in higher education?

Research Design and Rationale

A mixed methods design was selected to address the problem of online higher education teaching faculty knowledge (Creswell, 2008). The sequential mixed methods approach entails collection of quantitative data followed by qualitative data collection (Creswell, 2008). This study therefore began by collecting quantitative survey data administered by a questionnaire that examines aspects of online teaching and learning within the college’s online programs. A
The mixed methods design was chosen to provide for a more in-depth exploration of the problem than either quantitative or qualitative methods alone could produce (Creswell, 2008). The appeal of a mixed methods design is that it helps to explain in more detail the results of a statistical study by employing a qualitative follow up (Creswell, 2008). This qualitative follow up may stimulate new research questions and/or clarify and illustrate results from the statistical data (Green, Caracelli, & Graham, 1989).

Figure 2: This figure illustrates the integration of quantitative and qualitative mixed methods design (Creswell, 2008).

The mixed-methods approach is common in social sciences including education. Studies of TPACK specifically have included qualitative studies in which preparatory teachers students were assessed on their TPACK acquisition through coursework (Mishra & Koehler, 2006; Haris & Hofer, 2011) and quantitative studies in which large populations of K-12 teachers were assessed (Archambault and Crippen, 2009). The evolution and application of TPACK into the higher education teaching environment warranted the combination of both approaches. The quantitative approach provided for a measure of what level of TPACK currently exists among college level teaching faculty while the qualitative component will elucidate how instructors
develop their technology skills for online teaching and what instructors with high TPACK do in their online courses to engage learners.

**Site and Population**

The site location for the study was a diverse college within a large, private four year university in the mid-Atlantic region of the United States. The study focused on the online and hybrid teaching faculty within one college of the university. Institutional Review Board (IRB) approval was obtained by the researcher prior to undertaking this study and all potential participants were fully informed about the nature of the research study and the potential use of the research results. Each study participant was guaranteed confidentiality in their responses.

**Population Description**

This study focused on the online and hybrid teaching faculty of a diverse college at a large, private four year university to examine aspects of the online teaching and learning experience that contributes to or impedes student engagement within the college. The faculty population in the study included full-time and adjunct teaching faculty within college. The online teaching faculty population includes full-time faculty based at a main university campus in the mid-Atlantic, other full-time faculty based in California, and adjunct faculty who are geographically dispersed.

The online teaching faculty of the college is made up of over 129 teaching faculty in a given term with 80 of these faculty instructors consisting of adjunct faculty members (University, internal Hyperion Report, 2012). To take advantage of this population this study utilized a nonprobability, convenience sampling method to reach the most number of site participants for the quantitative data collection phase (Creswell, 2008, p.155).
Site Description

The site location is a private, non-profit, research university with the primary campus based in the Mid-Atlantic portion of the United States (Carnegie Foundation, 2010). A smaller graduate campus is located on the West Coast as well as other geographically dispersed satellite campuses in the Mid-Atlantic. The university has offered online courses and programs since 1996 and all degree programs, including online programs, are accredited by the Middle States Association of Colleges and Schools. The university enrolls over 11,500 full-time undergraduate students and 7,000 graduate and professional students. Online students at the university are nearly exclusively enrolled as part-time students at both the undergraduate and graduate levels.

Site Access

The college dean granted official site access upon the researcher receiving Institutional Review Board (IRB) approval from the university and through a follow up discussion. The researcher requested official site access by submitting a study proposal to the college dean. The researcher and the dean met to discuss his concerns and the researcher met his primary concern, which was an assurance that no students would be involved in the study. The researcher also agreed to another request by the dean that the researcher not be the sender of the survey to the college’s full-time faculty because of the researcher’s name recognition and potential bias in the faculty instructors’ responses. The dean allowed the researcher to directly send the survey out to the adjunct faculty since little to no name recognition or bias was perceived. Access to, and regular contact with, online teaching faculty was easily obtained and managed as a result of the researcher’s relationship with the institution and publicly available information system and data.
**Researcher Role**

My research position in this study was that of primary investigator. I administered the quantitative survey to the adjunct faculty via email distribution and I was the interviewer for all qualitative components. As previously stated the quantitative survey to the full-time faculty was administered by a third party in the college and the researcher’s identity was not known to this group of recipients. Upon data collection I conducted quantitative and qualitative data analyses and reported the study findings and results. I was also responsible for ensuring study site participant confidentiality throughout the study. I approached this study not as an advocate for online learning, but as a researcher interested in a thorough understanding of what good online instruction looks like at the college and how the college’s faculty acquire and assess technology and pedagogical teaching skills that fit their content expertise.

**Stages of Data Collection**

Data collection for this mixed-methods study was done in two phases. Phase one included the quantitative data collection including completion of a pilot study and phase two included qualitative one-on-one interviewing. Data from both methods was collected over a nine month period in 2013.

**Phase I.**

**Instrumentation**

The primary instrument used to conduct this study was a revised survey of preservice teachers’ knowledge of teaching and technology designed to measure technological, pedagogical, and content knowledge (TPACK). The original TPACK survey instrument was developed by Schmidt, Baran, Thompson, Koehler, Mishra, & Shin (2009) to measure the seven knowledge domains among undergraduate students majoring in education who had not yet experienced a
full-time student-teaching assignment. The instrument is a five point, 54 item Likert scale survey that measures a teachers’ technological knowledge; pedagogical knowledge; content knowledge; pedagogical content knowledge; technological content knowledge; technological pedagogical knowledge; and technology, pedagogy and content knowledge. There are also three quantitative survey questions requiring respondents to measure the percentage of their faculty who modeled TPACK and three qualitative questions requiring respondents to describe episodes in which TPACK was demonstrated to them included in the survey.

To repurpose the instrument within a higher education institution the researcher modified several items in the survey for use with the college level teaching faculty population and the variety of content disciplines within higher education. The revised TPACK survey questionnaire included a total of 27 quantitative questions representing seven categories or knowledge domains. The survey was divided into six questions related to technology knowledge (consistent with the original survey number), seven questions related to pedagogy knowledge (consistent with the original survey number), two questions related to content knowledge (reduced from the original 12 questions that measured content in mathematics, social studies, science, and literacy), and nine questions related to technological pedagogical knowledge (consistent with the original survey number). Additionally one question related to pedagogical content knowledge (reduced from original four questions where each one measured PCK in mathematics, social studies, science, and literacy), another question to technological content knowledge (reduced from original four questions where each one measured TCK in mathematics, social studies, science, and literacy), and one question related to technological pedagogical and content knowledge (reduced from original four questions where each one measured TPACK in mathematics, social studies, science, and literacy) for a total of 27 items. The revised survey also included several
questions related to demographics including 10 questions that focus on years of teaching in higher education, years of teaching in online environments, faculty status, gender, age, and prior technology trainings. Two of the qualitative questions were also retained.

To respond to each question in the survey, participants selected from five possible options for each question. The five possible options were based on a Likert scale and included the following possibilities: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. The following numerical values were assigned to each response: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. A score of five was the maximum value for any one question or any category of questions.

The revised TPACK survey was piloted with a separate group of faculty within the institution to re-test instrument validity before launching it within the study site. A total of six full-time, non-tenured faculty instructors participated in the pilot study. Three faculty instructors offered minor language feedback on two survey items and one demographic related question. Three other faculty instructors responded that they thoroughly understood the questions as they were written and had no additional feedback or suggestions to offer. The researcher adjusted the language on the two survey items for language clarity and adjusted the demographic related question to allow for multiple item selection.

**Reliability.** The original TPACK survey instrument has proven reliable with internal consistency scores of .78 to .93 for all categories. The original reliability score for each category is presented in table 1 below.
Table 1. Survey of Preservice Teachers’ Knowledge of Teaching and Technology Domain Reliability Scores

<table>
<thead>
<tr>
<th>TPACK Domain</th>
<th>Internal Consistency (alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Knowledge (TK)</td>
<td>.86</td>
</tr>
<tr>
<td>Content Knowledge (CK)</td>
<td></td>
</tr>
<tr>
<td>Social Studies</td>
<td>.82</td>
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<td>Mathematics</td>
<td>.83</td>
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<td>Science</td>
<td>.78</td>
</tr>
<tr>
<td>Literacy</td>
<td>.83</td>
</tr>
<tr>
<td>Pedagogy Knowledge (PK)</td>
<td>.87</td>
</tr>
<tr>
<td>Pedagogical Content Knowledge (PCK)</td>
<td>.87</td>
</tr>
<tr>
<td>Technological Pedagogical Knowledge (TPK)</td>
<td>.93</td>
</tr>
<tr>
<td>Technological Content Knowledge (TCK)</td>
<td>.86</td>
</tr>
<tr>
<td>Technological Pedagogical Knowledge</td>
<td>.89</td>
</tr>
</tbody>
</table>

The researcher re-tested the revised TPACK survey for reliability utilizing the split-half method in SPSS based on the Spearman-Brown formula for four areas of the TPACK survey. The three other areas not re-tested were not done so because they represented only one question for the category and thus could not be assessed for reliability under the split-half method. The revised reliability scores are presented in table 2 below.

Table 2. Revised TPACK Reliability Scores Utilizing the Split-Half Method

<table>
<thead>
<tr>
<th>TPACK Domain</th>
<th>Spearman Brown Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Knowledge (TK)</td>
<td>.90</td>
</tr>
<tr>
<td>Content Knowledge (CK)</td>
<td>.54</td>
</tr>
<tr>
<td>Pedagogy Knowledge (PK)</td>
<td>.88</td>
</tr>
<tr>
<td>------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Technological Pedagogical Knowledge (TPK)</td>
<td>.90</td>
</tr>
</tbody>
</table>

**Participant selection.** All actively teaching full-time and adjunct faculty instructors within the college were targeted for participation in the study. A total of three hundred faculty email addresses were identified for participation, which were comprised of 80 full-time instructor email addresses and 220 adjunct faculty email addresses. The full-time faculty email addresses were identified through the administrator of the college’s internal web portal while a list of the adjunct faculty email addresses was obtained by the researcher through an email request to each academic program’s administrative assistant or program manager. The revised TPACK survey was administered through the Qualtrics software program and electronically distributed to the college’s full-time faculty by the college dean’s administrative assistant. The survey was also distributed electronically by the researcher to the adjunct faculty instructors in the college. A total of 67 survey responses were received. One question included in the survey provided respondents an opportunity to participate in the qualitative interview process. Twenty-eight participants indicated their willingness to be interviewed by providing an email address for contact.

**Data Collection.** The revised web based TPACK assessment survey was deployed via email to collect quantitative data from online teaching faculty instructors. The TPACK assessment served as a measurement of the current faculty instructors’ technological, pedagogical, and content knowledge. The survey questions included categories of technology knowledge, content knowledge, pedagogy knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological
pedagogical and content knowledge. The full-time faculty received two email notices inviting them to participate in the study while the adjunct faculty received three email notices. The email invitation to both groups of faculty included information on participation consent, the study purpose, the potential risks and benefits of participating in the study, assurances of confidentiality if they chose to participate, and a contact person for follow-up questions. For the purpose of the full-time faculty the identified contact was the researcher’s dissertation chair while the researcher herself served as the identified contact for the adjunct faculty.

**Data analysis.** Quantitative data from the TPACK, Likert scale based survey was analyzed by the researcher using several statistical procedures. First, descriptive analyses were employed on the individual survey items to measure response rates, response bias, and descriptive analysis of items pertaining to the overall research question (Creswell, 2008). Frequency counts and calculations of means were analyzed next. Any item missing a data value was treated as missing data for the assigned category and was not considered in the analysis. Second, inferential statistical procedures were applied to analyze the data. An independent samples *t* test procedure was utilized to determine significance between the full-time and adjunct faculty instructors’ means on the five domains of knowledge: technology knowledge, content knowledge, pedagogy knowledge, technological pedagogical knowledge, and TPACK. An ANOVA statistical procedure was utilized to determine significance among the five knowledge domains above against four ranges of number of years teaching in higher education.

**Phase II.**

In addition to using the TPACK survey to collect quantitative data for the study, a qualitative interview protocol was developed by the researcher and vetted by the researcher’s dissertation chair to elucidate how instructors apply their TPK skills for the purpose of assessing
new technology tools for the online classroom and for understanding how online and hybrid faculty instructors engage students in online environments. A copy of the interview protocol is included in the appendix.

**Participant identification and invitation.** Participants for the second phase of the study were identified through a solicitation on the TPACK survey. Survey respondents were asked if they would like to participate in the qualitative portion of the study. Twenty-eight of the original 65 survey respondents signaled their willingness to be interviewed by providing their email address for contact and follow up. The researcher selected a group of 15 of those faculty instructors who had the higher range of scores on the TPACK survey and represented prototypical groups such as adjunct teaching faculty with high TPACK and full-time teaching faculty with high TPACK. The researcher then individually emailed each of the 15 identified participants inviting them to participate in the second phase of the study through either phone or in person, face-to-face interviews. Ultimately, six of the 15 faculty instructors responded to the researcher’s emails requesting participation. An additional three qualitative study participants were identified and added through snowball sampling to raise the number of qualitative study participants to a total of nine instructors. These three study participants were identified after the researcher contacted the program directors and program managers and asked them to identify high performing online instructors from within their academic groups based on performance reviews, course evaluations, and repeated hiring. Two of these additional participants also completed the TPACK survey. The interviews with the faculty instructors were utilized to elucidate the findings from the quantitative data by providing additional perspective and context in teaching in the online learning environment.
Data collection. The researcher conducted the qualitative interviews in a one-on-one format with each participant. Each participant was provided the interview protocol several days in advance of the interview to allow for deeper response and consideration of the individual questions. Three interviews occurred through face-to-face/in-person sessions while the other six interviews occurred by telephone. All of the interviews were audio recorded through an application on the researcher’s phone and each participant consented to the recording. The nine interview sessions ranged from 35 minutes to 70 minutes depending on how much the participant wanted to share and elaborate upon in their discussion. The researcher was careful to use open-ended questions when available, not to lead the interviewee to any particular response, and to listen intently to what the participant was sharing about their online teaching experiences. The researcher took minor, high level notes during each interview that would later assist in data analysis. Theoretical saturation was seen by the ninth interview.

Data analysis. The audio recordings of the data were transcribed by an independent transcription provider, Tiffany Seide. Tiffany signed a non-disclosure agreement with the researcher and has been utilized for transcription services by many fellow researchers. Tiffany quickly returned each transcription within two to four days of receipt and the researcher was able to begin analyzing the data. The researcher began the process of hand coding the data by printing each transcription on its own unique colored paper. This ensured that no transcription would get mixed up with another and allowed the researcher to easily cut segments into pieces for identification and arrangement. The next step in the analysis was for the researcher to read each interview transcription two times to develop the general sense of the data (Creswell, 2008). During the second reading of the transcription the researcher started coding data segments by highlighting specific interview quotes and jotting notes and codes in the margins of the
transcription. The researcher then used additional copies of the transcriptions to cut out thematic segments that could be used to create a matrix of sources (Creswell, 2008). Thematic areas sought for the qualitative data included the following:

- Methods and way in which faculty instructors learn or have learned technology skills, including examples of depth and breadth of technology skills.
- Methods and ways in which faculty instructors learn or have learned pedagogy skills, including types of pedagogy techniques specifically utilized.
- Methods and ways in which faculty instructors determine technology fit with content.
- Methods and ways in which faculty instructors establish an online presence.
- Methods and ways in which faculty instructors engage students.
- Methods and ways in which faculty instructors engage students with technology.

**Ethical Considerations**

Participants of this research study were protected through several methods and protocols. First, permission to conduct the study was obtained from the dean of the college at the study site since this study involves faculty from within the college. The dean is responsible for faculty supervision and is therefore, the appropriate level of authority to provide study permission. Second, approval through the university’s Institutional Review Board (IRB) was obtained by the researcher before any research commenced or interaction with potential subjects began. IRB approval is required for any research done at the university or by anyone working at the institution engaged in research. In addition to IRB approval the researcher has been trained and certified in human subjects training through the Collaborative Institutional Training Initiative (CITI). The CITI organization is a well-established collaboration that provides training modules
followed by quizzes on human subjects’ research. The CITI collaborative has trained over 1.3 million people since 2000 (Braunschweiger & Hansen, 2010).

The nature of the data collection in this study required protection and assurances in two distinct areas. The first area involved the web based survey that faculty instructors completed. Informed consent for the web survey was managed via two access points. The first access point was in the email invitation that the faculty instructors’ received. This email invitation contained an overview of the research including the purpose of the research, its anticipated use and benefits, time of participation in the survey, and the researcher’s plan to disseminate a summary of the research findings at the conclusion of the study (Creswell, 2008). Faculty signaled their consent by clicking on the web based link in their email that then took them to the survey. Prior to the launching of survey questions faculty were again able to view and read a consent document that overviews the same information. Faculty therefore, could opt not to participate in the study by not activating the email link or by ending the survey at any point in time by closing their web browser.

Informed consent for the one-on-one interviews with the selected faculty instructors occurred at the start of interview. All interviewees were given an overview of the interview purpose, format, and approximate length at the start of the recorded interview and were asked if they were still interested in participating in the interview. Through email correspondence with the interviewed faculty instructors and reiteration at the start of the recorded interview session the faculty instructors were informed and guaranteed that the data they provided in the survey and interviews would be kept confidential.

Because the interview method of data collection is not anonymous and because these sessions were audio recorded, additional protections were made to keep data confidential.
Specifically, the researcher used no identifying markers, including academic discipline, when quoting any subject within the research. The researcher also took great care to ensure protections of audio recordings by immediately downloading and storing recordings on a separate electronic device, which are stored in a locked office. After considerable amount of time and conclusion of the researcher’s dissertation these items will be destroyed. It is through these mechanisms that the subjects’ participation in the research study can be protected and confidence in the process maintained.
Chapter 4: Findings, Results, and Interpretations

Overview

The purpose of this research study was to measure and understand the presence of technological pedagogical and content knowledge (TPACK) among college teaching faculty who teach in online or hybrid environments. To achieve this purpose, a quantitative survey was utilized to measure the level of TPACK among the college teaching faculty in a large, private four-year university across a variety of academic disciplines. In addition to measuring the level of TPACK among the college teaching faculty, the study also sought to determine if any relationship existed among the components of TPACK and years teaching of the faculty and the components of TPACK and full-time or adjunct faculty status. This study also sought to determine how instructors develop their technological and pedagogical knowledge of new technologies and how instructors with high TPACK engage online students.

Research Questions

The research questions for this study were the following:

1. What is the level of TPACK among the online college teaching faculty within a diverse college at a large, private four-year university?

2. What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?

3. What techniques do instructors with high TPACK utilize to engage online students?

Quantitative Demographics

As previously mentioned, the TPACK survey was distributed to approximately 300 faculty email addresses comprised of 80 full-time and 220 adjunct faculty email addresses in a variety of academic disciplines. Of that group 67 faculty members responded and completed some portion of the survey while 57 faculty members of that group fully completed all
quantitative survey related questions with three members of that group omitting some demographic data responses.

The academic disciplines represented among the group of faculty respondents included such areas as, construction management, computing and security technology, culinary arts, e-learning leadership, engineering technology, human resource development, multidisciplinary and emerging programs, professional studies, project management, sport management, and education related areas including special education, global and international education, higher education, and teacher education. Of the 67 respondents, 44 were male, 21 were female and two did not report. Also within the group of 67 respondents, 50 participants reported being adjunct faculty members, 16 participants reported being full-time faculty members, and one participant responded as a teaching assistant. Twenty-four survey participants reported teaching for 10 years or more, eight reported teaching between 7.5 to 10 years, 17 reported teaching between 3.5 to seven years, 16 reported teaching for 0 to three years, and one did not report. Fifty survey participants reported having taught online courses, 58 participants reported teaching a fully face-to-face class, and 39 participants reported teaching in a hybrid learning environment.

Quantitative Data Findings

The first research question addressed in the study was what was the level of TPACK among the online college teaching faculty within a diverse college at a large, private four year university? To address this question several components of the quantitative survey were utilized. The survey was divided into six questions related to technology knowledge, seven questions related to pedagogy knowledge, two questions related to content knowledge, and nine questions related to technological pedagogical knowledge. Additionally one question related to pedagogical content knowledge, another question to technological content knowledge, and one
question related to technological pedagogical and content knowledge for a total of 27 quantitative based questions.

Two questions of the survey are not reported in the results. These questions include the one question on pedagogical content knowledge and one question on technological content knowledge. The lack of content specificity in these two questions, which was modified from the original TPACK survey that measured preservice teachers content knowledge in literacy, mathematics, science, and social studies, and the fact that these two questions could not easily be assessed for reliability were determined to be an incomplete measure of the college level teaching faculty’s content expertise with regard to pedagogical content knowledge and technological content knowledge and were therefore disregarded in reporting. However, for the sake of understanding content knowledge with regard to this study, the researcher makes an assumption that college level teaching faculty are assumed to be experts in their teaching content areas due to their terminal degree status and scholarship endeavors. Despite the fact that the TPACK category itself included only one TPACK specific question in the survey it is extensively discussed in the results, findings, and interpretations sections.

To address the first research question of what was the level of TPACK among online college teaching faculty within a diverse college at a large, private four year university the domains of technology knowledge, content knowledge, pedagogy knowledge, technological pedagogical knowledge, and technological pedagogical and content knowledge questions were measured. Table 3 below contains the mean for each category of questions and number of respondents per category compared among the full-time faculty and the adjunct faculty as well as a total combined mean for the entire group of respondents. A single teaching assistant’s score is not reported separately below since he was determined to be an outlier to the data due to his lack
of primary classroom teaching responsibilities and terminal degree. However, his values are included in the overall combined number reported in table 3. For a value to be counted and reported respondents must have answered each question in a category. If a respondent omitted any question in a category their responses were treated as missing data and therefore are not considered. Figure 3 graphically presents the data from table 3 for further illustration.
Table 3. TPACK Domain Measures for All Faculty Types

<table>
<thead>
<tr>
<th></th>
<th>Full-Time Faculty Instructors</th>
<th>Full-Time Faculty Instructors</th>
<th>Adjunct Faculty Instructors</th>
<th>Adjunct Faculty Instructors</th>
<th>Total Combined for all Faculty Instructors</th>
<th>Total Combined for all Faculty Instructors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Knowledge</td>
<td>3.75 N = 15</td>
<td>3.98 N = 48</td>
<td></td>
<td></td>
<td>3.94 N = 63</td>
<td></td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>4.59 N = 16</td>
<td>4.65 N = 50</td>
<td></td>
<td></td>
<td>4.63 N = 67</td>
<td></td>
</tr>
<tr>
<td>Pedagogy Knowledge</td>
<td>4.39 N = 13</td>
<td>4.30 N = 49</td>
<td></td>
<td></td>
<td>4.31 N = 62</td>
<td></td>
</tr>
<tr>
<td>Technological Pedagogical Knowledge</td>
<td>3.85 N = 15</td>
<td>3.77 N = 47</td>
<td></td>
<td></td>
<td>3.79 N = 63</td>
<td></td>
</tr>
<tr>
<td>Technological Pedagogical and Content Knowledge (TPACK)</td>
<td>4.18 N = 16</td>
<td>4.16 N = 50</td>
<td></td>
<td></td>
<td>4.16 N = 67</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3. TPACK Domain Measures for All Faculty Types

As the data in table 3 represents, adjunct faculty instructors had a higher technology knowledge (TK) score with a mean of 3.98 compared to the full-time faculty instructor mean of 3.75. The higher TK mean for adjunct faculty instructors may be explained by several reasons. One reason is that the adjunct faculty instructors are often competing for more teaching opportunities and the more abundant opportunities for teaching within the college are through online course instruction. Thus, in order to earn more teaching opportunities and repeatedly be hired, the adjunct faculty instructors might have more online teaching experience than full-time faculty instructors who would teach in a mix of face-to-face and online courses, and thus possess a higher technology knowledge score. A second explanation for the higher TK score for adjunct instructors may be because the adjunct instructors are practitioners of their fields and the businesses in which they work, such as hospitality management, construction management,
engineering technology, and project management may require higher technology aptitude and utilization in day-to-day work environments than a full-time faculty career may require.

Despite the higher technology score among the adjunct faculty instructors, the full-time faculty instructors represent higher mean score values for pedagogy knowledge, technological pedagogical (TPK), and technological pedagogical and content knowledge (TPACK), though the mean values for these three categories are not widely separated. The researcher had hypothesized that the full-time faculty instructors would have a statistically significant higher technology knowledge score, pedagogy knowledge score, TPK score, and TPACK score. While the values presented in table 3 indicate that the full-time faculty instructors’ scores were higher for each category other than technology knowledge and content knowledge these means alone do not reveal if these values demonstrate any statistical significance.

To determine significance an independent samples t-test was conducted to compare technology knowledge for full-time faculty status and adjunct faculty status; pedagogy knowledge for full-time faculty status and adjunct faculty status; content knowledge for full-time faculty status and adjunct faculty status; TPK for full-time faculty status and adjunct faculty status; and TPACK for full-time faculty status and adjunct faculty status. There was not a significant difference in the scores for full-time faculty status (M=3.75, SD=0.68) and adjunct faculty status (M=3.98, SD=0.78) for technology knowledge; t (61)= -1.00, p = 0.32; for full-time faculty status (M=4.39, SD=0.58) and adjunct faculty status (M=4.30, SD=0.53) for pedagogy knowledge; t (60)= 0.52, p = 0.60; for full-time faculty status (M=4.59, SD=0.58) and adjunct faculty status (M=4.65, SD=0.41) for content knowledge t(64) = -0.42, p = 0.67; for full-time faculty status (M=3.85, SD=0.60) and adjunct faculty status (M=3.77, SD=0.58) for TPK; t(60)=0.44, p = 0.65; and for full-time faculty status (M=4.81, SD=0.54) and adjunct faculty
status (M=4.16, SD=0.61) for TPACK, t(64)=0.15, p =0.87. The results of the \textit{t-test} are presented below in table 4. Because no significance could be determined for the five knowledge domains the null hypothesis, which stated that there would be no difference in the two groups’ means is retained.
Table 4. T Test Results of Adjunct versus Full-Time Faculty Status on the Four Domains

<table>
<thead>
<tr>
<th></th>
<th>Independent Samples Test</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Levene's Test for Equality of Variances</td>
<td>t-test for Equality of Means</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(F) (p) (t) (df) (Sig. (2-tailed)) Mean Difference Std. Error Difference 95% Confidence Interval of the Difference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Knowledge</td>
<td>Equal variances assumed</td>
<td>.95 .33</td>
<td>1.00 61</td>
<td>.32</td>
<td>-.22</td>
<td>.22</td>
<td>-.67 .22</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>1.07 26.52</td>
<td>.29</td>
<td>-.22</td>
<td>.21</td>
<td>-.65 .20</td>
<td></td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>Equal variances assumed</td>
<td>1.78 .18</td>
<td>-.42 64</td>
<td>.67</td>
<td>-.05</td>
<td>.13</td>
<td>-.32 .20</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>-.35 20.20</td>
<td>.72</td>
<td>-.05</td>
<td>.15</td>
<td>-.38 .27</td>
<td></td>
</tr>
<tr>
<td>Pedagogy Knowledge</td>
<td>Equal variances assumed</td>
<td>.278 .600</td>
<td>.52 60</td>
<td>.60</td>
<td>.08</td>
<td>.16</td>
<td>-.24 .42</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>.50 17.75</td>
<td>.62</td>
<td>.08</td>
<td>.17</td>
<td>-.28 .46</td>
<td></td>
</tr>
<tr>
<td>TPK</td>
<td>Equal variances assumed</td>
<td>.21 .64</td>
<td>.44 60</td>
<td>.65</td>
<td>.07</td>
<td>.17</td>
<td>-.27 .42</td>
</tr>
<tr>
<td>TPACK</td>
<td>Equal variances not assumed</td>
<td>Equal variances assumed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>-----------------------------</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.43 22.88 .66 .07 .17 -.28</td>
<td>.06 .79 .15 64 .87 .02</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>.17 28.47 .86 .02 .16 -.30</td>
<td>.37 .35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to analyzing the domains of technology knowledge, content knowledge, pedagogy knowledge, TPK, and TPACK mean values by faculty status, the score means were also analyzed based on number of years teaching in higher education. Table 5 below presents the data for each knowledge domain based on four separate breakdowns in years teaching. Figure 4 also graphically presents the data below for further illustration. As table 5 presents, the technology knowledge (TK) domain proved to have the greatest range and score differences compared to the other four domains. Most notably below is the TK score of 3.77 for faculty who had been teaching for 10 plus years compared to faculty with fewer years of teaching. The researcher had hypothesized that the faculty with the greatest number of years teaching would have the lowest TK score among the groups for several reasons. First, this group would have been the farthest removed from exposure to new technology tools in the formal education setting and as research has shown, faculty teach the way they were taught (Conti, 2004). Consequently, this more experienced teaching group may be more comfortable with older forms of technology within the classroom setting, which were the tools and applications that were in place during their undergraduate and graduate education years. However, it may also be that this group, with more teaching seniority, may prefer to teach more face-to-face courses than online courses, and
thus have less exposure to the latest online technology tools. Finally, this group of experienced faculty may be opting to spend their professional development time more on research and scholarship and less on their instructional technology development.

While the lower TK score for the 10 plus years group of faculty fit the researcher’s hypothesis, it was not known if this score value is statistically significant. To determine if the mean scores of number of years teaching were statistically significant for the five domains an ANOVA test was conducted with SPSS. The ANOVA results revealed that there was not a significant effect of years teaching in higher education on technology knowledge at the p < .05 level for the three conditions \([F(3, 59) = 0.71, p = 0.54]\), on content knowledge at the p < .05 level for the three conditions \([F(3, 62) = 0.48, p = 0.69]\), on pedagogy knowledge at the p < .05 level for the three conditions \([F(3, 58) = 0.13, p = 0.94]\), on TPK at the p < .05 level for the three conditions \([F(3, 58) = 0.15, p = 0.92]\), and TPACK at the p < .05 level for the three conditions \([F(3, 62) = 0.31, p = 0.81]\). The results of the ANOVA test are presented in table 6. Because no significance could be determined for the five knowledge domains the null hypothesis is retained here as well.
Table 5. TPACK Domain Measures Compared Among Years of Teaching

<table>
<thead>
<tr>
<th></th>
<th>0-3 Years Teaching</th>
<th>3.5- 7 Years Teaching</th>
<th>7.5-10 Years Teaching</th>
<th>10+ Years Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>4.03</td>
<td>3.93</td>
<td>4.21</td>
<td>3.77</td>
</tr>
<tr>
<td>Knowledge</td>
<td>n = 15</td>
<td>n = 18</td>
<td>n = 7</td>
<td>n = 23</td>
</tr>
<tr>
<td>Content</td>
<td>4.66</td>
<td>4.72</td>
<td>4.50</td>
<td>4.60</td>
</tr>
<tr>
<td>Knowledge</td>
<td>n = 16</td>
<td>n = 18</td>
<td>n = 8</td>
<td>n = 24</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>4.26</td>
<td>4.35</td>
<td>4.39</td>
<td>4.28</td>
</tr>
<tr>
<td>Knowledge</td>
<td>n = 15</td>
<td>n = 17</td>
<td>n = 8</td>
<td>n = 22</td>
</tr>
<tr>
<td>TPK</td>
<td>3.82</td>
<td>3.72</td>
<td>3.80</td>
<td>3.85</td>
</tr>
<tr>
<td></td>
<td>n = 16</td>
<td>n = 17</td>
<td>n = 7</td>
<td>n = 22</td>
</tr>
<tr>
<td>TPACK</td>
<td>4.12</td>
<td>4.22</td>
<td>4.00</td>
<td>4.20</td>
</tr>
<tr>
<td></td>
<td>n = 16</td>
<td>n = 18</td>
<td>n = 8</td>
<td>n = 24</td>
</tr>
</tbody>
</table>
Figure 4. TPACK Domain Measures Compared Among Years of Teaching
Table 6. ANOVA Results Among the Five Domains Against Year of Teaching in Higher Education

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1.27</td>
<td>3</td>
<td>.42</td>
<td>.71</td>
<td>.54</td>
<td>.03</td>
</tr>
<tr>
<td>Within Groups</td>
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<td>23.16</td>
<td>65</td>
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</table>

Interpretive Information about Qualitative Sample

The second phase of the research study was to understand the processes that the online college teaching faculty use to develop their technological pedagogical knowledge of new technologies and, to understand the techniques that instructors with high TPACK utilize to engage online students. To address these questions a qualitative interviewing approach was undertaken. The qualitative interview participants were pooled from the quantitative portion of the study. Ultimately nine faculty instructors participated in the qualitative interviewing process. Of that group of nine, five of the instructor participants reported serving as full-time faculty instructors while four instructor participants reported serving as adjunct faculty instructors who had full-time positions in a non-teaching profession. Six of the qualitative interview participants were male and three were female. There were no tenured or tenure track faculty members within
the qualitative interview group. Specific academic disciplines will not be identified from among this group of qualitative participants because of the risk of identification and potential loss of anonymity within the unit of the university. However, all qualitative study participants represented a discipline from within the previous aforementioned list and no academic discipline was repeated from among the group of qualitative participants.

Qualitative Data Findings

Research Question 2. The second research question this study sought to understand was what processes do good online instructors use to develop their technological pedagogical knowledge of new technologies? This research question was addressed through the qualitative interviews. Specific interview questions that helped to address this research question included the following:

Table 7. Selected Qualitative Interview Questions for Research Question 2

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Can you describe any training you have in pedagogy?</td>
</tr>
<tr>
<td>2.</td>
<td>Can you describe your background and expertise with pedagogy?</td>
</tr>
<tr>
<td>3.</td>
<td>Can you describe any training you have with technology?</td>
</tr>
<tr>
<td>4.</td>
<td>Can you describe any background or expertise you have with technology?</td>
</tr>
<tr>
<td>5.</td>
<td>Do you consider yourself a “tinkerer” or early adopter of technology?</td>
</tr>
<tr>
<td>6.</td>
<td>How do you go about learning new technologies?</td>
</tr>
<tr>
<td>7.</td>
<td>Do you utilize technologies outside of what is supported by your institution in your classes?</td>
</tr>
<tr>
<td>8.</td>
<td>What do you consider when introducing a new technology into the classroom?</td>
</tr>
<tr>
<td>9.</td>
<td>How do you go about matching technology with the pedagogy or learning</td>
</tr>
</tbody>
</table>
Themes

The nine instructor interview participants revealed a variety of ways and influences in how they develop their technological pedagogical knowledge of new technologies. Upon analysis the researcher has identified several themes and constructed a framework that depicts the instructors’ interview responses. These components of the framework include the following areas: Instructor determined methods, internal organizational forces, and external forces. The relationship of these components to one another and to development of faculty technological pedagogical knowledge is depicted in Figure 4 below. No level of importance was determined among the three components, but all interview responses revealed that some element of each component was evident in shaping how faculty develop their technological pedagogical knowledge of new technologies. Each component area is further explained in Table 8.

*Figure 5. Components Leading to Faculty Technological Pedagogical Knowledge Development of New Technologies*
Table 8. Critical Areas to Faculty Technological Pedagogical Knowledge Development of New Technologies

<table>
<thead>
<tr>
<th>Instructor Determined</th>
<th>Internal Organizational Forces</th>
<th>External Forces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-guided research and play</td>
<td>Leadership culture</td>
<td>Assessment and accreditation</td>
</tr>
<tr>
<td>Experiences</td>
<td>Support and resources</td>
<td>Competition for instructional jobs</td>
</tr>
<tr>
<td>Personal assessment of strengths</td>
<td>Academic freedom</td>
<td>Cross-institutional trainings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Textbook publishers</td>
</tr>
</tbody>
</table>

Instructor Determined

Instructor interview data revealed that all instructors possessed a high level of motivation and initiative that led them to continually seek out improvements in their teaching. For many instructors this included self-guided research consisting of one or more of the following self-described activities: reading Google alerts or blogs on current industry trends, receiving RSS newsfeeds on industry trends, subscription to industry specific list-serves, reviewing industry journals or trade publications, and watching You Tube or other videos on new technologies. From the interviews it was evident that these good online instructors were continually engaged in growth within their professions and possessed a desire to stay current in their respective industries with regard to substantive content changes and technological advances. One instructor illustrates his self-guided research by stating: “I spend on an average two hours a day going through all of my Google alerts for my industry, what I’m teaching, and I’ll find something significant, I can bet on it, that applies to what I’m teaching…” while another instructor illustrates the importance to her of conducting self-guided research,

My Ph.D. is in communications, specifically mass media, but by virtue of what we do as communicators and how it’s evolved, both on the practitioner side and the academic side,
it’s just simply – I couldn’t do my job if I wasn’t up to date on every element of technology.

Another instructor heightens this concept by stating, “the best job security you can ever have is your skills. You got great skills, great degree, that’s the best job security in the world.”

Though the self-guided research served as the launching point for learning about new technologies many of the instructors interviewed indicated that their next step would be to try the technology out on their own. One instructor describes the process as such: “…those journal articles, professional development, all of that really sparks my interest in technology but it doesn’t help me understand how to really use the technology until I play with it myself.” Another instructor adds “the best thing is to go in and use them [applications] and sort of tool around in there and figure out what the utility is and then what the strategy is behind them.”

One instructor illustrates his concept of learning about new technologies in the following quote:

I would say that usually it is a three-step process. The first step would be: It has to be recommended to me by someone I trust. And then obviously if it’s required, it’s required, but if it’s a new software and someone I trust says “Hey, you gotta use this, let me show you.” And then I’ll tinker with it would be the second step, but I’ll usually come back very quickly in a third step with questions, clarifications. I’m not a person that would spend a whole weekend working a software program.

The responses above reveal that these instructors are focused on developing both their content knowledge and technological knowledge that advances their teaching and practitioner day jobs. The notion of “tinkering” or playing around with technology as demonstrated by the three instructors above is similar to Mishra and Koehler’s (2009) TPACK theory learning-by-
design approach. While the TPACK authors constructed the learning-by-design approach within a teacher education course for K-6 teachers it is appears that the college level faculty instructors interviewed here are undertaking their own learning approach for online teaching purposes. Through the instructors’ words of “understanding the technology” and “what the utility and strategy” is of the technology illustrates deep thinking about technological pedagogical and content knowledge development and assessment of new technologies.

Besides the instructors self-guided research, the qualitative interview data also revealed that the instructors’ personal experiences greatly influenced development of technological pedagogical knowledge of new technologies. For instance, some faculty instructors were very purposeful in how they approached a course after having experienced a course as an online learner and research has shown that instructors are more in tune with learner needs when they have experienced a course as an online learner themselves (Karaman, Yildirim, & Gulsoy, 2010). In the case of the nine interviewed faculty instructors some had in fact taken an online course as part of a professional development experience while two instructors had experienced an online course as part of their graduate education. Through these experiences instructors developed a sense of what they liked as a learner while learning to navigate the tools they would later use as an instructor. One instructor describing his online learning experience through a professional development workshop states as follows: “We had to do a video introducing ourselves; we had to post content; we had to use the tools that were available in Blackboard; create discussion boards a grade center and stuff like that.” The instructor who earned his degree online describes his learning process as follows:

…for the most part it’s just a skill you pick up after doing a bunch of classes of what’s a good class and what’s going to be a bad class. I try to get rid of the stuff that’s bad, keep
the stuff that’s good for me personally and assume that most people are like me, they want to learn, they want to know technology; that they want to be there.

The ideas of trial and error or years of experience teaching regarding what was good and what was bad were often repeated through instructors’ personal experiences as part of the process in developing technological pedagogical and content knowledge and assessing new technologies. One instructor illustrates her years of teaching experience in shaping her learning development as follows:

I’ve consistently taught since [19] 99 without a break so as experience goes…you go through this period where you start to feel like you really got it down and you think you’re doing well, and then it feels like you have so much more to learn again. So I think there’s ebbs and flows…

One instructor discussed his experience with a failed tool as part of his learning process.

I used the wiki because another instructor had it in the course, and then I realized that there was really no reason to use the wiki other than just to get them [the students] accustomed to playing with the wiki. So in other words I could have easily just done it on the discussion board, but I think the instructor [who developed the course]… was trying to get them to use all the variety of tools for the sake of learning the tools.

The descriptions above also illustrate the learning-by-design approach for TPACK developed by Mishra and Koehler (2009). Several of these examples were even done in a structured learning environment with the purpose of teaching and familiarizing new online instructors with the types of skills that they would need to know and utilize in an online learning environment. Such an approach perfectly mimics Mishra and Koehler’s (2009) K-6 teacher method of acquiring TPACK while the other approaches of learning within one’s own course
demonstrates how experienced instructors continue to refine their technological pedagogical and content knowledge development and assessment of new technologies.

The third factor in the instructor determined category that emerged is the idea of an instructor knowing thyself or playing to personal strengths. This concept influenced the selection of specific tools and applications within an instructor’s class. One instructor highlighted this concept while talking about the use of video in her online courses compared to other good instructors she knows who do not use video.

I know there are some instructors that they’re not overly positive or they don’t come across as being energetic, but they are brilliant at what they do and they do a really amazing job in an online course. They might not want to be the person that does video because for them it’s not their strength and so they might not want to use that. I really think it has to do with knowing what your strengths are as an instructor in a face-to-face classroom and then trying to translate that into the online course.

The notions of instructor strengths or predisposition are not specifically addressed in the literature review research. However, Zhao and Frank’s (2003) study that attributes technology adoption in schools using the ecosystem metaphor does represent psychological reasons among individual teachers as one of the explanations for why technology adoption fails in K-12 education settings. Therefore, it could be that instructors’ strengths or predispositions toward specific technologies may fit categorization as psychological reasoning within Zhao and Frank’s (2009) framework. Moreover, considered from the TPACK framework what is identified as a personal strength of an instructor could actually prove to be a limitation of that instructor’s technology knowledge, TPK, or TPACK. Perhaps if an instructor had a demonstration of how
personal video could be used for their content discipline then this perceived weakness or predisposition could be overcome and thereby improve the course learning experience.

Internal Organizational Forces

The interview data also revealed that internal organizational forces strongly influenced instructors’ development of technological pedagogical knowledge of new technologies through the organizational culture, the support and resources that are provided to teach online, and the perceived level of academic freedom. Many of the instructors’ interview responses centered on one of these themes when discussing their online teaching approaches and preparations. All of the instructors interviewed were united under the same college dean at the time of the interviews. This dean has made it a priority and mission of the college to expand high quality online programs. To achieve this mission the dean built a team of instructional designers and learning technologists to support the faculty and online course expansion.

Throughout the interviews, instructors repeatedly pointed to this team of experts as critical to improvements in their online teaching approaches. One full-time faculty member cited her use of the instructional design team in helping her obtain a license and implement the Poll Anywhere mini-survey technology and the use of a technology tool that allows her students to evaluate grade-level readability in an education course. A second full-time faculty member discusses more thoroughly her experience with the learning design team when exploring an interest in learning games,

Our instructional designer couldn’t support me, but then said that she would learn the technologies so that she could support me. I’ve never come across something that an instructional designer wasn’t willing to learn. I think they also appreciate when faculty
want to learn things. They have that type of culture in their group so it helps out quite a bit when they’re willing to learn things.

Additionally, an adjunct faculty member stated how he was able to make improvements to his online class through the instructional design team:

…working closely with the instructional technologist, he showed me ways to organize the data that I hadn’t thought of before and it really made it much more crisp and easier for the student to navigate, and it’s just stuff that you don’t…always think about [as an instructor] because you’re so busy finishing one class, and getting ready to do another one.

Finally, a third full-time faculty member who likes to focus his teaching around storytelling and videos and less around structured lectures describes his use of the instructional design team as follows:

…the so-called lectures [are really] videos and fortunately with Kristian [the instructional videographer] and all we have teleprompters and I do it off of the teleprompter…there’s no PowerPoint that comes up. We have B roll, we’ll have cutaways, too. You know if I’m doing a quote of Winston Churchill we’ll cutaway to Wiston Churchill or something like that…

Since Mishra and Koehler’s (2009) TPACK theory is focused on individual teachers/instructors it does not address or account for how an organization influences faculty knowledge development or new technology assessment and utilization. However, other, more recent, TPACK research has demonstrated the problem of faculty professional development trainings as distinct efforts within higher education institutions with IT departments focused on conducting training on technology tools, centers for teaching and learning focused on pedagogy
workshops, and academic specific conferences focusing on discipline specific content knowledge (Stover and Veres, 2013). In addition to considering this recent TPACK research in higher education professional development models is the research from Zhao and Frank (2003) that was presented in the literature review. Zhao and Frank’s (2003) ecosystem metaphor does specifically address organizational reasons as influencing the level of computer usage and adoption in schools. The authors specifically attribute the hiring of technology directors, providing resources, and providing a general vision for technology use to account for 10-15 percent of computer usage in K-12 school settings. While exact percentages were not measured or cannot be determined from this researcher’s study among the college level teaching faculty, the internal organizational forces still clearly presented as an element of faculty technological pedagogical knowledge development and determination of new technologies.

The notion of and adherence to academic freedom was an important theme under internal organizational forces with regard to instructor technological pedagogical knowledge development and assessment of new technologies. With very few tenured faculty members teaching in the college’s online courses two distinct ideas emerged from the interview data. One idea that emerged is that some online instructors did not challenge the dean’s directive that a faculty member would develop an online course that would then be re-used and re-taught by multiple instructors in the future. The other idea that emerged is that such a directive challenges a faculty member’s academic freedom and the ability to direct a class that fits with that instructor’s strengths, ideas of learning effectiveness, and interest in growing and improving a course each time it is taught.

While the notion of academic freedom did not emerge from adjunct instructor interviews, it did emerge as an issue and concern from full-time faculty instructors. And while adjunct
instructors did not reveal any academic freedom implications per se, some of the adjuncts
interviewed did discuss the constraints they felt when teaching a course developed by someone
else. One full-time faculty member explained the issue as such, “…one [of the issues] is the
voice-over PowerPoint. A lot of instructors refused to use it because it’s someone else’s voice
and it makes it looked canned, and full-time faculty want to have their own voice on it. He
further states that while standardized courses may be good for consistency it is not good for
academic freedom because each faculty member brings their own flavor to a course. Another
full-time faculty instructor who had previously been an adjunct faculty instructor describes his
online teaching experience as follows:

   It’s very difficult taking on a course that someone else has developed and their
   personality is scattered throughout and you have to kind of bring you own self into it as
   well as little antidotes and things that you want to bring to the table, and that’s difficult.
   While another instructor highlights academic freedom implications as it relates to unique
   student populations in a course. She says:

   It’s also about responding to the needs of our students, and so it really is important not
   just to take the pedagogy and the methodologies behind it and apply it, but also to get a
   sense of who are our students today. [Within the course that I teach] the majority of our
   students are female, they are first time to go to college, and they are minority. So it’s
   important as we’re selecting [content and technology] – what’s going to really start to
   resonate with our students? We need examples of women. We need examples of
   leadership – women in leadership and things like that. So those kinds of things – knowing
   who the demographic is as far as the student population also comes into play for sure.
An adjunct faculty member who teaches courses on creativity describes his experience teaching a course that he did not develop as such: “the challenge for me is I didn’t design the course so you’re learning the material and you’re also trying to understand the flow that the designer or previous instructor built into it, so making that my own so it flows logically for me.”

External Forces

In addition to the instructor determined and internal organizational forces that influence technological pedagogical and content knowledge development of new technologies are the external forces exerted on instructors and faculty. The external forces include assessment and accreditation pressures, the increased competition and higher level skill set needed to get college level teaching jobs, the trainings provided by other higher education institutions, and the increased availability of online content and instructor resources provided by textbook publishers.

Several of the adjunct faculty instructors who were interviewed repeatedly cited their desire to get more online teaching assignments through the various institutions in which they teach. Many of these institutions mentioned included large, well-known providers of online learning. The ability to get additional teaching assignments at these institutions was often dependent on participation in faculty development trainings and departmental reviews of an instructor’s online teaching. One institution mentioned in an interview included a faculty incentive program that allows for stock options as instructors complete more training. One interview participant mentioned mandatory trainings at one such institution that included such topics as how to teach online, how to teach adult learners, and sessions on coaching and mentoring faculty to guide and facilitate engagement in online community. This same interview participant mentioned that one of the institutions she taught at had “secret reviews” of her courses, which included unannounced shadowing and monitoring of her response time to
students and posting of content in the online courses she taught. While she knows this can seem off-putting to some instructors she also recognized that accreditation purposes drive such institutional practices.

Another recent development that surfaced in the instructor interviews that seem to influence the development of faculty TPACK of new technologies arises from the use of content and instruction developed by textbook and other publishers of industry specific content. From the interview data it appears that some faculty who develop online courses utilize lectures, quizzes, and learning activities that are provided as instructor resources from textbook providers. One instructor cited her use of a case-studies platform that provides readings, resources, and materials for students that integrates with platforms such as Blackboard Learn to work through field related case studies. While several instructors interviewed mentioned their use of such content, the researcher was unable to assess whether this hindered or advanced an instructors’ TPACK development.

While accreditation and assessment pressures are not discussed or presented specifically in the literature review as a consideration for instructors when selecting new technologies, the presentation of Bates’ (2005) ACTIONS framework does seek to redress the political, commercial, and administrative motivations that lead to technology purchases and adaptations in education settings. Such commercial motivations could be broadened to include the pressures presented by accrediting bodies as well as the content and learning activities supplied by textbook publishers.

In summary of this research question’s results, there are a number of influences impacting faculty instructors’ technological pedagogical knowledge development of new technologies. The self-determined initiatives combined with internal organizational and external
forces demonstrates the faculty instructors’ and institutions’ concerted efforts in developing technological knowledge, content knowledge, and pedagogical knowledge for rich online learning. It is clear that these motivated and experienced faculty instructors have a desire to do more and be better at what they do, but have not been provided a framework for understanding, evaluating, and assessing how these three areas may and should intentionally merge to build and teach better online courses. While the interview data demonstrates that these high performing instructors appear to have developed their TPACK of new technologies through their many years of teaching experience a more focused approach could better serve instructors in their early years of teaching and more rapidly advance high quality online learning teaching. This research study will now turn to understanding how these interviewed instructors use their TPACK to engage online learners.

Research Question 3. To address the third research question of the study of what techniques do instructors with high TPACK utilize to engage online students the researcher utilized specific interview questions. The specific interview questions that sought to explore and understand this question included the following:

Table 9. Selected Qualitative Interview Questions for Research Question 3

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<table>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>As you got integrated in the online learning platform, what were the biggest adjustments that you needed to make to engage students into your online class?</td>
</tr>
<tr>
<td>2</td>
<td>What do you feel are the biggest challenges to teaching an online student?</td>
</tr>
<tr>
<td>3</td>
<td>Online faculty often struggle to establish a presence in an online course. Please describe how you go about achieving this.</td>
</tr>
<tr>
<td>4</td>
<td>What, if any features, of the online learning platform that you use do you</td>
</tr>
</tbody>
</table>
feel connects you to your students?

5. Online courses typically run as asynchronous, but do you offer any specifically scheduled synchronous sessions also? How and why do you do this?

6. What areas of online learning do you see students struggle with the most?

7. What if anything have you done to address these struggles?

8. In your view, what would improve learning engagement for online students?

9. How does engagement compare and differ between your online students and your face-to-face students? What evidence do you see to point to their engagement?

Themes

The interview data gathered from the online instructors regarding techniques utilized to engage online students produced five notable themes leading to a model of construction. The five themes that emerged from the interview data on techniques utilized by instructors to engage online students included, (1) the idea of building community in online courses; (2) the idea of creating structures within courses to ensure student learning and engagement; (3) the idea of an instructor establishing a presence in an online course; (4) the idea of becoming observant of students in other ways; (5) and the idea of continually demonstrating trust and care to students in an online course. These themes are illustrated below in Figure 5. Sample codes of these themes are presented in table 10.
Figure 6. Techniques used by Instructors to Engage Online Students

Table 10. Sample Codes for Instructor Engagement

<table>
<thead>
<tr>
<th><strong>Building Community</strong></th>
<th><strong>Creating Structures</strong></th>
<th><strong>Establishing a Presence</strong></th>
<th><strong>Becoming Observant in Other Ways</strong></th>
<th><strong>Demonstrating Trust and Care</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mimic face-to-face classroom behaviors when able</td>
<td>Building rubrics for online activities</td>
<td>Weekly announcements or “welcome to the week” by instructor</td>
<td>Instructor participation in discussion boards</td>
<td>Skype/ Phone calls to students</td>
</tr>
<tr>
<td>Live/synchronous classroom sessions with student web cams</td>
<td>Creating calendars for class with all due dates</td>
<td>Video introduction by instructor</td>
<td>Checking the number of logins</td>
<td>Personal email outreach</td>
</tr>
<tr>
<td>Creating a “student lounge” to get questions answered</td>
<td>Scaffolding of assignments</td>
<td>Post replies to discussion boards threads</td>
<td>Polling students throughout the course</td>
<td>Texting with students</td>
</tr>
<tr>
<td>Field trip opportunities</td>
<td>Early alert/early warning systems</td>
<td>Sharing own industry experiences as learning</td>
<td>Ask questions in multiple ways and in multiple places</td>
<td>Critiquing without being off-putting</td>
</tr>
<tr>
<td>Opportunities</td>
<td>Repetition of posting one to two times a day</td>
<td>Have students tell you a story back</td>
<td>Telling students great job</td>
<td></td>
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<tr>
<td>------------------------------------------------------------------------------</td>
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<td>------------------------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>Ensuring everyone has a voice and contributes</td>
<td>Make sure course is focused and consistent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparing and orienting students for online learning</td>
<td></td>
<td>Have students do activities that demonstrate application of learning versus comprehension</td>
<td>Use of storytelling approach</td>
<td></td>
</tr>
</tbody>
</table>

Building Community

The full-time and adjunct faculty instructors interviewed for this study demonstrated a commitment to building ways to engage their online learners and creating a sense of community in their online classes. The instructors accomplished this in a variety of ways, some of which may seem counter to the notion of convenience of online learning. Some instructors used live video classroom sessions to engage their students, with one instructor bringing together both his on campus, face-to-face students with his online students into a live web based discussion, while another instructor invited his online students to participate in a weekend field trip opportunity.

The instructors who created such synchronous opportunities for their students did not make any of these sessions mandatory, but through a combination of the instructors’ tone, style, and approachability all experienced high participation in their community building initiatives and seemingly engaged students in extraordinary ways. One instructor described why she offers live video classroom sessions in her online classes as follows:

…for me it’s valuable because it’s a way that I can connect with them and they see one another. To see the smiles on their faces from the time we start…then as we progress through the session they see that I’m relaxed about it, they’re enjoying it, we’re all learning from one another and it’s a really good experience.
For those instructors who may not have used such novel methods, other ways that an instructor established a sense of community in an online class included posting of photos of students and the instructor, constructing a careful and thoughtful approach to verbal tone and style throughout the course interactions, and ensuring that each student in the class contributes and has a voice. One instructor acknowledging the anxiety that can accompany new online students is careful in establishing a comfort level for her new students. As she states, “everybody is going to have a voice and everybody is going to see what everybody has to say” while also at the same time being mindful of her language in the course by stating that “it really is critical to be thoughtful about how every word is going to be received. We want to be there to offer critique, but we don’t want to be off-putting.”

Evidence of community building mimics the concept of Online Human Touch (Betts, 2009) that was presented in the literature review. Online Human Touch (OHT) characterizes the social presence students establish with their instructor in an online course. OHT supports the notion that links to on campus student events and the tone in instructors’ written communication are important concepts that promote student persistence and engagement. The statements above by the interviewed instructors demonstrate that this notion of community building helps these instructors connect with individual students while also promoting student-to-student connection and instructor-to-class connections.

Creating Structures

Whether or not the instructors were designers of the courses they were teaching, the interviews from the online instructors revealed that all of the instructors were quite purposeful in creating structures within their online classes that supported student learning and engagement and addressed common pitfalls that online students’ experience. The structures that these faculty
instructors created in their online courses that supported continued student engagement included scaffolding of assignments throughout the term, providing classroom calendars or weekly reminders about due dates, and creating rubrics for discussion boards and assignments so students could ensure assignment clarity and expectations.

Other structures that were jointly created by faculty and staff included online orientations on how to utilize and navigate the online learning platform, creating early warning systems that alerted advisors to students struggling academically, instructor and staff reviews that ensured a course was focused and consistent, and creating online polls for students to provide continuous feedback. One instructor who has built her own mid-term polling-feedback system did so because she found that she was not getting enough useful student feedback from the standard end-of-term course evaluation and was not able to make just-in-time adjustments to the course that would benefit her current students. With her own polling system she can have students anonymously discuss the areas where they are struggling the most, the types of projects they have appreciated and why, and the level of instructor communication. Her system also allows students to rank order certain areas rather than using a straightforward yes/no response system. While faculty polling systems were not presented in the literature review as a specific tool to impact online student engagement, other structural support services such as online orientations, virtual office hours, and early warning interventions did present as methods to promote student persistence in online courses (Truluck, 2007).

Establishing a Presence

The interview data from the online instructors also revealed that these instructors were adept at establishing a presence in their online courses and asserting their voice in a variety of ways. The instructors utilized such methods as video introductions, photos of themselves, weekly
voice announcements, “welcome to the week” introductions, postings and responses to discussion boards, storytelling and sharing of personal experiences, humor, repetitive postings and reminders, and continuous feedback to students to ensure that the student felt their presence in the course and felt that the instructor was engaged with each learner.

One instructor describes his methods of establishing a presence in his online classes as just being repetitive. He states that he post daily, at least once, sometimes twice just to let his students know he is there and reading their content. He states that some students have written him back surprised to receive comments on their assignments and discussion boards rather than just grades. He states that students have said to him that they think he is their first instructor to have actually read their work. Another instructor highlighting the importance of feedback to students describes her approach as follows:

Early feedback and lots of feedback because that’s what’s going to help them, help to guide them through challenges and guide them through, and if they’re doing a really great job it’s critical that we tell them what a great job they’re doing and to keep on going.

This same instructor describes her actions as “establishing the credibility of the [online] classroom.”

The faculty who exhibit the above behaviors demonstrate high level engagement in their online courses and as research in the literature review presented, instructor interaction and faculty contact in online courses have been shown to positively impact student retention and persistence (Bocchi, Eastman & Swift, 2004; Tello, 2007) while the Reisetter & Borris (2004) study demonstrates that instructor knowledge and helpfulness has been rated as one of the most important factors to students when taking an online course.
Demonstrating Trust and Care

In addition to building community, creating structures, and establishing an online presence the instructor interview responses demonstrated strong elements of trust and care in their online courses that supports student learning and engagement. While some of these actions may overlap with other themes, it is apparent from the data that the interviewed instructors go above and beyond minimal instructor expectations when it comes to engaging with their learners and they do so because they genuinely care about and are vested in the learning of the students in their online courses. The instructors interviewed mentioned ways that they outreach to students outside of the learning management system to let the students know they trust and care about them and their learning. Some of these ways included doing Skype video calls with students, individual phone calls with students, text messaging with students, and ensuring that the students receive positive and congratulatory messages from them. In addition, nearly all of the instructors were mindful of responding to their online students sooner than the stipulated 24 hour response time. One instructor describes his personalized outreach below:

I call students on their cellphone…people are absolutely floored that an instructor would reach out and talk to them. I usually do that midpoint in the course because I started to see the quality of their work, it gives them a chance to ask me questions, to go over the syllabus, and then most importantly talk about the final assignments which are usually the larger ones, and get people on the right track so that they know that I’m not opposed to talking to them on the phone. Students have been very receptive to that.

Strong instructor action and outreach such as the experience described above personalizes the online learning experience for students and lessens the isolation often experienced in online courses. Much like an instructor establishing a presence in the online course this personalized
attention done outside of the learning management system demonstrates the importance the students’ learning is to the course instructor and has shown to positively impact student retention and persistence (Bocchi, Eastman & Swift, 2004; Tello, 2007).

**Becoming Observant in Other Ways**

Finally, the last theme that points to high online instructor engagement is the ways in which the online instructors overcame loss of non-verbal cues to assess students’ learning and struggles in an online course. All of the instructors interviewed revealed that the loss of body language, tone of voice, and eye contact from students required them to establish new ways of assessing a students’ engagement with the course. These instructors therefore, had to become observant of student behavior in other ways. The most common method of establishing learner engagement in an online course for all instructors interviewed was through the online discussion boards. Through the discussion boards many of the instructors were able to assess which students were comprehending and applying the course material. A few instructors required their students to demonstrate their learning in discussion boards by telling them a story back. Another method some instructors utilized to determine if a student was engaged in the course was by simply looking at the online metrics that measured how frequently and how long a student was accessing their online course. The instructors who utilized this method, though, also know that it alone does not determine how engaged a student is in a class, but for some instructors it is an easy method to identify lost or missing students. One of the instructor’s interviewed who is used to working with non-traditional student learners is particularly concerned about identifying students who are struggling, students who need additional resources, or a student who may just need some one-on-one faculty time. She states her thinking as follows:
...if I don’t hear from you, I’m not going to assume necessarily that everything is okay. Maybe something’s not okay. So it’s about, let me ask again, let me ask it differently, and let me ask it in several different places. So if you missed it here, let me ask in your individual forum, or let me ask you wherever it is so that it’s really feeding the same content in ways that students will find it, and access it, and utilize it.

In summary, all of the interviewed instructors demonstrated components of each of these five elements of building community, creating structures, establishing a presence, demonstrating trust and care, and becoming observant in other ways throughout their online teaching. While retention rates and student satisfaction rates are not known from these instructors’ courses their methods of engaging their students are consistent with research presented in the literature review as positively impacting student retention, persistence, and learner engagement and satisfaction. With regard to demonstrating TPACK, the concepts of building community, creating structures, establishing a presence, demonstrating trust and care, and becoming observant in other ways particularly demonstrates the instructors integrated approaches of combining technology tools with purposeful pedagogy that fits the content and desired learning outcomes of the course.

Results and Interpretations

The first research question this study sought to measure and understand was the level of TPACK among college level teaching faculty. This was done by utilizing the survey of preservice teachers’ knowledge of teaching and technology developed by Schmidt, Baram, Thompson, Koehler, Mishra, and Shin (2009). The researcher’s survey findings revealed that college level teaching faculty measured a mean of 3.94 on their technology knowledge, 4.65 on their content knowledge, 4.31 on their pedagogy knowledge, 3.85 on their technological
pedagogical knowledge, and 3.83 on their TPACK. While there is little published data on this specific instrument with respect to college level teaching faculty available to compare to, other TPACK related studies may shed light in interpreting meaning of these values. In one TPACK study of K-12 online distance educators the researchers found that knowledge domains were highest in pedagogy, content, and pedagogical content and less so for technology knowledge (Archambault & Crippen, 2009). The mean values above for the researcher’s college level teaching faculty point to similarly high pedagogy knowledge and high content knowledge and slightly lower technology knowledge. Similar to the K-12 online distance education study is a TPACK study from within higher education that found that high levels of technology knowledge, defined by the ability to use a variety of technology tools, did not necessarily translate into an effective integration of teaching and learning or high TPACK amongst the faculty (Kushner Benson and Ward, 2013). The idea of instructor’s possessing low technology, but high TPACK fits several of the interviewed faculty instructors in this study. As several of the interviewed faculty instructors mentioned they were not early adopters of technology and were surprised that they were recruited to teach online given their sometimes use of more antiquated technology tools. In the case of these interviewed instructors their high pedagogy and high content knowledge as well as their desire to be purposeful and effective in an online environment allowed them to develop their TPACK over multiple online and hybrid teaching experiences while continuing to develop their technology knowledge, their TPK, and TPACK.

Challenging these findings, though, is the development of a recently revised TPACK survey instrument, which is a more robust version of the preservice teachers survey. This new instrument has been more critically evaluated for reliability and validity and has demonstrated strong correlations between an instructor’s secondary knowledge bases of TCK, PCK, and TPK
with TPACK and only an indirect impact of the core knowledge bases of technology, content, and pedagogy on TPACK (Pamuk, Ergun, Cakir, Yilmaz, & Ayas, 2013). Replicating results from this new survey tool may help strengthen the measures and interpretation of TPACK research and understand the building of hierarchical knowledge in online teaching.

These TPACK related studies point to the extensive research being done on TPACK in a variety of educational settings, but also the challenge of interpreting the importance of the core knowledge components of technology knowledge, content knowledge, and pedagogy knowledge within TPACK. With regard to this researcher’s study on the college level teaching faculty, however, an interpretation can be made that a value of four, which signaled that the faculty agree with the various statements in each category that the college level teaching faculty feel a strong level of knowledge confidence in the core domains of technology knowledge, content knowledge, and pedagogy knowledge. The slightly lower scores in technological pedagogical knowledge (TPK) and TPACK may reveal a lower comfort level with the integrated knowledge components, but since these mean values are not statistically significant such a conclusion cannot ultimately be determined.

The data also reveals that there was no statistically significant difference between adjunct and full-time faculty instructors mean values in the five knowledge domains of TK, CK, PK, TPK, and TPACK. It is therefore difficult to interpret any meaning with regard to differences in faculty as a full-time teaching profession and faculty who are practitioners of their content teaching areas with regard to TPACK. However, the fact that the mean values of the adjunct and full-time faculty were so close in range may represent similar comparative strengths among the two groups despite difference in their training and background. Such a result may ultimately bode well for online and hybrid student learners since many online classes are being taught by
adjunct faculty. The students in these classes may feel reassured that the adjunct faculty who are teaching them in online and hybrid environments possess similar technology knowledge, content knowledge, pedagogy knowledge, TPK, and TPACK strengths as the full-time faculty.

Similar to adjunct and full-time faculty score ranges there was also no statistical significance seen with regard to the number of years teaching in higher education. This finding did surprise the researcher since it was hypothesized that technology knowledge may be lower for the 10 plus years teaching group as opposed to the faculty who are more recent in their professions and thus more likely current on recent technology tools. It was also hypothesized that the 10 plus years teaching group would have a higher pedagogy knowledge score compared to the groups with fewer years of teaching experience. While the null hypothesis could not be rejected for either one of these hypotheses it may be that the small sample size of the study population limited such a determination. A larger population of college teaching faculty may reveal something of more significance with regard to the five knowledge domains. In addition to a larger instructor population a correction would also need to be made in how the data was captured for these groups. There was an error in how the years of teaching were written for survey respondents. The ranges of 0-3, 3.5-7, 7.5-10, and 10+ years that were presented to the survey respondents did not account for values in between 3-3.5 and 7-7.5. For this reason some respondents may have been confused in how to respond and thus the data may not accurately represent actual respondents’ years of teaching experience in higher education. Such a correction would need to be made in any future version of the survey.

The use of the survey of preservice teachers’ knowledge of teaching and technology developed by Schmidt, Baram, Thompson, Koehler, Mishra, and Shin (2009) in this research study provides a baseline measures of TPACK and the core domains of TPACK among college
level teaching faculty. The survey was robust with questions measuring technology knowledge, pedagogy knowledge, and technological pedagogical knowledge among college level teaching faculty, but because there were no content discipline specific questions the full measure of TPACK has not fully been explored among the college level teaching faculty. Therefore, this study’s results may not provide a full picture of the integrated knowledge components within TPACK, but does shed light on the core knowledge components of technology knowledge, pedagogy knowledge, general content knowledge, and the secondary knowledge base of TPK. For these reasons, this study’s results should interpret more importance on the findings of technology knowledge, pedagogy knowledge, and technological pedagogical knowledge domains amongst the college level teaching faculty while the qualitative findings reveal TPACK from among the interviewed faculty instructors.

If the importance of the quantitative study findings are reemphasized to consider technology knowledge, pedagogy knowledge, and TPK instead of content knowledge and fully integrated TPACK then these score components may serve as more accurate measures for college level teaching faculty teaching in online and hybrid learning environments within the institution studied. These three knowledge domain scores can serve as a baseline measure in understanding the college level teaching faculty to aid in professional development planning within the institution and in the future may be of value in determining findings against future comparative study populations.

Despite the lack of fully explored TPACK, an interpretation can be made that the quantitative study findings appear to reveal the college level teaching faculty’s high confidence in the domains of technology knowledge, content knowledge, pedagogy knowledge, and technological pedagogical knowledge within the diverse college at a large, private four year
university since the mean for each category approaches or exceeds a value of four signaling the participants’ agreement with the various statements that comprise each category. The qualitative data may further explain this finding and interpretation.

The data from the nine interviewed faculty instructors initially sought to address the additional two research questions of the study of what processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies and what techniques do instructors with high TPACK utilize to engage online students, but the interview data also helps to further explain the faculty instructors technology knowledge, pedagogy knowledge, TPK, and TPACK scores of the study.

The data from the nine interviewed faculty instructors reveal that they possess and are using technological pedagogical and content knowledge skills to assess the inclusion of technology tools within their content specific online classes. The instructors’ own language on “understanding the technology” and “what the utility and strategy” is of the technology points to such a determination. These nine interviewed instructors also demonstrate their use of TPACK skills to engage in high impact practices with online learners when they use technology tools to create structures for their online students, build community, or establish their presence in an online course. While none of these instructors had known about the TPACK framework prior to this study, they had developed their TPACK skill set through years of online and hybrid teaching. The ability to develop TPACK over years of online teaching has been confirmed through Oster-Levinz & Klieger’s 2010 study that examined online tasks through a TPACK digital indicator framework. Since each of the nine interviewed college level teaching faculty instructors in this researcher’s study represented over 10 years of online and hybrid teaching
experience and through their analyzed responses on assessing new technologies and instructor engagement they are demonstrating their acquisition and strength of TPK and TPACK.

The second research question of the study on assessing new technologies utilized the qualitative interview data from the nine interviewed online faculty instructors. The faculty instructors’ responses demonstrated the purposeful and sometimes, methodological approach they took when determining how a new technology tool could assist in achieving online learning outcomes. However, what also became clear from the data is that there are many forces exerted on the faculty that influence their technological pedagogical knowledge development including the faculty instructors’ own initiatives, the experiences they bring to the table, their assessment of their strengths, the leadership culture of the organization, the support and resources provided by the organization, the perception of academic freedom within the institution, the pressures of assessment and accreditation committees, the competition for online teaching assignments, the material provided by textbook publishers, and the myriad and diverse trainings each faculty instructor brings to the institution. These forces combine and swirl with one another to shape the faculty instructor’s online course instruction and correspondingly, the student learning experience. While most of these influences appear to be positive within the institution studied, it also became clear that the faculty greatly depend on many of these structures, particularly including the college’s instructional design team.

Throughout the interviews the faculty instructors repeatedly mentioned the college’s instructional design team’s assistance in improving their online courses. What was also notable is that few of the interviewed instructors were identifying technology tools on their own. It appears that most of the instructors interviewed were utilizing and implementing what the institution purchased and the instructional design team had vetted. The reliance on the college’s
instructional design team throughout the interviews may explain the confidence these instructors revealed with regard to their technological pedagogical knowledge development and utilization of new technologies. However, while it is clear that this instructional design team provided access to new technology tools and training on the learning management system, it is the faculty instructor’s themselves who had to assess the meaning and utility of the tool within the courses they were teaching. This practice of university IT department’s focusing on solely the learning management system or on a few generic technology tools appears to be common and limiting practice within higher education professional development trainings and development of TPACK (Stover and Veres, 2013; Kushner Benson and Ward, 2013).

A final and notable component of the second research question that may explain the technological pedagogical knowledge skill amongst the surveyed and interviewed faculty instructors is their cross institutional experiences and trainings. With many of the interviewed faculty instructors having taught at some of the large providers of online learning the hiring of instructors with this level of training, experience, and engagement expectation appears to have benefitted this institution’s online teaching quality. These instructors bring their experiences and heightened skill sets to their online classes at this large, private four year institution and the students in their classes are the true beneficiaries of such trainings and experiences. However, despite the extensive training and experience some of these faculty instructors possess there is also a group of faculty instructors at the institution who could benefit from more targeted trainings. While many of the adjunct faculty instructors bring with them online teaching certifications achieved through other institutions, the institution being researched provides no such similar level of training program for the lesser experienced faculty instructors. An opportunity to work toward such a credential within the institution and within a TPACK
framework may help meet some faculty instructors’ professional development goals, further enhance the institution’s online teaching quality and reputation, and positively impact student persistence and engagement in online courses and programs.

With regard to the third research question of the study on instructor engagement, the interview data revealed the variety of ways in which this group seeks to engage learners in online and hybrid classes. The themes of building community, creating structures, establishing a presence, demonstrating trust and care, and becoming observant in other ways demonstrate how these instructors have adapted their teaching practices to create robust and engaging online learning environments using their technology and pedagogy skills matched with their content expertise. Recent TPACK research has demonstrated that combining the domains of TPK and content knowledge in e-learning environments creates a synergy that allows students to consistently engage in meaningful learning (Maor & Roberts, 2011).

Additionally, these themes match many similar themes presented in the literature such as good course design (Rovai & Downey, 2010; Morris & Finnegan, 2009; Reisetter & Borris, 2004; Dietz-Uhler, Fisher & Han, 2007) strong instructor engagement and consistent faculty contact (Tello 2007; Bocchi, Eastman & Swift, 2004) and Online Human Touch (Betts, 2010) that lead to higher student persistence rates and learner satisfaction in online courses. Such high quality online teaching practices need to be showcased and promoted amongst other online faculty at the institution to promote greater awareness of what good online faculty instructors are doing in their classes. Nearly all surveyed and interviewed faculty instructors indicated that they had not had an opportunity to see a colleague’s work nor were they provided with an example of an excellent online or hybrid class from their content area from which to learn and gain ideas. The opportunity to share these best practices and showcase discipline specific examples may
prompt other faculty instructors to make changes to their online classes, which could positively impact student persistence and learner engagement in online and hybrid courses and programs. The learning engagement initiatives practiced by the interviewed faculty instructors are particularly interesting to the researcher because several of the interviewed faculty presented low technology knowledge scores on the TPACK survey. Some of the interviewed faculty instructors even presented skepticism about technology within their individual interview responses with such statements as “one of the reasons that I studied learning technology is because I’m a firm believer that it is not an end in itself” and the “the future frightens me” building to a scenario where students will just swallow a pill one day and will be able to access all of the data they need through a cloud type of server. These same faculty instructors were even surprised that they were initially asked to teach online because they were not recognized as technology enthusiasts amongst the college’s faculty.

Despite their technology shortcomings these instructors proved to be leading the efforts to engage their students in the online classroom. These instructors maintained regular contact with their students through phone, text, and discussion board postings. They also worked closely with the learning designers and technologists in their college to find new ways of presenting their content and repurposing what they teach in their face-to-face classes for the online classroom. Because these instructors cared about their students’ learning and because they are passionate about their content and fields of study they pushed themselves out of their comfort zone to find new ways to reach their online students. Such a concept is highlighted by Bates (2005) when he states that good instructors can overcome limitations of technology, but also by TPACK research that has demonstrated that an instructor with low technology knowledge can still have high TPACK (Kushner Benson and Ward, 2013). These instructors’ actions demonstrate that a teacher
does not have to be an early adopter of technology or technology hobbyist to be a good online teacher. They prove that to be a good and engaging online instructor one must know their pedagogy and content, have an understanding of the function and utility of the technology, and be passionate about sharing their content.

Summary

The findings presented in Chapter four present the data from the survey of preservice teachers’ knowledge of teaching and technology repurposed for use with college level teaching faculty instructors. The survey findings provide the measures for the college level teaching faculty instructors within a diverse college at a large, private four year university for the knowledge domains of technology knowledge, content knowledge, pedagogy knowledge, technological pedagogical knowledge, and technological pedagogical and content knowledge (TPACK). While no statistical significance was found with regard to these measures the score means do provide a baseline level of knowledge for use in assessing the college faculty and for designing more robust professional development trainings.

The findings and results for chapter four also highlights the activities that college level teaching faculty instructors practice in their online and hybrid classes to engage online learners, which are consistent with best practices found in the literature. Finally, the findings and results reveal the processes these faculty instructors engage in to learn about new technology teaching tools and how they have developed their technological pedagogical and content knowledge.
Chapter 5: Conclusions and Recommendations

Introduction

The purpose of this research study was to measure and understand the presence of technological pedagogical and content knowledge (TPACK) among college teaching faculty who teach in online or hybrid environments within a diverse college at a large, private four year university. To achieve this purpose a quantitative survey was utilized to measure the level of TPACK among the college teaching faculty across a variety of academic disciplines. In addition to measuring the level of TPACK among the college teaching faculty the study also sought to determine if any relationship existed among the components of TPACK and years teaching in higher education and the components of TPACK and full-time or adjunct faculty status. This study also sought to understand how instructors develop their technological and pedagogical knowledge of new technologies and how instructors with high TPACK engage online students.

Study participants consisted of 67 surveyed faculty instructors and nine interviewed faculty instructors. The surveyed faculty instructors completed a revised survey of the preservice teachers’ knowledge of teaching and technology developed by Schmidt, Baram, Thompson, Koehler, Mishra, and Shin (2009). Nine faculty instructors were then selected for qualitative interviewing to understand what processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies and to understand what techniques do instructors with high TPACK utilize to engage online students.

A framework was constructed for faculty technological pedagogical and content knowledge development of new technologies that consisted of the instructor determined factors, the internal organizational forces, and the external influencing forces. A model of instructor engagement was also developed from the data and builds on the literature that included the
themes of building community, creating structures, establishing a presence, demonstrating trust and care, and becoming observant in other ways in online and hybrid learning environments.

Conclusions

This study was comprised of the following three research questions:

1. What is the level of TPACK among the online college teaching faculty within a diverse college at a large, private four year university?
2. What processes do online higher education instructors use in developing their technological pedagogical knowledge of new technologies?
3. What techniques do instructors with high TPACK utilize to engage online students?

After reviewing and analyzing the quantitative and qualitative data from the study, the following conclusions were made:

1. The technological knowledge, content knowledge, pedagogical knowledge, and the technological pedagogical knowledge of the surveyed faculty instructors appear to reveal strength among the four knowledge domains.
2. A full measure of the integrated knowledge components of technological pedagogical and content knowledge (TPACK) was not established for college level teaching faculty due to incomplete data captured on the surveyed faculty instructor’s content knowledge domain.
3. The interviewed college level teaching faculty appear to have high technology knowledge, content knowledge, pedagogy knowledge, TPK, and TPACK based on how they approach new technology integration within their online courses and the structures they create in the courses to support online student learning.
4. The interviewed college level teaching faculty instructors develop their assessment of new technologies through a combination of self-research, utilization of the college’s instructional design team, and other, cross institutional trainings.

5. The interviewed college level teaching faculty instructors are engaged in high impact practices with their online students that demonstrates their high TPACK skills and that the literature suggests points to learner engagement.

6. The institution surveyed benefits from hiring of faculty with cross institutional online teaching, trainings, and experience.

**Recommended Research and Actionable Solutions**

The findings presented in this study provide a benchmark for measuring and understanding the college level teaching faculty instructors’ knowledge with regard to technology, content, pedagogy, and technological pedagogical knowledge, but further research in these areas is warranted to assess the integration of these knowledge domains within the college level faculty’s content disciplines. Recent research on the application of TPACK within higher education and within online and hybrid teaching environments demonstrates the importance of integrated knowledge to teach in dynamic learning environments at all levels of formal learning. Based on the results in this study, it is recommended that future researchers continue the quest for understanding TPACK within higher education and online and hybrid learning environments by replicating this study with a larger college teaching population and by utilizing the revised 2013 TPACK survey that more robustly accounts for content related knowledge. This more recent instrument would build on this study by more fully exploring the content specific knowledge integration with technology and pedagogy knowledge. Additionally, a larger teaching population could help determine if there is a significant difference among the years of teaching experience
with regard to the core knowledge domains of T,C,P and the secondary knowledge domains of TCK, PCK, TPK, and TPACK.

It is further recommended that additional academic research occur on learner engagement and TPACK. This study’s qualitative method could be expanded to include data collection on learner engagement with faculty instructors who have lower technology knowledge, pedagogy knowledge, and technological pedagogical knowledge, and TPACK scores to learn where these faculty instructors’ struggle are in the online and hybrid learning environments.

In addition to studying faculty’s perception of their TPACK a study measuring students’ perceptions of faculty TPACK is recommended to achieve a more balanced interpretation of the integrated knowledge bases. A study focusing on student perceptions of faculty instructor TPACK would also provide for an understanding of how TPACK translates into increased learner engagement in online and hybrid courses.

Beyond pursuing academic research there are actionable recommendations for the institution studied and institutions like it that could be implemented to develop TPACK among college level teaching faculty who teach in online and hybrid learning environments. As a starting point within the institution, all faculty instructors should be educated on the TPACK framework, its importance, and value in assessing one’s current teaching practices. This would need to happen with the institution’s center for teaching and learning and also within the instructional design group. It is also recommended to the institution’s provost that these two centers be incented to collaborate more closely with one another on instructional teaching practices and that the best examples of online and hybrid course be available to every faculty member within their content disciplines at the university. Such collaboration could result in a yearly faculty teaching showcase to promote the best uses of TPACK at the university.
In addition to these recommendations it is recommended that the institution’s instructional designers and learning technologists more closely align with specific academic disciplines. Much like librarians at the university studied serve content specific areas it would serve the faculty and students well at the institution if the instructional designers and learning technologists more closely understood the content experts with whom they are working.

Additionally, considering the needs of new and lesser experienced faculty instructors, a training certification program should be developed for new online and hybrid teaching faculty to allow for introduction and continued professional development in the areas of online and hybrid teaching using the TPACK framework as the model of development and assessment.

Finally, with respect to strengthening instructor engagement in online and hybrid courses it is recommended that a short one page best practices guide be developed by the researcher based on the model presented in this study that highlights the five areas of how faculty can immediately impact their courses through the constructs of building community, creating structures, establishing a presence, demonstrating trust and care, and becoming observant in other ways. This best practices guide for faculty should be included in any and all instructional and technology workshops and should be a built-in component of all online and hybrid course shells within the learning management system.

Additional Assumptions and Limitations

This study utilized the survey of preservice teachers’ knowledge of teaching and technology developed by Schmidt, Baram, Thompson, Koehler, Mishra, and Shin (2009), which as the title suggests is intended for a college student population studying education as a field of study prior to their classroom teaching careers. Revisions to the study were made to be applicable to a college level teaching faculty, which may or may not represent the best tool for
measuring of the domains of content knowledge, technological content knowledge, pedagogical content knowledge, and TPACK within the college level teaching population. The survey did prove limiting for understanding how the domain of content knowledge truly is integrated with the faculty instructors’ technology and pedagogy knowledge.

The survey results may prove limiting for a variety of reasons. First, because it was conducted as an online survey with one of the domains measuring technology knowledge it could be that only those faculty instructors who are most comfortable with technology completed the online survey thereby eliminating a group of instructors with lower technology knowledge. Also, as is possible with any survey that asks’ respondents to assess their own strengths it should be assumed that some response inflation may occur.

Other limitations of this study include the fact that the college level teaching faculty instructors who were surveyed represent a unique group of faculty within a private four year higher education environment. As previously stated there were no tenured or tenure track faculty instructors interviewed and the population of tenured and tenured track faculty within the survey would have been quite small given the composition of the college site’s faculty at the time. Additionally, given the emphasis of online and hybrid teaching models by the dean of the college that the faculty were united under the surveyed faculty scores may represent a higher mean value than what would be achieved at a large, private four year college without such emphasis and resources.

Summary

The purpose of this research study was to measure and understand the presence of technological pedagogical and content knowledge (TPACK) among college teaching faculty who teach in online or hybrid environments within a diverse college at a large, private four year
university and to understand how such knowledge can contribute to online student engagement within online and hybrid learning environments. The findings of this study should provide a basis for further TPACK related research and comparison among other college level teaching populations while the recommendations for action should provide for real implementable solutions to help advance online and hybrid teaching among faculty instructors within the institution studied.
References


Appendix A

TPACK Survey Instrument

Q2 Technology is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology is referring to digital technology/technologies. That is, the digital tools we use such as computers, laptops, iPods, handhelds, interactive whiteboards, software programs, etc. Please answer all of the questions and if you are uncertain of or neutral about your response you may always select "Neither Agree or Disagree"

Q1 Please identify the academic program/content area in which you teach (e.g. hospitality mgmt., higher education, engineering technology, etc.):

Q3 I know how to solve my own technical problems.
   - Strongly Disagree (1)
   - Disagree (2)
   - Neither Agree nor Disagree (3)
   - Agree (4)
   - Strongly Agree (5)

Q4 I can learn technology easily.
   - Strongly Disagree (1)
   - Disagree (2)
   - Neither Agree nor Disagree (3)
   - Agree (4)
   - Strongly Agree (5)

Q5 I keep up with important new technologies.
   - Strongly Disagree (1)
   - Disagree (2)
   - Neither Agree nor Disagree (3)
   - Agree (4)
   - Strongly Agree (5)
Q6 I frequently experiment with technology.
- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q7 I know about a lot of different technologies.
- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q8 I have the technical skills I need to use technology.
- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q9 I have sufficient knowledge about my teaching content area.
- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q11 I have various approaches of furthering my understanding of my teaching content area.
- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)
Q12 I know how to assess student performance in a classroom.

○ Strongly Disagree (1)
○ Disagree (2)
○ Neither Agree nor Disagree (3)
○ Agree (4)
○ Strongly Agree (5)

Q13 I can adapt my teaching based-upon what students currently understand or do not understand.

○ Strongly Disagree (1)
○ Disagree (2)
○ Neither Agree nor Disagree (3)
○ Agree (4)
○ Strongly Agree (5)

Q14 I can adapt my teaching style to different learners.

○ Strongly Disagree (1)
○ Disagree (2)
○ Neither Agree nor Disagree (3)
○ Agree (4)
○ Strongly Agree (5)

Q15 I can assess student learning in multiple ways.

○ Strongly Disagree (1)
○ Disagree (2)
○ Neither Agree nor Disagree (3)
○ Agree (4)
○ Strongly Agree (5)
Q16 I can use a wide range of teaching approaches in a classroom setting.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q17 I am familiar with common student understandings and misconceptions.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q18 I know how to organize and maintain classroom management.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q19 I can select effective teaching approaches to guide student thinking and learning in my content area.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)
Q20 I know about technologies that I can use for understanding and applying practices in my teaching content area.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q21 I am capable of choosing technologies that enhance the teaching approaches for a lesson.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q22 I can choose technologies that enhance students' learning for a lesson.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q23 My faculty development course training has caused me to think more deeply about how technology could influence the teaching approaches I use in my classes

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)
Q24 I am thinking critically about how to use technology in my classes.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q25 I can adapt the use of the technologies that I have learned in trainings to different teaching activities.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q26 I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q27 I can use strategies that combine content, technologies and teaching approaches that I have learned from faculty development trainings.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)
Q28 I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my institution.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q29 I can choose technologies that enhance the content for a lesson.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q30 I can teach lessons that appropriately combine my teaching content area, technologies, and teaching approaches.

- Strongly Disagree (1)
- Disagree (2)
- Neither Agree nor Disagree (3)
- Agree (4)
- Strongly Agree (5)

Q31 Please complete this section by writing your responses in the boxes.

Q43 Describe a specific episode where you effectively demonstrated or modeled combining content, technologies and teaching approaches in a class lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) was implemented. If you have not utilized any such approach, please indicate that you have not.

Q32 Describe a specific episode where a professional colleague effectively demonstrated or modeled content, technologies and teaching approaches in a class lesson. Please include in your description what content was being taught, what technology was used, and what teaching
approach(es) was implemented. If you have not observed any such approach, please indicate that you have not.

Q33 Gender
☐ Male (1)
☐ Female (2)

Q34 Age Range
☐ 25-30 (1)
☐ 31-35 (2)
☐ 36-40 (3)
☐ 41-45 (4)
☐ 46-50 (5)
☐ 50+ (6)

Q35 Number of Years Teaching in Higher Education?
☐ 0-3 (1)
☐ 3.5-7 (2)
☐ 7.5-10 (3)
☐ 10+ (4)

Q36 I have taught using the following modes of delivery (please select all that apply)
☐ Blended/Hybrid Instruction (portion of class meeting hours takes place in online environment) (1)
☐ Face-to-Face (2)
☐ Online (at least 80 percent of instruction occurs online) (3)

Q37 If you have taught exclusively face-to-face do you or have you used a web supplement such as Blackboard Learn or BB Vista to support your classroom teaching?
☐ Yes (1)
☐ No (2)
Q38 Number of years teaching online or hybrid?

- 0-3 (1)
- 3.5-7 (2)
- 7.5-10 (3)

Q39 Faculty status

- Full-time Drexel Faculty (1)
- Full-time faculty at another institution/part-time Drexel Faculty (2)
- Adjunct faculty member (3)
- Teaching Assistant (4)

Q40 Have you ever completed an education technology related major or minor?

- Yes (1)
- No (2)

Q41 Have you ever completed an instructional technology training (eg. Blackboard Learn, webfolio, etc.)?

- Yes (1)
- No (2)

Q42 I would like to individually interview a handful of faculty members based on their responses above. Would you be inclined to do a confidential one-on-one interview about teaching online or hybrid in higher education? If so, please provide your preferred email address below:
Appendix B

Qualitative Interview Protocol

1. To begin, please describe for me how you got involved in online teaching?
2. What is your content teaching area?
3. Can you describe any training in pedagogy?
4. Can you describe any background or experience in pedagogy?
5. Can you describe any training you have with technology?
6. Can you describe any background or expertise you have with technology?
7. Would you consider yourself a “tinkerer” or early adopter of technology?
8. How do you go about learning new technologies?
9. Did you participate in the college’s online instructor training course? If yes, how did this course help prepare you for teaching online?
10. Do you integrate or utilize technologies outside of what is supported at the institution?
11. How do you go about matching technology with pedagogy or learning outcomes?
12. As you got integrated into the online learning modules and systems what were the biggest adjustments that you needed to make to engage students into your online class?
13. What do you feel are the biggest challenges to teaching an online student?
14. Online faculty often struggle to establish their voice or to assert their presence in an online course. Please describe how you go about achieving this.
15. What if any features of the online learning system that you use do you feel connects you to your students?
16. Online courses are typically run as asynchronous, but do you offer any specifically scheduled synchronous sessions also? How and why do you do this?
17. What areas of online learning do you see students struggle with the most?
18. What if anything have you done to address the struggles that online students experience? What tools and resources are you able to integrate into your online courses to address these struggles?
19. In your view what are the top three things that would improve learning engagement for online students?

20. How does engagement compare and differ between your online students and your face-to-face students? What evidence do you see to point to their engagement?

21. What else if anything would you like to share about online teaching or teaching with technology?
Appendix C

Dear Prospective Study Participant,

I am conducting a dissertation research study within the college entitled “Assessing and Improving Online Teaching and Learning through Instructional Faculty TPACK” and I am truly in need of your participation. This research study is to fulfill my requirements for the Doctorate of Education (Ed.D.) at Drexel University. I am seeking your voluntary participation in my study. You should know that you are not required to participate in my study and you may withdraw your consent at any time if you do decide to participate. The survey should take approximately 15 minutes to complete. The purpose of my research study is to measure faculty knowledge with regard to online teaching and to assess whether an online instructor training contributes to improvements in faculty technological pedagogical content knowledge.

I will be collecting data through a survey questionnaire designed to measure technological, pedagogical, and content knowledge (TPACK). Current and continuing college faculty are invited to complete the survey. Additional data will be collected through one-on-one interviews with faculty participants who choose to volunteer.

As a study participant you have the right to ask questions before or during the research study. As a study participant your participation will be confidential and no results will be used to measure teaching performance or used to make a determination of future teaching opportunities. No individual results will be shared with program directors who may have hired you or assess your performance. Your participation in this study is completely confidential and your identity will not be known unless you choose to share it. I will be sharing my research results with all Goodwin and School of Education faculty at the conclusion of my study.

There are no foreseeable risks for participating this research. The expected benefit associated with the study is an increased awareness of the importance of the skills needed to teach in online environments.

If you have questions about this study you may contact Dr. Aroutis Foster, my dissertation chair via email at aroutis@drexel.edu

Click link to launch survey: http://drexel.qualtrics.com/SE/?SID=SV_1N4SbqBluxWClgB

Thank you very much for your consideration in completing this study.

Ed.D. candidate