APPLIED TECHNOLOGIES TO SUPPORT TEACHING AND LEARNING IN HIGHER EDUCATION

AN EXPLORATORY EVALUATION OF FACULTY AND STUDENT SERVICES AT SACRAMENTO STATE'S STUDENT TECHNOLOGY CENTER

A Thesis

Presented to the faculty of the Department of Public Policy and Administration

California State University, Sacramento

Submitted in partial satisfaction of
the requirements for the degree of

MASTER OF PUBLIC POLICY AND ADMINISTRATION

by

Teresa Palmer

SPRING
2017

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By

Teresa Palmer

Approved by:

_____, Committee Chair
Andrea Venezia, Ph.D.

_____, Second Reader
Su Jin Jez, Ph.D.

_____
Date

Student: Teresa Palmer

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_____, Department Chair _____
Robert Wassmer, Ph.D. Date

Department of Public Policy and Administration

Abstract

of

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Higher education students in the United States are leaving college without the necessary skills to succeed in the 21st century's digital and social economy. Although social media technology is ubiquitous in the lives of most students, they often lack the breadth and depth of technology skill required to flourish within today's heavily digitized business and social institutions and the abundance of knowledge technology puts at our fingertips. In order to properly prepare students and address the skill gaps in question, universities need institution-level efforts that support faculty in addressing these needs and students in achieving the desired learning outcomes.

The Student Technology Center (STC) at Sacramento State is one such institution-level effort at addressing the skills gap. As a critical piece of the University's technology-skill building resources, it is important to determine whether the STC is effectively meeting its goals and producing the desired outcomes amongst faculty and students. My thesis represents the first formal attempt to evaluate the STC.

The purpose of this evaluation is to determine whether the STC is achieving its dual goals of removing technology as a barrier, in different ways, for both faculty and students. The main criteria I used for the evaluation include perceptions of technology as a barrier (faculty and students), anxiety about using technology (faculty and students), perceptions of workshop effectiveness (faculty and students), and the development of high quality products (students). I designed survey instruments to gather data from the faculty and students who participate in the STC's technology workshops as well as a rubric to evaluate the work products students produce after participating in those technology workshops.

The evaluation produced inconclusive results regarding the STC's impact on student and faculty perceptions of the technology-related barriers and anxieties they face. However, the knowledge gained from this initial exploratory evaluation will help the STC team to hone the evaluation design to target these variables. Additionally, the evaluation's workshop satisfaction measurements revealed that students and faculty are highly satisfied with the workshop service and believe it helps the students produce

better coursework. The evaluation also included a rubric assessment of student work in the form of posters for class assignments. This assessment revealed that students who self-select into visiting the STC for assistance, as compared to those who are required to visit with a class, better internalize and apply the technology and design information provided by the STC and produce improved work products. Overall, the evaluation provided a foundation for the STC to build upon, revealed that its customers are largely satisfied with the service, and that the STC is helping students to produce improved coursework products.

_____, Committee Chair
Andrea Venezia, Ph.D.

_____
Date

ACKNOWLEDGEMENTS

I want to thank my generous thesis advisor, Andrea Venezia, and second reader, Su Jin Jez. Each offered their encouragement, guidance, and exceptional patience in my thesis writing process. I admire Andrea and Su Jin for their impressive professional achievements, tireless efforts to make a contribution to and impact on our educational system, and their impressive ability to balance all of this with the vital and essential work of caring for others. I am also exceedingly grateful for Mary Kirlin, Peter Detwiler, Rob Wassmer, Steve Boilard, and Ted Lascher who provided encouragement and guidance during my time in the Public Policy and Administration program.

I also want to thank my former boss and mentor, Maureen McQuestion, for guiding me toward the PPA program in addition to her many other countless contributions to my personal and professional growth. Finally, I want to express my deepest gratitude to my mother who instilled in me the value of education along with the rest of my family and friends who offered their encouragement and exceptional patience as I made my way through my graduate studies.

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Chapter One

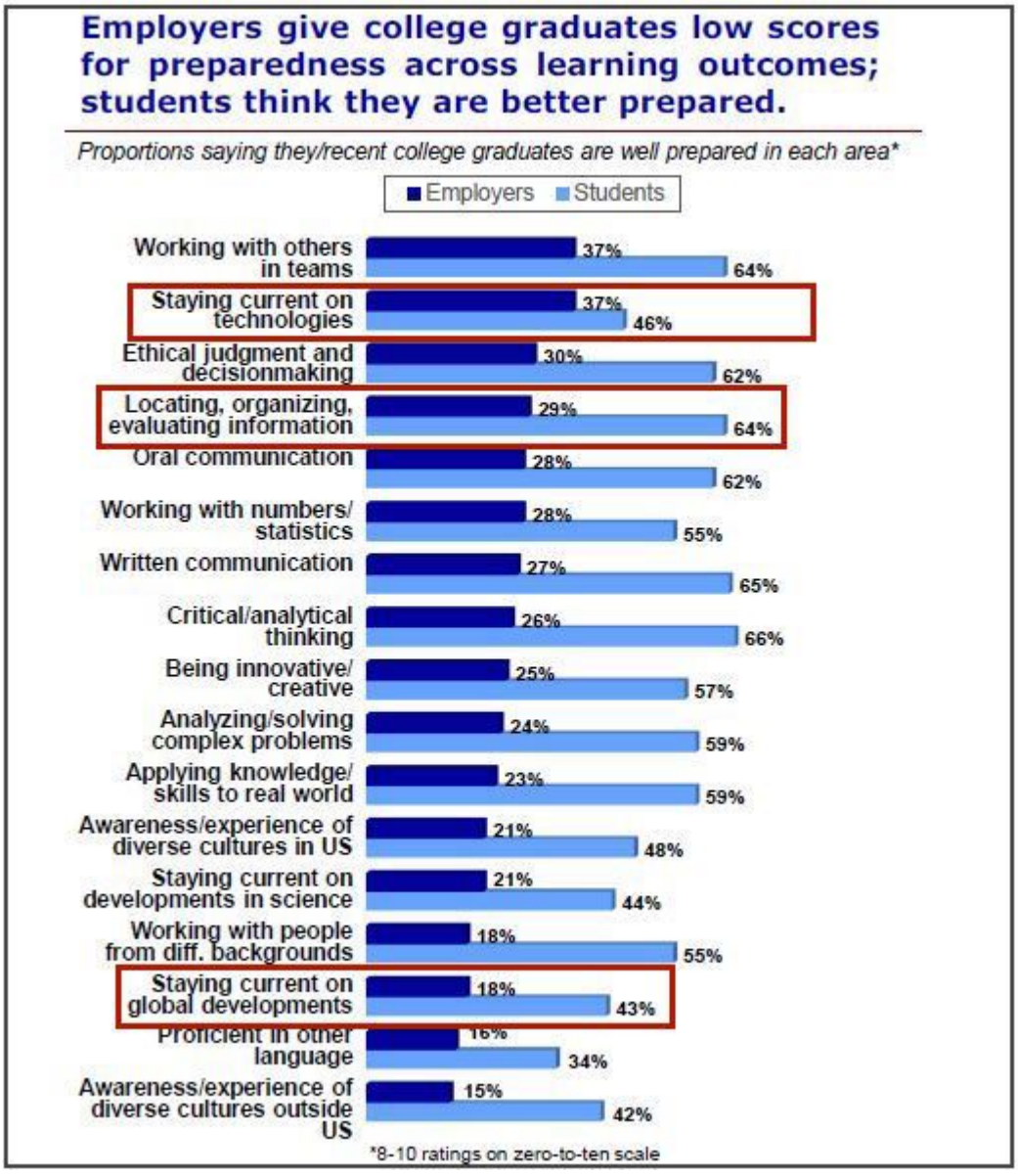
UNDERSTANDING THE NEEDS, BACKGROUND, AND CONTEXT BEHIND THE STUDENT TECHNOLOGY CENTER EVALUATION

The Skills Gap

Higher education students in the United States are leaving college without the necessary skills to succeed in the 21st century's digital and social economy. Although social media technology is ubiquitous in the lives of most students, they often lack the breadth and depth of technology skill required to flourish within today's heavily digitized business and social institutions and the abundance of knowledge technology puts at our fingertips.

A survey by the Association of American Colleges and University (2015) highlights these skill gaps. As Figure 1 below demonstrates, employees perceive graduates as underprepared and lacking skill in: locating, organizing and evaluating information; staying current on technologies; and staying current on global events (AACU, 2015).

Figure 1. Employers give college graduates low scores for preparedness.



SOURCE: Hart Research Associates (2015)

The skills highlighted above are increasingly important as our world becomes more global and infused with ever-increasing amounts of information and technology. In order to prepare students with the skills in question, universities need institution-level

efforts that support faculty in addressing these needs and students in achieving the desired learning outcomes.

The Student Technology Center (STC) at Sacramento State is one such institution-level effort at addressing this skills gap. As a critical piece of the University's technology-skill building resources, it is important to determine whether the STC is effectively meeting its goals and producing the desired outcomes amongst faculty and students. To that end, I worked to design and execute a systematic evaluation of the STC and summarize the results here.

Technology in Education: Conceptual Context for the STC's Goals

In the following sections, I provide background information to contextualize the STC evaluation. First, I review of federal government efforts to impact technology in education and follow that with a review of the 21st Century Learning movement. In the absence of a federal mandate to ensure that all students leave college with a minimum level of technological proficiency, the 21st Century Learning movement provides the intellectual framework and support for the STC's mission. After exploring the 21st Century Learning movement, I outline the STC's history and goals along with providing an overview of the evaluation process.

The Role of the Federal Government. Digital technology has been a core feature of the modernization process in education systems over the past few decades. This transition is reflected in the fact that a defined educational technology strategy to

guide education institutions in use of digital technology in teaching and learning is present is virtually all developed nations and many others as well (Sewlyn, 2010).

Although such efforts in the United States are more consolidated and visible in K-12 than higher education due to greater public control, the developments in K-12 policy reflect similar changes in higher education in the U.S. and internationally. Beginning with 2002's No Child Left Behind Act, each iteration of the Elementary and Secondary Education Act (ESEA) including its most recent incarnation signed into law by President Obama in December of 2015, which is now the Every Student Succeeds Act (ESSA) includes the integration of technology skills into curriculum (Thibaudeau, 2015). The current ESSA includes the Enhancing Education Through Technology (EETT) act which states one of its primary goals is, "[t]o assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability" (Every Student Succeeds Act, 2015).

However, the federal government has primarily focused on core academic subject competencies in administering the ESSA rather than technology literacy. When federal efforts do address technology, particularly in the postsecondary environment, they tend to focus on supporting equal access and security such as providing accessible technology options for students with disabilities and protecting copyrighted data. A core example of this focus is the Higher Education Act (HEA) signed into law in 1965 by President Lyndon B. Johnson and expected to be reauthorized by the 115th Congress in

2017 (Higher Education Act, 2016). The purpose of the HEA is to buttress the education resources of colleges and universities, as well as to address the benefits of financial aid in postsecondary and higher education (Hegji, 2014). The HEA is the single most inclusive piece of legislation focused on the cost of higher education. As such, the HEA impacts technology in higher education by emphasizing low cost, high volume options such as open access digital textbooks and distance education courses, which can accommodate larger numbers of students.

The 21ST Century Learning Movement. Despite the limited role federal policy plays in guiding technology within higher education, national organizations such as the Association for Advancement of Computing in Education, EDUCAUSE, Sloan Consortium, and the American Council on Education provide leadership in efforts to define priorities and guide the trajectory of technology in higher education by bringing together communities of practice, supporting research, and policy advocacy (Forset, 2016). Of particular importance to the role of the STC at Sacramento State is the Partnership for 21st Century Learning (P21) and the related 21st Century Learning movement.

The 21st Century Learning movement is based on recognition that the 21st century is unique with regard to the skills necessary for participation in contemporary education, employment, and citizenship. Self-sufficiency in any of these realms must be cultivated differently than it was in the past, particularly within our educational institutions. This shift is, in large part, due to the highly-sophisticated information and

communication technologies (ICTs) now embedded in commonplace tasks. As computers and telecommunication become increasingly able to accomplish traditionally "human tasks", the nature of work done by people is continuously in flux (Dede, 2010). Economists Frank Levy and Richard Murnane (2004) describe this shift and the accompanying knowledge and skill adjustment it demands:

> Declining portions of the labor force are engaged in jobs that consist primarily of routine cognitive work and routine manual labor – the types of tasks that are easier to program computers to do. Growing proportions of the nation's labor force are engaged in jobs that emphasize expert thinking or complex communication – tasks that computers cannot do. (p.53-54)

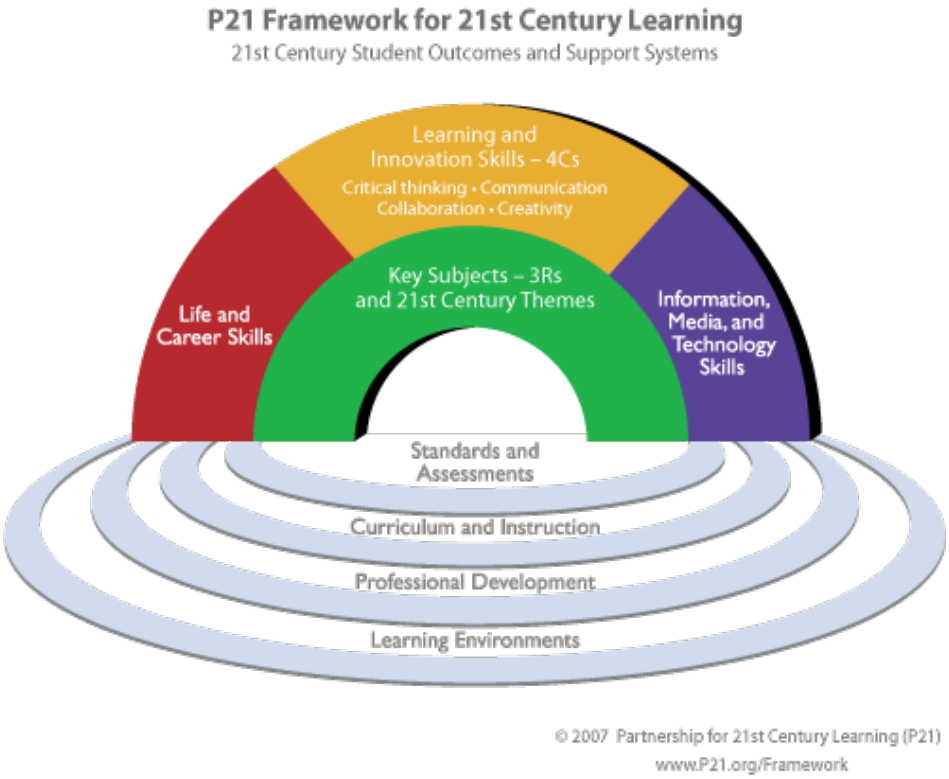
This evolving relationship between humans and technology presents a challenge for educators. How do we best equip the next generation for success? What skills will be necessary for them to thrive professionally and personally? How does that translate into specific technological skills for any given profession or social context? These questions have given rise to the concept of 21st century skills in education which rests on the belief that educators should prioritize the teaching of skills that are highly in demand, applicable across a broad spectrum of occupations, and more generally useful in modern life. Teaching students to perform well within the confines of an academic environment is no longer sufficient. The 21st century skills concept dictates that the educational environment should speak directly to the specific demands faced by students in the knowledge-based, technology-driven economy of our information age and speak to its

competitive and complex nature (21st Century Skills, 2015). Our public education intuitions in particular, from K-12 schools up through the highest levels of universities, need to adapt and reflect our changing world by developing and applying new teaching and learning methods (Hidden Curriculum, 2014).

Defining 21st Century Learning. The concepts of 21st century skills and the attendant 21st century learning environment(s) required to teach those skills do not have a single definition. However, several key organizations have worked to develop relatively consistent working definitions of concepts that provide a helpful reference point to inform research on technology in education.

In particular, the Partnership for 21st Century Learning (P21) developed the Framework for 21st Century Learning which defines the skills and knowledge required for student success in all areas of life including education, career, and citizenship. The framework is a tool used by educators in the U.S. and internationally to ensure that core academic subjects are suffused with 21st century skills and those skills are central to the overall learning experience. As illustrated in the figure that follows, Figure 2, the framework blends content knowledge, specific skills, expertise, and literacies while focusing on both student outcomes and necessary support structures.

Figure 2. P21 Framework for 21st Century Learning



SOURCE: Partnership for 21st Century Learning (2007)

The core elements defined by P21's Framework are generally shared across the multitude of definitions for 21st century skills. The first of these elements is "Content Knowledge and 21st Century Themes" which encompasses the traditional realms of education content such as English, History, Economics, Science, the Arts, Government, etc., with a focus on contemporary themes (e.g., global awareness; humanitarianism; multicultural literacy; and civic, ethical, and social-justice). Moving beyond such traditional subject matter, P21's Framework specifically focuses on "Learning and Innovation Skills" such as critical thinking, collaboration, and creativity. These skills

along with general “Life and Career Skills” (e.g., perseverance, self-direction, self-discipline, and adaptability) define fundamental abilities students need for success in the complex, ever-shifting environment of modern work and life.

Finally, and most critically for the work of this STC evaluation, the Framework requires “Information, Media and Technology Skills”. In order for students to be effective in the 21st century in their personal lives, as citizens, and as workers, learning to create, assess, and effectively apply media, data, and technology is essential. This skillset includes a mastery of media and internet literacy as well as data interpretation and analysis, information and communication technology (ICT) literacy, and commonly even computer programming (Ed Glossary, 2015). Developing this skillset amongst students is what the STC works to promote.

Student Technology Center Evaluation Background

STC History and Evaluator Role. The Student Technology Center (STC) opened in September 2008 as part of the Information Resources and Technology (IRT) division at Sacramento State. The STC originally include a drop-in tutoring space and accompanying collaborative learning lab. Unfortunately, subsequent budget cuts and a hiring freeze prevented significant investment in the STC during its first few years of operation. By 2010, IRT hired a full-time staff STC Coordinator along with a Director to oversee the STC along with other areas within the division of Information Resources

and Technology. Over the next five years, the STC Coordinator and Director built the center's services out into a robust operational model.

My personal role in the STC's development began as a member of a broader team that encompassed the STC. Although my work was divided between the STC and other responsibilities, I participated in supporting the STC's operations and, at times, even delivered some of the STC's technology workshops. This experience with the STC provided me the background knowledge, access, and staff relationships necessary to design and administer this evaluation of the STC. Although I subsequently transitioned into another position, I still work with Sac State's IRT division and have an interest in the STC's success. Due to my personal investment in the STC, I use substantial caution in my interpretation of the evaluation results found in Chapter 4.

STC Mission and Goals. The leadership within IRT envisioned the STC as a key campus resource to promote a 21st century learning environment. The role of STC supports members with efforts to imbue course design and coursework with technology. These technology-infused course designs give students opportunities to practice fundamental 21st century skills such as enhancing communication, accessing and analyzing information, and generating multimedia artifacts.

Mission Statement: "The mission of the Student Technology Center is to ***teach*** students the technology needed to complete their coursework, ***collaborate*** with faculty

on the use of technology in courses, and ***develop*** the professional skills of our Student Staff."

This mission is expressed in the STC's primary goal of removing technology as a barrier to achievement. The STC works to complete that goal by focusing on:

- assisting faculty in incorporating technology into courses by removing the burden of teaching and supporting the technology so faculty can focus on pedagogy and
- helping students learn course related technology and complete assignments that involve technology.

STC Service Offerings. The STC offers several core services centered on supporting use of technology within courses. These services include:

- partnering with faculty to support the integration of technology into their courses by design custom workshops for students on use of technology required for course assignments;
- delivery of general technology workshops designed to increase the technology proficiency of all students;
- large-scale printing for media produced as part of student coursework;
- one-on-one or small group tutoring for students on a drop-in basis; and
- self-help resources for students to support a "24x7" environment.

Note: The STC uses a peer-to-peer teaching model by training student staff to deliver technology tutoring and workshops.

Existing STC Data. At this point in its trajectory, the STC reaches a substantial number of Sacramento State students. During the Spring 2016 term, the STC:

- Recorded approximately 5,500 student drop-in visits from an enrolled student population of 25,586.

- Held more than 100 “Faculty Collaborations” (i.e., dedicated workshops specific to a faculty member’s course and students).
- Printed more than 770 posters and over-sized media (i.e., larger than 8.5”x11”) artifacts for student assignments.

In addition to these overall statistics, I emailed end-of-term surveys to student visitors. However, I designed those surveys to collect general customer satisfaction information rather than including a strategic, research-informed design. As a result, the customer satisfaction information is highly subjective, specific to this context, and cannot be compared to any external measures or benchmarks.

Evaluation Purpose and Criteria. This evaluation represents the first formal attempt to evaluate the STC. The purpose of this evaluation is to determine whether the STC is achieving its dual goals of removing technology as a barrier, in different ways, for both faculty and students. The main criteria I used for the evaluation include perceptions of technology as a barrier (faculty and students), anxiety about using technology (faculty and students), perceptions of workshop effectiveness (faculty and students), and the development of high quality products (students). I defined these measures based upon research into technology barriers which is reviewed in the following chapter as well as the STC’s mission and goals described above.

With regard to the faculty programming, this evaluation focuses on understanding whether the STC helps faculty integrate technology into their courses and lowers faculty anxiety about using different technologies. Regarding students, the evaluation focuses on whether the STC helps students feel less anxious about

technology, if students view technology as a barrier before and after receiving an STC service, and if the STC helps, students create high quality products. This evaluation process will provide baseline measurements and build an evaluation process that can be refined in the future to provide increasingly useful data.

Evaluation Questions. The key questions I explore in the evaluation include the following. After participating in an STC workshop:

1.) Do faculty perceive fewer barriers to integrating technology into their courses?
2.) Do faculty express lessened anxiety about working with technology?
3.) Do faculty believe that the workshop helped achieve their instructional goals?
4.) Do faculty believe that the workshop improved the quality of student coursework?
5.) Do students feel less anxious about working with technology?
6.) Do students perceive technology as less of a barrier to completing their coursework?
7.) Do students believe the workshop helped them complete their coursework?
8.) Do students produce higher quality poster designs than students who did not attend a workshop?

Method Overview. My evaluation addresses these research questions in a set of pre- and post-surveys administered to faculty and students attending STC workshops. I will then evaluate these results to identify any change in technology anxiety or perceptions of technology as a barrier. Additionally, I will use a rubric-based evaluation of student-designated posters printed in the STC to compare the quality of posters produced by students who attended STC workshops with the quality of those by students who did not.

Chapter Two

THE LITERATURE ON TECHNOLOGY AS A BARRIER IN EDUCATION

In order to operationalize the STC's concept of "technology as a barrier" and evaluate its goal attainment, I explored existing research on barriers to technology adoption, use, and proficiency within the educational environment. This field of research is typically broken down by a focus on technology adoption by educators or technology adoption by students because the challenges faced by and the factors influencing each population can be unique. Although this research literature in this area is not particularly robust, some common technology barrier themes emerge including individual knowledge and skill, institutional factors, technology-related anxiety, and access. I explore these themes in greater depth below.

Technology-Related Barriers for Educators

Achieving the benefits of technology in education is a two-way relationship that involves both students and educators. To capitalize on technology’s full potential, educators must also possess general technology literacy. In studies, students of teachers who were high-level technology users produced significantly higher test scores compared to students in classrooms where technology was used infrequently (Center for Applied Research in Educational Technology, 2005). Researchers in these studies identified “high-level” technology users not only based upon frequency of technology use but also incorporated measures of the instructional method variation when technology was incorporated, the extend of student computer use involved, and teacher

perceptions of technology's value in the learning experience. Thus, removing barriers to technology integration provides the primary foundation for the STC's mission and the variables I used in the subsequent evaluation are informed by the following review of related research literature.

Knowledge and Skill Barriers. Despite the value of incorporating technology into the educational environment, adoption can prove challenging for educators. Traditional concepts of core educator knowledge must be built upon and supplemented with technology-specific knowledge and skills in order to educators to effective incorporate technology into the teaching and learning experience. This additional layer of knowledge is described in various ways across the literature including: TPCK (focused on technological pedagogical knowledge; Pierson, 2001); ICT-TPCK (arm of TPCK that highlights the need to build up knowledge of relevant communication and information technologies; Angeli & Valanides, 2009); and PTICK (addresses pedagogical technology integration with content knowledge; Brantley-Dias, DeCastro, Kinuthia, Rigole, & Shoffner, 2007). Inherent in all of these models is the understanding that effective integration of technology requires that educators become proficient with and understand the relevant technology tools along with the how the features of each tools can facilitate student learning of challenging concepts.

Simple familiarity with hardware or software is insufficient. Effective teaching now requires an expanded understanding of pedagogical practices and how technology impacts the related planning, application, and assessment processes. For example, when

using technology as a pedagogical tool, an array of knowledge and skills is required of educators including: selecting appropriate software to support the learning outcomes of the curriculum and the learning styles of students, managing the intricacies of computer hardware and software use, and determining how the students will be taught skills necessary to use the technology in question (Coppola, 2004). Researchers Brush and Hew (2007) also noted that the general level of skill with technology across any given student cohort can further inhibit educators in their technology adoption. These barriers to integrating technology are hurdles the STC seeks to remove for faculty at Sac State. As such, my evaluation will work to determine whether faculty felt relieved of the following burdens:

- evaluating the fit between particular technologies and their instructional needs and
- delivering technology instruction for their students.

Personal and Institutional Factors. Research based on Rogers' (2003) diffusion of innovations theory examined relationships between technology adoption by teachers and basic biographic features such as sex, age, education level, and teaching experience along with broader personal and institutional factors including general level of technology anxiety, subject area taught, technology available for use, perceived barriers to technology integration, and training sources available. Researchers gathered data from nearly 200 business, math, science, English language arts, and social studies in Minnesota using online surveys. Subsequent statistical analysis of the data suggests

that a few of the predictor variables were significantly related to technology adoption including: availability of technology, training sources taken advantage of by teacher, teacher anxiety about technology, and perceived barriers to integrating technology. The subject area of the teacher was also revealed as a factor; technology was adopted at significantly higher levels by business teachers in comparison to teachers or other subject areas and adoption rates by math and science teachers were noticeably low in comparison to others (Cherry, 2015).

Mumtaz (2000), BECTA (2003), and Redmann and Kotrlik (2004), all found that teacher adoption of technology was significantly reduced when technology availability was low. Furthermore, according to Brinkerhoff (2006), barriers such as a lack of teacher training, resources, experience, and institutional support along with teacher personality factors often cause the instructional potential of technology to go unleveraged. Similarly, BECTA (British Educational Communications and Technology Agency) identified a mix of important personal and administrative factors as predictor variables including technology training availability, level of institutional support, confidence in technology skills, personal knowledge, availability of technology and equipment including up-to-date software, and technical support.

Honing in on Technology Anxiety. Technology anxiety often results when teachers are equipped with technology but the institution fails to provide the necessary level of training for teachers or has a limited understanding of complex curriculum related issues in technology application (e.g., the potential difference in fitness of

technology application across theoretical vs. applied subject matters) (Budin, 1999). Researchers have found that technology anxiety accounts for much of the disparity of technology adoption across subject matters and level of technology training (Redmann & Kotrlik, 2004). Redmann and Kotrlik identified a noticeable negative correlation between technology anxiety and adoption, concluding that as technology anxiety decreased, technology adoption increased. Although Vannatta and Fordham (2004) found an educator's level of technology training to be one of the strongest predictors of their classroom technology use, BETCA (2003) found that the technology training offered to educators rarely went beyond basic skills to encompass a broadened focus on integration of technology into the teaching and learning process. This combination suggests that basic technology skills and a feeling of institutional support may be enough to encourage many educators to take the leap and begin integrating technology into their teaching process. However, these findings also suggest that enhanced training on technology integration and the kind of course re-design consultation provided by the STC address a significant gap in the resources commonly made available to educators.

These findings identify a few critical factors that speak to the STC's goals and will be central to this evaluation. Although personal factors such as age, gender, and subject matter may affect technology adoption, the STC's role limits its influence to making technology available, providing technology instructions, reducing technology anxiety, and making faculty feel supported throughout the process of technology

integration. Thus, measuring the STC's impact on these factors is the primary focus of this evaluation.

Technology-related Barriers for Students

Technology permeates the day-to-day activities of college life from the tools used to execute basic financial and HR processes to financial aid disbursement, scheduling classes, and course enrollment, technology is foundational to much of a university's business. Beyond providing support for business processes, technology is deeply integrated into the teaching and learning process including students accessing digital library resources, generating projects with graphic design software, analyzing data using statistical software packages, and even creating the technology tools others will use in the future. Implicitly, students are presumed to enter the university with the technology aptitude necessary to adequately traverse modern technology-infused university life. However, college entrance processes rarely include any explicit technology coursework, testing, or other demonstration of skill, resulting in vast discrepancies in the level of technology preparedness across any given student body with low-income students, minorities, and women often being the most underprepared for the technology demands of the university environment (Farrell, 2005; Margolis and Fisher, 2001).

Research on the ways technology acts as a barrier to student success appears to be more limited than research on faculty related barriers. However, the literature on barriers for students involves similar themes of demographic factors combined with

knowledge, access, support, and general attitudes toward or anxiety about technology (Deursen and van Dijk, 2015).

The Digital Divide of Access. The traditionally, the highest-profile technology barrier for students in education has been access-related and is often called “the digital divide”. This concept encompasses both access to technology hardware, software, and services and the quality of services related to those tools (Cohron, 2015). The classic digital divide is defined as inequality of technology access across geographic and socio-economic divides (OECD, 2001). This divide most negatively impacts minorities, second language and/or non-English speakers, and the poor.

The demographics of the California State University population ensure that the Digital Divide is an important issue and should not be overlooked. Per Sacramento State's most recently compiled "University Fact Book" (2016), the Fall 2016 student body of 30,510 was "majority minority" with 29.4% of students self-identifying as "Latino", 28.2% as "White", 20.1% as "Asian", and 6.0% or less as "Multiracial", "Other", "African American", "Foreign", "Pacific Islander", and "American Indian". In addition to the ethnic diversity of the campus, socioeconomic factors indicate that the Digital Divide is a particular concern for Sacramento State: more than 46% of that student population was "Low Income" in Fall 2016 (University Fact Book, 2016).

The STC helps bridge the Digital Divide for Sacramento State's most vulnerable students. The STC integrates with a suite of other services that speak to the Digital Divide such as the Laptop Loan Program, traditional computer labs, and the Virtual Lab

service. As a result, student perceptions of the technology access, services, and support they receive at the STC are important for this evaluation.

A New Digital Divide of Skills. Despite productive efforts to address the traditional digital divide by providing access to valuable tools and services, the challenge of support effective technology use remains even when the basic resources are secured. Having sustained access to hardware and software does not necessarily mean that people who know how to apply that technology effectively to achieve their goals. While social media is ever-present in the lives of many students, that form of experience may not extend to the kinds of skills necessary for effective technology use in the academic environment.

As noted in the report, “The Digital Divide and Its Impact on Academic Performance” (Metros, Sun, 2011), a lack of technology experience and skill can be a substantial barrier to student success in their coursework. In an environment that supplies technology tools without the attendant support required to develop technology skills, another form of the digital divide often appears. As Johnson, Adams, and Haywood (2011) summed up this skills-related barrier in a New Media Consortium report, "the digital divide, once seen as a factor of wealth, is now seen as a factor of education: those who have the opportunity to learn technology skills are in a better position to obtain and make use of technology than those who do not" (p.4).

Resolving all forms of the digital divide ultimately comes down to enhancing opportunities for both access and technology-related learning.

This skill-related barrier speaks to the core goal of the STC and its support of students. The center seeks to provide students the technology skills they need to complete their assignments as part of their overall university-based preparation for the professional world. As a result, this evaluation will measure student perceptions of the STC's impact on their technology skills and ability to complete coursework.

Technology Identity and Anxiety. Technology integration differences across institutions serving divergent student population has been captured in several studies. For example, in a study led by Becker (2000), data from nearly 900 schools were collected and the researchers determined that, despite less frequent technology amongst middle-class students, their application of tools typically address higher-level academic pursuits such as research while their less affluent peers frequently used technology for remedial purposes. Students with higher incomes were also found to engage in multimedia production, data analysis, and presentation construction with technology more often than low-income peers. Similarly, when Warschauer (2000) analyzed implementation of technology initiatives at an affluent school and a low-income school, he concluded, "One school was producing scholars and the other school was producing workers" (p.5).

The cumulative effect of this disparate exposure to and experience with technology can define a student's lifelong relationship with technology. As educational

researcher Joanna Goode has argued, students develop a cluster of interrelated conceptions and expectations about their relationship to technology that constitutes a defined “technological identity” by the time they reach college (2010). Students from low-income background and others who have experienced limited technology access may enter the college classroom with anxiety about their own technology skills and ability to achieve a shared level of technology proficiency with their peers. As Goode argues, these students who get a late start in the technology race need more than simple access; they require training and support to develop the necessary skills and confidence.

The STC seeks to provide students with the training and support necessary to overcome any negative relationship to technology, go beyond their technology identities, and make up for any lack of experience with technology. As a result, this study will use “technology anxiety” measures to quantify the STC’s ability to limit technology anxiety as a barrier to student success.

Chapter Three

THE EVALUATION METHOD

Introduction

In this section, I provide details on the evaluation methodology that was designed to quantify student and faculty satisfaction with the STC's services as well as identify any relationship between STC workshop services and the following variables: 1. technology anxiety among faculty and student participants; 2. perceptions of technology barriers among faculty and student participants; and 3. quality of work produced by student participants. I designed the evaluation during the Fall 2015 term, administered it throughout the Spring 2016 term, and conducted analysis during the Summer 2016 session.

Method Selection

Although a randomized experiment would be the ideal design to identify causal relationships, in this context, I was unable to achieve randomized population selection or establish a control group. No ethical process would condone purposeful exclusion of faculty and students from STC services. Thus, I selected pre-experimental designs as my best option for this initial exploratory evaluation of the STC. If the results prove to be valuable, the STC team will then have a foundation upon which to build and design more tightly controlled evaluative techniques with more direct causal implications.

In order to track changes in participant attitudes regarding technology, I elected to use a "one group pre-test/post-test". This pre-experimental design collects data from

a single group both before and after “treatment” to identify changes (Wang & Morgan, 2010). In this case, I used surveys to track changes in technology anxiety and perceptions of technology barriers in addition to collecting general service satisfaction data by administering one survey before faculty and students participated in a workshop and another after their participation.

Next, I chose the “static-group comparison” pre-experimental method to measure the impact of STC workshop participation on the quality of work produced by student participants. This design calls for comparing outcomes with a group that has experienced some treatment to outcomes in a group that has not experienced the treatment (Wang & Morgan, 2010). In this case, my designed included comparing the quality of posters designed by student who attended STC workshops with posters designed by students who did not attend workshops.

Pre-experimental designs are cost-effective, resource efficient, and provides an opportunity to avoid the ethical challenges that may arise with creating control groups. They provide valuable tools for assessing changes in participants’ knowledge and attitudes in order to provide some indication of a program’s effectiveness. However, since true control groups are not involved, I could not identify causal relationships and the results are subject to validity issues as well as other complications. For example, with the pre- and post-test design, changes observed may be due to data bias in data collection or any other factors that intervene between pre- and post-test administration. Similarly, groups used in static-group comparison efforts may include different

population characteristics that or other features that act as alternative explanations for any differences observed in dependent variable outcomes. Thus, I am cautious when interpreting the results of this study, assessing the strength of conclusions drawn, and/or generalizing the results.

First Phase: Surveys

I conducted the survey portion of this evaluation by obtaining data from student and faculty participants in STC workshops. I asked all workshop participants, via email, to fill out a web-based pre-workshop survey during the week before their workshop attendance and another web-based survey during the week following the workshop. This method allowed me to contact the full population of workshop participants without generating the kind of social desirability bias that would likely emerge in face-to-face surveys/interviews. Using an online survey also provided for ease-of-administration and removed any bias might be produced by the influence of the interviewer/surveyor. However, the tradeoffs I accepted when choosing to email requests and deliver surveys online included receiving a lower than desirable response rate.

I developed and delivered the survey instruments in question using a web-based survey design, administration, and analysis tool called Select Survey that is available to Sacramento State faculty and staff. Select Survey's well-protected status behind campus wireless contributed to the security of data collection in this case and I set the surveys to require authentication with campus accounts, thus further adding to the security of the data involved.

Population and Response Rate. The student workshop attendee population numbered approximately 1,750. I distributed electronic surveys to all participants and 296 completed both the pre and post surveys necessary for analysis. Thus, I achieved an approximate response rate of 16.9%.

A faculty population of just over 50 partnered with the STC to deliver workshops for their classes during the Spring 2016 term. However, only 13 faculty members completed both the pre and post surveys necessary for data comparison. As a result, I achieved a response rate of 26% amongst the faculty surveyed, which, I explore in Chapter 4 for implications.

Achieving a high response rate via electronic distribution of surveys is notoriously difficult and researchers should weight this cost against the efficiency and ease-of-administration they provide. In this case, the typical low response rates were likely compounded by the need for each respondent to complete two surveys, the fact that participants completed the surveys on their own time, and the overall length of the surveys. While I employed easy-to-use Likert Scale questions for most of the survey content, the surveys were rather long in term of the number of questions involved. In the end, the low response rates I achieved further complicate questions of validity around the results produced from this study. I discuss the implications of these responses rates further in Chapter 4.

Survey Variables. The primary variables targeted in these surveys are measures of technology anxiety and perceptions of technology as a barrier. These measures speak

directly to the goals of the STC in working with faculty and students. Research has also shown that these variables influence faculty adoption rates of technology and student success when confronted with technology in a university setting. Both variables are measured using survey instrument adapted from the work of Kotrlik and Redmann. These researchers have a long-running body of work focusing on technology adoption including the use of their well tested “technology anxiety” Likert scale survey instrument and a scale measuring perception of technology barriers (2002a, 2006, 2009). Those scales form the basis of the survey instruments that follow in addition to a few basic satisfaction measures administered only in the post workshop survey.

Faculty Survey Instrument.

Which of your course(s) did you bring to the STC for a workshop?

_____

Is this your first semester working with the STC? _____

Consider the kinds of trouble you may experience with using technology for your courses and rate how much of a role these potential barriers play in your teaching experience at Sac State.

	Not a Barrier (1)	**Minor Barrier (2)**	**Moderate Barrier (3)**	**Major Barrier (4)**
Availability of technology appropriate for my class size or scheduled meeting times				
Availability of technology relevant to my course				
Enough time in my schedule to learn relevant technology and develop lessons that use the technology				
My ability to integrate technology in the teaching/learning process				
My students' skill (or lack of skill) in using technology in the teaching/learning process				
Availability of technical support at Sac State to support effective use of instructional technology in teaching/learning				
Administrative support for integration of technology in the teaching/learning process				
Other (please specify)				

How anxious do you feel when…

	No anxiety (1)	**Some anxiety (2)**	**Moderate anxiety (3)**	**High anxiety (4)**	**Very high anxiety (5)**
…you are faced with using new technology?					
…you try to learn new technology-related skills?					
…you fear you may break or damage the technology you are using?					
…someone uses a technology term that you do not understand?					
…you cannot keep up with important technological advances?					
…you think about your technology skills compared to the skills of other faculty?					
…you consider using technology in instruction					
…you consider the possibility of making mistakes with technology during class, in front of students?					

STC Workshop Satisfaction and Effectiveness Measures - Post Faculty Survey Only.

When thinking about the technology workshop provided for your class, please rate your level of agreement with each of the following statements.

	Strongly disagree	**Somewhat disagree**	**Neutral**	**Somewha t agree**	**Strongly agree**
The workshop provided for my class was relevant to my coursework and learning objectives.					
The workshop instruction was clear and organized.					
My students are now better prepared to complete their coursework.					
I believe my students will produce better work as a result of the knowledge they gained.					
I was able to focus on pedagogy and refer students with technology-related questions to the STC.					
I advanced my own technology skill as a result of participating in the STC workshop for my class.					

Are there any additional services you would like to see offered by the STC or any suggestions for improving existing services?

Are there any other thoughts you would like to share regarding your STC experience?

Student Survey Instrument.

Which of your classes visited the STC for a workshop (please list all that have)?

_____

When considering your use of technology for your college courses, please rate how well these statements reflect your feelings.

	Strongly disagree	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Strongly agree**
When I entered college, I was adequately prepared to use technology needed in my courses.					
I wish I had been better prepared to use institutionally specific technology (e.g., My Sac State, SacCT, online registration, the library search system) when I started college.					
I wish I had been better prepared to use basic software programs and applications (e.g., MS Office) when I started college.					
I feel anxious when I am faced with using new technology.					
I avoid using unfamiliar technology.					
I feel anxious when I think about my technology skills compared to the skills of other students.					

Consider the kinds of trouble you may experience with using technology for your college courses and rate how much of a role these potential barriers play in your life.

	Not a Barrier (1)	**Minor Barrier (2)**	**Moderate Barrier (3)**	**Major Barrier (4)**
Availability of technology resources on campus (e.g., access to software programs, computer labs, high-speed internet access, printing services, etc.)				
Availability of technology resources at home (e.g., access to software programs, computer labs, high-speed internet access, printing services, etc.)				
Availability of technical support to help me use the technology required in my courses				
My instructors' ability to use technology in the teaching and learning process				
Other (please specify)				

STC Workshop Satisfaction & Effectiveness Measures -- Post Student Survey Only.

When thinking about the technology workshop provided for your class, please rate your level of agreement with each of the following statements.

	Strongly disagree	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Strongly agree**
The workshop was relevant to my course assignments.					
The workshop instruction was clear and organized.					
I am more prepared to complete my coursework with the skills I learned.					
I believe I will produce better work as a result of the knowledge I gained.					
I am now more familiar with the software tool(s) used in the workshop.					
I feel comfortable visiting the STC on my own for further assistance.					
I am likely to visit the STC for help with future classes/assignments.					

Are there any additional services you would like to see offered by the STC or any suggestions for improving existing services?

Are there any other thoughts you would like to share about your STC experience?

Second Phase: Student Work Artifact Assessment

In order to supplement the survey data, I devised a complimentary method of evaluating STC workshop effectiveness through student work products. One of the most commonly taught workshops in the STC addresses poster design using various technology tools that provide layout design options. The related STC poster printing service provided an opportunity to examine student work produced after receiving STC workshop instruction. Because the poster printing service is open to all students, independent of workshop attendance, I was able to separate the evaluations of posters into students who attended workshops and students who did not. I then conducted a comparison between the results for these two populations to determine whether STC poster design workshops help students produce higher-quality work.

Population and Sampling. Students printed more than 700 posters in the STC during the Spring 2016 term. I assigned each digital poster layout an ID coded to indicate whether the student in question attended a poster design workshop. I then separated the collection of posters into one of two categories based upon workshop attendance status. I then took a random sample of 30 posters from each subgroup (i.e., students who attended workshops and students who did not) for a total of 60. I consolidated the randomized samples into a single group prior to evaluation in an effort to prevent any bias created by knowing whether any given poster represented a student who attended a workshop. Once consolidated, I then applied the rubric that follows to score each poster in terms of fidelity to the standard design principles taught during

STC workshops. Ideally, I would compare scores for students who attended workshops with a much broader, randomized sample of student-produced poster designs. However, since such a sample was not available, I compared the work of students who attended workshops with that of other student-customers who did not attend workshops but used STC services to print posters. On the surface, this should indicate how effective workshop attendance is at communicating the desired design principles. Upon closer examination, this distinction becomes murkier because students who did not attend workshops may have self-selected into one-on-one or small group STC tutoring addressing the same material.

Poster Assessment Rubric. I included the assessment rubric as Figure 3. The rubric employs a zero to three rating scale across five key categories of poster layout design:

- Overall organization of content and flow;
- Balance of text, graphics, and white space;
- Grammar and spelling;
- Quality of font and graphics; and
- Attractiveness.

These categories represent the basic design principles incorporated into each STC poster design workshop, regardless of the technology tool used to generate the layouts. Assessing the degree to which poster designs of students who attended STC workshops reflect these principles gives some indication of how effective the workshops are and how well the students internalized the content. Comparing rubric scores of students

who attended workshops and students who did not may reveal differences across the groups generated by STC workshop attendance status.

Figure 3. Artifact Assessment Rubric

Poster # _____

	3	2	1	0
Overall Organization of content and flow	▪ Components and content are easy to identify/find - and follow. ▪ Content is clearly arranged so that the viewer can understand order without narration. ▪ Explicit numbering used of columns used to indicate flow (top to bottom, then L to R) ▪ Appropriate, logical organized	▪ Components and content are easy to identify ▪ Content is arranged so that the viewer can understand order without narration. ▪ Implicit flow used by making headings stand out. ▪ Not as well organized	▪ Most components and content can be found, but are not clearly identified. ▪ Content arrangement is somewhat confusing and does not adequately assist the viewer in understanding order without narration ▪ Somehow confusing on how to move through poster ▪ Not logically organized	▪ Poster lacks organization and is missing much of the content and additional components ▪ Content arrangement is confusing and does not assist the viewer in understanding order without narration. ▪ Cannot figure out how to move through poster
BALANCE of Text, Graphics, and White Space	▪ Test & graphics are evenly dispersed in the poster ▪ Graphics (tables, figures, pictures etc.) are engaging and enhance the text ▪ Plenty of room to rest the eyes. Enough separation between content ▪ There is a perfect amount of space used form margins	▪ Text & graphics are evenly dispersed in the poster ▪ There might not be enough text to explain graphics ▪ Sections of the poster are separated from one another ▪ Enough space left for margins	▪ Text & graphics are not too evenly dispersed in the poster ▪ Graphics (tables, figures, etc.) somehow enhance the text ▪ There is either too much text/graphics or not enough ▪ Not enough separation from one section to another. ▪ Not enough space left for margins	▪ Graphics (tables, figures, etc.) do not enhance the text ▪ Gives the impression of a solid mass of text and graphics. ▪ Margins are missing, poster's elements seem cut off

	3	2	1	0
QUALITY Of Font and Graphics	▪ Uses font sizes/variations which facilitate the organization, and readability of the content ▪ All text is clear and readable ▪ High contrast between text and background – text can be read very easily ▪ Uses high quality graphics (pictures, tables, figures etc.)	▪ Adequate use of font sizes/variations to facilitate the organization, and readability of the content ▪ There is enough contrast between text and background ▪ Uses good quality graphics (pictures, tables, figures)	▪ Use of font sizes/variations to facilitate the organization, readability of content is somewhat inconsistent/distracting ▪ Somehow there is contrast between text and background but not enough ▪ Graphics (pictures, tables, figures etc.) are either a little stretched or compressed or somehow pixelated	▪ Use of font sizes/variations to facilitate the organization and readability of the content is inconsistent/distracting ▪ No use of contrast between text and background – text is hard to read ▪ Graphics (pictures, tables, figures etc.) are very pixelated, or either very stretched/compressed
Grammar and spelling	▪ No spelling and grammar mistakes ▪ Author(s) name(s) is/are present and properly formatted in poster	▪ Minimal spelling and grammar mistakes that are not very obvious ▪ Author(s) name(s) is/are present	▪ Noticeable spelling and grammar mistakes ▪ Author(s) name(s) is/are half present (missing last or first name)	▪ Excessive spelling and/or grammar mistakes ▪ Poster does not include the name(s) of the author(s)
Attractive ness	▪ The poster is exceptionally attractive in terms of design, layout, and neatness ▪ Overall visually appealing ▪ not cluttered ▪ Colors and patterns enhance readability	▪ The poster is attractive in terms of design, layout and neatness ▪ Overall visually appealing ▪ not cluttered ▪ Colors & patterns support readability	▪ The poster is acceptably attractive though it may be a bit messy ▪ Visual appeal is adequate ▪ somewhat cluttered ▪ Colors and patterns detract from readability	▪ The poster is distractingly messy or very poorly designed. ▪ Not very visually appealing ▪ cluttered ▪ Colors and patterns hinder readability

Chapter Four

FINDINGS AND ANALYSIS

Overview

In this chapter, I provide the results of the analyses compiled for this evaluation. I organized the chapter so that I present the relevant results by evaluation method and population. I separated faculty from students because the STC's goals differ for each population and the STC's overall effectiveness may differ between the populations. Additionally, I separated survey results from artifact assessment because the instruments I employed target different aspects of the student STC experience. I constructed the surveys to measure technology barriers, technology anxiety, and overall service satisfaction while I designed the artifact assessment to measure the quality of the posters produced and, more specifically, the internalization, conceptual mastery, and application of the poster creation tools and techniques the STC teaches.

My review of the data revealed that the surveyed faculty and students came from a diverse array of academic programs including: Child Development; Education; English; Communications; Finance; Government; History; Human Resources and Organizational Behavior; Journalism; Mechanical Engineering; Public Policy and Administration; Recreation, Parks and Tourism; Sociology; and Speech Pathology and Audiology. This array represents six of the University’s seven colleges and indicates that the STC has likely had a broad reach across the campus. This broad customer base speaks to the flexibility built into the STC’s services, a feature that allows these service offerings to adapt to a variety of academic disciplines and pedagogical styles.

However, the low response rate my surveys generated means that the data in question could be providing a distorted picture. Readers should view interpretations of the data with a

critical eye and only see them as conclusive if more future evaluation efforts corroborate those interpretations.

Technology Anxiety and Barrier Assessment

Changes in Technology Anxiety and Barrier Scores. My initial goal in applying Kotrlik and Redmann's survey instruments was to determine whether faculty technology anxiety and perception of barriers differed after bringing their students to the STC for workshops. I decided to broaden the approach and adapt the measures to address technology anxiety and barriers relevant to the student experience in an effort to measure any potential change in the student population as well. To capture this information, I surveyed faculty and students the week before their STC workshop and then again during the week following the workshop.

In order to compare the pre and post-workshop scores from faculty and student responses, I needed participants to complete both versions of the survey (i.e., pre and post). Unfortunately, only 13 of the 51 faculty and 296 of more than 1,750 students completed both surveys producing 26% and 16.9% response rates, respectively, and insufficient data to draw solid conclusions. In addition to the generally low response rate, my results must also be considered in light of potential nonresponse bias as faculty and students who persisted through the process and filled both surveys may have differed from those who did not. It's quite possible that the analysis represents faculty and students who had a more pronounced positive or negative experience with the STC than those who chose not to respond which may have skewed the results in their direction or simply made them more extreme overall.

However, my review of the limited results from those who completed both surveys demonstrated that faculty and student technology anxiety levels and their perception of technology barriers might not move in the expected direction after an STC workshop. If any

movement in technology anxiety and barrier scores occurred after STC workshops, I expected those scores to be lower based on the sense of support faculty and students might feel after working with the STC. In reality, the survey results revealed anxiety and barrier scores that moved in both directions.

Faculty and students self-reported on several anxiety and barrier measures before and after workshops. I then paired those pre and post response values and analyzed them to measure changes in the pre and post values. Among the paired pre/post values, 24.7% of the faculty scores and 19.8% of the student scores increased while 16.7% of the faculty score and 40.2% of the student scores decreased. Table 1 and Table 2 outline the changes in scores for each population and category.

Table 1. Changes in Faculty Technology Barrier and Anxiety Scores

Total Faculty Respondents	Total Faculty Pre and Post Responses Pairs	Decreased Anxiety and Barrier Scores	Increased Anxiety and Barrier Scores	Stable Anxiety and Barrier Scores
13	182	16.7%	24.7%	58.6%

Table 2. Changes in Student Technology Barrier and Technology Anxiety Scores

Total Student Respondents	Total Student and Post Responses Pairs	Decreased Anxiety and Barrier Scores	Increased Anxiety and Barrier Scores	Stable Anxiety and Barrier Scores
296	2,960	40.2%	19.8%	40%

Again, the results are limited and a larger sample size would be necessary to provide a basis for making conclusions. However, I can say that the results defied expectations and provide

tentative speculation regarding potential sources of the unexpected outcome. Possible ways to interpret the findings include:

- Waiting one week to administer post workshop surveys may be too long. The surveys attempted to measure participant perceptions and feelings and any affect STC workshops had on those perceptions may be fleeting and/or most significant immediately after a workshop.
- The increase in some anxiety and barrier scores may be because classes working with the STC are taking on the fundamental challenge of incorporating technology into course design and the STC is unable to relieve all the stress associated with that challenge.
- If #2 above is true, the STC may legitimately be reducing anxiety around technology, but it might be unable to remove the full burden produced when faculty introduce technology into courses. This could be the case because, although the STC team assists instructors and students, the support is limited to dedicated times and places. The STC team cannot be present in the classroom and directly support the day-to-day use of technology in these courses. (Note: A campus "Learning Space Services" team supports use of classroom technology but that is limited to classroom hardware and does not address the myriad software tools instructors can use to augment courses.) However, the much higher percentage of scores that decreased amongst students, as compared to faculty, suggests that the STC may be relatively more effective at reducing technology anxiety amongst students.

Quantitative Technology Anxiety and Barrier Feedback. Although the original goal of measuring changes in anxiety and barrier scores did not turn out as expected, the overall faculty and student ratings of technology anxiety and barriers may provide data instructive for the STC's growth.

Rather than looking for changes in the pre and post survey data, I use this section to provide an overview of all the survey information on technology anxiety and barriers to get a sense of which factors most influence faculty and students. Looking across the data, 32 of the 51 faculty responded and 432 of the 1,750 students producing response rates of 62.7% and 24.7%, respectively. As a result, the conclusions I draw more solid foundation of a 62.7% response rate.

For this analysis, I translated the anxiety and barrier related survey data into numeric values as pictured in Table 3. Anxiety ratings are coded from one to 5 representing ratings of "No anxiety" up to "Very high anxiety" and barrier ratings are coded from 1 to 4 representing ratings of "Not a barrier" to "Major barrier".

Table 3. Anxiety and Barrier Coding Values

Anxiety/Barrier Rating	Numeric Value
No anxiety	1
Some anxiety	2
Moderate anxiety	3
High anxiety	4
Very high anxiety	5
Not a barrier	1
Minor barrier	2
Moderate barrier	3
Major barrier	4

After translating the information into numeric values, I identified the mean for each anxiety cause and barrier. Figures through 7 illustrate those mean anxiety and barrier values for the faculty and student populations.

Figure 4. Faculty Anxiety Ratings (Mean Value)

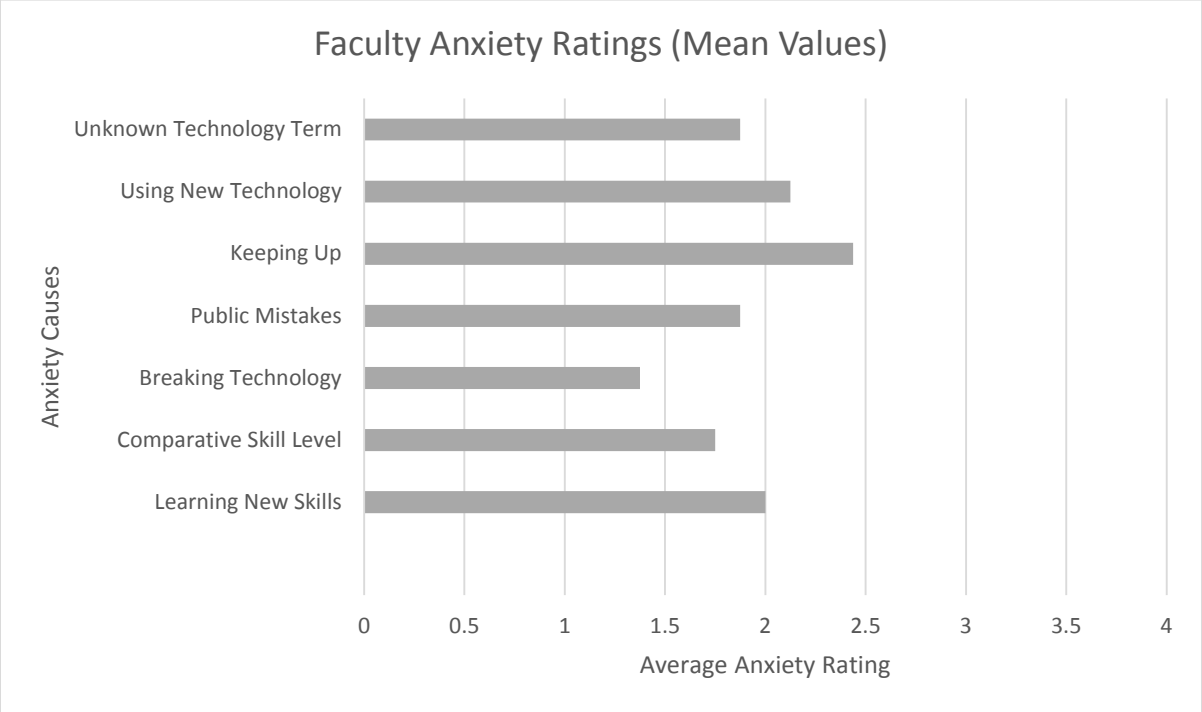


Figure 5. Student Anxiety Ratings (Mean Value)

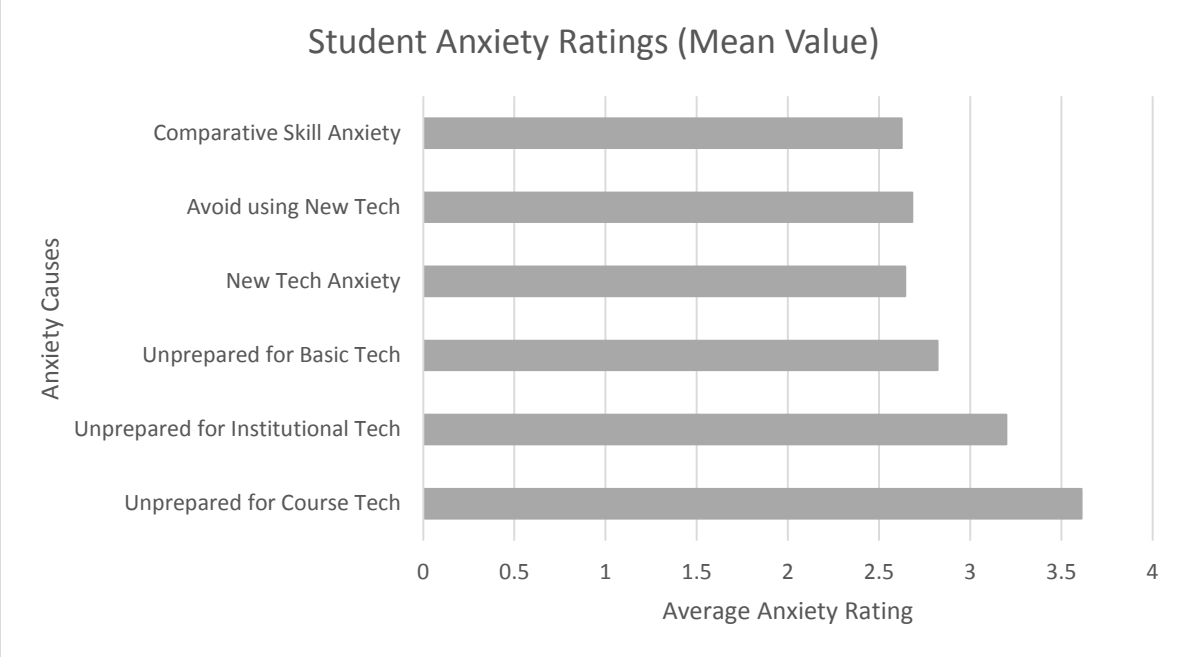


Figure 6. Faculty Barrier Ratings (Mean Value)

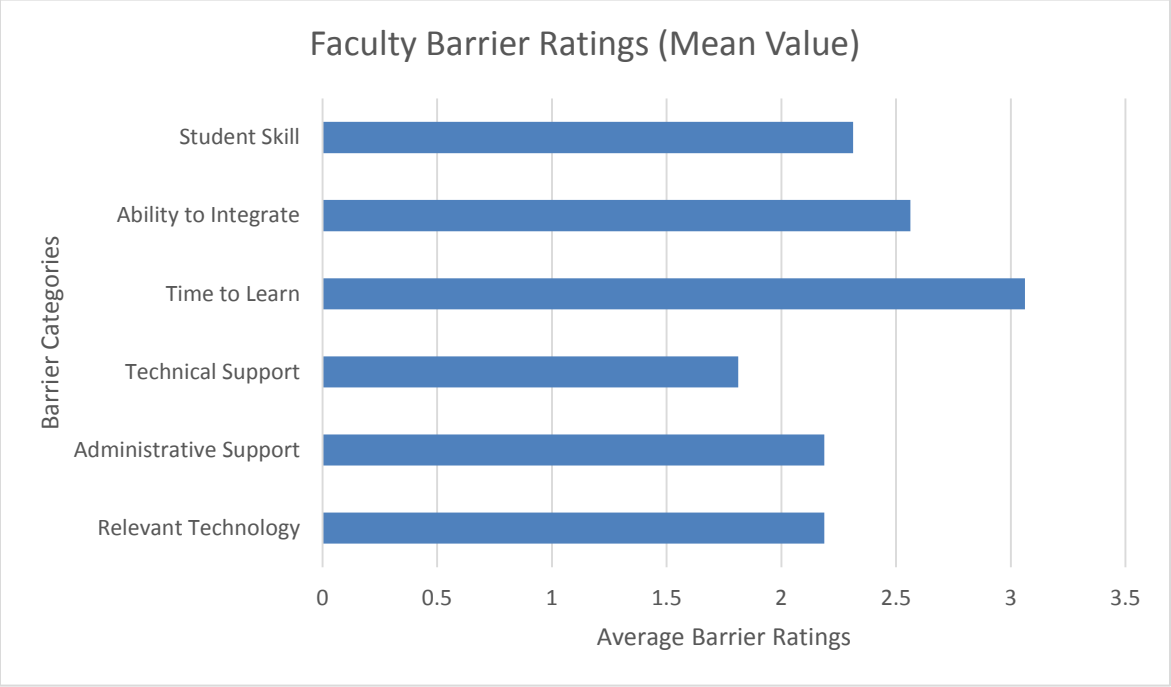
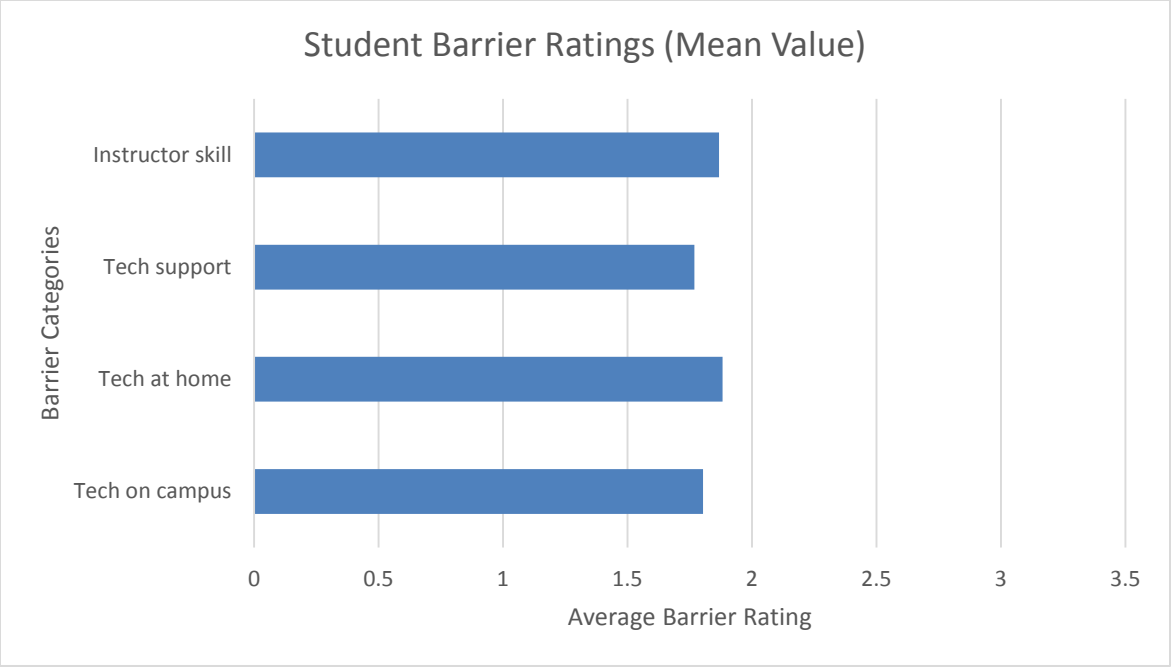


Figure 7. Student Barrier Ratings (Mean Value)



Note: More detailed breakdowns of the data by each anxiety and barrier category can be found in Appendix A.

The mean values produced for each category reveal that the following technology anxiety triggers and barriers to technology use are markedly more important to the STC's partners than the others are:

- Faculty Technology Anxieties – Faculty rated "keeping up with technological advanced" as, by far, their greatest technology anxiety amongst the available choices (mean score of 2.44) while "using new technology" followed (mean score of 2.17).
- Student Technology Anxieties – Students technology centered disproportionately around use of course and institution specific technology with mean scores of 3.20 and 3.61, respectively.
- Faculty Barriers – Faculty identified insufficient "time to learn relevant technology" and "ability to integrated technology into teaching and learning" as their most prominent barriers with respective mean scores of 3.06 and 2.56.
- Student Barriers – Although student respondents as a whole ranked none of the technology barriers particularly high, a lack of access to technology at home and limited instructor skill with technology were rated disproportionately higher than other potential barriers with mean scores of 1.88 and 1.87.

Overall, students rated their technology anxieties substantially higher than did faculty while students rated potential technology barriers much lower. The greater level of technology anxiety amongst students may seem counter intuitive as we often assume that young people are disproportionately skilled with technology. However, STC staff often observe that many students lack much depth of knowledge across even the most widely used software tools such as Microsoft Office programs. The student survey responses seem to align with this general observation as student report high levels of anxiety around using technology required for their courses and the University more broadly.

Conversely, faculty ratings focused disproportionately on barriers to using technology rather than anxieties around technology. More significantly, faculty reported that "time to learn relevant technology" and their "ability to integrate technology into teaching and learning" presented the greatest barriers. Based upon these results, I believe the STC has an opportunity to hone its goals and more effectively target the barriers and anxieties their faculty and student partners

identified as most impactful. Specifically, there seems to be a greater need amongst students for direct “how to” support of software tools while faculty need greater resources to reduce the time necessary to understand and incorporate technology into their pedagogy.

Qualitative Technology Anxiety and Barrier Feedback. The pre- and post-surveys included free format response space for additional feedback on technology-related anxieties and barriers. Faculty submitted a handful of qualitative responses and, thus, I only interpret the feedback as anecdotal evidence. Faculty responses highlighted a lack of usability in the campus Learning Management System (Blackboard/SacCT), limited Smart Classroom availability, and trouble assisting students with thesis formatting. Unfortunately, the design of Blackboard and availability of Smart Classroom technology are not within the STC’s purview but the STC does offer workshops and tutoring on research paper formatting in Microsoft Word, which includes the skills necessary to meet thesis-formatting requirements. Although past STC efforts to collaborate directly with Graduate Studies on thesis formatting workshops proved difficult to maintain, the STC could focus marketing of its formatting workshops and tutoring more explicitly on addressing thesis-formatting needs.

Qualitative feedback from students on technology anxieties and barriers was more robust. I analyzed the data to identify common themes, and outlined them below. I considered response themes that appeared in at least two students' feedback most valuable in terms of informing the STC's development and I included those in the thematic summary that follows.

- On Campus Tech Availability, Quality, and PrintSmart system is difficult to use, and so forth).
- Personal Technological Skill and Disposition – 12 students identified their personal skill level and/or disposition as a barrier to technology use. For example, several students cited unfamiliarity with particular software tools, others reported a general sense of insecurity

regarding technology (e.g., “it just isn’t my thing”), and still others felt that being older and not growing up with technology put them at a disadvantage.

- At Home Technological Availability, Quality, and Compatibility – nine students identified technology resources at home as a barrier including slow internet, lack of a smart phone, incompatibility of personal devices and required tools, and
- Instructor Tech Skill – four students also pointed out that some faculty choose not to use technology or use technology but have limited skill with it.

Although faculty only provided a handful of responses, they focused on the availability, quality, and support of campus technology tools, which was also the primary theme in the student feedback followed closely amongst students by personal technology skill and disposition toward using technology.

Although the STC cannot increase overall availability and quality of technology on campus, it can improve the quality of campus technology support offered to faculty and students to improve upon the primary concern identified by both populations. The second most common theme mentioned amongst students, “Personal Technological Skill and Disposition”, is the primary target of the STC’s core services. The STC designs its workshop services to increase student skill with specific software programs and its tutoring services to help reduce student anxiety regarding technology, making them feel more supported, and providing a foundation of technology literacy.

Workshop Satisfaction Feedback

Quantitative Workshop Satisfaction Feedback. In addition to the analysis of technology anxiety and barriers, I chose to incorporate general workshop satisfaction measures

into both the faculty and student surveys to provide a more general assessment of the STC's workshop services.

I incorporated these satisfaction measures into the electronic post-workshop survey distributed to students and STC staff asked faculty to provide workshop satisfaction responses via a paper survey handed out in-person after workshops were completed. Distributing the surveys in person and encouraging faculty to fill out the surveys on the spot produced a higher response rate. The pre and post survey population included 51 faculty members with each receiving one pre and one post survey. However, faculty often arrange workshops for multiple classes and, in this case, those faculty members received satisfaction surveys for each workshop session. Thus, the survey population remained 51 but the sample size and number of surveys distributed was 68. With 44 responses, the workshop satisfaction survey achieved a response rate of 64.7% and produced better data for drawing conclusions. Unfortunately, on the student end, these measures were part of the electronic surveys rather than distributed in-person, which produced a response rate of 16.9% and less conclusive data.

As the figures 8 and 9 below illustrate, faculty and student satisfaction with STC workshop service was overwhelmingly positive with 86.4% of faculty providing a rating of "strongly agree" and 79% of students providing ratings of "strongly" or "somewhat agree". Based upon these measures, the STC largely appears to be achieving its program goals. However, the data also reveal room for improvement. For example, more than 20% of faculty did not "strongly agree" that STC workshops allowed them to focus on pedagogy rather than technology. Although many of the faculty responses "somewhat agree" that they were able to focus on pedagogy, this represents one of the STC's primary goals and should motive the STC team to redouble its efforts in this area. Furthermore, when compared with the faculty

satisfaction data, students were much more likely to “somewhat agree” rather than “strongly agree” with the satisfaction measures. This result indicates that the STC has room for improvement in understanding and addressing student needs via their workshops. Additionally, workshop participant comfort-level with the STC and likelihood to visit in the future included more “neutral”, “somewhat disagree”, and “strongly disagree” responses than the other measures. This result indicates that the STC is not necessarily doing as well as desired at laying the groundwork for on-going relationships with students through its workshops.

Figure 8. Faculty Workshop Satisfaction Response Distribution

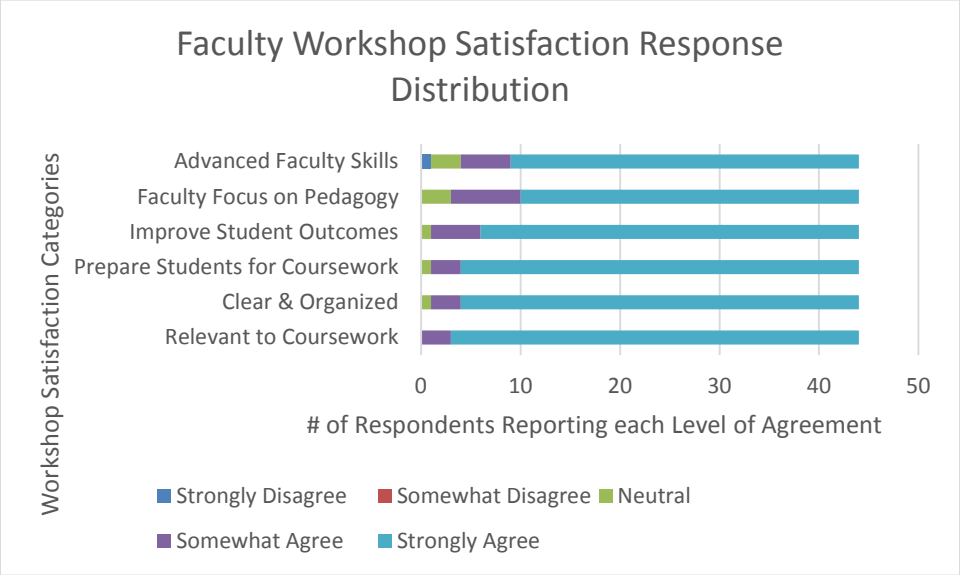
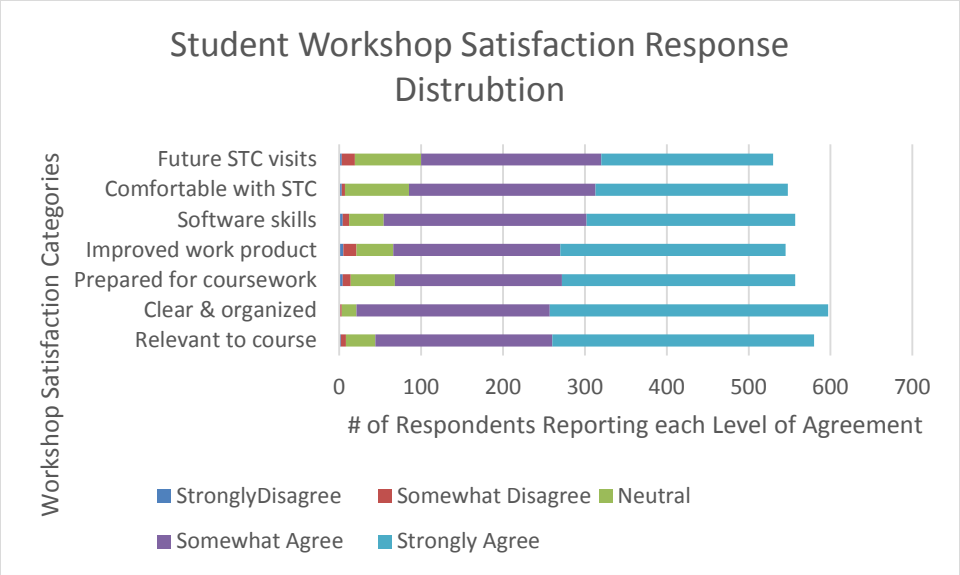


Figure 9. Student Workshop Satisfaction Response Distribution



Qualitative Workshop Satisfaction Feedback. The satisfaction survey questions included free format space for additional feedback on the STC workshops. The surveys asked

faculty and students for service improvement suggestions and any other comments they would like to provide. The feedback provided broke down into the following themes:

- Expressions of Gratitude – 20 instructors and 27 students responded with expressions of gratitude for the STC, its services, and for specific staff.
- Workshop Organization & Delivery – Nine instructors and nine students provided various notes on workshop delivery and organization including compliments on adjusting to student needs and noticing when students required more engagement. Conversely, some instructors requested more frequent checks to verify student engagement and understanding. Similarly, while some faculty and students praised workshop leaders for chunking up content and providing hands-on practice time, others requested more opportunity for hands-on practice.
- Workshop Content – Eight faculty provided a range of content related feedback including appreciation for content tailored to the class in question, requests for more discipline-specific examples in workshops, and requests for better alignment of content difficulty to audience skill level (e.g., PowerPoint content was too simple for the graduate students in the workshop).
- Service Communication – Four students expressed a desire for more communication from the STC to make students aware of its services.

Interestingly, faculty and student feedback included very similar themes at similar frequencies. While the bulk of the responses represented expressions of gratitude, both students and faculty had mixed responses to workshop organization, delivery, and content. This feedback reflects some of the core day-to-day challenges of the STC's operations. Tailoring workshop content to align with student skill-level is difficult because STC staff have typically never worked with the students in question before they arrive at a workshop. Furthermore, assessing student engagement during a workshop, properly pacing content delivery, and allowing sufficient time for hands-on practice are all soft-skills that the STC constantly seeks to build in its workshop leaders. The feedback received from faculty members confirms that the challenges in question are ongoing and are currently addressed better in some workshops than in others.

Student Work Artifact Analysis

For the artifact analysis, I compared the quality of student work products from students who attended STC workshops with their classes and students who did not. The artifacts in question were posters designed using Microsoft's PowerPoint program. (Note: The STC also teaches more complex design tools such as Adobe Illustrator but this analysis was limited to poster designed in PowerPoint to provide a consistent and fair comparison.)

Taking into account the common statistical rule of thumb that a sample size of approximately 30 is generally sufficient and the overall manageability of the analysis, I decided to analysis a total of 60 posters (Hogg, Tanis, and Zimmerman, 2015). I randomly selected and analyzed 30 posters from students who attended design workshops and 30 from students who did not. Each poster received a score of 0 to 3 across five categories using the rubric on page 18. Categories included:

- Overall organization of content and flow;
- Balance of text, graphics, and white space;
- Quality of font and graphics;
- Grammar and spelling; and
- Attractiveness.

Table 4 below outlines the mean quality score achieved for each population. Originally, I anticipated seeing better results for workshop participants or results that were on par between the two groups. Somewhat counterintuitively, the scores for workshop attendees were actually lower than those whose classes did not attend poster design workshops. I expected to see better results for workshop participants or results that were on par between the two groups.

Table 4. Artifact Analysis Summary Statistics by Population

Artifact Analysis Summary Statistics by Population		
	Sample Size	Mean Quality Score
Workshop Attendees	30	2.14
Non-Workshop Attendees	30	2.4

These results could be due to several factors:

- A bias in the non-workshop attendee population sample because students self-select into that group. The students who independently seek out STC services may typically be more high-achieving students and/or more be more personally invested in the assignment for which they are producing a poster.
- Students who do not attend course-specific workshops may be receiving one-on-one poster design assistance from the STC and this method of instruction may produce help improve student work products even more than group workshop instruction.

The overall lower scores for workshop attendees do not necessarily mean that the STC's poster design workshops are ineffective. The students who attended workshops are likely producing better quality products than they would have if their classes did not visit the STC for workshops. The scores simply provide evidence that students who visit the STC independently for post printing services (and possibly one-on-one poster design assistance) are producing even higher quality products than the outcomes achieved through course-specific workshops. I recommend further evaluation in future semesters to corroborate these results.

Chapter Five

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Future Program Evaluations – Lessons Learned

My evaluation of the Student Technology Center was an exploratory process and represents the first formal evaluation attempt for the STC. I designed the evaluation to assess the STC's goal achievement but also act as a learning opportunity upon which to build more robust, on-going evaluation processes. Thus, the lessons learned summarized below offer a significant portion of the evaluation's fundamental value.

Achieving higher response rates would increase the value and reliability of the evaluation data. In order to achieve a higher response rate in the future, I suggest that the STC:

- Convert the post-surveys to paper-based surveys completed in-person at the end of a workshop.
- Increase the focus on workshop and service satisfaction measures.
- Offer incentives to those who complete both the pre and post workshop surveys.
- Streamline the anxiety and barrier scales to include fewer metrics and make them easier to fill out.
- Discuss the survey process with faculty members when they initially arrange workshops to encourage participation.
- Explore other data collection methods such as focus groups.

Overall Assessment Results and Conclusions

Fundamentally, the overall workshop satisfaction data produced the most direct and conclusive evidence regarding the STC's goal achievement. The satisfaction surveys measured how well the workshops addressed the STC's primary goals:

- Assisting faculty in incorporating technology into courses by removing the burden of teaching and supporting the technology so faculty can focus on pedagogy.
- Helping students learn course related technology and complete assignments that involve technology.

Student and faculty feedback on the workshops was overwhelmingly positive: 79% for students and 93% for faculty. It is possible that faculty and students who were highly pleased with their STC experience self-selected into providing customer satisfaction feedback at a higher rate than those who were displeased. Future evaluators could address this potential self-selection bias by adjusting the survey methods to achieve a higher response rate. In addition to the overall satisfaction ratings, various data points from the evaluation highlight potential areas of improvement for the STC's services. I explore those key areas of improvement below.

Recommendations for Addressing Faculty Technology Barriers

Although tracking changes in reported faculty technology anxiety and barrier measures did not turn out to be a fruitful effort, the overall pre and post-survey data from faculty on these topics is instructive. Faculty reported that "time to learn new technology" and their "ability to integrate technology into the teaching/learning process" were the two most significant barriers to use of technology in their courses. Furthermore, workshop satisfaction data indicated that faculty ability to focus on pedagogy rather than technology received the lowest satisfaction scores (although the satisfaction scores were positive overall).

These reported concerns and barriers are precisely what the STC seeks to address by offering course-specific workshops so that faculty can focus on pedagogy rather than learning and supporting technology. However, realizing the outsized importance of these factors, I would recommend that the STC venture more deeply into the area of course design support. STC staff currently offer to consult with faculty on which tools might be most appropriate for a particular project but the team could go further and build out samples of technology-infused, discipline-specific projects with related learning outcomes and assessment rubrics that could become "plus and play" for instructors.

Furthermore, faculty and students both reported faculty skill with technology as a potential area for improvement. The STC focuses on support coursework that involves technology but does not currently address faculty use of technology in course delivery. Considering this, I would recommend that the STC collaborate more closely with its related Technology Learning Center (TLC) program, which offers technology training and support to faculty. A seamless integration between the STC and TLC would improve current capacity to address both student coursework that involves technology and faculty course design/delivery involving technology.

Recommendations for Addressing Student Technology Barriers

Although overall feedback from students on STC service was largely positive and self-selection bias may have generated artificially high satisfaction numbers, the degree of positivity amongst students was noticeably lower than that of faculty. For example, approximately 80% of faculty gave satisfaction ratings of "strongly agree" in the feedback surveys while roughly 50% of students did the same. This outcome indicates that the STC's workshops are significantly better at addressing faculty needs than those of students.

- Intensive Student Needs Assessment: My primary recommendation for improving services to students would be executing more intensive surveys and focus groups with students to better understand their concerns in order to improve service alignment with their needs.

In addition, the evaluation data highlighted a few specific areas of improvement that warrant increased focus.

- Relationship Building: STC workshops play a fundamental role in building on-going relationships with both faculty and students. However, workshop satisfaction scores for student comfort with the STC and likelihood to visit in the future were lower than any other metrics. The STC should focus on ways to make the workshop experience more universally welcoming and actively solicit connection with students post-workshop such as sending follow-up invitations to visit the STC for support.

- Workshop Training/Delivery: Several students and faculty members mentioned workshop pacing and integration of hands-on practice time as an issue. These areas are constant challenges facing the STC and there is no single approach that will universally address the preferences of all workshop participants. However, I recommend that the STC redouble its efforts to train workshop leaders on the soft skills of workshop delivery including reading your audience, frequent check in's, and how to supplement and/or pare down workshop content when delivery takes more or less time than expected.
- Technology Access: The STC student services are heavily focused on tutoring, workshops, and printing. However, student feedback highlighted a need for increased access to computers and software on campus. Thus, I recommend that the STC increase its marketing focus on its role in providing hardware, software, and space for students.

Improving Communication and Campus Outreach

A common theme in the evaluation's qualitative feedback from students was improving STC communications. Students were generally happy with the STC's services but often mentioned that they wanted more information about STC services and/or wish they knew about the STC earlier in their educational career. Faculty workshop feedback included similar feedback regarding reaching students earlier in their academic careers. The STC understands the value of marketing its services to campus and reaching students as they enter the university.

However, student feedback indicates that current efforts do not go far enough. The STC's current communications and marketing efforts include: CAMP, the Student Research Symposium, EOP, Summer Bridge, First Year Experience, Orientation, and the Leadership Initiative[1]. Yet, many students are still unaware of the program's services. I would recommend that the "intensive student needs assessment" mentioned above include a specific focus on how best to communicate with students.

In addition to building relationships with faculty, cultivating awareness amongst students is, ultimately, the foundation that allows the STC to make a difference. By better understanding how to reach students, the STC will improve its ability to build the foundational technology literacy critical to student success across all academic disciplines that will serve them as they enter the professional job market upon completing their degrees.

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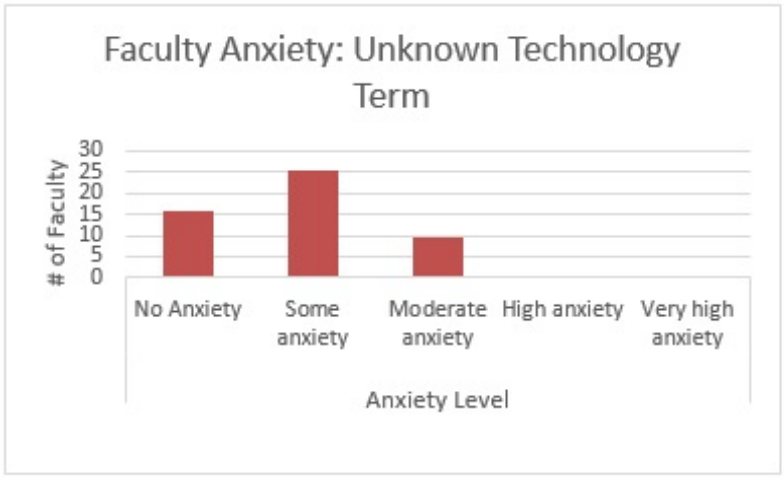
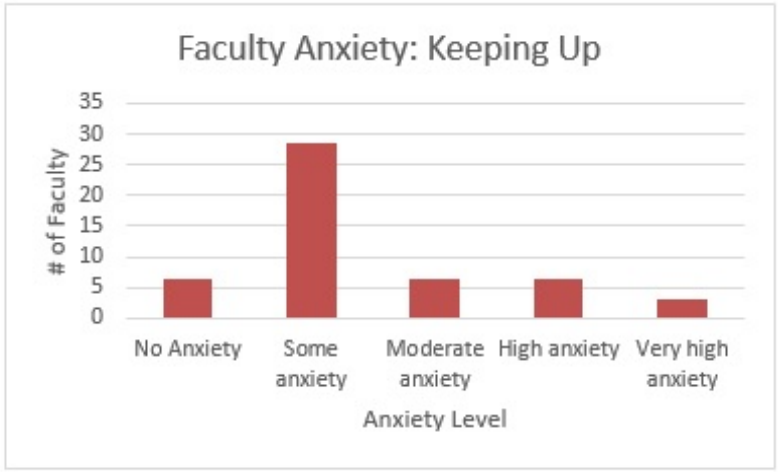
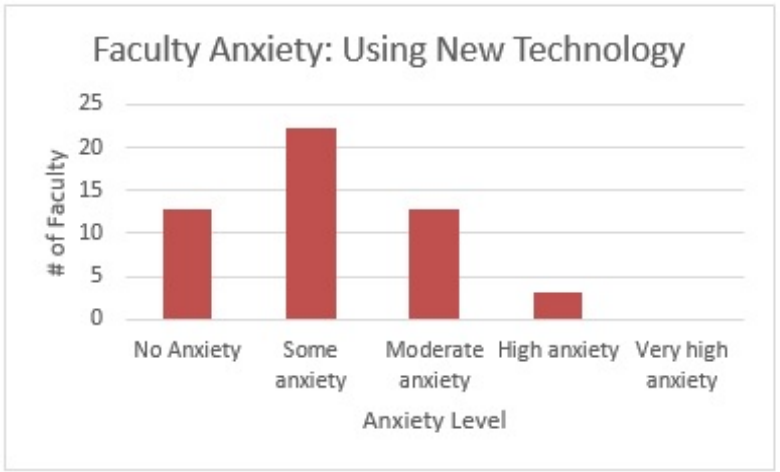
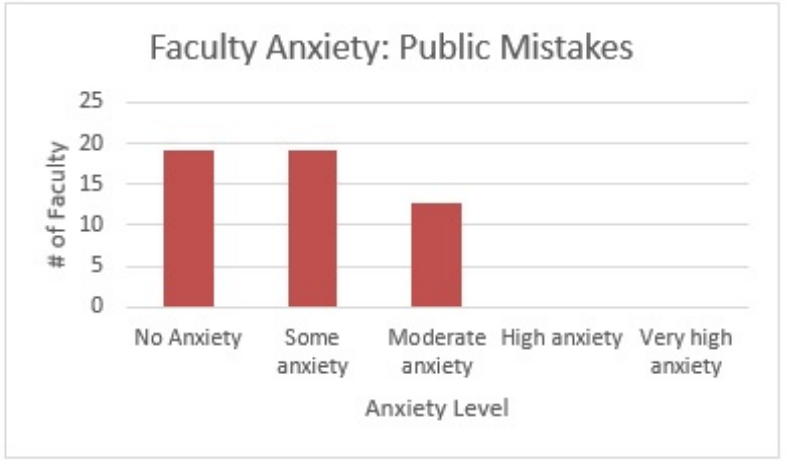
[1] These STC partner programs are a diverse set of student-focused programs. Programs such as College Assistance Migrant Program (CAMP), Educational Opportunity Program (EOP), and EOP's Summer Bridge focus on improving outcomes and graduation rates for vulnerable and underrepresented student populations. Student Orientation and the First Year Experience work to support students during their earliest days at Sacramento State and work to ease them into the college experience. Additionally, the Leadership Initiative and Student Research Symposium provide university-wide opportunities for student to enhance their educational experience by developing leadership skills, engaging with the campus, and highlighting their work.

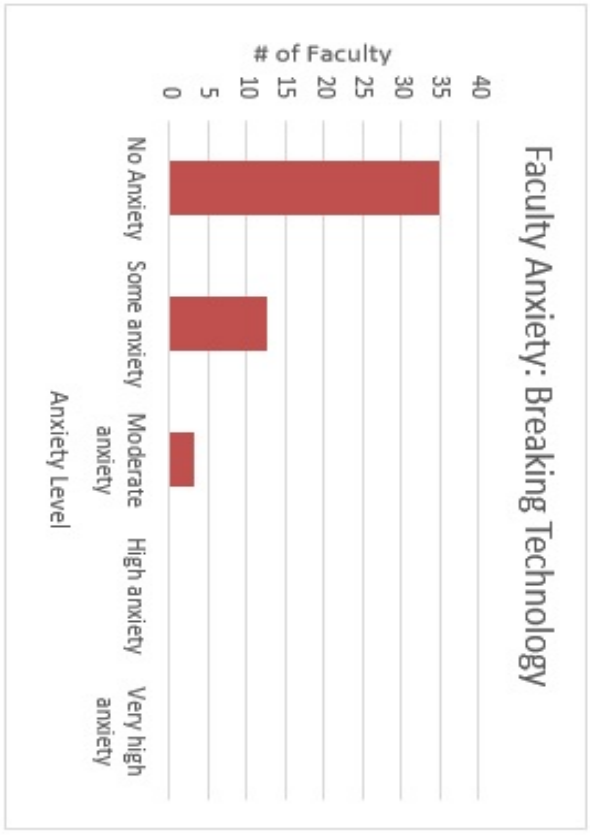
Appendix A: Detailed Faculty Survey Results

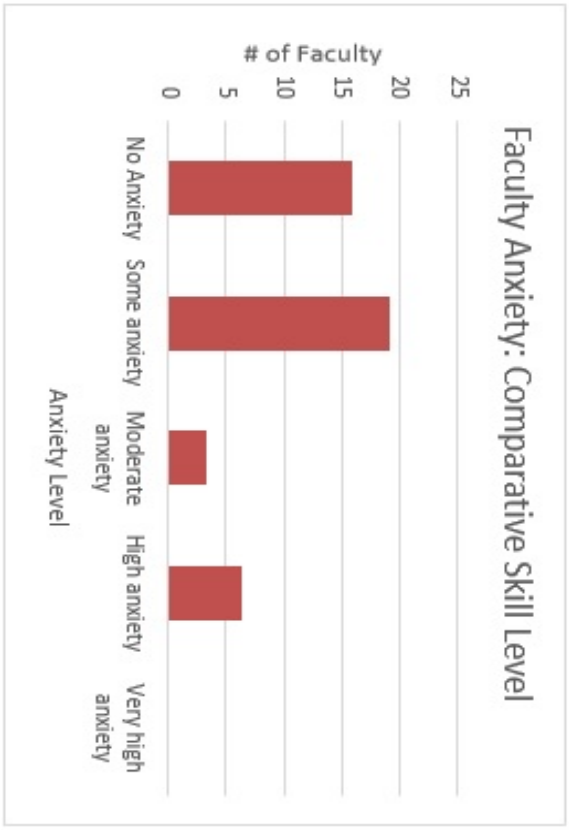


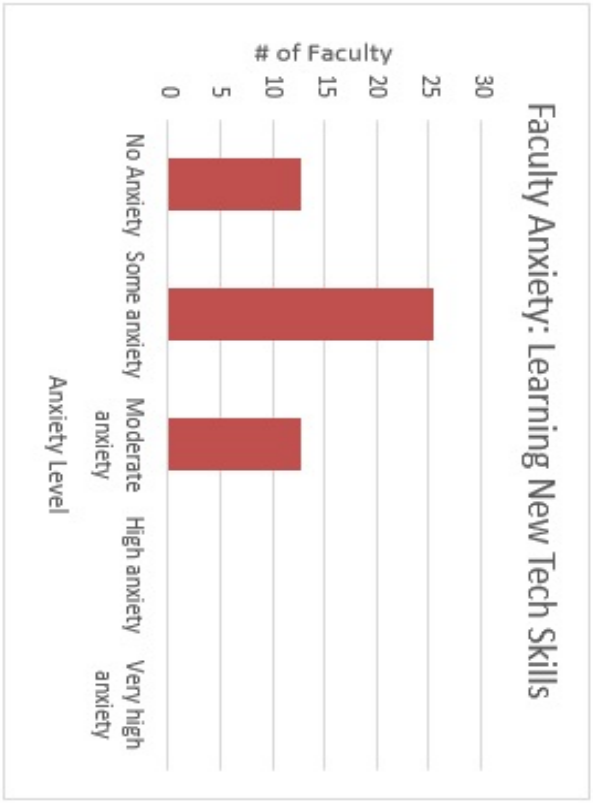


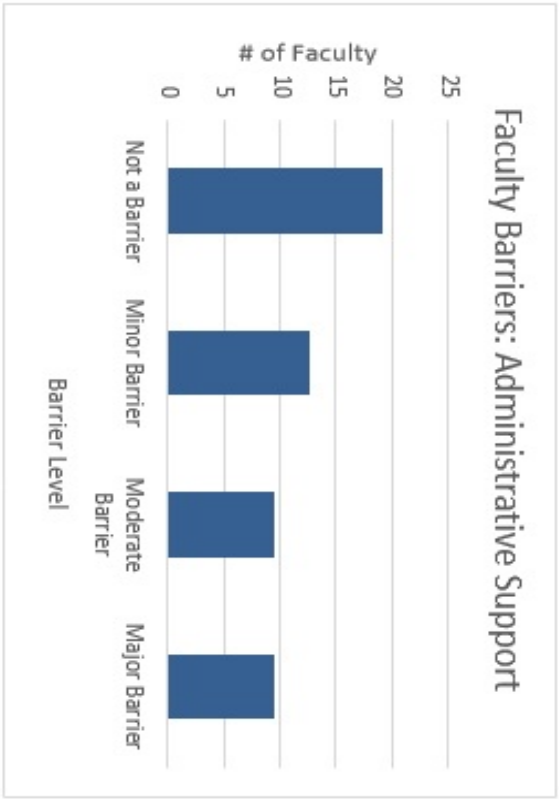


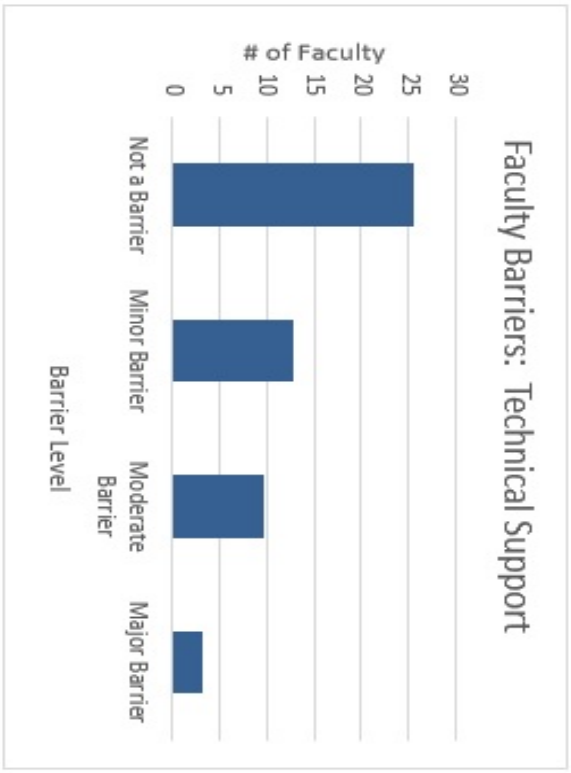


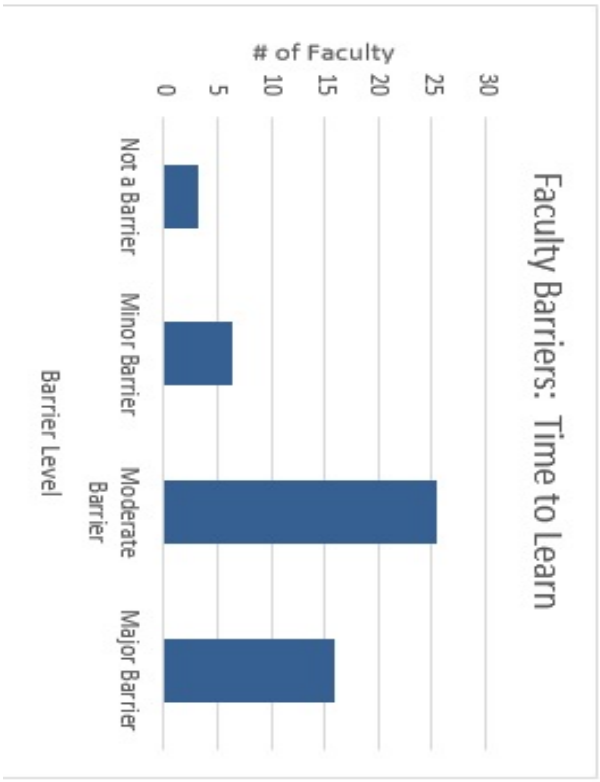

Faculty Anxiety: Breaking Technology
# of Faculty
0
5
10
15
20
25
30
35
40
No Anxiety
Some anxiety
Moderate anxiety
High anxiety
Very high anxiety
Anxiety Level

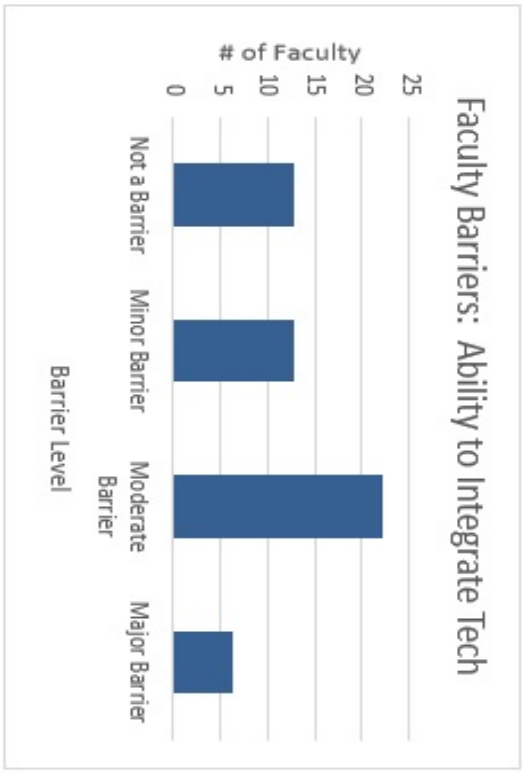

Faculty Anxiety: Comparative Skill Level
# of Faculty
0
5
10
15
20
25
No Anxiety
Some anxiety
Moderate anxiety
High anxiety
Very high anxiety
Anxiety Level

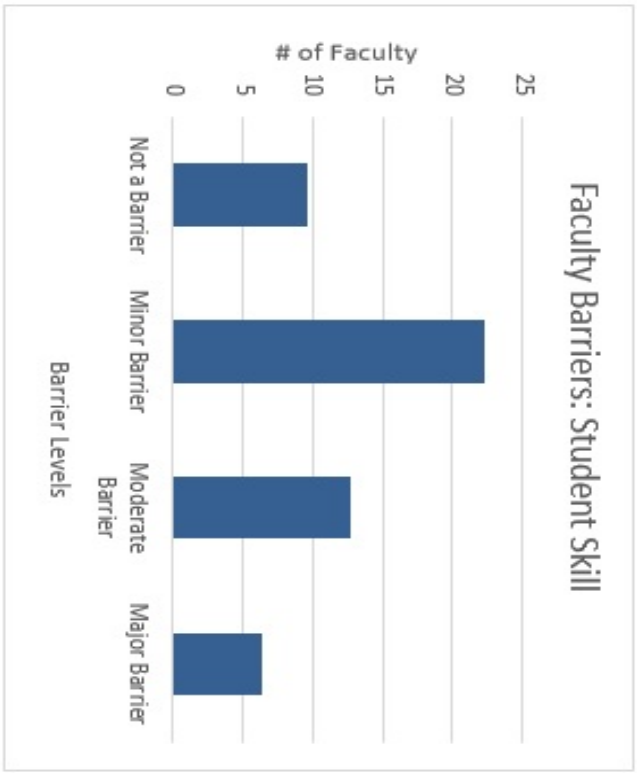

Faculty Anxiety: Learning New Tech Skills
# of Faculty
0
5
10
15
20
25
30
No Anxiety
Some anxiety
Moderate anxiety
High anxiety
Very high anxiety
Anxiety Level


Faculty Barriers: Administrative Support
# of Faculty
0
5
10
15
20
25
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Level

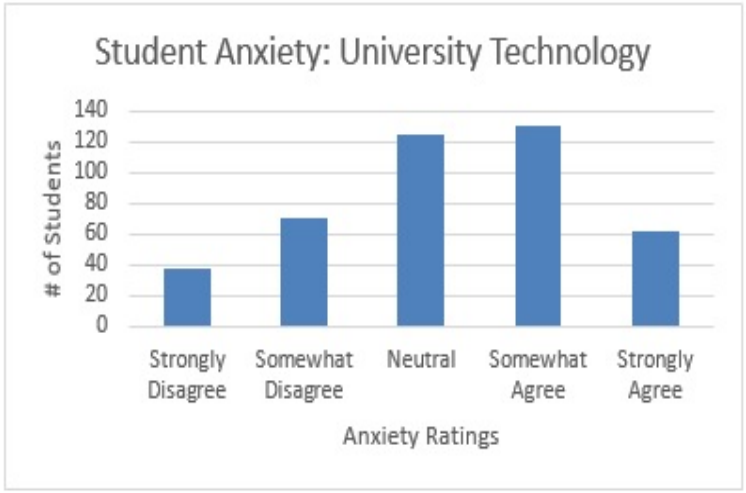

Faculty Barriers: Technical Support
# of Faculty
30
25
20
15
10
5
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Level

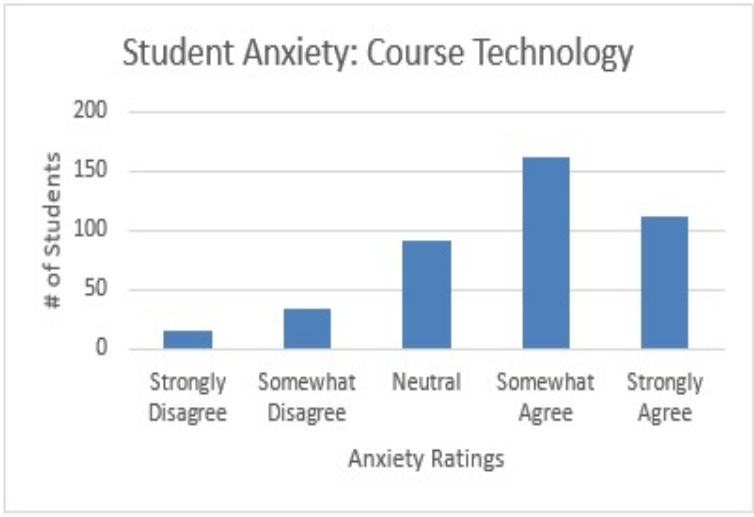

Faculty Barriers: Time to Learn
# of Faculty
30
25
20
15
10
5
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Level

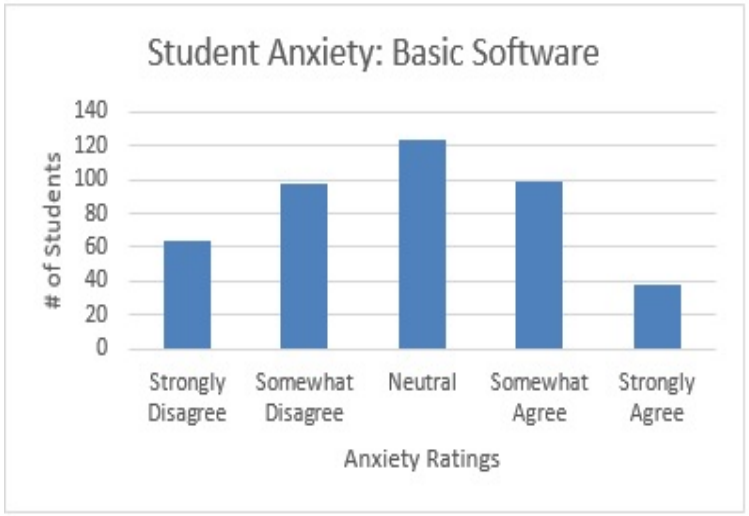

Faculty Barriers: Ability to Integrate Tech
# of Faculty
25
20
15
10
5
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Level

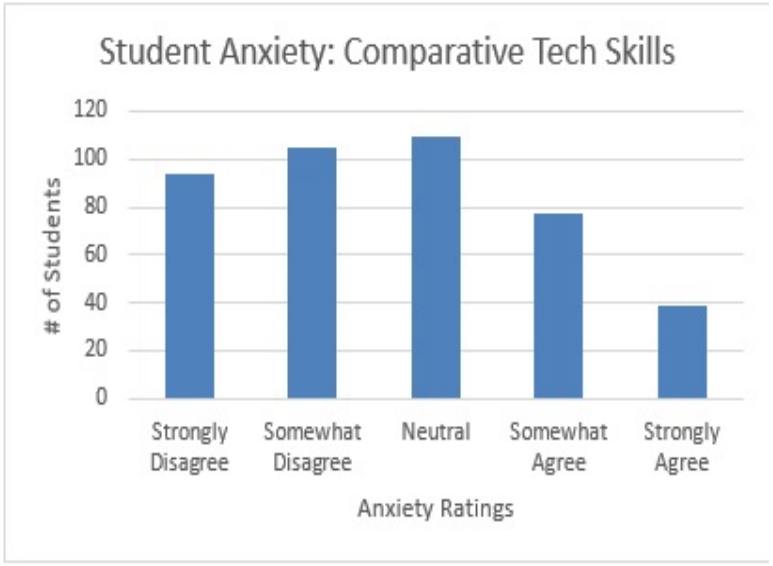

Faculty Barriers: Student Skill
# of Faculty
25
20
15
10
5
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Levels

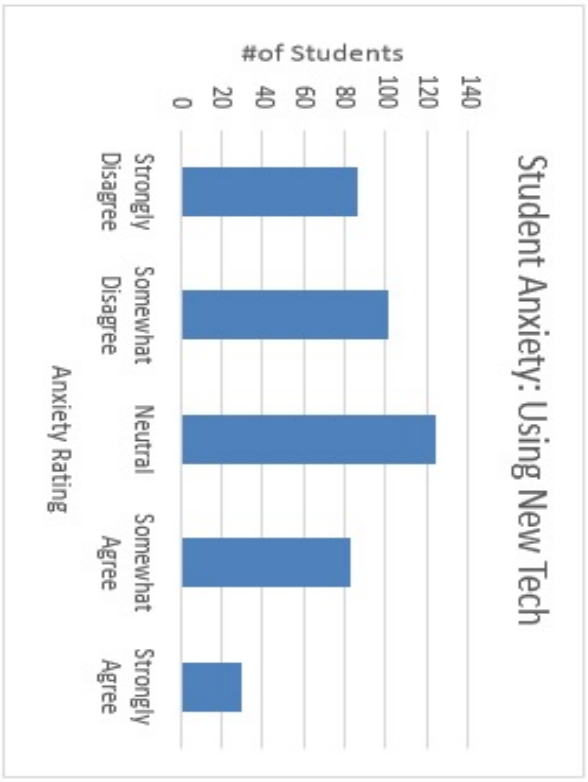
Appendix B: Detailed Student Anxiety and Barrier Survey Results

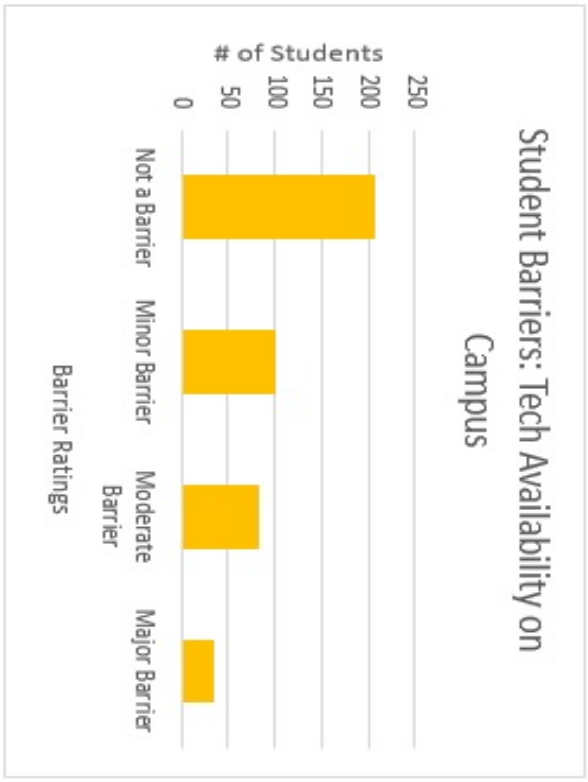


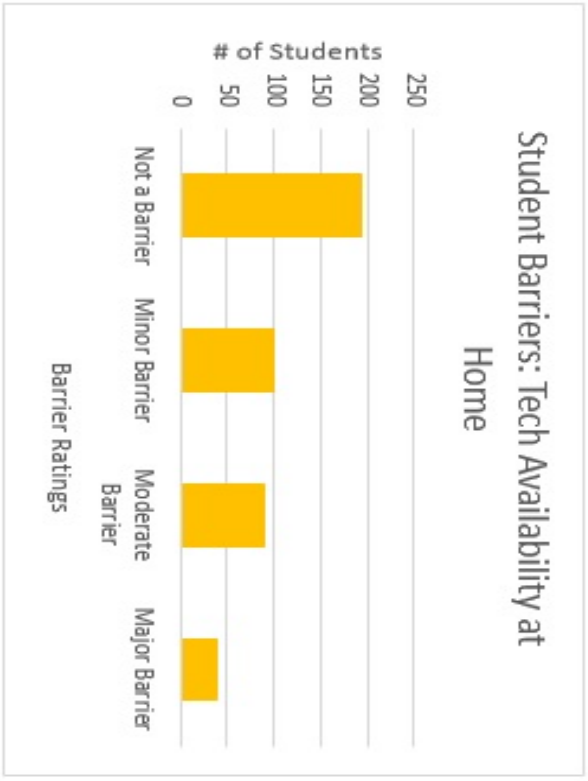


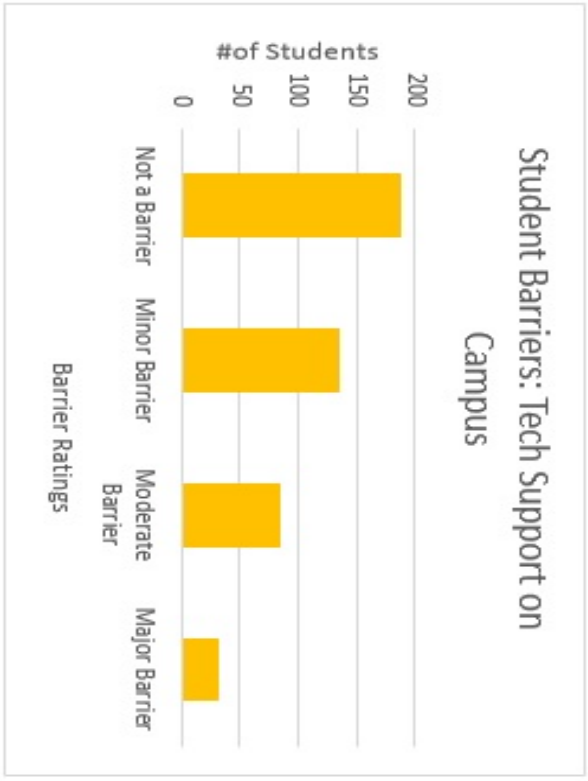


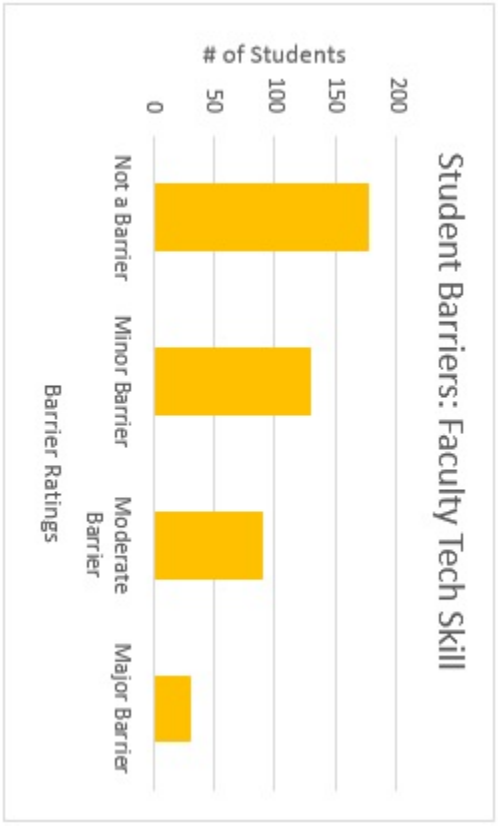



Student Anxiety: Using New Tech
#of Students
140
120
100
80
60
40
20
0
Strongly Disagree
Somewhat Disagree
Neutral
Somewhat Agree
Strongly Agree
Anxiety Rating


Student Barriers: Tech Availability on Campus
# of Students
250
200
150
100
50
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Ratings


Student Barriers: Tech Availability at Home
# of Students
250
200
150
100
50
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Ratings


Student Barriers: Tech Support on Campus
#of Students
200
150
100
50
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Ratings


Student Barriers: Faculty Tech Skill
# of Students
200
150
100
50
0
Not a Barrier
Minor Barrier
Moderate Barrier
Major Barrier
Barrier Ratings

Appendix C: Student Work Artifact Analysis Scores

Poster #	Workshop Attendee	Overall organization of content and flow	And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
1	Yes	3		2	1	1	1.6
2	Yes	1		2	2	1	1.6
3	Yes	3		2	3	2	2.2
4	Yes	3		3	3	3	3
5	Yes	3		3	2	2	2.4
6	Yes	2		2	2	1	1.6
7	Yes	3		1	2	2	2
8	No	3		2	1	1	1.6
9	Yes	1		3	1	2	1.8
10	Yes	3		2	3	2	2.2
11	Yes	2		2	2	2	2

Poster #	Workshop Attendee	Overall organization of content and flow	And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
12	Yes	2		2	2	1	1.8
13	No	2		1	1	2	1.4
14	No	3		3	3	2	2.6
15	No	3		2	1	1	2
16	No	3		3	2	2	2.6
17	No	3		3	2	2	2.4
18	Yes	3		2	2	2	2
19	Yes	2		2	2	2	2
20	No	3		3	1	2	2
21	No	3		2	3	2	2.6
22	No	3		2	2	1	1.6
23	No	3		3	3	3	2.8

Poster #	Workshop Attendee	Overall organization of content and flow	And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
24	Yes	2		2	1	2	1.6
25	No	2		2	2	2	2
26	No	3		2	2	2	2.4
27	Yes	2		3	2	1	2
28	No	3		3	3	3	3
29	Yes	2		1	2	1	1.6
30	Yes	3		2	3	2	2.2
31	No	3		3	2	3	2.8
32	Yes	3		2	3	1	2.2
33	No	2		3	1	2	2
34	Yes	3		3	3	2	2.8
35	Yes	3		2	2	1	2

Poster #	Workshop Attendee	Overall organization of content and flow	And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
36	Yes	1		2	3	2	2.2
37	No	3		2	3	2	2.6
38	Yes	3		2	2	3	2.6
39	No	3		3	2	3	2.8
40	Yes	2		3	2	3	2.6
41	Yes	3		2	3	2	2.6
42	No	2		2	3	2	2.2
43	No	2		2	3	2	2.4
44	Yes	3		2	3	2	2.4
45	No	3		3	3	3	3
46	No	3		2	3	2	2.6
47	No	2		2	2	2	2.2

Poster #	Workshop Attendee	Overall organization of content and flow	And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
48	No	3		3	3	3	3
49	No	3		3	3	3	3
50	Yes	3		2	3	2	2.6
51	No	3		3	2	3	2.8
52	No	3		3	3	2	2.8
53	No	3		3	2	2	2.6
54	Yes	3		3	3	2	2.6
55	Yes	3		2	3	3	2.8
56	No	2		2	3	3	2.6
57	Yes	2		2	2	2	1.8
58	No	2		3	3	2	2.6
59	No	2		3	3	2	2.6

Poster #	Workshop Attendee	Overall organization of content and flow And	Quality of font and graphics	Grammar and spelling	Attractiveness	Individual Average
60	Yes	3	2	3	2	2.4
61	Yes	3	3	3	2	2.6

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